

**3<sup>rd</sup>** International  
Conference on  
**Smart  
Plant  
Protection**  
January 03-04, 2023



**Institute of Plant Protection**  
**Muhammad Nawaz Shareef University of Agriculture,**  
**Multan, Pakistan**

3rd International  
Conference on  
**Smart Plant  
Protection**

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INTRODUCTION TO

# Institute of PLANT PROTECTION

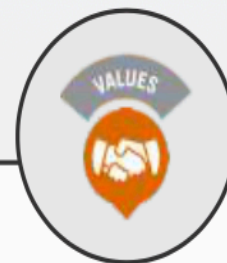
The foundation of teaching and research in Entomology and Plant Pathology in Southern Punjab was laid with the establishment of the MNS-University of Agriculture Multan in 2012. Based on Plant Pathology, Entomology and Weed Science, Institute of Plant Protection (IPP) was established in 2019. We owe to our distinction, the dedication to excellence in research and teaching, therefore attracting many students at undergraduate as well as postgraduate and doctoral levels. The main thrust of IPP is the application of plant protection measures and techniques in identification, characterization of newly emerging and reemerging pests and to devise their management strategies for food security. The Institute has inherited ties with local research institutes like CCRI, CRS, MRI, AMRI, Agri. Extension, Pest Warning and Quality Control of Pesticides etc. These links will pave the path in grooming the students at the Institute in a professional and practical way. Several research projects have been submitted to renowned funding agencies of National and International like USAID, Higher Education Commission (HEC), Pakistan Science Foundation, Pakistan Agriculture Research Board (PARB), International Foundation for Science (IFS), ACIAR and JICA. Moreover, five research projects have been funded by PARB, HEC and IFS on Cotton Whitefly and Pink bollworm, Mango Fruit and Shoot Borer and Mango Fruit Fly, and viruses of onion, garlic, and cucurbits respectively. Currently, active programs are B. Sc. (Hons.) Agriculture (Entomology & Plant Pathology), M. Sc. (Hons.) Entomology, M. Sc. (Hons.) Plant Pathology, Ph. D Entomology and Ph. D Plant Pathology.



Developing an integrated system of research and outreach for plant protection.

#### Mission of Institute of Plant Protection

Uplifting the agricultural community through enhancing agricultural productivity by minimizing losses caused by insect pest complex and diseases using modern and environmentally friendly measures, stabilizing the natural ecosystem.



#### Goals of Institute of Plant Protection

- Development of human resources equipped with modern innovative technologies to manage and control insect pests and disease-causing organisms.
- Introducing eco-friendly approaches for effective management of biotic stresses.
- Offer diagnostic services to public and private sector organizations and farming communities.
- Ensuring sustainability of the natural agro-ecosystem promoting biological control of insect-pest complexes and diseases.



Everyday a plant faces plenty of challenges of biotic factors including insect pests, diseases, competition of weeds and several abiotic stresses. Smart Plant Protection is critical to secure and maintain crop productivity. Pesticide-dominated control strategies are threatened by the widespread evolution of resistance in many major crop pests, whilst regulation to limit the unintended environmental and human health impacts of pesticides is reducing control options therefore there is an urgent need for innovation in crop protection.

The Smart Plant Protection conference is designed to address these challenges by bringing the latest technology to bear on improved detection, monitoring, prediction, and control of biotic threats. We focus on understanding the mechanisms, genetics, ecology, evolution, and management of crop-pest interactions. The SPP platform would highlight the need for crop protection strategies that enable more targeted interventions, using a systems-based approach that integrates chemical, genetic and agroecological approaches. The participants would develop a vision to reduce pesticide use, limit evolution of pesticide resistance and to design integrated and evidence-based approaches that deliver innovation in crop protection, limit unintended negative environmental impacts and secure the long-term productivity of agroecosystems.

#### **The Conference Aims and Objectives**

The International Conference will provide insight into innovations and advances in Plant Protection, aiming to protect the plant resources from the invasion and infestation of insect pests, plant pathogens and weeds. The conference would provide a collection of innovative ideas and recent research undergone by students, academia and industrialists, world over. A pool of thought-provoking opportunities would enable networking and provide opportunities for collaborations and alliances on plant protection; stimulate and facilitate discussions and dialogues between stakeholders like scientists, researchers and practitioners including policy makers, business, civil society, and farmers.

Prospective authors across the globe have contributed through submissions of their research abstracts, papers, and e-posters. High quality research contributions describing original and unpublished results of conceptual, constructive, empirical, experimental, or theoretical work in all areas of Plant Protection are cordially invited for presentation at the conference. The conference solicits contributions of abstracts, papers and e-posters that address themes and topics of the conference, including figures, tables, and references of novel research materials.



# CONFERENCE THEMES

## **1. INSECT PEST MANAGEMENT**

1. IPM - Integrated Pest Management
2. Migratory Pests and Biosecurity
3. Pesticide application and Management
4. Biopesticides/Microbial/Natural pesticides
5. Biodiversity of pests
6. Conservation of beneficial insects
7. Innovative techniques in Plant protection
8. Climate change and **insect pest management**
9. Resistance

## **2. PLANT DISEASE DIAGNOSTICS AND MANAGEMENT**

1. Innovative techniques
2. Population's genetics
3. Induced Plant Immunity
4. Invasive and Emerging Plant Diseases under changing climate
5. Plant-microbe interactions
6. Recent trends in Plant Disease Management
7. Role of Plant Pathology in Global Economy
8. Disease modeling
9. Resistant sources
10. Postharvest pest management

## **3. WEEDS MANAGEMENT**

1. Weeds as risk to food security
2. Alien invasive weeds
3. Weeds role in conserving pathogen and insects
4. Weedicide Resistance
5. Allelopathic weeds

## **4. BIOTECHNOLOGY FOR PLANT PROTECTION**

1. Biotechnological tools for pest management
2. Endophytes and plant protection
3. Genome editing
4. Innovative approaches for plant protection

# KEYNOTE SPEAKERS

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Participants from 15 different countries i.e. Australia, Benin, Canada, Chile, China, Egypt, England, Indonesia, Iraq, Japan, Malaysia, Pakistan, Sudan, Turkey, United States of America graced the event physically or online. Organizing Committee of the SPP-2023 is thankful to all the friends for supporting the success of the conference since 2021.

## Our Participants



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# **THEME-1:**

## **INSECT PEST MANAGEMENT**

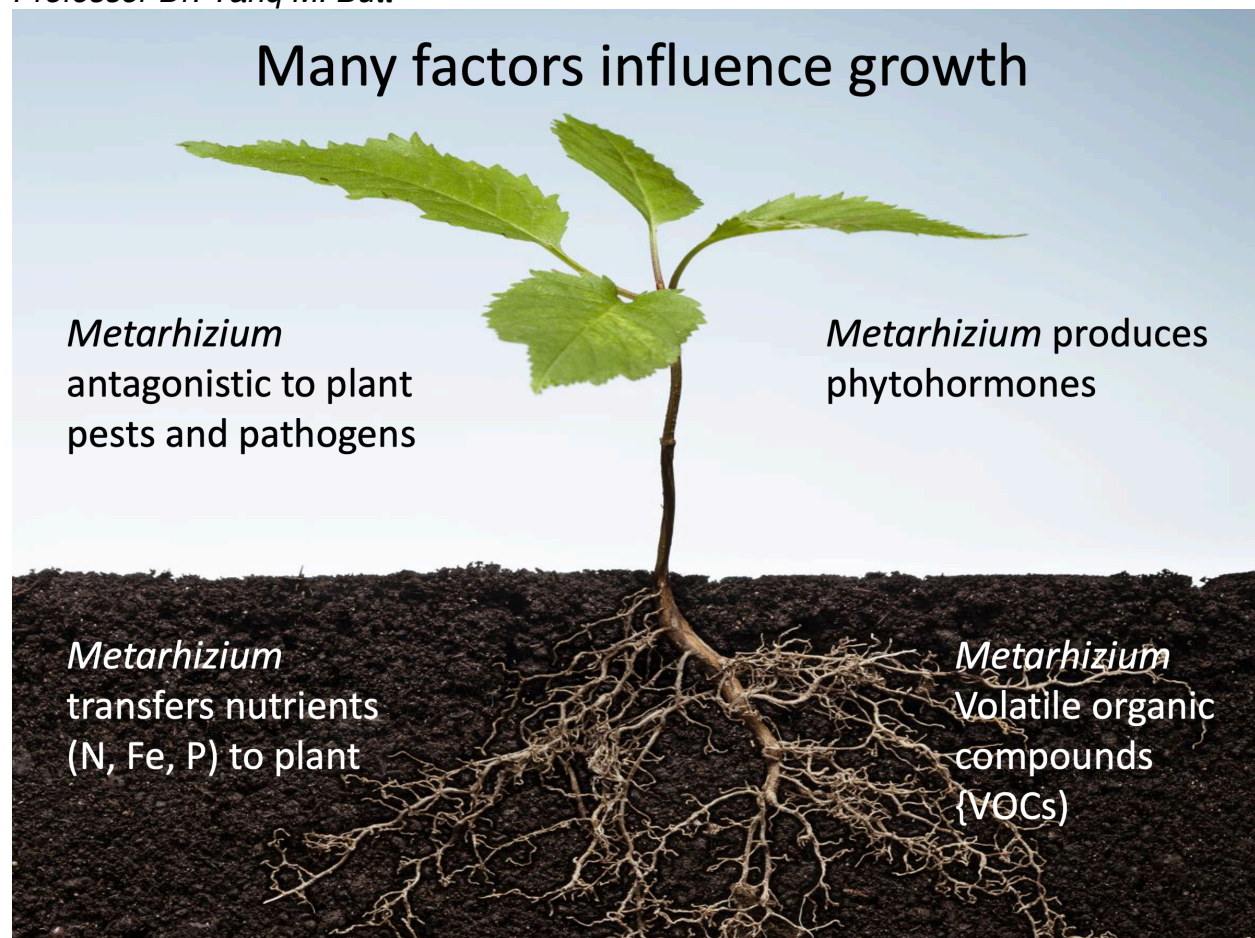
### **ORAL TALKS**

**THEME-1: INSECT PEST MANAGEMENT  
ORAL TALKS**

**SPP-IPM-101**

**Metarhizium – a multifunctional microbe**

*Professor Dr. Tariq M. Butt*

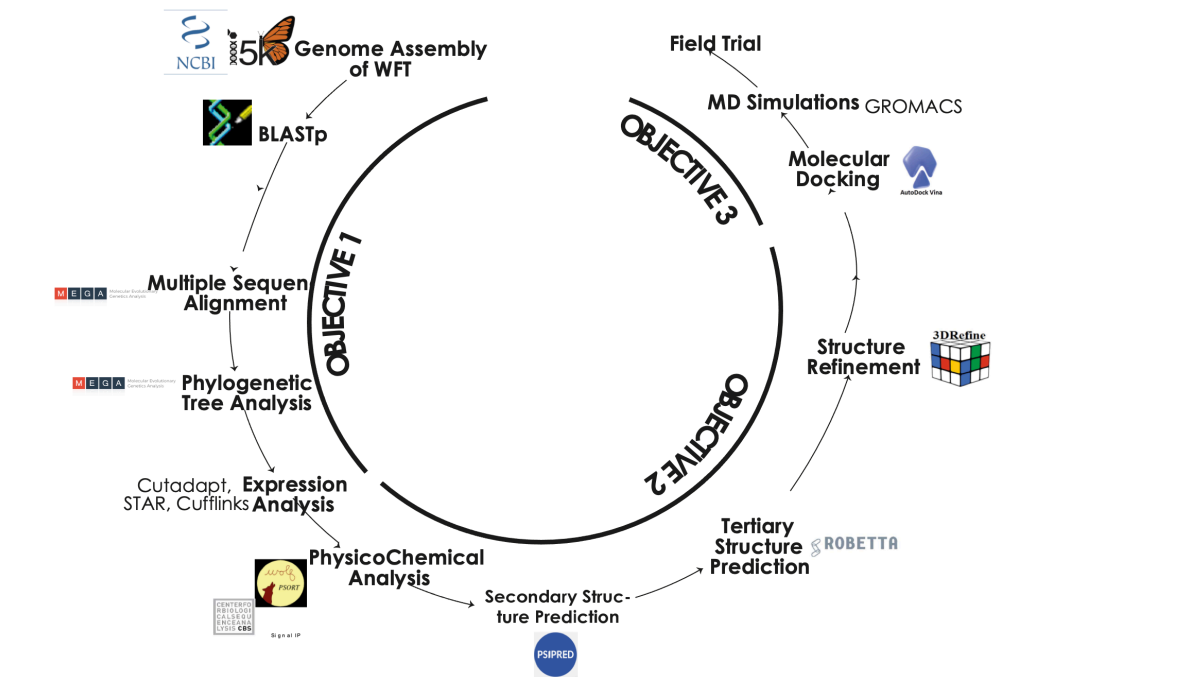


SPP-IPM-102

**Computational and Genomic Analysis for semiochemicals screening  
 Western Flower Thrips lure development as a case study**

*Dr. Syed Farooq A. Shah, Razbio Limited*

**Methodology**



**SPP-IPM-103**

**Efforts to use soft Pesticides for the Control of Insect Pests as contribution towards Green Chemistry**

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**ABSTRACT**

**BACKGROUND:** In the last decades during the post-war period, agriculture has developed towards methods that are more intensive. Among these is increased use of agrochemicals. In the Sudan Gezira, as an example, cotton spraying started as early as season 1945/46 when only 1% of the cotton area was sprayed once. By 1978/79 the problem caused by the cotton insect pests, particularly the cotton whitefly (*Bemisia tabaci*), flared up. The number of sprays per season went up, reaching 9.25 sprays in season 1978/79, which might be attributed partly to the rapid resurgence of insects' pests as a result of the use of non-selective insecticides, which badly affected the natural enemies of these pests. The joint use of natural enemies and selective pesticides might contribute to combat this problem. Studying the side effects of pesticides is of prime importance to save the natural population and encourage their role as biological control agents. This paper discusses the various methods which can be used to study the side effects on natural enemies and the results of some studies carried out on the side effects of some insecticides on natural enemies both at small and large scale levels in Sudan. The study includes testing the side effects of some insecticides and their impact on biosafety (Talstar, Polo, Metasystox, Marshal and the mixture Reldan + Endosulfan) on two Predators at small-scale level at the Gezira Research Farm, Wad medani. The Impact of Polo (diafenthiuron) on natural enemies in the cotton-based ecosystem of the Gezira Scheme (Large Scale) was tested in the Study. The results indicated that Polo was relatively safe both at small scale and large-scale level to the natural enemies observed during the study. This study can be considered as the beginning of a regional testing program in Africa with collaboration of international organizations interested in conserving bio-agent.

**Keywords:** Cotton, Sudan, Biodiversity, insecticides, side effects

#### SPP-IPM-104

### **Effect of Communication Towers on the Performance and Behavior of *Apis mellifera* L. (Hymenoptera: Apidae) (the external activity) in Baghdad, Iraq**

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#### **ABSTRACT**

**BACKGROUND:** Beekeeping of honey bees, *Apis mellifera* and the multiplication of this insect is one of the most important branches of agricultural investments. Bees are one of the best and most active pollinators, representing 80% of pollinated insects of cultivated crops. Many factors affect their activities, one of them is electromagnetic radiation.

**METHODS:** The aim of this study was to investigate the effect of the radiation emitted by communication towers on the behavior of honeybee communities externally. The experiments were conducted in the apiaries of the College of Agricultural Sciences and Engineering in Al-Jadriyah area. The first location was 500 meters, the second location was 150 meters from the telecommunication tower and the third transaction was placed directly under the tower. The height of the tower was 30m and the amount of radiation emitted from it was 925 MHZ.

**RESULTS:** The results of the external activity of the foraging workers recorded the first treatment as highest average followed by the second treatment at an average while the third treatment recorded the lowest average for the foraging bees. The triple overlap between the site, the time and date recorded the second treatment as the highest rate for evening time, followed by the first treatment in the morning. While the third treatment recorded the lowest average for the foraging bees. The activity of collecting pollen was highest in the second treatment, followed by the first treatment. The lowest rate of collection was recorded in the third treatment. The triple overlap between the site, time and date showed significant differences between treatments. The total activity of bee nectar or water collection recorded the highest activity rate in the first treatment, followed by the second treatment and the lowest activity in the third treatment. The triple overlap between the site, the time and date recorded the first transaction on the date of 9/5 pm the highest rate, followed by the second treatment for the morning time on the same date. The lowest rate for the preparation of the workers of the whole nectar or water was recorded in the third treatment for morning. The effect of the radiation emitted by the tower on the ability of bees in the metabolism showed no significant differences between the rates (wet weight, dry weight, protein ratio, fat percentage). The results of the analysis showed significant differences in carbohydrate levels and the ash content). At the end of the experiments, the total weight of honey was calculated for all the cells according to their location. The treatment at the distance of 500 m gave 8 kg for the treatment, while the lowest was in the treatment under the tower (6.99) kg.

**CONCLUSION:** It could be concluded that communication towers have a negative effect on the activities of *A. mellifera*.

**SPP-IPM-105**

**Lethal effects of selected novel pesticides on immature stages of *Trichogramma pretiosum* (Hymenoptera: Trichogrammatidae)**

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**ABSTRACT**

**BACKGROUND:** *Trichogramma pretiosum* Riley is an important egg parasitoid and biological control agent of caterpillar pests.

**METHODS:** We studied the acute toxicity of 20 pesticides (14 insecticides/miticides, three fungicides and three herbicides) exposed to recommended field rates. Egg, larval, and pupal stages of the parasitoid in their hosts were dipped in formulated solutions of the pesticides and evaluated 10 days later for percentage of host eggs with holes, number of parasitoids emerged per egg with holes, and stage-specific mortality of immature as well as adult wasps within the host eggs.

**RESULTS:** Seven insecticides (buprofezin, chlorantraniliprole, spirotetramat, flonicamid, flubendiamide) and miticides (spiromesifen, cyflumetofen), one herbicide (nicosulfuron), and three fungicides (myclobutanil, pyraclostrobin, trifloxystrobin + tebuconazole) caused no significant mortality to immature stages or pre-emergent adult parasitoids relative to controls. By contrast, seven insecticides/miticides (abamectin, acetamiprid, dinotefuran, fipronil, novaluron, spinetoram, tolfenpyrad) adversely affected immature and pre-emergent adult *T. pretiosum*, with tolfenpyrad being particularly lethal. Two herbicides had moderate (glufosinate ammonium) to severe (s-metolachlor) acute lethal effects on the immature parasitoids. Conclusion: This study corroborates earlier findings with adult *T. pretiosum*. Over half of the pesticides – and all the fungicides – tested in the current study would appear to be compatible with the use of *T. pretiosum* in integrated pest management programs, with respect to acute parasitoid mortality.

**Keywords:** *Trichogramma pretiosum*; immature stages; egg parasitoid; biological control; pesticides.



SPP-IPM-106

## **Pathogenicity of mycoproteins of *Beauveria bassiana* and *Metarhizium anisopliae* to *Bactrocera zonata***

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### **ABSTRACT**

**BACKGROUND:** The current study revealed the potential release of mycoproteins of *B. bassiana* and *M. anisopliae* and their lethal effects on *B. zonata*. After inoculation and precipitation of crude proteins in 95% (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> at 25° C, the crude samples were subjected to SDS-PAGE. The gel electrophoresis analysis revealed the presence of low molecular weight bands of 11kDa and 25kDa proteins from *B. bassiana* and *M. anisopliae* respectively. The pathogenicity of mycoproteins from *B. bassiana* and *M. anisopliae* was evaluated when second instar larvae, 3day old pupae and 3day old adults were subjected to protein concentrations. The larval bioassays revealed that significant maximum mortality of 73.3±3.3 and 86.6±3.3 was recorded at interval of 7 days when fed @ 10µl/g of *Bb* and *Ma* proteins respectively. Low adult emergence of 33.3±4 and 37.5±5.3 was observed when 3day old pupae were treated with proteins @ 30µl of *Bb* and *Ma* at an interval of 10 day. Low mortality of 38.0±3.7 and 48.0±5.8 was recorded when 3day old adults (♂ and ♀) were exposed to 30 µl protein from *Bb* and *Ma* at an interval of 10 days respectively. The findings of the study conclude the production of proteins and their pathogenic effects. The melanization of the larval tissues, abnormal adult emergence and deformation in wing structures were found symptomatic after ingestion of the proteins. However, the purification process of these proteins, their persistence with respect to environmental regimes and their evaluation under the field condition further are needed to be investigated.

**Keywords:** *B. zonata*, *B. bassiana*, *M. anisopliae*, crude proteins, SDS-PAGE, pathogenicity.



**SPP-IPM-107**

**To check the effect of Imidacloprid on Differentially Expressed Cytochrome P450 in Aphid Lion, *Chrysoperla zastrowi* through Comparative Transcriptome Analysis**

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**ABSTRACT**

**BACKGROUND:** *Chrysoperla zastrowi sillemi*, commonly known as the aphid lion, is a species of the order Neuroptera belonging to the family Chrysopidae. It is a useful predator that has evolved resilience to a number of different pesticides and is very efficient against many pest species.

**METHODS:** The successful implementation of IPM programs must comprehensively understand the molecular mechanism of pesticide resistance in predators. As a result, RNA-seq analysis was performed on the transcriptomes of both resistant and sensitive strains. The cytochrome P450 gene family is crucial in the metabolic process involving xenobiotic compounds. As a result, the primary emphasis of our research was focused on the CYP gene family. Through extraction, taxonomy, and phylogenetic analysis, we discovered a total of 95 distinct CYP genes, with significant growth occurring in the CYP3 and CYP4 families.

**RESULTS:** In addition, differential gene expression (DGE) analysis found that ten CYP genes from the CYP3 and CYP4 clans were differentially expressed. Out of these ten genes, nine were downregulated in the resistant strain compared to the susceptible strain (CYP4419A1, CYP4XK1, CYP4416A10, CYP4416A-fragment8, CYP6YL1, CYP6YH6, CYP9GK-fragment). The findings of the DGE are in agreement with the expression validation carried out by quantitative real-time PCR (qRT-PCR).

**CONCLUSION:** It is possible that the proliferation of CYP genes and the differential expression of those genes might serve as markers of the predator's potential to detoxify a certain class of pesticides.

**Keywords:** Transcriptome Analysis, Gene Expression, Cytochrome P450, Pesticide Resistance, *Chrysoperla zastrowi*

**SPP-IPM-108**

## **Impact of abiotic factors on foraging behavior of *Apis mellifera* in semi-arid environment of Dera Ghazi Khan**

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### **ABSTRACT**

**BACKGROUND:** The overlapping generations, cooperative brood care, and reproductive division of labor characterize honeybees as mature eusocial insects. Because of their significance to agriculture, the economy and the environment; honey bees, *Apis mellifera*, have attracted a lot of attention. Honeybees are generalist foraging bees who take food from a wide variety of classes when out foraging.

**METHODS:** To study the impact of a-biotic factors on foraging behavior of *A. mellifera*, an experiment was carried out at the research farm area of the airport campus of Ghazi University Dera Ghazi Khan. *Brassica* crops were grown at the farm area. Besides, there were beer (*Ziziphus moritiana*) and kikar (*Acacia nilotica*) trees on the farm and wild shrubs around the campus. Three average sized German type colonies of *A. mellifera* with ten frames containing one queen and fifteen thousand honeybees were used. The foraging activity observed during the blooming season of *Brassica napus* started from 15<sup>th</sup> February to 30<sup>th</sup> April. The foraging activity of each colony was observed for 10 minutes at 10:00 am, 11:00 am, 12:00 pm, 1:00 pm, 2:00 pm, 3:00 pm. The Pearson Product-Correlation Coefficient was used to evaluate the correlation of foraging accomplishments of honeybee with different abiotic factors like temperature, relative humidity, wind speed, rainfall.

**RESULTS:** The results indicated that the foraging rate of colony-1 was higher than the foraging rate of colony-2 and colony-3 as it was 48.56, 39.79 and 38.64 bees respectively. The foraging proportion of all the colonies was higher at 11:00 am than other times. At 10:00 a.m., 11 a.m., 12:00 p.m., 01:00 p.m., 02:00 p.m. and 03:00 p.m. as it was 43.67, 48.08, 45.75, 39.08, 30.92 and 31.25 bees respectively. The highest foraging rate of 151.5 bees was observed during the temperature range of 20- 27°C. When temperature was from 27- 42°C the foraging rate decreased to 9 bees. Regarding relative humidity, the highest foraging rate of 180 bees was observed at 34- 73%. Wind speed was found negatively correlated with the foraging behavior of *A. mellifera*. When the wind speed increases from 20 km/hour the foraging rate of *A. mellifera* decreases to 35 bees. However, the highest foraging rate of 106 bees was observed when wind speed ranges from 10-12 km/hour.

**CONCLUSION:** Our observations showed that *A. mellifera* worked more efficiently on a sunny day to a partly cloudy day as their foraging rate was 75.83 to 163 bees respectively. While there was no foraging on a rainy day.

**Keywords:** *Apis mellifera*, foraging, abiotic factors, semi-arid region

## SPP-IPM-109

### **Adaptability assessment of small brown planthopper, *Loadelphax striatellus* (Hemiptera: Delphacidae) to laboratory grown wheat, maize and rice using age-stage, two-sex life table**

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### **ABSTRACT**

**Background:** Population of planthoppers in rice crop has increased tremendously in the last five years in Punjab state of Pakistan especially in Kallar tract that is famous for aromatic (Basmati) rice production throughout the world. The small brown planthopper (SBPH), *Laodelphax striatellus* Fallén (Hemiptera: Delphacidae) is a polyphagous insect pest and causes huge losses to a wide range of cereal crops. However, the influence of host plants on the demographic characteristics of SBPH is still unclear.

**METHODS:** In this study, biotic potential of SBPH was determined on two other Poaceae crops, maize (*Zea mays*) and wheat (*Triticum aestivum*) in comparison to rice.

**RESULTS:** First three nymphal instars were significantly developed faster (2.1-3.2 d) when they fed on rice plants compared to maize (2.6-4.4 d) and wheat 2.3-3.7 d). No significant difference ( $P > 0.05$ ) in developmental time of 4<sup>th</sup> nymphal instar was recorded. The last nymphal instar developed longer on maize (3.95d) than on rice (3.33d) and wheat (3.17 d). The adult longevity was recorded highest on wheat (21.1 d) than on maize (18.6 d) and rice (18.7 d). The fecundity rate was reduced to 143.7 eggs/female on maize and 133.4 eggs/female on wheat as compared to rice 199.2 eggs/female. Further, age-stage specific parameters also indicated lower fecundity, life expectancy and survival of SBPH when they fed on maize and wheat than on rice. The population parameters such as intrinsic and finite rate of increase of SBPH were also lower when they fed on maize and wheat as compared to rice.

**CONCLUSION:** In spite of lower biotic potential of SBPH on wheat and maize, it can successfully survive on these alternate hosts in the absence of a major host, rice crop. Our findings could broaden our understanding of interactions among SBPH and host plant selectivity, and also exemplified the basis of integrated pest management for SBPH population.

**Keywords:** rice, maize, wheat, adaptability, assessment, survival, small brown planthopper

**SPP-IPM-110**

**Integrated Management Of Fruit Fly (Diptera; Tephritidae) Under Field Conditions**

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**ABSTRACT**

**BACKGROUND:** The present study was carried out on different fruit orchards of mango and guava in District Faisalabad for determined the population of fruit fly and evaluated various combinations of the five components of IPM.

**METHODS:** Seven treatments included treatment 1 (MATOS) + (BAT), Treatment 2 (MATOS) + (IME), Treatment 3 (MATOS) + (BP), Treatment 4 (MATOS) + (BAT) + (IME), Treatment 5 (MATOS) + (BAT) + (BP), Treatment 6 (MATOS) + (BAT) + (IME) + (BP) and Treatment 7 (MATOS) was used as control treatment.

**RESULTS:** The results showed maximum population of fruit fly before the application of different treatments in horticulture fruit garden was recorded in treatment 2 (MATOS) + (IME) in guava (79.00/trap) and minimum was recorded in treatment 7 (MATOS) mango (48.00/trap). Maximum mean fruit fly captured in treatment 1 (MATOS) + (BAT) in guava (71.00, 66.67, 62.33 and 55.00/trap) and minimum treatment 6 (MATOS) + (BAT) + (IME) + (BP) in mango (37.00, 32.00, 25.00 and 21.00/trap) on respected date. The fruit fly population before the application in square nine showed that maximum in treatment 2 (MATOS) + (IME) in guava (76.00, 68.00, 71.00, 62.00 and 57.00/trap) and minimum was recorded in treatment 6 (MATOS) + (BAT) + (IME) + (BP) in mango (42.67, 37.67, 34.67 and 28.67/trap). The data of mean fruit fly population before the application of different treatments in UAF showed maximum mean fruit captured in 2 (MATOS) + (IME) in guava (71.00/trap) and minimum in treatment 6 (MATOS) + (BAT) + (IME) + (BP) in mango (37.67/trap). Maximum mean fruit captured in treatment 2 (MATOS) + (IME) in guava (66.00, 63.00, 58.00 and 51.00/trap) and minimum population was recorded in treatment 6 (MATOS) + (BAT) + (IME) + (BP) in mango (32.67, 29.67, 24.67 and 17.67 /trap). The loss experiment results showed that highest fruit loss was recorded in treatment 1 (MATOS) + (BAT) in horticulture fruit garden guava (12.67, 10.33, 9.67, 6.33 and 3.75 %) and lowest loss was calculated in treatment 6 (MATOS) + (BAT) + (IME) + (BP) in square nine mango (3.00, 1.67, 1.33, 0.67 and 0.33%) on respected date. **CONCLUSION:** Hence, it's concluded that less loss was observed where all management methods were carried out to suppress the fruit fly population in fruit orchards.

**Keywords:** Fruit fly population, Mango, Guava, BAT and IPM

**SPP-IPM-111**

## **Integrated Management Of Fruit Borer (*Leucinodes orbonalis*) (Pyralidae: Lepidoptera) In Spring Brinjal Crop At District Peshawar Khyber Pakhtunkhwa**

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### **ABSTRACT**

**BACKGROUND:** The shoot and fruit borer, *Leucinodes orbonalis* is the major insect pest of eggplant, causing severe yield loss up to 90 per cent. Chemical insecticides remain the sole option for control of *L. orbonalis*, adopted by most of the farmers. Indiscriminate use of various insecticides led to insecticide resistance and subsequent control failure. Therefore, the study was conducted to evaluate different management practices alone and in integration against Brinjal fruit borer (*L. orbonalis*) was carried out at Newly Developmental Form (Horticulture section) The University of Agriculture Peshawar, Khyber Pakhtunkhwa during Spring, 2020.

**METHODS:** The experiment consisted of 9 treatments including control. Treatments included (Hoeing, Clipping, Hoeing + Clipping, Flubendiamide (Belt 48SC), Chlorantraniliprole (Coragen 20SC), Hoeing + Clipping + Flubendiamide (Belt 48SC), Hoeing + Clipping + Chlorantraniliprole (Coragen 20SC), Hoeing + Clipping + Flubendiamide (Belt 48SC) + Chlorantraniliprole (Coragen 20SC) and Control) followed Randomized Complete Block Design with three replications. Treatments were applied to the whole plot, twice at a 14 days interval but data was recorded on randomly selected five plants in each plot.

**RESULTS:** Results revealed that tested treatment alone and in integration were found better than control in reducing the infestation of *L. orbonalis*. However, spray application of Belt in integration with Hoeing and clipping was found the most effective in managing *L. orbonalis* infestation with the lowest shoot infestation (14.06%), fruit infestation (5.92%) and highest Brinjal yield (3178.69 kg ha<sup>-1</sup>). Results further yield that the application of Belt and Coragen used alone twice at 14 days intervals was the most profitable with highest CBR 1:8.71 and 1:8.64 respectively.

**CONCLUSION:** It is concluded that *L. orbonalis* can be well managed by integrating Hoeing+ Clipping with Flubendiamide (Belt 48SC) and Chlorantraniliprole (Coragen 20SC) rather than these control methods used individually. Hence, it is recommended to integrate with other control strategies in the IPM program for sustainable management of *L. orbonalis* in brinjal.

**SPP-IPM-112**

**Parasitism effect of *Bracon hebetor* on two Lepidopteran pests; *Chili infuscatellus* Snellen and *Scirpophaga nivella* Fab.**

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**ABSTRACT**

**BACKGROUND:** *Bracon hebetor* say (Hymenoptera: Braconidae) is a parasitoid wasp which attack on the lepidopteran's larvae of different crops especially sugarcane which is the 2<sup>nd</sup> largest cash crop and plays an important role in the national economy of Pakistan.

**METHODS:** In this study, the parasitism effect of *B. hebetor* was carried out on two Lepidopteran pests: sugarcane early shoot borer (*Chili infuscatellus* Snellen) and top borer (*Scirpophaga nivella* Fab), both these pests are parasitize by *B. hebetor*. Bioassay was conducted on the 3<sup>rd</sup> and 4<sup>th</sup> larval stage of pests that were collected from the field. The laboratory reared *B. hebetor* was used for this experiment.

**RESULTS:** Result of parasitism of parasitoid wasp on *Ch. infuscatellus* and *S. nivella* were significant based on the ANOVA table as both male and female sex ratio showed significant parasitization rate of the wasp. They showed that the eggs laid on third instar larvae were less as compared to their mean value as followed,  $5.5 \pm 0.65$  and with the fourth instar larvae as  $11.25 \pm 1.49$  of the host body. But the emergence of female wasps from the host body of 3<sup>rd</sup> larval instars were higher than the 4<sup>th</sup> larval instars, if we compare their mean values as  $6.5 \pm 0.04$  and  $5.00 \pm 0.29$  respectively. But there was no significant difference in the tested species if we compare their means.

**CONCLUSION:** The results are confined to give the high parasitization rate of the pest of the sugarcane.

**Keywords:** Lepidopterans pest, parasitization, *B. hebetor*, Sugarcane early shoot borer



### SPP-IPM-113

#### **Evaluation of different size sand particles as an effective physical barrier against *Heterotermes indicola* (Blattodea: Rhinotermitidae) under laboratory conditions**

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#### **ABSTRACT**

**BACKGROUND:** Termites are economically important pests causing damages to human belongings including *Heterotermes indicola* as an urban subterranean pest in Pakistan. It makes satellite nests for access to the food source and thus locating, controlling and eradication is not always possible.

**METHODS:** For a sustainable control, various mesh size sand particles were assessed as a physical barrier in a hollow glass tube for making tunnels of 3 cm and 5 cm in equal (03 subgroups i.e. I-III) and unequal (14 subgroups i.e. IV-XVII; based on pre-mixtures categories (A+C and A+BC) combinations at different ratios. C-20 (0.85 mm) and C-80 (60-80; 0.25-0.18 mm) mesh size sand was used as a control standard with the release of 50 workers + 2 soldiers in each glass tube.

**RESULTS:** The released termites covered significantly higher mean distance and made significantly higher mean number of tunnels in 3 cm and 5cm control barrier as compared to equal combination (subgroup I-III) mixtures. In unequal combination (A+C), termites traveled significantly longer mean distance in 5cm control (C-80) and zero mean distance in sand mixture combination of subgroup VIII, IX, X and control (C-20) with significantly more mean number of tunnels in control (C-80) and zero mean number of tunnels in sand mixture combinations of group VIII, IX, X and control C-20. Similarly, significantly longer mean distance was observed in C-80 and zero mean distance in unequal sand mixtures combination (A+BC) subgroup XVI, XVII and C-20 with significantly more mean number of tunnels in C-80 and zero mean tunnels in sand mixture combinations of subgroup XVI, XVII and control (C-20) and overall, zero blotting paper consumption.

**CONCLUSION:** Overall, coarse sand particles alone (0.85-0.30 mm) and in combination with fine particles (0.25+ mm) of equal and unequal ratios successfully stopped the tunneling and caused maximum mortality while increasing the ratio of the fine particles (0.42+ mm) have increased the chances of tunneling with the reduction in the mortality.

**Keywords:** Sand mixtures, *Heterotermes indicola*, tunneling, Control, Management.

**SPP-IPM-114**

**Impact of artificial diet and natural diet on the fitness of *Pectinophora gossypiella* Saunders (Lepidoptera: Gelechiidae) through age-stage two-sex life table**

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**ABSTRACT**

**BACKGROUND:** The fundamental studies of *Pectinophora gossypiella* are crucial to the creation of integrated management approaches.

**METHODS:** Two-sex life table is most important tool for describing the fitness and population parameters of both sexes (male and female) of an insect, while traditional life table only explains the female sex of a insect. However, no study was reported on the biology of *P. gossypiella* using two-sex life table tools. Therefore, this study explains the fitness of *P. gossypiella* on cotton seed based artificial diet and natural diet.

**RESULTS**

According to the results, the oviposition period of *P. gossypiella* was recorded to be longer on artificial diet as compared to natural diet. The total fecundity of *P. gossypiella* was maximum on artificial diet in comparison to natural diet. The population parameter including intrinsic rate of increase  $r$ , finite rate of increase  $\lambda$ , gross reproductive rate  $GRR$ , and net reproductive rate  $R_0$  of *P. gossypiella* were highest on artificial diet in comparison to natural diet.

**CONCLUSION:** This study concluded that the cotton based artificial diet was most suitable for rearing of *P. gossypiella*. This work will be useful for future studies of *P. gossypiella* regarding the molecular and genetic studies.

**Keywords:** *Pectinophora gossypiella*, cotton, artificial diet, life table, fitness.



## SPP-IPM-115

### Integration of botanicals and electromagnetic waves for in vitro control of sucking insect pests in cotton

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#### ABSTRACT

**BACKGROUND:** Sucking insect pests are more dangerous to crops owing to their ability not only to damage crops by feeding but also by vectoring several plant diseases. The use of pest control measures has significant ecological and economic consequences for insect pest management (IPM). The toxicity of conventional insecticide formulations poses a significant threat to farm workers, environment as well as to consumers. In contrast to conventional pesticides, non-chemical approaches selectively harm pest species, break down rapidly and produce edible food without harmful residues.

**METHODS:** In this study, we evaluated the combined effectiveness of electromagnetic waves (Microwaves) and the botanicals *Azadirachta indica* (L.), *Moringa oleifera* (L.) and *Citrus limon* (L.) for the control of *Bemisia tabaci* (L.), *Aphis gossypii* (G.), *Amrasca biguttula* (L.), *Oxycarenus hyalinipennis* (C.) and Thrips (L.) in cotton. Different exposure times of 5, 10, 15 and 20 seconds were used to induce microwaves with a power of 2.4 MHz.

**RESULTS:** We found that *Bemisia tabaci* (L.) experienced the highest mortality rate (27.34%), followed by *Oxycarenus hyalinipennis* (C.) (22.41%), *Thrips tabaci* (L.) (L.) (21.42%), *Aphis gossypii* (21.10%) and *Amrasca biguttula* (20.67%) when exposed to the same conditions for 20 seconds. Then hourly applications of *Azadirachta indica* (L.), *Moringa oleifera* (L.) and *Citrus limon* (L.) at four different concentrations (5, 10, 15 and 20%) were combined with ten seconds of microwave exposure time on pests. After 24 hours of the botanicals application, the highest mortality rate was recorded when a 20% solution of botanicals was integrated with microwave.

**CONCLUSION:** From above findings we concluded that microwaves and their integration with plant extracts can be helpful for the management of sucking insect pests.

**Keywords:** botanical, electromagnetic waves, in vitro control, cotton

**SPP-IPM-116**

### **Taxonomic Studies Of Aphid Fauna Of District Swat**

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#### **ABSTRACT**

**BACKGROUND:** With a view to record aphid fauna of district Swat, surveys were conducted throughout the study area during summer season of the year 2021.

**METHODS:** Specimens were collected from 26 various host plants including grass, bushes, vegetables, ornamental plants and trees.

**RESULTS:** A total of 414 specimens were recorded yielding 22 species under 17 genera. The specimens were identified through taxonomic literature.

**CONCLUSIONS:** The study came up with important results from the area and further surveys are recommended.

**Keywords:** Aphid, specimen, district Swat

**SPP-IPM-117**

## **Climate Change A Threat For The Cotton Growers In Pakistan**

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### **ABSTRACT**

**BACKGROUND:** Agriculture is the major economic pillar for Pakistan, while this sector extremely vulnerable to various factors likes climate change. Climate change means the changing conditions of various climatic factors. Currently climate change is serious threat for the whole globe. Specifically in Asia, it has significant effect on the agriculture sector which is the major revenue generating sector in these countries, like; In Pakistan about two third population is dependent on the agriculture sector. Overall climate change is serious threat for all the agricultural crops but unfortunately cotton crop is most vulnerable crop. According to the Bureau of Statistics (PBS), Pakistan, in the past ten years cotton production has almost halved due the climatic factors. Climate change has accelerated pests and diseases on crops especially cotton crop Excessive heat and extensive rain fall make the plant more susceptible for pink bollworm, white fly and other pests. High temperature also effects the quality and quantity of cotton crop, while day by day cotton demand is increasing with increasing population. Cotton industry is also in challenging condition because of decreasing cotton production area among the cotton growers. Gradually farming community is switching to the other crops which are less vulnerable. Industry and departments are working on the adapting strategies, but unless emissions are slashed, some cotton-growing areas will become unsuitable for the crop in the future.

**CONCLUSION:** So, there is dire need to transfer research-based Climate SMART cotton crop production technologies to the farming community using Agricultural Extension Approaches and strengthen the technology transfer process via using ICT's as an Agricultural Extension approach.

**Keywords:** Cotton crop, Climate change, Cotton Industry, climatic factors, Climate SMART Agriculture, Agricultural Extension, ICT's in Agriculture

**SPP-IPM-118**

## **Biodiversity Of Short Horned Grasshoppers From Middle Sindh, Pakistan**

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### **ABSTRACT**

**BACKGROUND:** Middle Sindh includes three Districts namely District Dadu, Shaheed Benazirabad and Naushero Feroze. These above said Districts possess agriculture field, their temperature is suitable for rapid multiplication of insects, like short horned grasshoppers belonging to family Acrididae and long horned grasshoppers family Tettigoniidae. They have economic importance to consider pests of different crops in these districts of Middle Sindh, so that proper diagnosis can be made, because locust is a notorious member of the above said family and is a major pest of the various cash crops.

**METHODS:** Sampling was carried out during the year 2021-22 monthly visit was made in different localities, and samples/Specimens were collected by Insect-nets and by Hand picking method from various agricultural fields of Maize, Rice, Cotton, Wheat, Grasses, Sugar cane and other vegetation from different ecological areas of District Dadu, Shaheed Benazirabad and N. Feroze.

**RESULTS:** We have collected 2416 specimens from different localities of Districts of Middle Sindh, namely village Qazi Arif, Village Ghulam Hussain Gadhi, Village Phaka, Village Muhammad Ibrahim Panhwar and Village M. Bachal Bouk of district Dadu, village walidad Zardari, village Bux Ali Dahri, village Bandhi, Village Baharo Khan Mari and village Sardar Khan Rind of District Shaheed Benazirabad and Village Puran, Gh;Hyder Jesar, Aayal Khan Tunio, Halani and Tharu Shah of District Naushero Feroze.

**CONCLUSION:** We have collected the following 17 species namely *Oxya hyla hyla*, Serville 1831, 7.28%, *Oxya fuscovittata*, Marshal 1836 7.98%, *Hieroglyphus perpolita*, Uvarov 1832 7.78%, *Aiolopus thalassinus thalassinus* Fabricius 1781 9.47%, *Aiolopus thalassinus tamulus*, Fabricius 1798 9.97%, *Acrotylus insubricus*, Scopoli 1786 7.16%, *Acrotylus fischeri*, Azam 1901 5.83%, *Locusta migratoria*, Linnaeus 1758 5.75%, *Sphingnostus savingnyi*, Saussure 1884 4.75%, *Trilophidia anulata*, Thunberg 1815 2.11%, *Truxalis eximia eximia* Eichwald 1830, 2.35%, *Acrida exaltata*, Walker 1859 5.54%, *Hilethera aeolopoides* Uvarov 1922 5.50%, *Gonista rotundata* Uvarov 1933 4.51%, *Anacridium rubrispinum* Bie Benkio 1948 4.47%, *Oxya velox*, Fabricius 1787 8.27%, *Oxya japonica*, Thunberg 1815 1.20%

**Keywords:** Short Horned Grasshoppers, Sindh, biodiversity

**SPP-IPM-119**

***Helicoverpa armigera* baseline susceptibility to *Bacillus thuringiensis* Cry toxins**

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**ABSTRACT**

**BACKGROUND:** *Bacillus thuringiensis* is a gram-positive spore forming bacteria belonging to the *Bacillus cereus* group of *Bacilli*. They produce ICP Cry toxins or Cysts toxins, as parasporal crystalline inclusion bodies (also known as  $\delta$ -endotoxins) at the onset of sporulation during the stationary growth phase. During vegetative growth, they do not form crystals and are called vegetative insecticidal proteins (VIP) and Secreted Insecticidal protein (SIP). For pest management *B. thuringiensis* (Bt) are important either in the form of insecticides or through incorporated genes in the crop.

**METHODS:** Bioassays were conducted on 1<sup>st</sup> instar larvae of *H.armigera* by the diet incorporation method to determine the susceptibility to Bt Cry toxins (Cry1Ac, Cry2Ab, Cry2A). The F2 generation was used in all bioassays.

**RESULTS:** The Median lethal concentration (LC<sub>50</sub>) of Cry1Ac, Cry2Ab, Cry2A ranged from 0.11 to 1.06  $\mu$ g/ml. The Moulting Inhibitory concentration (MIC<sub>50</sub>) of Cry1Ac, Cry2Ab, Cry2A ranged from 0.05 to 0.25  $\mu$ g/ml. The Bt Cry toxin Cry1Ac found most toxic as compared to other Bt Cry toxins.

**RESULTS:** The susceptibility data provides important information regarding variation in the susceptibility of *H. armigera* to Cry1Ac toxins. This data will aid in development and implementation of resistance monitoring.

**Keywords:** Baseline susceptibility, *Bt* toxin, *Helicoverpa armigera*, Cry1Ac, Cry2Ab, Cry2A

**SPP-IPM-120**

**Insecticidal Bioactivity of Pyriproxyfen, Lufenuron and Green Synthesized Nanoparticles of Zinc Oxide against Saw-Toothed Beetle (*Oryzaephilus surinamensis*)**

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**ABSTRACT**

**BACKGROUND:** The saw-toothed beetle (*Oryzaephilus surinamensis*) degrades the quality and quantity of stored dry fruits and cereal products.

**METHODS:** Pyriproxyfen and lufenuron along with green synthesized nanoparticles of zinc oxide were evaluated for their biocidal and growth inhibitory potential against *O. surinamensis*. When adults of *O. surinamensis* were treated with pyriproxyfen at different concentrations then significant difference was observed among the different concentrations of pyriproxyfen at 7 day, 14 day and 21 days of post application treatments. The control mortality among all the intervals was found less than 5%.

**RESULTS:** In general, the increase in mortality was observed with the increased concentration tested while increase the day interval also caused greater mortality as less mortality was found at 7 days while the maximum mortality was observed at 14 day and 21 days of post exposure period. At 7 day of treatment the mortality was ranged between 5.23%-12.5% among the different concentrations tested. At same day the highest mortality was found at concentration of 200ppm that caused greater mortality which is about 25.5% while all other concentrations were unable to cause 25.5% mortality. The mortality was found from 12.5%- 18.5% among the different tested concentrations after 14 days of treatment. After last count the greater mortality was found which is 25.25% with maximum mortality was observed with concentration of 200ppm. The lowest mortality was recorded at 50ppm. And the lowest mortality day was recorded which was day 7 and highest mortality was recorded after 14 and 21 days after treatment. While data of overall population development was observed after 30 days. Corrected mortality (%) was computed using Abbot's formula. Growth inhibition (%) was also computed before data analysis. Zinc oxide gave 49.58% adult inhibition 48.83% and 44,16% pupae inhibition values were given by lufenuron. Adult emergence inhibition of *O. surinamensis* showed an increasing trend as concentration of insecticides increased.

**CONCLUSION:** Overall, pyriproxyfen caused least adult emergence ~~it~~ at all applied concentrations.

**Keywords:** Bioactivity, Pyriproxyfen, Lufenuron



## SPP-IPM-121

### Impact of vermicompost and biopesticides on the reproduction of *Meloidogyne incognita* in eggplant

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## ABSTRACT

**BACKGROUND:** Eggplant, (*Solanum melongena*) commonly known as brinjal, is a significant vegetable crop farmed in Pakistan. Eggplant is infected by a variety of pests, the most important of which is the root-knot nematode. This pest's devastation causes the agriculture industry, especially the production of eggplant, to suffer significant economic losses.

**METHODS:** Current study was conducted to check the impact of vermicompost (vermicompost of rice straw, maize straw, and farmyard manure) alone and in binary combination with biopesticides (radiant, novastar) on Root knot nematodes (*M. incognita*) reproduction in eggplant. The *in-vivo* experiment was conducted at the Department of Plant Pathology's field area at the University of Agriculture, Faisalabad. Two eggplant cultivars (Black Beauty and Hybrid 888) were evaluated with three replications under completely randomized design (CRD). The experiment was conducted in two parts. In the first part the effect was checked on two genotypes (V1-Black Beauty and V2-Hybrid 888). In second, the impact of fourteen treatments (Rice straw, Maize straw, Farmyard manure, Rice+Maize+FYM, Rice+Radiant, Rice+Novastar, Maize+Radiant, Maize+Novastar, FYM+Radiant, FYM+Novastar, Rice+Maize+FYM+Radiant, Rice+Maize+FYM+Novastar, Disease control, Healthy control) were evaluated.

**RESULTS:** The cultivar Hybrid 888 showed minimum reproduction of nematodes and maximized the growth of eggplant. Based on a comparison of all the treatments' results, it was observed that vermicompost with biopesticide "FYM+Novastar" showed maximum yield of eggplant and reduce the reproduction of *M. incognita* followed by FYM+Radiant, Rice+Novastar, Rice+Radiant, Maize+Novastar, Maize+Radiant, Rice+Maize+FYM+Novastar, Rice+Maize+FYM+Radiant, Rice straw, Maize straw, Farmyard manure, Rice+Maize+FYM. *Meloidogyne incognita* population was significantly reduced in the soil when vermicompost and novastar were combined.

**CONCLUSION:** *M. incognita* reproduction. The findings showed that vermicompost combined with biopesticides is better for organic farming. It is useful to reduce the destructive nematodes as well as make up for the lack of nutrients in the soil.

**SPP-IPM-122**

**Farmers' perception about lecanium scale (Coccidae: Hemiptera) of apples in Ziarat, Balochistan**

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**ABSTRACT**

**BACKGROUND:** Scale insects are homopterous insects that feed on many plant species and are notorious pests of crops, vegetables and fruits. With the changing climate, like other pests, scales are now becoming emerging pests in many areas of Pakistan. Apples are among important fruit crops in temperate regions of Pakistan, especially Ziarat Valley. Since the last few years, several species of soft scale called Lecanium have become recurring pests of stone fruits and apples in Ziarat and vicinity.

**METHODS:** Questionnaire surveys always serve a good tool to assess the issues and problems faced by the target populations. Such surveys help researchers and policy makers to work on solutions for the problems discussed in the surveys. Observing the same, the current study was planned to assess the perception of apple farmers of Ziarat valley about the knowledge, attitude and practices regarding the lecanium scale. For the study, a pre-tested questionnaire was developed and 100 apple farmers were surveyed from Kawas and Cheena villages, Ziarat.

**RESULTS:** Results of the study depicted that there was severe attack of the pest on apple and plum trees in Kawas. On the contrary, less attacks were observed in Cheena. No respondent was aware of the relation between ants and the lecanium scale on the trees. They were also not aware of biological control of the pest under study, although they knew about the presence of ladybird beetles at the same time.

**CONCLUSION:** The results of the present work will serve as reference study for the policy makers and researchers to devise the management plans against the lecanium scale on apple and other fruit plants of the area.

**Keywords:** biological control, Heteroptera, IPM, KAP, sucking pest



**SPP-IPM-123**

**Identification of elusive pheromone for *Carpophilus* near *dimidiatus* management in Australian almond orchards**

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**ABSTRACT**

**BACKGROUND:** *Carpophilus* near *dimidiatus* is an emerging insect pest in almonds, causing significant damages to the crop. To control this pest, farmers are relying on the attract and kill (A&K) system which is being used in stone fruits for other species of *Carpophilus* beetles. But this A & K system didn't prove effective for this pest. There is a need to develop a new A & K system for *C. nr dimidiatus*.

**METHODS:** In order to find pheromone for *C. nr dimidiatus*, we tested adult beetles against males feeding on diet, females feeding on diet and diet alone in dual choice assays using y tube olfactometer.

**RESULTS:** After having evidence in behavioral trials that male *C. nr dimidiatus* produced odour attracted significantly higher percentage of both male and female beetles, gas chromatography-mass spectrometry (GC-MS) analysis revealed presence of male specific compound in the headspace from feeding males. Moreover, GC-MS coupled with electroantennography (EAG) confirmed the biological activity of male specific compounds in both male and female beetles' antennae.

**CONCLUSION:** This pheromone will be a breakthrough in the management of *C. nr dimidiatus* beetle in Australian almond orchards.

## SPP-IPM-124

### **Adaptability assessment of small brown planthopper, *Loadelphax striatellus* (Hemiptera: Delphacidae) to laboratory grown wheat, maize and rice using age-stage, two-sex life table**

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## **ABSTRACT**

**BACKGROUND:** Population of planthoppers in rice crop has increased tremendously in the last five years in Punjab state of Pakistan especially in Kallar tract that is famous for aromatic (Basmati) rice production throughout the world. The small brown planthopper (SBPH), *Laodelphax striatellus* Fallén (Hemiptera: Delphacidae) is a polyphagous insect pest and causes huge losses to a wide range of cereal crops. However, the influence of host plants on the demographic characteristics of SBPH is still unclear.

**METHODS:** In this study, biotic potential of SBPH was determined on two other Poaceae crops, maize (*Zea mays*) and wheat (*Triticum aestivum*) in comparison to rice.

**RESULTS:** First three nymphal instars were significantly developed faster (2.1-3.2 d) when they fed on rice plants compared to maize (2.6-4.4 d) and wheat 2.3-3.7 d). No significant difference ( $P > 0.05$ ) in developmental time of 4<sup>th</sup> nymphal instar was recorded. The last nymphal instar developed longer on maize (3.95d) than on rice (3.33d) and wheat (3.17 d). The adult longevity was recorded highest on wheat (21.1 d) than on maize (18.6 d) and rice (18.7 d). The fecundity rate was reduced to 143.7 eggs/female on maize and 133.4 eggs/female on wheat as compared to rice 199.2 eggs/female. Further, age-stage specific parameters also indicated lower fecundity, life expectancy and survival of SBPH when they fed on maize and wheat than on rice. The population parameters such as intrinsic and finite rate of increase of SBPH were also lower when they fed on maize and wheat as compared to rice.

**CONCLUSION:** In spite of lower biotic potential of SBPH on wheat and maize, it can successfully survive on these alternate hosts in the absence of a major host, rice crop. Our findings could broaden our understanding of interactions among SBPH and host plant selectivity, and also exemplified the basis of integrated pest management for SBPH population.

**Keywords:** rice, maize, wheat, adaptability, assessment, survival, small brown planthopper

## SPP-IPM-125

### Management of vegetable leaf miner, *Liriomyza spp.*, (Diptera: Agromyzidae)

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## ABSTRACT

**BACKGROUND:** Vegetables are considered medium value crops in Pakistan based on their growing areas and productivity. The vegetable crops are affected by a variety of insect pests throughout the season. Leaf miner is an immature of an insect that lives inside and consumes the leaf tissues of plants. Adult females of leaf miner puncture the leaf with their ovipositor, forming a tube pattern, and feed on the punctured parts.

**METHODS:** Host plants survey of leafminer available in Multan area was conducted and infestation percentage was calculated. Field trials for four tomato varieties were conducted as RCBD. Color traps were arranged in different combinations in separate fields for color attraction. Data of insect counts were calculated. Insecticides efficacy trials were conducted using different insecticides. Pre-treatment and post treatment data were counted after 48 hrs, 72 hrs and 7 days after treatment.

**RESULTS:** Twenty-four host plants were found infested with *Liriomyza spp.* i.e., watermelon (24% infestation), long melon (75%), pumpkin (71%), round gourd (67%), snake melon (70%), bitter gourd (50%), long gourd (89%), bottle gourd (93%), pointed gourd (80%), snap gourd (86%), ridge gourd (83%), cucumber (98%), mung bean (98%), eggplant (60%), *Petunia alba* (88%), *Zinnia elegies* (30%), cotton (10%), okra (5%), berseem (7%), tomato (89%), Pea (52%) and Canola (28%). No infestation of leaf miners was observed on potato, chilies, and sweet potatoes. Color attraction results showed that there was maximum attraction of tomato leafminer towards yellow sticky cards as compared to blue sticky cards. Varietal preference of tomato crop showed that Baby red variety was the most preferred by leafminer (*Liriomyza spp.*), and Sehar was the least preferred variety. Efficacy of different insecticides i.e., Spinetoram 120 SC, Deltaphos 960 EC, Bifenthrin 10% EC against leaf miner were also tested to evaluate chemical control of this pest. Statistical analysis of mean and variance of leafminer infestation showed that the most effective insecticide after 7 days of application, Spinetoram 120 SC @ 60 ml/acre gave 76.98%, Bifenthrin 10% EC @ 330 ml/acre showed 57% mortality. Deltaphos 960 EC @ 500 ml/acre (43 %) was the least toxic insecticide against *Liriomyza spp.*

**CONCLUSION:** Integrated approaches are recommended to manage vegetable leafminers like application of yellow sticky traps, discouraging preferred host plants, application of insecticides with novel modes of actions like spinetoram and Spinosad for effective management.

**Keywords:** *Liriomyza spp.*, Leaf miner, Color preference, Varietal preference, Management

## SPP-IPM-126

### Response of wheat aphids to different biopesticides under field conditions

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#### ABSTRACT

**BACKGROUND:** Wheat is a potential crop that could meet the country's food requirements. Although considered an agricultural country, Pakistan still suffers from a severe lack of food production. Insect pests are a key source of yield losses in the wheat crop. Aphids are among the economic yields reducing major pests of wheat. Aphid management is an essential aspect of increasing wheat yields. The cherry oat aphid, *Rhopalosiphum padi* Linnaeus, green bug, *Schizaphis graminum* Rondani, and corn leaf aphid, *Rhopalosiphum maidis* Fitch (Hemiptera: Aphididae) are all recorded to damage the wheat crop. Wheat seedlings that have been infested with aphids often develop wilted cotyledons and yellowed leaves. Aphid infestations on the podding or flowering sections cause yield reductions. Pesticides are used exclusively to control pests. Additionally, increasing applications of synthetic insecticides have resulted in higher resistance and pest resurgence. Alternatively, the use of botanicals along with insecticides can affect the activity of the aphid.

**METHODS:** The current research has been planned keeping in view the importance of managing aphid pests. The study evaluated the effectiveness of botanicals i.e., Neem, *Azadirachta indica* A. Juss (250ml/10L of water), Kortuma, *Citrullus colocynthis* Linnaeus (250ml/10L of water), Tobacco, *Nicotiana tabacum* Linnaeus (250ml/10L of water), silver nanoparticle spray (12.5ml in 10L of water), S1 bacteria (S1B) (40 $\mu$ l in 10L of water/Acre), Biopesticide (Bio-N) (10 ml in 10L of water), one insecticide Advantage (40ml/Acre), and Control on wheat aphid. Field experiments were done on wheat crops in the MNS-University of Agriculture, Multan experimental areas. Randomized complete block design under factorial was followed with three replications. Data was recorded before and after 24, 48, 72 and 168 hours.

**RESULTS:** Research on the population (%) of different species of aphids revealed that there were significant differences found in the treatments of kortuma (10.62%), Ag nanoparticle (46.65%), and Bio-N (28.45%) treatments. The data showed that the effect of biopesticides like Ag nanoparticle, Bio-N and kortuma was relatively better as compared to all other treatments because of less resistance. Aphid populations were found to be higher in the case of the control and certain other biopesticide treatments like neem, tobacco and S1 bacteria after particular hours.

**CONCLUSION:** The data obtained revealed that biopesticides had a considerably better effect than conventional treatments because of reduced resistance and the fact that it was produced under natural conditions. Such research will facilitate the management of aphids in wheat and offer fundamental direction for future researchers.

**Keywords:** Aphid, Biopesticides, Botanicals, Biological control, Management, Wheat.

**SPP-IPM-127**

**Evaluation of New Chemistry Insecticides against *Coptotermes heimi* (Blattodea: Rhinotermitidae)**

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**ABSTRACT**

**BACKGROUND:** Termites are important pest of woods and wood products in buildings. They are usually managed by the application of soil termiticides especially repellent insecticides. In the current study, two insect growth regulators and two new insecticides were tested for their effectiveness to kill an important termite species, *Coptotermes heimi* (Blattodea: Rhinotermitidae) under laboratory conditions.

**METHODS:** The insecticides (Lufenuron, Pyriproxifen, Pyrifluquinazon and Chlorfenapyr) were purchased from local market. There were 5-6 concentrations (Lufenuron and Pyriproxifen 15.62, 31.25, 62.5, 125, 250, 500 ppm, Chlorfenapyr 0.25, 0.5, 1, 2, 4, 8 ppm, Pyrifluquinazon 1.56, 3.125, 6.25, 12.5, 25, 50 ppm) of each insecticide prepared in distilled water. Each concentration was replicated four time. Filter paper treated with each concentration was placed in petri plates and 30-40 workers released in each petri plate. The mortality data was recorded after every 24 hr for a total of 10 days.

**RESULTS:** Chlorfenapyr was the most toxic insecticide as compared to others and mortality was increased with the increase in concentration of insecticides except for chlorfenapyr. In chlorfenapyr, less mortality was observed at higher concentrations (8,4,2 and 1 ppm) while maximum mortality was recorded at 0.5 ppm concentration. At higher doses, the termite workers consumed less amount of food as compared to lower doses. However, in other insecticides, the amount of food consumed was statistically similar.

**CONCLUSION:** The chlorfenapyr insecticide is more toxic and potent as compared to other insecticides and can be used for soil treatment against *C. heimi*. While IGRs can be used in bait for the management of *C. heimi* after comprehensive field trials.

**Keywords:** Insect Growth Regulators, Feeding Repellency, Mortality, Lower termites

**SPP-IPM-128**

**Systematics of Genus *Helicoverpa* Hardwick with a new record of *Helicoverpa punctigera* Wallengren (Lepidoptera: Noctuidae) from Punjab, Pakistan**

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**ABSTRACT**

**BACKGROUND:** Genus *Helicoverpa* belongs to family Noctuidae with order Lepidoptera. This genus was erected first time by David F. Hardwick in 1965, specimens of this genus are commonly known as moths which are serious pests of different agricultural crops. Despite their great economic importance, very little taxonomic work has been done on these insects in Pakistan.

**METHODS:** Specimens were collected with light traps and aerial nets. Collected moths were identified up to species level with the help of taxonomic keys. Species richness and evenness were also applied.

**RESULTS:** The research was carried out to collect and identify species of Genus *Helicoverpa* from Punjab, Pakistan. A total of three species viz., *Helicoverpa armigera* (Hubner), *Helicoverpa zea* (Boddie) and *Helicoverpa punctigera* Wallengren were collected. Of these, *H. punctigera* is a new record for Pakistan. Fore wings of *H. punctigera* are brown with a dark tracery with a black comma (kidney shaped) and a dot is present on the lower side of the wings. The moths lack a pale large spot in the black border of the hind wing which is present in *H. armigera*. Newly collected specimens infesting Tobacco, Maize and Pea plants in Punjab. The specimens were collected from Rawalpindi, Lahore, Faisalabad, Sargodha, Mianwali, Rahim Yar Khan, Dera Ghazi Khan and Multan. Shannon-Wiener Index value varies from 1.39 to 1.63. A taxonomic key for future identification is also prepared.

**CONCLUSION:** Three species of genus *Helicoverpa* were collected. *H. armigera* (Hubner), *Helicoverpa zea* (Boddie) and a new record *Helicoverpa punctigera* Wallengren for Pakistan. Specimens were infesting Tobacco, Maize and Pea plants in Punjab.

**Keywords:** *Helicoverpa, punctigera*, Maize, Punjab, Pakistan New record



## SPP-IPM-129

### Residual toxicity of chlorfenapyr treated on different types of surfaces against lesser grain borer and grainary weevil

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#### ABSTRACT

**BACKGROUND:** The lesser grain borer and the granary weevil are two common insect pests of stored grains. These insects cause significant quantitative and qualitative losses in stored commodities.

**METHODS:** In research activities, experiments were conducted to study the residual effect of a new chemistry insecticide, chlorfenapyr, treated on different kinds of surfaces (Petri dishes were used to prepare concrete, metal, and wood). Cement paste (1 kg cement + 250 ml water) was poured in petri dishes (surface area, 63.6 cm<sup>2</sup>) to prepare concrete surface; galvanized steel cut into pieces of petri dish dimensions were used to prepare metal surface and wood surfaces were prepared by cutting plywood into round pieces of petri dish size. Six dilutions (10, 20, 30, 40, 50 and 60 ppm) of a commercial formulation of chlorfenapyr were prepared. There were three replications of each treatment. Each dilution was applied using micropipette sprayer to treat three kinds of surfaces. Distilled water was applied on these surfaces for control treatment. After air drying the treated petri dishes, 20 adults of *Rhyzopertha dominica* and *Sitophilus granarius* were released separately on treated surfaces. Petri plates were carefully covered and placed in an incubator set to 28±2°C and 65±5% relative humidity. After 24, 48, and 72 hours, data on % mortality were collected.

**RESULTS:** The residual toxicity of already treated dilutions of chlorfenapyr on three surfaces were observed after 2, 3 and 4 weeks of the treatment by releasing fresh insects on treated surfaces. Mortality data was observed after 24, 48 and 72 hours after release of the insects. The highest mortality rate of *Rhyzopertha dominica* after 24 hours' exposure, was observed on the plywood and plywood surface i.e., 47.58% at 60ppm concentration of chlorfenapyr followed by surfaces such as 45.24% on concrete and then 44.08% on steel. After the exposure of 72hours, the highest mortality rate of *Rhyzopertha dominica* was observed on the plywood surface (74.08%), on steel surface (71.36%) and on concrete surface (60.24%) against chlorfenapyr with 60ppm dose rate. In case of *Sitophilus granarius* maximum mortality rate was observed on the concrete surface (47.12%) and minimum on steel (42.38%).

**CONCLUSION:** Residual pesticides are effective in managing the stored grain insect pests

**Keywords:** Toxicity, Chlorfenapyr, lesser grain borer

**SPP-IPM-130**

## **Efficacy Of Transgenic Cotton Cultivars Containing Cry Toxins From *Bacillus Thuringiensis* Against Jassid**

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### **ABSTRACT**

**BACKGROUND:** Cotton (*Gossypium hirsutum* L.) is a significant fiber crop of Pakistan that is contributing 7 to 10% in GDP. In Cotton production, Pakistan is ranked at 4<sup>th</sup> position in major cotton growing countries. Various insect pests Attack cotton crops, especially chewing and sucking pests. Among the sucking pests, Jassid (*Amrasca biguttula*) causes the most significant damage at seedling stage. Due to immense usage of insecticides these pests have developed resistance against insecticides.

**METHODS:** Selection and cultivation of resistant cotton varieties is the best approach that can minimize the attack of Jassid on cotton crop. In the present study, five Bt cotton varieties with different cry toxins were assessed for their resistance/susceptible reaction to Jassid. Five cotton cultivars were selected for this study including four Bt cotton cultivars (two single and two double toxins) and one non-Bt cotton cultivar. The experiment was carried out under climatic conditions of Faisalabad, Pakistan, in a randomized complete block design with three replications.

**RESULTS:** In this study there is not any distinct difference in Jassid population on different Bt cotton cultivars whether they are single or dual toxin gene cotton cultivars. MNH186 and FH141 showed more decline in population of Jassid with the passage of time as compared to other Bt cotton cultivars. The little difference in Jassid population among the Bt cotton cultivars showed that all Bt cotton varieties had a good control effect on the Jassid population.

**CONCLUSION:** Jassid population with respect to leaf position was insignificant i.e., upper, middle and lower leaves. The correlation study of the Jassid population with different environmental factors exhibited r values of -0.2213, 0.49837 and 0.41735 for temperature, humidity, and rainfall, respectively.

**Keywords:** Cotton, Jassid population, Cry toxins, Environmental factors.



**SPP-IPM-131**

**Infestation of termites in trees located along roadside and in Parks of south Punjab, Pakistan**

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**ABSTRACT**

**BACKGROUND:** Termites are important pests of agriculture crops and wood and wood products worldwide. There are over 3000 species, 450 genera and seven families of termites. In Pakistan, there are about 50 species while in 10-12 species are known to cause damage. The termite genera that has been reported to cause damage in Pakistan include *Odontotermes*, *Microtermes*, *Microcerotermes*, *Heterotermes*, *Coptotermes* and *Angulitermes*. In the current study, we investigated the infestation of trees located in parks and along road sides in south Punjab.

**METHODS:** For infestation of trees along road side, 1000 trees were randomly inspected for termite infestation along Multan-Burewala, Multan-Khanewal, Multan-DG Khan, Multan to Bahawalpur roads. While for termite infestation of trees in Parks, 30 trees were randomly inspected in each park of Multan, DG Khan, Khanewal, Bahawalpur and Rahim Yar Khan.

**RESULTS:** Termite infestation was higher in trees located along Multan-Burewala road (60%) while lower infestation of termites was observed on Muzaffargarh-Dera Ghazi Khan road (10%). A higher infestation was observed in Askari park Multan and City Park L1 (28%) followed by Gulshan Park- RYK, Madni Park- MLT and Yousaf Park Khanewal (12%).

**CONCLUSION:** Termites are one of the major pests of trees especially located along roadside. This could be due to the fact that the trees are not managed and remained under stress which attract termites.'

**Keywords:** Termite damage, tree infestation, parks, roads

**SPP-IPM-132**

**Evaluation of Insecticides for the Management of Whitefly in Cotton**

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**ABSTRACT**

**BACKGROUND:** The cotton crop plays a vital role in the textile industry of Pakistan and contributes about 0.6% to the national GDP. However, a yield reduction of about 50% has been recorded during the last decade, severely affecting the farming community, textile industry, and national exports. One of the main reason for this decline include high infestation of cotton whitefly, *Bemisia tabaci* (Homoptera: Aleyrodidae). The pest was uncontrolled in spite of a series of pesticide application by the farmers. Keeping in view the problem, the trials were conducted to find the effectiveness of insecticides to manage its infestation.

**METHODS:** A total of 10 insecticides were selected and sprayed using knapsack power sprayer and tractor mounted sprayer at recommended dose at farmer fields. Each insecticide/combination was replicated three times. The data of whitefly nymphs and adults was recorded prior to spray followed by after 1, 3 and 7 days of spray. The application was repeated after seven days of 1<sup>st</sup> spray.

**RESULTS:** The most effective single insecticide against whitefly was Pyriproxyfen (@200g/acre) on 3<sup>rd</sup> day of 1<sup>st</sup> and 2<sup>nd</sup> spray. However, none of the insecticide caused more than 60% mortality. The efficacy of the insecticides/combinations was comparatively better when they were applied with tractor mounted boom sprayer. In both trials, insecticides caused higher mortalities (more than 60%) of natural enemies.

**CONCLUSION:** The insecticides were ineffective to control whitefly for more than three days. However, the farmers should apply insecticides using boom sprayer when the crop height is more than five feet for proper coverage.

**Keywords:** Cotton, Insecticides, Whitefly management, Natural enemies

**SPP-IPM-133**

**Effect of silicon availability on nutrient use efficiency and productivity of winter wheat (*Triticum aestivum* L.)**

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**ABSTRACT**

**BACKGROUND:** It is well known that silicon (Si) is a beneficial element for graminaceous plants. Recently, the significance of Si for cereal plant function has been underlined. As wheat is one of the essential crops in the world, little is known about the impact of Si availability on wheat (*Triticum aestivum* L.) biomass production, grain yield, nutritional status, and nutrient usage efficiency.

**METHODS:** Consequently, we examined the impact of various amorphous SiO<sub>2</sub> supply levels on the productivity of wheat plants at the College of Plant Protection, Gansu Agricultural University, Lanzhou, China.

**RESULTS:** Our findings showed that Si is mostly taken up and stored in the aboveground vegetative organs of the plants. The carbon (C) and phosphorus (P) status of plants changed in response to changing silicon (Si) availability. As the amount of Si in the straw increased, the amount of C in the bulk biomass decreased, while the amount of P increased from a slight limitation to optimal nutrition. Thus, aboveground biomass production increased at low to medium levels of silica availability, although grain yield improved only at the medium level of availability. Nutrient use efficiency was improved by Si insofar as biomass production was enhanced at a constant nitrogen (N) status of substrate and plants.

**CONCLUSIONS:** Our results suggest that Si has basic effects on the C cycle, P availability, and nitrogen usage efficiency of wheat, an important staple crop.

**Keywords:** Biomass, Silicon, Nitrogen use efficiency

# POSTER PRESENTATIONS

## SPP-IPM-134

### Evaluation of Different Concentration Levels on Pathogenicity of Entomopathogenic Nematodes Against Fruit Flies

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#### ABSTRACT

**BACKGROUND:** Fruit flies belong to order Diptera and family Tephritidae which consist of many economic fruits and vegetables pests of the world. Fruit flies are estimated to cause annual losses to fruit and vegetable farmers in Pakistan of over US\$800 million. Entomopathogenic nematodes (EPNs) have gained importance as safe and eco-friendly biological control of insect pests.

**METHODS:** In current study, in vitro experiments were performed to evaluate impact of different concentration levels (70 IJs/ml, 110 IJs/ml, 150 IJs/ml) on pathogenicity of EPNs. Pathogenicity of four EPNs spp. (*Heterorhabditis bacteriophora*, *H. indica*, *Steinernema carpocapsae*, and *S. feltiae*) were tested against fruit fly species *Bactrocera dorsalis* using completely randomized design (CRD). In this experiment petri plates were filled with 25 grams of sterilized soil then fruit fly larvae were released using a fork. Three different concentrations of EPNs in five replications for each treatment were maintained.

**RESULTS:** Higher mortality (%) of *B. dorsalis* was recorded in case of *S. carpocapsae* (79.43%) followed by *H. bacteriophora* (77.08%) and *S. feltiae* (67.3%), whereas, *H. indica* (67.23%) exhibited minimum mortality of *B. dorsalis*.

**CONCLUSIONS:** Application of EPNs against fruit fly is the most suitable strategy to manage fruit fly and it should be included in the IPM program.

**Keywords:** Entomopathogenic nematodes, *Bactrocera dorsalis*, EPNs Pathogenicity, Virulence of EPNs

**SPP-IPM-135**

**Management of Canola aphids (Hemiptera: Aphididae) using potassium silicate (K<sub>2</sub>SiO<sub>3</sub>) in integration with augmentation of *Chrysoperla carnea* under field conditions.**

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**ABSTRACT**

**BACKGROUND:** Aphids are considered serious pests of canola crop in Pakistan inflicting considerable economic losses. They suck cell sap from plants and can be found in large numbers on growing plant parts like leaves depending on the aphid species. Their population has reached its peak during the growing season, preceded by rainfall and at the time of nitrogen fertilizer application.

**METHODS:** Traditionally synthetic pesticides are used to manage aphids that results in residue problems, health hazards and negative impact on natural enemies. As an alternative to synthetic pesticides, potassium silicate can be potential essential nutrients to manage canola aphid. Keep in view, in the current study silicon in integration with *Chrysoperla carnea* were used to manage aphids. The trial was conducted in the Entomological research area (Young Wala), Department of Entomology, University of Agriculture, Faisalabad. Silicon was applied in the form of Potassium Silicate (K<sub>2</sub>SiO<sub>3</sub>) by foliar and soil drenching application methods. In both application methods, different concentrations of silicon (400, 800, and 1200 ppm) were used. First application was done after 30 days of emergence and second application after 45 days, while 3rd application at the appearance of aphids on crop. The *Chrysoperla carnea* cards were augmented in combination with silicon in both foliar and drenching application treatments. There were four replications for three treatments following the randomized complete block design (RCBD) layout.

**RESULTS:** The results showed that the foliar application of potassium silicate at 1200 ppm significantly reduced aphid's population as compared to other treatments. The drenching application of potassium silicate effectively reduced the aphid's population at 1200 ppm concentrations. The minimum aphid's population was recorded (10.50±0.95) after foliar application as compared to drenching application, which were recorded as (13±1.29). The maximum aphid population was observed at control treatment. Overall, the drenching application of potassium silicate was highly significant as compared to foliar application of potassium silicate. The integration of *Chrysoperla carnea* with potassium silicate showed great effect on the aphid population (7±0.91) in canola crop.

**CONCLUSIONS:** This study is useful for farmers for future management of aphids in canola crops with biological control methods. This study showed that the potassium silicate can be used as biopesticides for the management of aphids.

**Keyword:** Canola, Aphids, *Chrysoperla carnea*, Biological Control, Potassium Silicate, Silicon

**SPP-IPM-136**

### **Effectiveness of male and female bees in crop pollination: A Review**

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#### **ABSTRACT**

**BACKGROUND:** Bees are typically thought to be good pollinators in both agricultural and natural habitats. Bees are responsible for approximately 80% of world plant pollination. Both male and female bees play an important role in pollination of different crops. However, they may really be ineffective pollinators if pollen collection was made mostly for food purpose instead of supply on stigma. Quality of plant pollination is greatly dependent on the visitor's sex. Females to feed the offspring collect more and more pollen resources and thus frequently visit the floral resources in an area results in the good pollination of crops and ultimately leads toward good yield and production. On the other hand male travel more distance due to their mate searching nature, this makes them visit a diversity of plants but results in less frequent visits.

**METHODS:** The keywords were researched and top 20 paper were read for the relevance and data from them was compiled to review

Results: Shorter and frequent visits lead towards the constant foraging, which makes females superior to the males. Another factor which makes female bees more efficient than the males is collection of both nectar and pollen while males only are nectar forager. Male bees deposit more pollen on stigma than the females but lose their importance due to less frequent visits. Female bees reported highly efficient than males in pollination of different crops, i.e., females of *Megachile cephalotes* in *Grewia asiatica* (Phalsa) and *Andrena savignyi* in *Brassica campestris* reported highly efficient than males in terms of pollen deposition and visitation frequency.

**CONCLUSIONS:** Male bee pollinators work well on nectarous flowers while female bees have been reported most efficient and important in terms of pollen transferred.

**Keywords:** Bees, Female and male pollinators, Foraging behavior, Pollination

**SPP-IPM-137**

## **Prospects of Allelochemicals use in controlling Pests: A Review**

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### **ABSTRACT**

**BACKGROUND:** Agricultural pests like harmful insects, diseases and weeds are a constant threat to food security of human beings. Due to excessive use of synthetic pesticides, pests have developed resistance that has made pest control difficult. Biocidal substances, which are found naturally in plants such as allelochemicals (secondary metabolites) are a good source of ecological pesticides assisting plants in overcoming, tolerating, or compensating for insect pest stress. Several plants like Brassica, sunflower, sorghum, wheat, rice, maize and tobacco all have allelochemicals in their leaves, flowers, seeds, stems and buds. The most promising substances in controlling insect pests include alkaloids, saponins, phenols, and terpenes, which make up a wide category of secondary plant metabolites.

**METHODS:** The keywords were researched and top 20 paper were read for the relevance and data from them was compiled to review

**RESULTS:** Allelochemicals have been found to be useful in the treatment of a variety of plant diseases in several recent studies. Structure alterations or the manufacture of chemical analogues are frequently used to boost their biopotency. Several factors appear to limit. Regulatory hurdles and availability of microbial pesticides that are cost effective, are major limiting factors in the promotion of allelochemicals.

**CONCLUSIONS:** Apart from this their formulation at limited scale is also another drawback but with passing time the pest are developing resistance against microbial pesticides there is a potential for allelopathy for pest control.

**Keywords:** Synthetic pesticides, Resistance, Biocidal, alkaloids.



**SPP-IPM-138**

**Laboratory Evaluation of Commonly used Insecticides against Red pumpkin beetle, *Aulacophora foveicollis* Lucas on Different Host Plants**

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**ABSTRACT**

**BACKGROUND:** Red pumpkin beetle, *Aulacophora foveicollis* (Chrysomelidae: Coleoptera) is the most destructive insect pest which is responsible for low yield and quality deterioration in cucurbits. Both adult and larvae are voracious feeders of cucurbits and cause considerable damage by boring all plant parts from roots to leaves.

**METHODS:** Presently two new chemistries and three conventional insecticides were tested against ridge gourd and round sweet gourd fed red pumpkin beetle populations in laboratory using leaf dip bioassay method.

**RESULTS:** Findings revealed that imidacloprid (2.61ppm), emamectin benzoate (2.05 ppm) and methomyl (3.07 ppm) were more toxic with lowest LC<sub>50</sub> than profenofos (22.6 ppm) and bifenthrin (1.02 ppm) for sweet gourd population whereas profenofos (2.36 ppm) and bifenthrin (0.05 ppm) were more toxic with minimum LC<sub>50</sub> for ridge gourd fed red pumpkin beetle population for 72 hour of observation. Comparatively higher LC<sub>50</sub> values on ridge gourd suggested preference of red pumpkin beetle for ridge gourd as better host and their ability of higher survival rate. Considering LC<sub>50</sub> values, bifenthrin and imidacloprid were more toxic than other insecticides.

**CONCLUSIONS:** Toxicity response for both host fed red pumpkin beetles suggested their wise and rotational use in field population for effective and long term utilization of tested insecticides.

**Keywords:** red pumpkin beetle, toxicity, insecticides, leaf dip exposure

**SPP-IPM-139**

**Impact of climate change and crop intensification on biodiversity of insects**

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**ABSTRACT**

**BACKGROUND:** Insect population and diversity have been drastically decreasing after World War II, as this review demonstrates. Late in 2011, the world's population exceeded 7 billion, and it is estimated that by the year 2050, that number would rise to 9.3 billion. It is anticipated that the demand for food would increase by between 50 to 100 % by the year 2050. Agricultural intensification techniques, such as developing monocultures of high-yielding crop types and enhancing the application of chemical fertilizers and pesticides to improve productivity, have been utilized to meet the growing population's food requirements. Some of the insects that we are eradicating, such as predators, parasitoids, and pollinators of agricultural pests, are insects that provide direct benefits to the crops that we are growing. The following are necessary in order to lessen the impact of the Sixth Mass Extinction, which was caused by human activity and is something that we are presently going through: It will be necessary to have human populations that are stable (and probably decreasing) as well as economically sustainable and socially equitable in order to help the less privileged people and countries around the world, which is where the vast majority of us live. Natural vegetation in the tropics is being destroyed at an alarming rate and frequently replaced with export crops like soybeans and oil palms.

**CONCLUSIONS:** We conclude that the expansion and intensification of agricultural crops over the last 50 years is a major contributing factor to the loss of biodiversity.

**Keywords:** Biodiversity, Climate change, Pollinators, Predators, Pesticides.

**SPP-IPM-140**

**Black Soldier Fly (*Hermetia illucens*) as a Food Security**

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**ABSTRACT**

**BACKGROUND:** As the world population increases there will be increased demand for food in future. In many countries the prevalence of food insecurity and the issues that may arise in the future to feed more than 9 billion people by 2050, scientists are looking for alternate sources of protein in humans and animals. To meet alternative demand for feed the use of insects as a high-protein source has attracted a lot of interest. So to preserve environmental resources and meet high nutritional value, use of insects is considered a smart idea as a sustainable feed in the aquaculture, animal husbandry, and poultry industry. The Black soldier fly BSF, one of the many kinds of species, has paid special attention due to its consuming ability of different substrates including organic waste. This insect's capacity to convert organic waste into high-quality nutrition has created an innovative economic prospect. Insect protein is a suitable substitute for fish powder or soybean meal when it comes to feeding livestock, pets like dogs and cats, poultry, and fish. *Hermetia illucens*, BSF is a saprophytic fly that is indigenous to the Neotropics. These flies' geographic range has changed through time and now includes the warmer parts of the globe. The larvae of bsf have 45% protein contents and prevent the spread of pests and houseflies. Moreover, they do not attack humans, home environments and other insects. Also they do not spread any disease to humans. Larvae of bsf can replace 25% of fish meal and 38% fish oil. According to the Food and Agriculture Organization, insects can reduce world hunger and improve global health by reducing greenhouse gas emissions and air pollution levels. Because of this, there are high demands on rearing this insect to handle organic waste.

**Keywords:** Alternative feed, Insects, Organic waste, Protein

**SPP-IPM-141**

**Response of natural enemy fauna in wheat to different biopesticides**

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**ABSTRACT**

**BACKGROUND:** Due to the widespread usage of insecticides, certain aphid species have developed resistance to pyrethroids, organophosphates, and carbamates. To overcome resistance, various IPM models are used. Biological control (parasitoids and predators) is a key component of any integrated management of pests. Botanical-based biopesticides could be ideal substitutes for synthetic chemicals when food safety requirements improve. Insecticidal properties are found in some botanicals. They generally pose less environmental risk, and their use avoids the evolution of insect resistance.

**METHODS:** Wheat crop biological control agents include the ladybird beetle, syrphid fly, and *Chrysoperla carnea* Stephens. The goal of this study evaluated the effectiveness of several botanicals i.e., Neem, *Azadirachta indica* A. Juss, Kortuma, *Citrullus colocynthis* Linnaeus, Tobacco, *Nicotiana tabacum* Linnaeus, silver nanoparticle spray, S1 bacteria (S1B), one insecticide Advantage, and Control on biological control. In the experimental areas at the MNS-University of Agriculture in Multan, wheat crops were used for field tests. The randomized complete block design under the factorial was used with three replications. Before and after 24, 48, 72, and 168 hours data was recorded.

**RESULTS:** There was a significant population of ladybird beetle/plant found in the case of kortuma ( $0.60 \pm 0.40$ ) and silver nanoparticle ( $0.37 \pm 0.12$ ) treatments.

**CONCLUSIONS:** Such research will facilitate the management of aphids in wheat and offer fundamental direction for future researchers.

**Keywords:** Biopesticides, Botanicals, Biological control, *Chrysoperla carnea*, Wheat.

**SPP-IPM-142**

**Evaluation of four different oils against two-spotted spider mites (Tetranychidae: Acari) and thrips (Thripidae: Thysanoptera)**

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**ABSTRACT**

**BACKGROUND:** Mites are microscopic creatures placed in the class Arachnida with more than 50,000 described species. Mites are diverse and ecologically successful organisms of the phylum Arthropoda. Families of phytophagous mites like Tetranychidae, Tenuipalpidae, and Eriophyidae are important regarding their attack on plants causing damage and economic loss to plants. Due to their increased resistance against acaricides, developing new biological tactics for their control is crucial. In this respect, the present study was conducted to study the efficacy of four different plant oils against two-spotted spider mites (*Tetranychus* species) (Tetranychidae: Acari) and thrips (Thripidae). Plant oils like *Cymbopogon schoenanthus*, *Zingiber officinale*, *Allium sativum*, and *Coriandrum sativum* are considered the most efficient source of controlling two-spotted spider mites and thrips due to their non-lethal effects. Garlic and lemon grass are considered to be the most efficient bio-pesticides around the world.

**METHODS:** To propose an alternative to chemical control, the mortality assessment of plant oils was carried out under laboratory conditions against mites and thrips. Five treatments, including a control having four replications were used. Different concentrations of 2%, 1.5%, 1%, and 0.5% of each oil were used and mortality of mites and thrips was observed after applying four plant oils. Lemongrass showed the highest mortality rate in mites and thrips, which increases with the increase in time.

**RESULTS:** Mortality was maximum in the case of thrips and mites at 71% and 62.5%, respectively. Garlic was second on the mortality list for both mites and thrips at 61.5% and 43.5%, respectively. Ginger and coriander also proved effective against mites and thrips but showed less mortality than the other two plant oils

**CONCLUSIONS:** The results revealed that the above four plant essential oils could be used as an effective tool against mites (Tetranychidae) and thrips (Thripidae).

**Keywords:** Oils, two-spotted spider mites, Thrips

**SPP-IPM-143**

**Pathogenicity of Cuticle Degrading Enzymes against Different Life Stages of *Bactrocera zonata***

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**ABSTRACT**

*Bactrocera zonata* is the invasive tephritid fruit fly, which mainly attack on peach, mango, guava and ber causing economic damage to those crops. *Beauveria bassiana* is a promising agent for biological control of agricultural insect pests. The recent study aimed at managing *B. zonata* through application of cuticle degrading enzymes (CDE). CDE was extracted from indigenous isolates of *Beauveria bassiana*. The extraction of cuticle degrading enzymes was carried out using Tris HCL, olive oil and salts including calcium chloride, potassium dihydrogen phosphate, sodium phosphate, magnesium sulfate and zinc chloride with required quantity. After extraction of enzymes, it was subjected to Sodium Dodecyl-sulfate polyacrylamide gel electrophoresis (SDS-PAGE). The gel electrophoresis analysis revealed the various molecular masses of cuticle degrading enzymes including proteases, lipases and chitinases were 19-47 kDa, 32 kDa and 49.47 kDa respectively. The extracted enzymes (1.5, 3, 5, 7.5, and 10  $\mu$ l/ml of liquid medium containing mycelium of *B. bassiana*) were used against three different life stages (larvae, pupae, adults) of *B. zonata* by immersion method to observe mortality and adult emergence. The experiment was conducted under laboratory conditions with  $25\pm 2^\circ\text{C}$  temperature and  $65\pm 5\%$  relative humidity. The data was recorded after different time intervals and observed significant mortality in larvae and adults as  $78.50\pm 2.10$  and  $80\pm 2.15\%$  at 10  $\mu$ l/ml cuticle degrading enzymes respectively. At lower concentrations (1.5  $\mu$ l/ml), the mortality was  $13.33\pm 1.92\%$  followed by control. Low percentage of adult emergence ( $10\pm 2.63\%$ ) from pupae was observed in treated insects and higher adult emergence ( $65.0\pm 5.77\%$ ) in untreated groups of insects. The result showed that the mortality and adult emergence from pupae was concentration dependent. Therefore, by adding CDE in the mycelium of *B. bassiana* enhanced its pathogenicity against *B. zonata*.

**Keywords:** *B. bassiana*, cuticle degrading enzymes, mortality, adult emergence, *B. zonata*

**SPP-IPM-144**

**Extraction and Characterization of Cuticle Degrading Enzymes of *Beauveria bassiana***

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**ABSTRACT**

**BACKGROUND:** *Beauveria bassiana* is a stronger candidate for biocontrol of many important agricultural insect pests.

**METHODS:** The recent study indicated the extraction of cuticle degrading enzymes (proteases, lipases and chitinases) from *B. bassiana* by using Tris-HCL, calcium chloride, potassium hydrogen phosphate, sodium phosphate (sigma Aldrich) magnesium sulfate, zinc chloride and olive oil with required quantity. After centrifugation of liquid media, the supernatant separated that act as extracellular enzymes than media were subjected to sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) analysis for characterization of enzymes. Stacking gel (4%) and resolving gel (12%) were carried out with pH of 8.6 for the determination of molecular masses of samples (Enzymes) in kDa.

**RESULTS:** The result showed that after staining and destaining of gel the many bands of various sizes appeared that were characterized by comparison with standard size keys. The bands were various sizes including 19, 50, 25, 32 and 34.25 kDa showed the presence of proteases, lipases and chitinases respectively in *B. bassiana*.

**CONCLUSIONS:** The extracted CDE can be used with different combinations of the mycelial medium of the *B. bassiana* to enhance their pathogenicity against several agricultural insect pests.

**Keywords:** *B. bassiana*, *B. zonata* characterization, CDE, SDS-PAGE



**SPP-IPM-145**

**Evaluation of Entomopathogenic nematodes for the management of termites**

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**ABSTRACT**

**BACKGROUND:** Termites are a major problem all over the world and have a great impact on agriculture crops. Chemical control of termites is harmful and not ecofriendly. Therefore, biological control is the best alternative for management of termites.

**METHODS:** In present study, entomopathogenic nematodes (EPNs) were isolated and evaluated for the biological control of termites. EPNs isolated by Galleria baiting technique and dead larvae transferred to the white trap, multiplied by using *Galleria mellonella* larvae for further experimental use. EPNs cultured and applied with three different concentrations i.e. C1 (50ljs), C2 (100ljs), C3 (150ljs) and C0 used for control (only distilled water). The experiment was conducted in a laboratory under complete randomized design with three replications by taking thirty termites in each box. Data regarding mortality percentage of termites was recorded after 12, 24, 48, 72 and 96 hrs.

**RESULTS:** Results showed that mortality percentage of C1 after 12 hrs was 40%, C2 mortality percentage was 45%, C3 mortality percentage was 84% and C0 showed 21% mortality. Mortality percentage of C1 after 24 hrs was 42%, C2 mortality percentage was 47%, C3 mortality percentage was 87% and C0 showed 25% mortality. Mortality percentage of C1 after 48 hrs was 56%, C2 mortality percentage was 62%, C3 mortality percentage was 91% and C0 showed 33% mortality rate. Mortality percentage of C1 after 72 hrs was 75%, C2 mortality percentage was 78%, C3 mortality percentage was 96% and C0 showed 44% mortality rate. Data recorded after 96 hrs showed the mortality percentage of C1 was 91%, C2 mortality percentage was 95%, C3 mortality percentage was 100% and C0 showed 64% mortality rate.

**Keywords:** Entomopathogenic nematodes, mortality, termites.

**SPP-IPM-146**

## **Integrated Pest Management of *B. cucurbitae* in Luffa Gourd**

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### **ABSTRACT**

Cucurbits are vegetables that are members of the cucurbitaceae family. From seed through harvest, a number of insect pests target these vegetables. The cultivation of these veggies requires a significant investment of time, money, and natural resources. By preventing losses, sustainable pest management techniques can protect this investment. *Luffa Gourd*, in particular, requires efficient and cost-effective insect pest control for successful cultivation. Commercial vegetable growers are required to produce high-quality, inexpensive crops that are appealing and safe for consumers. Cucurbit insect pest infestations cost farmers a lot of money since they reduce output, raise production costs, and produce that is of lower quality. The use of cultural, mechanical, biological, and chemical techniques is necessary for effective, economical, and sustainable pest management. To effectively manage pests, it is vital to combine these various approaches. Only a long-term commitment to integrated pest management strategies will allow for pest management of cucurbits. IPM includes the strategic use of pest-resistant cultivars, tracking the prevalence of pests, cultural practices, mechanical pest removal, biological management, and the application of selected insecticides when needed. Insecticides can be replaced with integrated pest management (IPM), which supports the management of a sustainable environment.

**Keywords:** cucurbits, integrated pest management, vegetables, Luffa Gourd

**SPP-IPM-147**

***Tuta absoluta*: A looming threat to Pakistan and its coping strategy**

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**ABSTRACT**

Tomato leaf miner (*Tuta absoluta*) indigenous to South America is currently the most devastating biotic constraint of tomato plants and fresh tomatoes around globe. Although tomatoes are the primary host, but it can infect and attack other solanaceous crops too. It has invaded several tomato-producing regions resulting in variable yield loss ranging from 11% to 43% but can also result in complete devastation of crop. It's infestation results in significant losses of tomato and other crops, mainly reduction in crop quality which is further aggravated with reduced farmer's income directly due to low marketable yield and indirectly via imposing higher production costs. The management of *Tuta absoluta* is majorly dependent upon the chemical pesticides which itself is limited owing to the insect's nature of developing insecticide resistant strains. However, the development of control strategies using biocontrol, plant extracts and nanoparticles as an environmentally sound alternative is a promising approach now a days. In this regard, neem extract, silica nanoparticles and *Bacillus thuringiensis* based formulations has proven their efficacy. Thus, such bio-pesticides could be a suitable alternative for control of *T. absoluta* with low toxicity to humans and non-target organisms, easily biodegradable with different modes of action. Moreover, these compounds lowers the risk of resistance development in *T. absoluta*. Therefore, these bio-pesticides could provide an efficient, economical and promising results for the control of tomato leaf miner in Pakistan.

**SPP-IPM-148**

**Oil-based biopesticide a safe alternative to toxic chemical insecticides for Fruit fly management**

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**ABSTRACT**

**BACKGROUND:** Fruit fly is a major pest of the mango causing significant qualitative and quantitative losses. It is known as major quarantine pest having critical role in import of mango to highly profitable market. Mostly farmers used synthetic pesticides for control it. Due to resistance in pest, environmental concerns, residues in target fruits and effects on human health have shifted the interest of research towards ecofriendly management. Spores of entomopathogenic fungi are used as alternative pest control but they have some issues like low persistence in the field due to environmental conditions.

**METHODS:** Different liquid carriers were used to enhance persistence and efficacy of these fungal spores. Pathogenicity of these liquid formulations was tested against fruit flies. All formulations were tested by adult bioassay.

**RESULTS:** The combination of Vegetable oil with fungal spores showing a strong synergistic effect. These oil based formulations increased the mortality of fruit flies than expected. So, it can be integrated with other pest control measures.

**Keywords:** Fruit fly, pest management, insecticide resistance management, integrated pest management, entomopathogenic fungi

**SPP-IPM-149**

**Insecticidal Plant Protease inhibitors from *Citrullus colocynthis* L. (Cucurbitaceae) Seeds against Whitefly, *Bemisia tabaci* mitotype Asia II-1**

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**ABSTRACT**

**BACKGROUND:** *Citrullus colocynthis* L. is a perennial herbaceous plant of the Cucurbitaceae family that is grown as a traditional medicinal plant in tropical regions. Cotton is one of the important economic crops grown in Pakistan and is the backbone of Pakistan's economy. One of the major threats to the crop across the globe is the whitefly (*Bemisia tabaci*).

**METHODS:** In this work, plants have evolved to generate a variety of insecticidal activity substances, including a wide group of toxic proteins that play an important role in plant defense against whiteflies.

**RESULTS:** Plant protease inhibitors are defense proteins against whiteflies. We purified and characterized a 39 kDa protease inhibitor protein from the seeds of *Citrullus colocynthis*. Whiteflies were exposed to five concentrations 10mg/ml, 7.5mg/ml, 5mg/ml, 3mg/ml, 1.5mg/ml of insecticidal protein. The maximum population mortality rate against whiteflies (adults) was observed 81.6±3.3% at 10 mg/mL. The maximum population mortality percentage against whitefly (nymphs) was observed 77.0±2.88a % at 10mg/ml concentration.

**CONCLUSIONS:** The extraction, purification, characterization, and GC-MS of *Citrullus colocynthis* seed protein were also studied. Plant protease inhibitors have the potential to control whiteflies.

**Keywords:** Whitefly, *Citrullus colocynthis* seed, Plant protease inhibitors, Bioassay

**SPP-IPM-150**

**SPLAT-PBW: An eco-friendly, cost-effective mating disruption tool for the management of pink bollworm on cotton**

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**ABSTRACT**

*Bt* cotton production has benefited cotton growers. The pink bollworm (PBW) outbreak began in 2014 and spread throughout all of the nation's cotton-growing regions. Due to the pest's tolerance to *cry* toxins and pesticides, it grew and became more problematic, making it impossible to control using the new management techniques. Comparing a non-chemical method to conventional management techniques, its efficacy in changing PBW behavior was assessed. Pheromone was used in an area-wide management trial employing disruption mating technology. and pink bollworm lure application technique. In India, applications of the lure at a rate of 1250 g/acre in 2017 on 154 acres and 206 acres in 2018 resulted in considerable PBW control. The application of SPLAT-PBW at the highest acreage yielded the best results, as measured by the lowest rosette flower (7.23%), lowest green boll damage (8.30%), lowest locule damage (7.40%), and highest yield (33.50q/ha). As compared to the farmers' custom, which produced 22 q/ha despite the use of 6 times use of chemical spray. The field sample had 42 of the pheromone's active components at the end of the five-week period. When compared to other pheromones, it exhibits a sluggish release. The use of non-chemical methods to control insect pests in cotton greatly reduces the need for pesticides and lowers overall costs. Due to management issues with the most recent pest control method, this technology is an alternative to chemical pesticides for controlling PBW.

**Keywords:** *Bt* cotton, *Pectinophora gossypiella*, Semiochemical, Bollworm and Area-wide management.

**SPP-IPM-151**

**Impact of honey bee (*Apis mellifera*) as pollinator on the yield of Mustard crop in Rahim Yar Khan, Punjab, Pakistan**

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**ABSTRACT**

Mustard (*Brassica* spp.) family cruciferae, an important crop of Pakistan mostly cultivated for the production of oil used in cooking. Honey bees mostly prefer the open pollinated crops to pollinate because nectar and pollens are in a large quantity on the flowers of mustard. The present study was done to explore the mustard yield where *A. mellifera* is present as a pollinating agent as compared to the yield of mustard without *A. mellifera*. We evaluated the yield of mustard by categorized it into two field with same potential, same variety (super raya) the only difference is that one field in Khwaja Fareed University of Engineering and Information, Rahim Yar Khan where *A. mellifera* hives are present in nearest facility, and these bees visit the field for pollen collection along with pollinators and other field in Pattan minara with same potential and pollinators except *A. mellifera*. We examined the mustard field with *Apis mellifera* as a pollinator having yield about 32 mounds while yield without *A. mellifera* presence in the field as a pollinator is 28 mounds. This study shows the clear difference between the both same cultivars of mustard field yield. It is expected that by promoting the apiculture in Rahim Yar Khan we also increase our other crop yield.

**Keywords:** Mustard, Yield, Pollinator



**SPP-IPM-152**

**Efficacy of Different Insecticides against Cotton Jassid, *Amrasca biguttula* (Homoptera: Cicadellidae)**

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**ABSTRACT**

**BACKGROUND:** Cotton is one of the major crops of Pakistan it contributes about 0.8% of the national gross domestic product (GDP). There are many sucking insect pests of cotton which can cause major loss in cotton crop production; cotton jassid is one of them. The present study is carried out to test the efficacy of different insecticides against cotton jassid.

**METHODS:** One hundred and fifty nymphs of jassid were collected from the cotton field of cotton research institute Multan, Punjab, Pakistan. Four insecticides and one control were used in this experiment i.e. acephate, flonicamid, thiocyclam hydrogen oxalate and acetamiprid, three replications of each. Doses of insecticides were used flonicamid 25 $\mu$ g, acephate 330 $\mu$ g, thiocyclam hydrogen oxalate 250 $\mu$ g and acetamiprid 225 $\mu$ l in 100 ml of water, respectively. After preparation of the solutions 15 experimental plants were dipped in the solutions for 20 seconds of insecticides. After 5 minutes jassid was exposed to these plants with the help of a clip cage. These plants were put in the lab for 72 hours for observation. The data was recorded after 24, 48 and 72 hours discreetly.

**RESULTS:** After 72 hours percentage mortality of Jassid was observed. Percentage mortality acephate, flonicamid, thiocyclam hydrogen oxalate, acetamiprid and control 96%, 93%, 89%, 61% and 0% respectively.-

**CONCLUSIONS:** The present study recommends acephate is more efficient for the management of jassid.

**Keywords:** Cotton, Insect pest, Insecticides, Jassid

**SPP-IPM-153**

**The role of yeast odours in *Carpophilus* beetle attraction to stone fruits**

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**ABSTRACT**

**BACKGROUND:** *Carpophilus* beetles are important pests of stone-fruits and almonds in Australia. In stone fruits, two species, *C. davidsoni* and *C. hemipterus*, cause more damage and annual losses of up to 30% have been recorded. In almonds, *C. nr dimidiatus*, is considered responsible for damage to nuts. *Carpophilus* beetles, like other insects, rely on sensory information in order to find a suitable host plant.

**METHODS:** Three beetle species were collected from different ripening stages of stone fruits in Tatura, and from almonds in Mildura. Then yeast was extracted from the gut of sterilized beetles and identified based on the ITS region and D1/D2 domain of rDNA gene. Selected yeast species were streaked on sterile peach agar media (PAM) and volatiles were collected using dynamic headspace sampling. Yeast volatiles were analysed using GC-MS equipped with a DB-5MS non-polar column. *Experiment 1:* Bioassays on *C. hemipterus* larval survival and development on PAM and non-fruit media (PDA; Potato Dextrose Agar) inoculated with different yeasts (PK; *Pichia kluyveri* & HG; *Hanseniaspora guilliermondii*). *Experiment 2:* The relative attractiveness of *C. hemipterus* adults to odours from different yeast species was investigated using a two choice olfactometer. *Experiment 3:* Oviposition preference of female *C. hemipterus* to different yeast species was assessed using a three choice oviposition assay.

**RESULTS:** In total 13 yeast strains were isolated from beetles. Most of the yeasts isolated from *C. hemipterus* and *C. davidsoni* were the same, while different yeasts were isolated from *C. nr dimidiatus*. *Experiment 1:* Yeast inoculated treatments had a significant effect on larval development (time to pupation), pupal weight, and number of larvae reaching adulthood. Time to pupation was significantly faster in PK inoculated PAM compared to HG inoculated PAM and the sterile Control. Larvae fed on BYD (brewer's yeast diet) had significant difference in pupal weight compared to those fed on HG inoculated media. No pupae were recovered from the control. Survival to adulthood was not significantly different between BYD and PK inoculated media. Survival to adulthood was significantly lower on sterile control compared to HG inoculated media. Larval survival on yeast-PDA media: Only PK yeast supported larval development up to adulthood, which showed significant difference from HG and control. *Experiment 2:* Regardless of yeast species, yeast inoculated PAM attracted significantly more beetles compared to the control. Male beetles were more attracted to *H. guilliermondii* and female beetles attracted to both yeast species, *H. guilliermondii* and *P. kluyveri*. *Experiment 3:* The number of eggs laid by female beetles on yeasts inoculated PAM were significantly different compared to the control, and *H.*

*guilliermondii* was most preferred yeast for oviposition. Yeast volatile analysis: Headspace volatiles of three treatments were significantly different from one another. Eight volatile compounds found to be responsible for about 88% dissimilarities between the treatments.

**CONCLUSIONS:** *C. hemipterus* beetle larvae showed faster development and higher survival on *P. kluyveri* compared to *H. guilliermondii*. *P. kluyveri* alone was able to support larval development to adulthood. Adults were attracted to both species of yeast (*P. kluyveri* and *H. guilliermondii*), but females laid more eggs on *H. guilliermondii*. Volatile analysis showed significant differences among odors due to differences in concentration of 8 volatile organic compounds.

**Keywords:** Attractant, Beetle, Yeast, *H. guilliermondii*.

**SPP-IPM-154**

**Some laboratory studies for the evaluation of the fitness of fall armyworm *Spodoptera frugiperda* to *Bt* corn along with solanaceous crops grown in district Faisalabad, Pakistan**

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**ABSTRACT**

**BACKGROUND:** A preliminary study was conducted to evaluate the fitness of *Spodoptera frugiperda* fall armyworm (FAW), (Lepidoptera: Noctuidae) to solanaceous vegetables and genetically modified *Bt* corn for developing sustainable pest management strategies.

**METHODS:** A culture of the *S. frugiperda* collected directly from the infested corn was established in the lab for further experimentation. and newly emerged larvae were exposed to the fresh seedling of experimental plants i.e. eggplant (*Solanum melongena* L.), tomato (*Solanum Lycopersicum* Mill.), and *Bt* corn. Developmental duration of larval and pupal stages, pupal weight, survival rate, male and female longevity, and fecundity of females were studied.

**RESULTS:** Our findings reveal that FAW does not complete its life cycle on eggplant but tomato and *Bt* corn are its favorable hosts and the Larval/feeding duration of FAW was significantly different. Pupal duration on *Bt* maize was observed maximum along with the reduction in pupal weight (0.04 g). Survival rate was also observed maximum when larvae were fed with tomato and significant differences were observed in the mean fecundity of female females, with the highest (943.95) eggs laid when fed with tomato. FAW performance was ranked as : tomato>*Bt* corn>eggplant.

**CONCLUSION:** This preliminary information would be helpful in devising sustainable strategies for the management of FAW

**Keywords:** Fall armyworm, Fitness, *Bt* crops, and solanaceous crops

**SPP-IPM-155**

**Some preliminary studies of mathematical biology (population dynamics) of mango mealybug *Drosicha mangiferae* in mango orchards located in district Faisalabad, Pakistan**

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**ABSTRACT**

**BACKGROUND:** Several insect pests attack mango trees among these insects the mango mealybug *Drosicha mangiferae* is considered the most important pest insect of economic importance.

**METHODS:** Population dynamics of mango mealybug nymphs, *Drosicha mangiferae* Green were observed on the basis of seasonal abundance. Canopy of mango plants in a selected area was selected, and pin-marked as Tree-1, Tree-2, Tree-3 and, so on until Tree-20, and the number of nymphs of mealybugs present on the tree trunk, terminal twigs or, on inflorescence was recorded at an interval of a week. Population fluctuation with seasonal variation was observed. The population of insects was seen to be decreasing thereafter from mid-mid-February to last May on three trees. Further, the prevalence of nymphal instar on the whole mango plant was recorded and the obtained data was statistically analyzed by statistical design RCBD. The population of insects was observed from mid-February last May on three trees. Visual observations regarding the density of the nymphs of *D. mangiferae* was observed and identified the nymphal stage.

**RESULTS:** It reveals that nymphs of mealy bug seen on trunks in, in the beginning, identified as the first instar till mid-mid- Februarye obtained information was helpful in developing accurate control strategies for management of mango mealybug.

**CONCLUSION:** Population studies of mango mealy bug can be helpful in foreseeing the issue to avoid the future contaminations.

**Keywords:** *Mangiferae indica*, population dynamics, orchard, *Drosicha mangiferae*

**SPP-IPM-156**

**Insecticidal efficacy of *Nicotiana tabacum* leaves extract based biosynthesized silver nanoparticles against dusky cotton bug**

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**ABSTRACT**

**BACKGROUND:** Pesticides have become increasingly important in order to maximize agricultural production. Despite their usefulness in agriculture, pesticides are harmful to human and non-target organisms and also contribute to development of pest resistance. Nanotechnology is an emerging branch of study in agriculture in which biopesticides combined with metal salts to form nanoparticles, which played an important role in insect pest management.

**METHODS:** Washed *Nicotiana tabacum* leaves were placed in 100 ml deionized water overnight and macerated. The crushed leaves were filtered in elementary flasks and further diluted to 250 ml using deionized water. The 50 ml of diluted *N. tabacum* extract was added in 100 ml of 0.1 M AgNO<sub>3</sub> solution in a 500 ml beaker. The color of the solution changed to dark brown. Toxicity of biosynthesized nanoparticles was assessed using leaf dip bioassay method against dusky cotton bugs under laboratory conditions.

**RESULTS:** Results obtained were successful by using *N. tabacum* mediated silver nanoparticles. The maximum mortality was observed 87.25% after 72 hours against adult dusky cotton bugs.

**CONCLUSION:** The goal of this research is to provide successful insights as an alternative to synthetic pesticides in the management of insect pests. The use of biopesticides in combination with nanotechnology on a nanoscale can improve their effectiveness and prove to be a viable pest management and pest resistance solution that is also environmentally benign.

**Keywords:** AgNPs, *Nicotiana tabacum*, Mortality, Dusky cotton bug

**SPP-IPM-157**

**Developing Olfactory Traps for the Management of House flies**

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**ABSTRACT**

**BACKGROUND:** The house fly, *Musca domestica* L. (Diptera: Muscidae), is a metropolitan pest of domestic, medical and veterinary importance which annoys people, ruins food and spreads a variety of dangerous infections. Among the available physical and chemical approaches used for controlling house flies, the chemical method is used predominantly but due to a number of drawbacks associated with this method, it cannot be used indoors. The intensive and repeated use of chemicals is dangerous to human health and also inevitably leads to the development of insecticide resistance. To overcome these problems, we are developing food-bait attractants for the management of house fly for both indoor as well as outdoor premises. This food attractant consists of molasses, ammonium acetate, date and sugarcane vinegars, yeast and ethanol. Our food-bait attractant is working as effective as pheromone lure for house flies. This study shows that by using food bait attractants we can manage the house fly population in an eco-friendly way. Due to an increase in awareness among people about hygienic living and pesticide side effects, these kinds of olfactory traps are the need of the time.

**Keywords:** House fly, Bait, Management



SPP-IPM-158

## Importance of life table analysis for the management of fruit flies

### *Bactrocera zonata*

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### ABSTRACT

**BACKGROUND:** *Bactrocera zonata* (Saunders) Diptera: Tephritidae is a catastrophic pest, resulting in a \$200 million loss per year in Pakistan. *B. zonata* attacks on peaches, plums, mango, guava, banana, and apple. The larval stage of *B. zonata* is a major destructor of fruit quality and quantity. It affects the export of Pakistan adversely so it is necessary to manage the pest effectively. To understand the behavior of pest life table studies is implemented. The net reproductive rate, survival rate, fecundity rate, mean generation time, intrinsic rate, and finite rate are determined by life table studies. Life table studies also determine the factors of host acceptance by the pest. Favorable environmental conditions for the fruit flies are also studied through the life table. Under the climate change scenario, the incidence of fruit flies is increasing. Life table studies help to manage the pest in this climate change scenario effectively.

**METHODS:** The fruit flies were reared in the Laboratory of MNS University of Agriculture, Multan. A free-choice test was conducted to evaluate the importance of the life table. The host (Banana) is exposed to fruit flies for the oviposition for 24 hours. After larval emergence fruits were transferred into a plastic tub containing soil for pupation. The net reproductive rate, finite rate, fecundity, survival rate, mean generation time, and the intrinsic rate were recorded.

**RESULTS:** According to the life table analysis, the fruit flies can be managed at each stage through different IPM techniques. Hot water treatment for egg and larval stage, and different chemo sterilant baits can be used to manipulate the ovipositional behavior

**CONCLUSION:** The life table studies provide information on the effective stage, and the time to control the fruit flies.

**Keywords:** *B. zonata*, environmental conditions, host acceptance, life table, climate change.

**SPP-IPM-159**

## **Insects used as different pollution indicators**

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### **ABSTRACT**

**BACKGROUND:** Pollution is one of the most important issues in the modern world. With increasing world population, pollution is also surging. It is most important issue in developing countries. According to a report published in 2022, two bigger cities of Pakistan viz. Karachi and Lahore stands at 17<sup>th</sup> and 48<sup>th</sup> number respectively.

Discussion:- Insect are very sensitive to the slight changes in environment. Different insects act as pollution indicators which include dragonflies, butterflies, and houseflies. Among these insect lepidopteron are the only insects which are able to observe the changes occur in environment with respect to others. In Pakistan the concentration of heavy metals is high in water as well as in food. For the indication of heavy metals libellulid dragonflies (*crocothemis servilia*), acridid grasshopper (*Oxya hyla*), and nymphalid butterfly (*Danaus chrysippus*) are used by scientists.

Many terrestrial insects like ants, chrysomelid leaf beetle, arctiid moths, orthopterans are used for indication of pollution in soil.

**CONCLUSION:** All insect have some function in nature, many of them are beneficial for mankind like honey bees, lac insects, silk worm moths. Similarly, insect being used as bio-indicators must be surveyed and knowledge should be disseminate to public for awareness.

**Keywords:** BSF, Pollution, Pollution indicators, Housefly, Odonata, Removing of Polystyrene wastes, Terrestrial waste indication, Water pollution indication, Heavy metal indication.

**SPP-IPM-160**

**Non-chemical control of *Tribolium castaneum* (Herbst) for stored products**

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**ABSTRACT**

**BACKGROUND:** The aim of this study was to determine the influence of modified atmosphere CO<sub>2</sub> against *Tribolium castaneum* to provide a vital role for future perspective. *Tribolium castaneum* is a major and secondary insect pest of stored products. The greater infestation of this insect pest causes heavy damage to cereals both qualitatively and quantitatively. It is estimated that insect pest caused damaged 10 to 40% annually to stored products and there is huge loss for consumption. Chemical control is not to be suggested in stored products as it is not good for human health and stored products and cause several diseases. Modified atmosphere have just been registered in some countries for long-term safety against a range of stored grain insects containing the red flour beetle *T. castaneum*.

**METHODS:** The collections were done from different stores and rearing is done in plastic jars(500ml) at 27±2°C and 65±5 Relative humidity. After we taken 20 insects from jar in plastic bottles (120ml) and then apply different concentrations of CO<sub>2</sub> and check the mortality after 24h,48h,72h and 96 hour. Mortality percentage was calculated.

**RESULTS:** To apply modified atmosphere to control the insect pests of stored grains. The results after 24, 48, 72 and 96 hours of exposure revealed that all the treatments were found significant for all the stages. Higher mortality was recorded at treatment 5 (T5) at 50% CO<sub>2</sub> and lowest mortality was recorded at treatment 1 (T1) at 30% CO<sub>2</sub>.

**CONCLUSION:** Modified atmosphere is Eco-friendly method to control different insect pests of stored grains Benefits of modified atmosphere considering to determine the minimum exposure to control 100% of stored grains insect pests with different concentrations of CO<sub>2</sub> at 25±2°C and 65±5 relative humidity.

**Keywords:** *Tribolium castaneum*, Non-chemical control, Stored products

**SPP-IPM-161**

## **Ecotoxicological risk assessment of various insecticides on *Trichogramma chilonis* at different temperatures**

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### **ABSTRACT**

**BACKGROUND:** *Trichogramma chilonis* (Ishii) is an important biocontrol agent that is widely used around the world to control a variety of lepidopteran pests. The excessive use of pesticides in agricultural settings causes lethal and sublethal effects on biocontrol agents. In ectothermic organisms temperature influences the toxicity of insecticides.

**METHODS:** Toxicity of nine insecticides imidacloprid, bifenthrin, lambda-cyhalothrin, dimethoate, carbosulfan, lufenuron, fipronil, flubendiamide and chlorantraniliprole was studied on *T. chilonis* at 18, 25 and 32°C constant temperatures.

**RESULTS:** The temperature coefficient of imidacloprid, bifenthrin and lambda-cyhalothrin was negative at 25°C when compared to 18°C and became positive when temperature was increased to 32°C. Dimethoate and lufenuron expressed an opposite trend. For carbosulfan and fipronil, the temperature coefficient was positive and for chlorantraniliprole and flubendiamide the coefficient was negative at all tested temperatures. A positive temperature coefficient indicates an insecticide becomes more toxic at higher temperatures while a negative coefficient indicates an insecticide becomes less toxic at higher temperatures.

**CONCLUSION:** Insecticides having a negative temperature coefficient might be helpful in conserving *T. chilonis*. Risk quotient is the ratio of field doses to the LC<sub>50</sub> of beneficial organisms it indicated that chlorantraniliprole at 25°C and 32°C and flubendiamide at 32°C is harmless to *T. chilonis* and can be incorporated in integrated pest management (IPM) programs while the other tested insecticides should be avoided. This research will aid in the development of successful pest management systems by lowering the adverse effects of pesticides on non-target species.

**Keywords:** Temperature coefficient, Toxicology, Climate change, Pesticide, Risk quotient, Ecotoxicological Risk Assessment (ERA)

**SPP-IPM-162**

## **Role of chemical attractants in controlling mosquitoes**

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### **ABSTRACT**

**BACKGROUND:** The most dangerous animal on the Earth is mosquito. Mosquitoes act as vectors for different human diseases like malaria, dengue, and encephalitis which are spread by three genera of mosquitoes i.e. *Anopheles*, *Aedes*, and *Culex* respectively. In 2020, worldwide malaria cases were estimated around 241 million while estimated number of malaria deaths were about 627,000. Similarly, approximately 400 million people are affected by dengue virus, out of which, 100 million people become ill and 21,000 deaths occurred annually. Currently, pesticides are the only control method for mosquitoes. Where these pesticides are not only injurious to human health but also involved in the development of resistance in mosquitoes.

By adopting traps, we can control mosquitoes without causing any hazardous effects on humans. The reason behind this review is to highlight the importance of mosquito attractants. Understanding nature of attractants to control mosquitoes may serve as a key to vector control strategies. Different mosquito attractants like carbon dioxide, ammonia, acetaldehyde, acetone, lactic acid, acetic acid and *1-octen-3-ol* (OCT) have been reported so far but they are usually based on human odours, which are required by gravid females after they had mated. So there is a need to find out food based attractants because adult mosquitoes, both male and female, need food to survive as well as to provide energy for flight. So this is a neglected aspect of attractant development for mosquitoes. If a powerful food based attractant is developed it will not only help in controlling mosquito populations at early stage i.e. before they mate but will also help in reducing the incidence of diseases.

**CONCLUSION:** The use of food based chemical attractants (single volatile compounds, natural plant extracts and blends of volatile compounds) in controlling mosquitoes may provide an effective alternative to insecticides for vector management.

**Keywords:** Mosquitoes, Volatiles, lures, *Aedes*, *culex*, *Anopheles*, attractants

**SPP-IPM-163**

## **Female attractants for the management of Fall Armyworm (*Spodoptera frugiperda*)**

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### **ABSTRACT**

**BACKGROUND:** The fall armyworm (*Spodoptera frugiperda*:Noctuidae) is a major pest in Pakistan for maize crop, native to north and south America then invaded in Pakistan . *Spodoptera frugiperda* is a major pest of maize but has a greater host range for other crops. Fall army cause reduction in yield up to 15-73% and cause loss of almost 400 million dollars annually worldwide. Now a days, the management of insects is achieved through pesticides which are harmful for the environment. Lure traps are essential part of the integrated pest management (IPM) Program. These lure traps are very effective because they are environment friendly. The purpose of this review is to explore the effective lure to attract the female of FAW. We know that every insect species has a specific sex pheromone for communication between male and female. Mostly used insect sex pheromones are female oriented that attracts males in the pheromone trap. The main cause of increase in population is due to the female insects because they lay eggs. So if we want to manage the population of FAW in maize effectively then there is a need to decrease the population of females. We can do that if we can manage to maintain the conditions that are favourable for female to lay eggs. We can use some plant volatile chemicals that attract the females to lay eggs, and then the insect can be trapped on a sticky trap or any other suitable trap. This technique is effective but there are some limitations because during the search for egg laying site the female can prefer the natural conditions in the field also there are other pheromones and chemicals present in the field that can decrease the effectiveness of female lure traps.

**CONCLUSION:** Instead of pesticide application to manage the fall armyworm, lure traps can be effective to manage the female population because lure traps are environmental friendly and also because the female fall armyworm is more dangerous. The reason is that it proliferate and spread very fast through egg laying. So effective lures are produced through plant volatiles which help to manage the FAW population.

**Keywords:** Fall army worm, *Spodoptera frugiperda*, IPM ,lure attractants, Sex pheromones traps.

**SPP-IPM-164**

### **Biorational Management of Fall Armyworm in Maize**

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#### **ABSTRACT**

**BACKGROUND:** Maize, *Zea mays* L. Poaceae is an important cereal crop. It is the 3<sup>rd</sup> most important cereal crop in Pakistan after wheat and rice. It contributes 0.8% to the national GDP. Various factors affect the maize production including biotic and abiotic factors. In biotic factors, insect pests damage most of the crop resulting in less production of maize crop. Fall armyworm (FAW) is the most destructive insect pest of maize which costs plant damage ranging between 25-50 % and about 60 % decrease in yield of maize crop. Various cultural practices are used to save the crop from FAW which include hand removal of egg masses by crushing them in the field. Maize crop was sown in late August 2022. The plot was divided into blocks using randomized complete block design with 5 replications. Different plant powders including ash, turmeric, neem, and hot pepper were applied in combination with sand, and eucalyptus-based biopesticide was used. The mixture was applied to the central whorl of the plant. The botanicals are named as ash, turmeric, neem, and hot pepper which were used by mixing them with the sand. A control treatment was also maintained without any application. Our initial results found that neem powder and ash mixture showed relatively more effective FAW management than other botanicals. Using plant powders in fall armyworm management program could be helpful for sustainable production of the crop.

**Keywords:** Cultural practices, intercropping, plant powders, sustainable yield



**SPP-IPM-165**

## **Smart plant protection under changing climatic conditions: A need of the time**

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### **ABSTRACT**

**BACKGROUND:** Extreme climatic conditions drastically increased pest populations in recent years. If these conditions increase with constant rate, we may face food security and economical challenges.

**Discussion :** Severe weather conditions have a significant impact on crop production and agricultural pests. As all organisms including insect pests respond differently under the changing atmospheric conditions. These different responses from insect pests might be due to rising temperatures and increasing carbon dioxide levels that directly or indirectly. Similarly as precipitation patterns have changed rapidly during recent years, it exerts great pressure on agricultural insect pests. Since temperature is the most vital environmental factor having drastic impacts on insect population dynamics. So, it is expected that world-wide climate warming may trigger significant changes in the herbivorous behavior of agricultural pests. In addition, it would also lead to increased overwintering survival, higher number of generations and insect transmitted plant diseases. Similarly it also changes the interaction with host plants and natural enemies.

**Conclusions :** With the sudden changes in environmental conditions, we also need to alter the traditional integrated pest management techniques. Several research priorities can be identified to change traditional integrated pest management in a better way by which we can minimize the pests attacks under changing climate. These may include advanced integrated pest management techniques, including alterations in cultural practices, improved pest resistant varieties, advanced weather forecasting system, tech-based monitoring of pest populations and also the use of modelling prediction tools to minimize the consequences of climate on insect pests.

**Keywords :** Environmental conditions, temperature, carbon dioxide, herbivorous behavior, agricultural pests.

**SPP-IPM-166**

**Temperature dependent functional response of *Coccinella septempunctata* Linnaeus on two different aphid species**

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**ABSTRACT**

**BACKGROUND:** *Coccinella septempunctata* (Linnaeus), is a common predator of aphids, including *Aphis nerii* (Fonscolombe) and *Lipaphis erysimi* (Kaltenbach). In this study, we investigated the effect of two temperature on the Functional response of *C. septempunctata* praying on two different hosts

**METHODS:** The experiment was performed at two different temperatures (15 and 25 °C) and with 6 different prey densities (4,8,16,32,64, and 128 aphids). Each experiment was replicated for 5 times. To determine the type and parameters of the functional response, logistic regression and Roger's random predator models were used.

**RESULTS:** Results showed that at both temperatures, larvae, and adults of *C. septempunctata* exhibited type II functional response against tested aphids. The attack rate of fourth instar was maximum as compared to other predatory stages against both aphids. The attack rate was increased as temperature was increased. The attack rate recorded for the fourth instar at 15 °C was 1.314 h<sup>-1</sup> and 1.959 h<sup>-1</sup> against *A. nerii* and *L. erysimi* respectively. The attack rate of 4<sup>th</sup> instar at 25 °C, against *A. nerii* and *L. erysimi* was 1.747 h<sup>-1</sup> and 1.321 h<sup>-1</sup>, respectively. The handling time was varying with the stage of the predator and by the change in the temperature. The handling time of the later predatory stages decreases as the temperature increases. These results indicates that the later predatory stages are good predators. At 25 °C, *C. septempunctata* performed good.

**CONCLUSION:** Thus, it can be concluded that, the later predatory stages are effective predators and can be used in any biological control program of aphids in greenhouses or in field.

**Keywords:** Functional response, Temperature, Feeding protentional, Predator

**SPP-IPM-167**

**Encapsulation of Cysteine Protease with Graphene Quantum Dots for Enhanced Insecticidal Activity against *Sitotroga cerealella* (Olivier)**

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**ABSTRACT**

**BACKGROUND:** Storing grains for seed and food is a worldwide practice. These stocks of stored food grains are attacked by a number of insect pests. *Sitotroga cerealella* (Olivier) is a cosmopolitan pest of stored wheat/grains and deteriorate reserve by damaging grains and kernels. Adults of *S. cerealella* are capable of flying between the food sources. The larval stage is able to bore and live inside the grain until pupal stage, leaving grain as a hull. Management strategies for the insect pest involve use of insecticides as fumigants. Use of chemical insecticide is being limited in modern times because of evolution of resistance against these insecticides in insects and as well as due to environmental safety issues.

**METHODS:** The present study developed a bio-pesticide by using biomolecules and their encapsulation in nanoparticles. A 25kDa cysteine protease extracted from seeds of *Albizia procera* (ApCP) was encapsulated on/with graphene quantum dots (GQDs). The insecticidal activity of ApCP, with or without GQDs, against stored grain insect pest *S. cerealella* was explored. Insects were exposed to three concentrations 7.0, 3.5 and 1.7 mg of ApCP per a gram of wheat flour pellets.

**RESULTS:** The insecticidal activity of ApCP encapsulated with GQDs was improved as compared to that of ApCP without GQDs for tested insect pest. Insects fed on diet treated with the ApCP after encapsulated with GQDs @ 7.0 and 3.5 mg/g concentrations resulted in no population build-up, while 1.7 mg/g concentration exhibited fewer population numbers. The extraction, purification, characterization, quantification and encapsulation of ApCP with GQDs were also studied.

**CONCLUSION:** Cysteine protease nanocarriers have the potential to control stored grain insect pests and can be commercialized worldwide.

**Keywords:** Cysteine protease, Graphene quantum dots, *Albizia procera*, *Sitotroga cerealella*, Bio-pesticides.

**SPP-IPM-168**

## **Role of RNAi in plant protection and its application**

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### **ABSTRACT**

**BACKGROUND:** To maintain the yield along with the reduced use of chemical pesticides for food safety purposes and the protection of crop plants, there is a need for advancement in the genetics of both insects and plants. The *Bacillus thuringiensis* (*Bt*) transgenic crops have been used for years for pest control, but now pests have become resistant to *Bt*. RNA interference (RNAi) is a natural phenomenon, and it has been proven helpful in protecting crop plants against many disastrous insect pests.

**METHODS:** RNAi regulates gene expression in several manners: effective post-transcriptional gene silencing (PTGS), translational inhibition, RNA destabilization, or transcriptional gene silencing (TGS) by directing DNA methylation. In RNAi, the effect of the gene is knocked down by the binding of smaller anti-sense strands of ribosomal RNA to mRNA. Thus protein formation is stopped by the interference of double-stranded RNA (dsRNA) through the formation of a complex called RNA-induced silencing complex (RISC). The dsRNA is introduced into insects through injection, soaking, or an artificial diet.

**CONCLUSION** Synthetic dsRNA is derived from pathogens or pests' genes and applied as a foliar application on the crop in sprayable pesticides, i.e., spraying of dsRNA molecules derived from *Phytophthora infestans*, as a plant protection strategy for the management of potato late blight. dsRNA can also be applied via insecticidal baits, nanoparticle trunk injection, and root soaking for woody plants, such as fruit trees. Another method to produce dsRNA in the host plant is recombinant microbes such as viruses and bacteria, i.e., the viral vector is engineered using Tobacco Rattle Virus (TRV) to deliver dsRNA into *Nicotiana attenuata*.

**Keywords:** RNAi, plant protection, application

**SPP-IPM-169**

**Activity of mycoproteins and synthetic attractants baits against *Bactrocera zonata***

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**ABSTRACT**

**BACKGROUND:** *Bactrocera zonata* (Tephritidae: Diptera) is invasive species of fruit fly, which causes major economic damage to fruit crops. Biological control agents like, *Beauveria bassiana* contains mycoproteins that exhibit insecticidal activity against *B. zonata*. Attract and kill is the most competitive strategy for management of *B. zonata*.

**METHODS:** The recent study was designed to integrate crude mycoproteins of *B. bassiana* and synthetic food baits against adult of *B. zonata*. The integration of crude mycoproteins and baits were experimented in laboratory under CRD to observe the activity against *B. zonata* (adult and larvae).

**RESULT:** The mortality of adults and were  $90.01 \pm 4.81$  and  $88.89 \pm 2.78$  at  $15 \mu\text{l/ml}$  concentration respectively and minimum mortality  $44.47 \pm 2.77$ ,  $36.10 \pm 2.78$  were recorded in less concentrated treatments at  $3 \mu\text{l/ml}$  concentration followed by control. Same experiment was repeated in mango orchard against *B. zonata* to observe the activity of crude mycoproteins at concentration of 6, 12, 18, 24 and  $30 \mu\text{l/ml}$  were mixed with synthetic attractant baits in cylindrical traps (6×9 inches) at height of 2 meters from ground on mango tree. Data were recorded after 1, 2, 3, 4 days that showed the significant mortality  $84.23 \pm 2.54$  in adults at  $30 \mu\text{l/ml}$ .

**Conclusion:** This study helped to understand the pathogenic properties of mycoproteins attracting ability of food baits against adults and larvae of *B. zonata*.

**Keywords:** *B. bassiana*, *B. zonata*, mycoproteins, synthetic baits, mortality.

**SPP-IPM-170**

**Abdominal color masking on *Bactrocera zonata* to observe ovipositional responses on mango fruits**

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**ABSTRACT**

**BACKGROUND:** *Bactrocera zonata* is one of the major pests of mango. *B. zonata* mostly attack on ripened mango due to delicate upper layer of fruit. Many mechanical methods have been used to manage population of *B. zonata*. The recent study focuses egg laying and sexual behavior of *B. zonata* for effective management.

**METHODS:** The zebra line pattern on fruit body have been reported as effective in lowering the randomized oviposition capacity of fruit fly. White Chaunsa variety of mango were painted with different color of nail paints including Red, Black, White, Blue, and Yellow in zebra lines pattern to observe the oviposition. Forty eight adults for one treatment and each treatment replicated thrice, including male and female were taken from the stack culture of insect pathology laboratory Institute of Plant Protection MNS University of Agriculture Multan.

**RESULTS:** The maximum egg laying was on yellow and blue lined mango fruits followed by untreated ones. The sexual behavior of *B. zonata* was also observed by masking nail paints on abdomen and thorax of *B. zonata* male and female. The minimum egg laying percentage was recorded from colored females due to repelling behavior in females against male because males considered female species as Alien. So sexual behavior was disturbed.

**CONCLUSION:** The outcomes indicated that the best mechanical method for controlling *B. zonata* is nail paints coloring on mangoes in zebra lines pattern and masking on abdomen and thorax of *B. zonata* act as barrier between male and female during courtship.

**Keywords:** Mango, *B. zonata*, color masking, management

**SPP-IPM-171**

## **Response of the Peach fruit fly, *Bactrocera zonata* (Sunders) to some Synthetic proteinaceous food bait attractants**

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### **ABSTRACT:**

**BACKGROUND:** Peach fruit fly, *Bactrocera zonata*, is a serious pest, attacking fruits and vegetables causing a large quantitative and qualitative damages throughout the world. Fruit fly required proteinaceous food for sexual maturation and eggs development. Therefore, food bait attractants are widely used for detection, monitoring, mass trapping and controlling fruit flies.

**METHODS:** Therefore, screening out the most suitable synthetic proteinaceous food bait attractants to volatiles distinguished by the fruit fly antennae through Y-olfactometer (Behavioral assays). The response of *B. zonata* adults male and females to some ammonium compounds (Ammonium acetate, tri-methylamine and putrescine) that mixed with certain food attractants were evaluated under laboratory conditions from 5-day old flies to 30 days old. To find potential mixtures that might be beneficial in developing fruit fly attractants for male and especially for females. So, four base baits developed by mixing protein hydrolysate with Jaggery, papa powder, kachri powder, KOH and guava pulp. Finally, thirty-three, synthetic blends were developed when above four base baits mixed with synthetic attractants.

**RESULTS:** Results from the olfactometer bioassay indicated that protein hydrolysate + Jaggery and Protein hydrolysate + Jaggery + AA + Putrescine were effective both male and female throughout the adult life span when jaggery was used as base baits. Similarly, protein hydrolysate + Guava pulp + AA + TMA and protein hydrolysate + Guava pulp + AA + Putrescine also effective for the attraction of both male and female from 5<sup>th</sup> to 30 days life span when guava pulp was used as base baits. There was also variation in the pH of the baits due to different chemical composition of attractants as well as different food constituents.

**CONCLUSION:** Bait proteins pH was a significant factor that may be strongly associated with the attraction efficiency of male and female fruit flies *B. zonata*.

**Keywords:** *Bactrocera zonata*, Y-olfactometer, food attractants, ammonium compounds



## SPP-IPM-172

### Aphid pest management and their biological control in canola crop using biopesticides

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#### ABSTRACT

**BACKGROUND:** Canola is one of the crops that has the ability to fulfill the country's demand for edible oil. Pakistan, an agricultural country, lacks edible oil. Canola yield losses are mainly due to insect pests. Aphids are a significant economic yield reducing pest of canola. The control of aphids is crucial to increasing canola production. The canola crop has been known to be affected by the green peach aphid, *Myzus persicae* (Sulzer), turnip aphid, *Lipaphis erysimi* Kalt, and the cabbage aphid, *Brevicoryne brassicae* (L.) (Hemiptera: Aphididae). Infestations on podding or flowering sections reduce yield. The only method of controlling pests is the use of pesticides. Also, the widespread use of synthetic insecticides has led to increased resistance and a resurgence in pest populations. Alternative methods include using botanicals with pesticides, which can have an effect on aphid activity.

**METHODS:** The study compared the efficacy of botanicals i.e., Neem, *Azadirachta indica* A. Juss, Kortuma, *Citrullus colocynthis* Linnaeus, Tobacco, *Nicotiana tabacum* Linnaeus, silver nanoparticle spray, S1 bacteria (S1B), one insecticide Advantage, and Control on canola aphid and their biological control i.e., ladybird beetle. Wheat crops were tested out in the field at the MNS University of Agriculture in Multan. The experiment was set up in a factorial randomized complete block design with three replications. Before and after intervals of 24, 48, 72, and 168 hours data were recorded.

**RESULTS:** Studies of aphid population (%) after exposure to kortuma (10.62%) and Ag (46.65%) showed significant differences between the two treatments. In the cases of kortuma ( $0.17 \pm 0.09$ ) and silver nanoparticle ( $0.20 \pm 0.12$ ) treatments, a considerable population of ladybird beetles/plants was found. As a result of their lower resistance, biopesticides like Ag nanoparticles, Bio-N, and Kortuma were found to have the greatest effect. After specific hours, aphid populations were found to be higher in the control and some other biopesticide treatments, including neem, tobacco, and S1 bacteria.

**CONCLUSIONS:** Research showed that biopesticides performed significantly better than conventional treatments, likely due to the lower possibility of resistance and the fact that they were made in a more naturalistic way.

**Keywords:** Aphid, Biopesticides, Botanicals, Biological control, Management, Canola.

**SPP-IPM-173**

**Comparison of toxicity of selected biopesticides to *Bemisia tabaci* (Homoptera: Aleyrodidae)**

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**ABSTRACT**

**BACKGROUND:** Cotton whitefly, *Bemisia tabaci* Gennadius (Homoptera: Aleyrodidae), is a cosmopolitan insect that can be particularly destructive and is a pest of cotton, vegetables and ornamental crops.

**METHODS:** An experiment was performed to evaluate the lethal toxicity of one synthetic insecticide and two botanicals in the greenhouse of C block at MNS university of Agriculture, Multan, Pakistan during 2022. Synthetic insecticide afidopyropen and two plant-based insecticides, i.e. bitter apple fruit extract and a biopesticide (BioN) were used in the study. There were four replications of each treatment. Each treatment had 5 doses and one control in each replication. The data were recorded after 24 hours, 48 hrs and 72 hrs respectively. Lethal concentration 50 (LC50) of afidopyropen 511  $\mu$ l, BioN 678  $\mu$ l and 489  $\mu$ l of bitter apple fruit extract in 100 ml of water, respectively.

**RESULTS:** Where, the lowest LC50 was observed in bitter apple fruit extract i.e. 4.89%. According to the result bitter apple fruit extract was more effective than afidopyropen and BioN.

**CONCLUSIONS:** Present study recommends the use of bitter apple fruit extract for management of cotton whitefly in an eco-friendly way.

**Keywords:** Cotton, insect pests, plant-based insecticide, whitefly

**SPP-IPM-174**

**Management of *B. cucurbitae* through different Organic techniques**

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**ABSTRACT**

Fruit flies, or *Bactrocera* spp. (Diptera: Tephritidae), are a major economic pest of both fruits and vegetables around the world. *B. cucurbitae* is the most prevalent and harmful pest of vegetables worldwide among fruit flies. Tephritidae is thought to have caused fruit losses of up to 24% in Pakistan. In Pakistan, melon flies are largely controlled through chemical, pheromone, and field cleaning approaches. With an emphasis on organic vegetable farming, this study will investigate and evaluate cutting-edge techniques for controlling *B. cucurbitae* adults and pupae. To reduce the number of adult flies, food-based proteinaceous hydrolysates will first be screened with chemosterilants in both laboratory and outdoor settings. Second, to control fruit fly pupae, the effectiveness of various plant extracts such as neem, tobacco, hing, moringa, and kortumma through aerial spraying and bacterial biopesticides using chemigation will be assessed. The *Bactrocera cucurbitae* will be mass trapped, observed, had mating disruption, and finally controlled using the base baits. The aim is to find the best management strategy for organic farming. Fruit fly management strategies involving plant extracts, food baits, and inundation with biopesticides all show promise. The fruit fly population will be permanently reduced as a result of this study's findings.

**Keywords:** *B.cucurbitae* , organic methods, vegetables , bait

**SPP-IPM-175**

**Evaluation of *Azadirachta indica* Seed extract against dengue vector *Aedes aegypti* larvae**

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**ABSTRACT**

**BACKGROUND:** Dengue fever is a serious viral illness vectored primarily by a mosquito species, *Aedes aegypti*. Currently, there is no vaccination to encounter this disease. The most effective techniques for suppressing and controlling this deadly disease are restricted to vector management. Use of pesticides is an easy way for mosquito control, but injudicious use of these synthetic chemicals resulting in the development of resistance and harmful for other animals. So, we need to formulate bio-pesticides which are safe and easy to use.

**METHODS:** The experiment was carried out according to the methodology of the World Health Organization on lab population F26. The dose ranged from 3  $\mu$ l to 0.18753  $\mu$ l/ml in distilled water. All these concentrations proved to be lethal for late 3<sup>rd</sup> instar larvae. In 1000 ml of water, 600 g of *Azadirachta indica* seed was added, and boil the water until we got 60% solution. For every concentration, 25 larvae are used in 100 ml of water at 27 °C  $\pm$  2 °C and RH 60%  $\pm$  5%.

**RESULTS:** At 3  $\mu$ l, 100% mortality occurred after 12 hours of exposure. 50% mortality came out at the concentration of 0.78  $\mu$ l/100 ml of distilled water.

**CONCLUSION:** The study demonstrates *Azadirachta indica* is a good naturally occurring larvicidal agent against *Aedes aegypti*. It is a safe and effective alternative to conventional insecticides.

**SPP-IPM-176**

**Killing two birds with one stone: Integrated Pest Management – A promising solution to insecticides resistance as well as for Diamondback Moth Control**

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**ABSTRACT**

**BACKGROUND:** Diamondback moth (DBM), *Plutella xylostella*, is amongst the most damaging insect pests of crucifer crops globally. Among the other hosts of DBM are radish, cabbage, broccoli, turnip, and cauliflower. Management cost of this pest may reach up to \$4 billion. The average lifecycle of DBM is shorter in the lowlands (13 days) than in the highlands (27 days). The insect is, usually, more prevalent during the dry season of the year. Managing this pest is a major challenge. Now, mainly insecticides are being used to control this pest which not only cause considerable environmental problems, but DBM has also developed high resistance against many traditional insecticides, including pyrethroids, organophosphates, fipronil, Spinosad, and *Bacillus thuringiensis*. Excessive reliance on chemical control has also led to a dramatic reduction in natural enemies' population. An environmentally friendly integrated pest management (IPM) strategy with different management techniques (microbial control, biological control, culture control, blending disruption, pesticide circulation strategy, and plant resistance). Modern IPM programs Microbial insecticides for crop protection are becoming more prevalent in the agricultural industry and improving by using DBM biocontrol, especially when the pest complex is simple and DBM is the dominant species. The potential of a variety of entomopathogens, including bacteria, nematodes, viruses, fungi, and protozoa, can be harnessed to improve crop protection. *D. semiclausum* and *C. plutellae*, which have been extremely effective in reducing diamondback moth populations in the highlands and lowlands, respectively, play a crucial role and set a positive example for the fundamentals of a strong IPM program for the DBM control needs to be introduced.

**CONCLUSION:** The present study summarizes the information provided on pesticide resistance against *P. xylostella* and emphasizes the importance of using sustainable IPM strategies for its management.

**SPP-IPM-176**

### **Image processing as a tool for insect pest management: A Review**

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#### **ABSTRACT**

**BACKGROUND:** Agriculture plays an important role to fulfill the hunger of both humans and animals. Detection of pests is one of the important issues in the agriculture field. Therefore, an effective measure to monitor insect pests is needed for their timely management. Image processing techniques (IPT) are widely applied in agriculture and can play a role in improving crop management and production. Image Processing for Pest Management (IPPM) is a remote diagnostic tool for identifying diseases and insects. The IPPM's objective is to automate the diagnostic process based on the interaction of producers and experts over the Internet, enabling the use of photography to diagnose crop pests at an early stage of crop production. Image processing technique refers to computer-assisted manipulation and analysis of images captured by different sensors, such as visible light cameras, infrared imaging devices and sensors operating in different bands of the electromagnetic spectrum. Image processing algorithms diagnose digital photographs in a fast, accurate and cost-effective manner.

**METHODS:** The keywords were researched and top 20 paper were read for the relevance and data from them was compiled to review

**RESULTS:** There are three main steps in image processing. First, it converts the captured image into a binary value that the computer can process. Second is image enhancement and data compression. The third is the output, which consists of displaying or printing the processed image. MATLAB (programming platform) is used for the analysis of crop insect images. IPTs can be used to recognize crop diseases based on images of leaves, stems, flowers and fruits and monitoring the progression of plant diseases. Accurate diagnosis of insect pests helps in more economical use of pesticides and causes to reduce production costs while protecting the environment and improving access to highly regulated but lucrative markets such as the EU, America and Japan.

**CONCLUSIONS:** The purpose of image processing is to detect insects. Early detection will increase crop production by timely application of management operations. Image processing techniques (IPT) have been implemented to overcome the shortcomings of the classical diagnostic method. It is clear that the time required to perform a full diagnosis with the IPPM is much less than that needed in traditional diagnosis.

**Keywords:** Agriculture, economic damage, cost effective, production losses

**SPP-IPM-177**

### **Novel Approaches in Pest Management: A Review**

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#### **ABSTRACT**

**BACKGROUND:** Pests are the organisms which damage the crops and lower the yield. Total global production losses due to pests are about 31% in maize, 50% in wheat and 80% in cotton. Therefore pests are a major concern for the farmers. Conventional pesticides and other old practices are not sufficient for successful management of pests. Due to increasing world's populations, there is a need to use and adopt novel approaches for pest management and to meet the world's food problems by increasing crop yield.

**METHODS:** The keywords were researched and top 20 paper were read for the relevance and data from them was compiled to review

**RESULTS:** Novel approaches like Thermal identifying technology, portable harmonic radar system, information communication technology (ICT) and web based software, remote sensing techniques and unmanned aerial vehicles should be used for monitoring and identification of pests. Heat treatments can be used to control pests like thermal analyses in flour mills. CRISPR gene technology tool prove helpful in pest control by altering the key gene in insect that control fertility and sex determination. Genetically modified crops developed using gene silencing through RNA interference (RNAi) prove a boon for management of phloem-feeding pests like brown-plant hopper in rice. Communication tools like the mobile data capture devices which are able to capture real time data and proved helpful in pest management.

**CONCLUSIONS:** Non-toxic heat treatments, IGRs, pheromone assisted techniques, biorational products, second generation green products and RNAi approaches should be used that are safer than pesticides for pest control. Major advances will be achieved by using emerging techniques for automated early detection and monitoring of pests.

**Keywords:** Conventional pesticides, Thermal identifying technology, CRISPR, phloem-feeding pests.



**SPP-IPM-178**

**Spatio-temporal distribution of *Tuta absoluta* (Meyrick 1917) (Lepidoptera : Gelechiidae) from Pakistan**

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**ABSTRACT**

**BACKGROUND:** The tomato leaf miner *Tuta absoluta* (Meyrick 1917) (Lepidoptera: Gelechiidae) was reported for the first time in 2018 from Multan, the southern part of Punjab, Pakistan.

**METHODS:** It is an invasive pest so with the intention to monitor the geographical distribution of this invasive pest, a survey was carried out for three consecutive years from 2019 to 2021 in tomato growing districts of Punjab province including Multan, Muzaffargarh, Lodhran, Rahim Yar Khan, Rawalpindi and Charsadda from the province of Khyber Pakhtunkhwa. Monitoring was done through field surveys and sex pheromone delta traps.

**RESULTS:** Results showed that 17.62% of samples were found with *Tuta absoluta* attack or life stages i.e., egg, larvae, pupa and adults. Out of the total attacked samples, 15.54% of the samples were reported from Charsadda district, followed by Rawalpindi and Multan in surveyed years with 1.45% and 0.62%, respectively. No larval infestation or adults were captured from Muzaffargarh, Lodhran and Rahim Yar Khan districts throughout the survey. Maximum numbers of adults were captured in 2020 with 132 adults per week. However, no significant difference was observed among moths captured per year. The number of adult moths captured per week increased with the rising temperature and with the maximum capture occurring in temperatures ranging between 25 and 35 °C.

**CONCLUSION:** The results concluded that the *T. absoluta* has established itself in the Charsadda district, whereas in Rawalpindi, it is in the establishing process. Due to its reproductive rate and high capacity to disseminate, there is a high-level risk that the pest can spread to the whole province of Khyber Pakhtunkhwa. Consequently, an integrated pest management strategy is the utmost need of time to control this invasive insect pest in Pakistan.

**Keywords** Tomato leaf miner · South American pinworm · Invasive species · Pheromone trap · Pest monitoring



## THEME-2

# PLANT DISEASES AND DIAGNOSTICS

## THEME-2: PLANT DISEASES AND DIAGNOSTICS

### ORAL TALKS

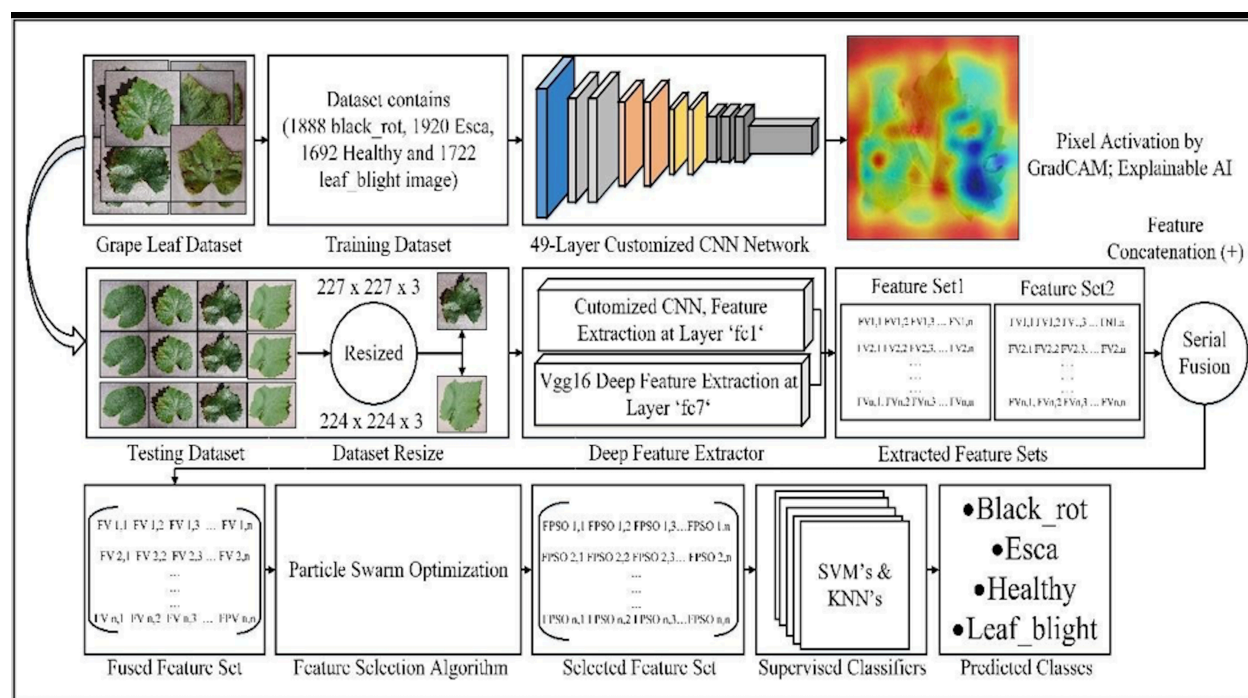
#### SPP-PP-201

### Identification of Grapes Leaf Diseases using Computer Vision Techniques

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### ABSTRACT

**BACKGROUND:** Grapes (*Vitis vinifera L.*) are found in more than sixty species with a significant genetic diversity. Almost 70% of its diverse genotypes are grown in different geographical regions of Pakistan. Grape vines are host to a large number of intracellular pathogens that negatively affects the quality of the fruit and overall yield. Climate change leading to intense temperatures and up level of greenhouse gasses increases the intensity of plant diseases. Grapes leaf diseases Esca, black rot, and leaf blight are viral and bacterial diseases that adversely affect fruit production and quality. Manual identification of these diseases is hard due to similar symptoms. This can be avoided using automated grapes disease identification systems using computer vision techniques

**METHODS:** This paper presents an automated system to identify grapes leaf diseases using image processing and machine learning techniques. The system classifies the

diseases based on the color, size, and shape of the leaf. A five-step sequential approach including preprocessing, deep feature extraction, feature fusion, feature selection, and classification was used for the identification of grape leaf diseases.

**RESULTS:** The system was evaluated on a grape leaf image dataset consisting of 7122 images where 70% images were used for training and 30% images for validation. We compared the performance of VGG16 and a customized Convolutional Neural Network (CNN) model for feature extraction, a serial approach was used for feature fusion, Binary Particle Swarm Optimization (BPSO) model was used for feature selection, and supervised learning algorithms (SVM and KNN) was used for classification. We performed six experiments for grape leaf disease detection and classification. All these experiments were based on the pre-trained, custom CNN, and optimized feature set. The first experiment was based on the pre-trained (Vgg16) model used for feature extraction. The customized CNN is used for grapes leaf classification in experiment 2. The experiments 3 - 6 were based on fused (vgg16, CNN) extracted features and generated optimized feature sets that were used for calculating the classification rate. The highest optimized accuracy of 99.55% was achieved in experiment 6 with 2616 selected features of the grape leaf disease dataset having 1805 images. The system achieved an average accuracy of 98.78% validated by comparing with ground truth data annotated by agriculture experts.

**CONCLUSION:** Classification and monitoring of grape leaf diseases (Esca, Black rot, and leaf blight) can be performed with high accuracy using computer vision techniques. The main contribution of this paper is the implementation of a customized CNN and comparative analysis of feature fusion techniques with different combinations. It was observed that the number of selected features affects the accuracy rate of disease classification. Feature extraction using VGG16 and CNN followed by cubic SVM based classification outperformed other combinations.

**Keywords:** esca; black rot; leaf blight; deep learning models; feature fusion; CNN; VGG16, BPSO, SVM, KNN

**SPP-PP-202**

**Exploring the innate immunity of wheat germplasm against yellow rust of wheat**

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**ABSTRACT**

**BACKGROUND:** Wheat has been found to be extensively afflicted by rust disease as a result of significant seasonal fluctuation. Yellow rust (YR), often known as 'stripe rust of wheat' is a severe, recurring disease in wheat-growing regions around the globe.

**METHODS:** Two-year study (2020-21 and 2021-22) was conducted at MNS-University of Agriculture, Multan in order to screen out a set of hundred breeding lines against the natural inoculum of YR. The disease severity (DS), Coefficient of infection (CI) and average coefficient of infection (ACI) was recorded by using Modified Cobb's scale. The results were correlated with the environmental variables.

**RESULTS:** All breeding lines had shown low disease severity (DS) and area under the disease progress curve (AUDPC). Out of hundred breeding lines, less than 20 lines were shown to be moderately resistant to moderately susceptible in both years. Maximum and minimum temperatures correlated positively in both years, while humidity correlated negatively in the first year and positively in the second.

**CONCLUSION:** The present study highlights the importance of favorable environmental conditions for the YR progression. Epidemiological factors made it challenging for the disease to proliferate on a broad scale during both study years.

**Keywords:** Wheat, yellow rust, disease severity, meteorological factors, correlation

**SPP-PP-203**

**Influence of *Parthenium hysterophorus* dry powder contaminated soil on germination indices and growth of maize.**

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**ABSTRACT**

**BACKGROUND:** *Parthenium (Parthenium hysterophorus L.)* is one of the most aggressive herbaceous weeds of the Asteraceae family. It is widely distributed, almost across the world and has become the most important invasive weed. The infestations of parthenium have been reported to reduce grain and forage yields by 40-90%. The spread of parthenium has been attributed to its allelopathic activity. Allelochemicals released from parthenium have been reported to decrease germination and growth of agronomic crops, vegetables, trees and many other weed species. Growth promoting effects of parthenium extracts at low concentrations have also been reported in certain crops.

**METHODS:** A laboratory experiment was carried out to evaluate the germination and germination indices of maize with estimation of maize growth infested with parthenium allelopathy. This trial was conducted in CRD designs with 3 replications.

**RESULTS:** Parthenium dry powder % mixed with soil produced variable responses regarding seed germination and seedling growth. Emergence index, mean germination time, vigor index was significantly affected by various parthenium dry powder percentages. The smaller amount of parthenium powder (5, 10 and 15%) promoted the maize germination and seedling growth. The highest parthenium dry powder (20%) negatively affects the maize germination and seedling growth. Germination %, time to start germination, time taken to 50% could not be affected by parthenium dry powder. Physiological characteristics, SPAD value, Crop growth rate and plant height are significantly reduced from T1 control from proceeding to T5 (20% dry powder). Similar trends were found in root length, shoot length, plant fresh weight and plant dry weight also.

**CONCLUSION:** In light of this study it is recommended that a smaller amount of parthenium dry powder percentage (5, 10 and 15%) promoted the maize germination and seedling growth positively. Therefore the maize can be planted in the field infested with parthenium weed to some extent and its planting should be avoided where the higher population of parthenium precedes the maize planting.

**Keywords:** Allelopathy, *Parthenium hysterophorus*, Germination, Growth, Development



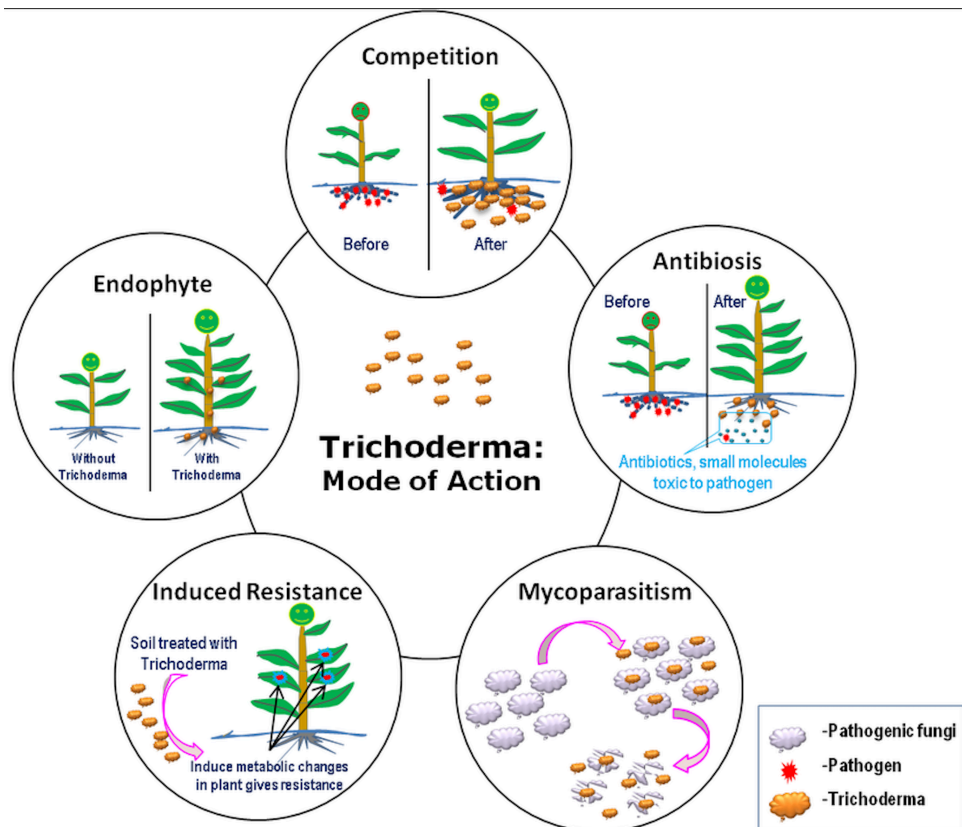
SPP-PP-204

**Trichoderma produce the glycan and chitinase to degrade the soil borne fungal propagules**

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**ABSTRACT**

**BACKGROUND:** *Trichoderma* produces antibiotics like trichodermin, Beta-(1-3)glucanase and chitinase and degrades the glucans in the cell wall of *Pythium* and *Rhizoctonia* these enzymes lyse the pathogen hyphae.

**METHODS:** Bio Product of *Trichoderma* is prepared in laboratory and applied in three parts: seed, germination, flowers, and maturity at 4 g/kg, 4 ml/L along with the mixture of farmyard manure (FYM).

**RESULTS:** *Trichoderma* are antagonists to fungal pathogens in soil, especially in wheat fields, to control the uredo and teleutospores of rust. It causes the lysis of germinating propagules of pathogens through enzyme activity.

**CONCLUSION:** The present study highlights the importance of *Trichoderma viride* in soil to control soil-borne pathogens through degradation of cell walls, especially in wheat, to make the symbiotic relationship with roots and yield increase up to 25%.

**Keywords:** *Trichoderma*, glucanase, chitinase, Farm yard manure (FYM)



**SPP-PP-205**

**Evaluation of different fungicides and plant extract against *Fusarium oxysporum* f. sp. *ciceris* causing chickpea wilt**

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**ABSTRACT**

**BACKGROUND:** Chickpea (*Cicer arietinum* L.) is a rich source of plant protein. A number of diseases attack chickpea crop but wilt disease is the most destructive one.

**METHODS:** In the present study *in-vitro* fungicides and plant extracts assay were evaluated against *Fusarium oxysporum* f. sp. *ciceris* at different levels.

**RESULTS:** *In-vitro* fungicides assay maximum individual inhibition of the growth of the fungus was recorded by Nativo followed by Derosal, Socre and Topsin-M (100-76%) at a concentration of 1.5% after 8 days respectively. Dithane M-45 was found to be least effective at a concentration of 0.5% and gave the minimum inhibition (58%) after 4 days. *In-vitro* plant extracts assay *Azadirachta indica* followed by *Allium sativum*, *Moringa oleifera* and *Datura stramonium* (87-65%) at a concentration of 3% after 8 days correspondingly. While *Eucalyptus camaldulensis* at a concentration of 1% was found to be least effective, it gave the minimum inhibition (59%) after 4 days. In greenhouse experiments, Nativo was proved to be most effective on susceptible varieties Thall-2006 expressed minimum disease reduction percentage followed by Derosal, Score, and Topsin-M (4-20%) over control (50%) at 1.5% concentration. While Dithane M-45 expressed maximum disease reduction percentage (34.30%) at 1% concentration over control (49%). *Azadirachta indica* was found to be most effective on susceptible varieties Thall-2006 showed minimum disease reduction followed by *Allium sativum*, *Moringa oleifera* and *Datura stramonium* (12-34%) over control (49%) at 3% concentration. While *Eucalyptus camaldulensis* exhibited maximum disease reduction percentage (33.30%) at 2% concentration over control (49%).

**CONCLUSION:** For the management of chickpea wilt disease, use of Nativo and *Azadirachta indica* should be encouraged on a commercial basis.

**Keywords:** Chickpea, *Fusarium oxysporum*, wilting, fungicides, plant extracts

**SPP-PP-206**

### **Bio-Chemical Management Of Fusarium Wilt Of Tomato**

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### **ABSTRACT**

**BACKGROUND:** Tomato (*Solanum lycopersicum* L.) belonging to the Solanaceae family is a chief component of daily food. It is cultivated by market gardeners as well as for kitchen gardening. It is largely produced in Punjab, Sindh and KPK province in Pakistan. *Fusarium oxysporum* f. sp. *lycopersici* is the significant soil-borne pathogen causing fusarium wilt in tomatoes. In Pakistan, yield is reduced by 21.9% due to tomato wilting. The fusarium wilt of tomato was managed by using different fungicides and biocontrol agents.

**METHODS:** Tomato seeds were sown in trays followed by transplanting. Fungicides; Score (Difenoconazole) at dose of 0.3 ml/L, Topsin-M (Thiophanate methyl) 2 g/L and biocontrol agents (*Trichoderma* sp. and *Bacillus* sp. at concentrations of  $1 \times 10^3$  and  $1 \times 10^3$  spore/ml) were applied after inoculating the transplanted plants with disease inoculum. Treatments were applied after a week of tomato seedling transplant. Using disease rating scales, disease severity symptoms and disease incidence were recorded at weekly intervals. Collected data was analyzed statistically.

**RESULTS:** First symptoms of the disease appeared at day 8 after pathogen inoculation. The result indicated that after application of treatments, in controlled pots T0 showed maximum disease of 32.64% which was recorded after spraying with distilled water. Minimum disease was recorded in those plants which were sprayed by *Trichoderma* sp. (9.52%) and *Bacillus* sp. (12.41%) was found most effective against fusarium wilt of tomato. The fungicide sprays; Difenoconazole (25.43%) were less effective than biocontrol sprays. Thiophanate methyl (18.91%) was given fair results among other chemicals. In present study, results of *Trichoderma* sp. and *Bacillus* sp. applications revealed that all the other three treatments were significantly superior over control in managing the Fusarium disease spread. Among all sprays, T3 and T4 were significantly superior over other treatments. With the exception of all treatments, that were found superior in action over T0 (control). The overall results showed that T3 (*Trichoderma* sp.) was most effective against fusarium wilt of tomato. Thus, use of biocontrol agents were most effective and at the same time it is environment friendly.

**CONCLUSION:** This study will be fruitful for the farmers to manage these soil-borne pathogens that will lead to high production of tomatoes.

**SPP-PP-207**

## **Identification and characterization of begomoviruses-whitefly complex infecting Soybean**

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### **ABSTRACT**

**BACKGROUND:** Soybean crop suffers significant losses due to numerous viruses especially begomoviruses, which have single stranded (ss) DNA and are called legume yellow mosaic viruses (LYMV). There is a need to understand the begomovirus-whitefly pathosystem infecting soybean crops.

**METHODS:** During the soybean season crop was surveyed for the presence of typical begomovirus symptoms, leaves and whiteflies were collected in zip bags and aspirator, respectively. The symptomatic leaves and whiteflies were subjected to total genomic DNA extraction followed by PCR for begomoviruses and amplification of partial cytochrome oxidase subunit I (COXI) gene. The begomovirus positive sample was used to amplify the whole genome of begomovirus through rolling circle amplification technique followed by cloning and sequencing of the amplicons while the amplified COXI gene was also sequenced. The obtained sequences were assembled using Geneious R7 software package and BLAST analysis was conducted online at NCBI web portal. The similarity index matrix and phylogenetic tree were constructed through sequence demarcation tool and MEGAX software packages. Sequences were subjected to megablast and 18 related sequences were downloaded. The obtained sequences along with the downloaded sequences, of begomovirus and whitefly, were aligned using MUSCLE algorithm embedded in Sequence Demarcation Tool (SDT) followed by pairwise sequence comparison analysis.

**RESULTS:** SDT results showed the similarity with *Tomato Leaf Curl New Dehli virus*. It shows 98% similarity with ToLCNDV [KP235542] and ToLCNDV [HM007120]. Results from SDT identity matrix confirmed that the Multan isolate infecting soybean of begomovirus known as *Tomato Leaf Curl New Dehli Virus* as per species demarcation criteria of begomovirus genus. Likewise, the whitefly sequence analysis showed 99.9% similarity with *Bemisia tabaci* mitotype Asia II-I with accession numbers [OL763913] and [OL763907] reported from Nasirabad and Rahim Yar Khan on Tomato and Brassica plants. The study confirms the infection of *Tomato Leaf Curl Dehli Virus* and Asia-II-I presence on Soybean in Multan, Pakistan.

**CONCLUSION:** The study confirms the infection of Tomato Leaf Curl New Dehli Virus in Soybean in Multan, Pakistan. This is first report of ToLCNDV infection in Soybean crop also confirm Asia II 1 presence and involvement in begomoviruses transmission to Soybean.

**Keywords:** Soybean, *Bemisia tabaci*, Geminiviridae, Begomoviruses

**SPP-PP-208**

**Characterization of Environmental factors conducive for brown rust development in wheat**

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**ABSTRACT**

**BACKGROUND:** Wheat (*Triticum aestivum* L.) is one of the world's most important cereal crop in terms of cultivated area and quantity of grain produced. It is the most communal staple food in Pakistan, followed by rice and maize. Wheat is susceptible to a wide range of biotic and abiotic stressors, which can lead to severe yield reductions. Rusts are economically the most significant biotic factor of wheat crop. Leaf rust, commonly known as brown rust, is a severe wheat disease in Pakistan that results in production losses ranging from 10% to 40%.

**METHODS:** In the present study, screening of wheat breeding lines against natural inoculum of brown rust and relationship of leaf rust with different environmental parameters was done in two years data. The disease severity (DS), Coefficient of infection (CI) and Average Coefficient of infection (ACI) was recorded by using Modified Cobb's scale.

**RESULTS:** During 2020-2021, among 100 breeding lines, 16 breeding lines revealed immune response, 14 exhibited moderately resistant response, 5 showed susceptible response and remaining were moderately resistant-moderately susceptible responses. In season 2021-22, 19 breeding lines were immune, 19 showed moderately resistant response, 4 breeding lines were susceptible and remaining were moderately resistant-moderately susceptible. Correlation clearly demonstrated the response of disease development to environmental factors. Maximum temperature, minimum temperature, wind speed and sunshine hours showed positive relationship with leaf rust severity while a negative relationship was evident in relative humidity and disease severity during both year study.

**CONCLUSION:** During 2020-21 to 2021-22, among 100 breeding lines, 9 breeding lines showed the immune response to brown rust which are: BL-35, BL-61, BL-64, BL-70, BL-71, BL-72, BL-75, BL-78, BL-86. So, these breeding lines could be utilized in future breeding programs to develop leaf rust resistant varieties/ cultivars.

**Keywords:** Brown rust, Correlation, Disease severity, Environmental factors, Wheat

**SPP-PP-209**

**Assessment of ITS region as a primary DNA barcode to identify the pathogen causing leaf spot disease of mungbean in District Faisalabad**

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**ABSTRACT**

**BACKGROUND:** In Pakistan, mungbean is ranked second among leguminous crops after chickpea. It is rich in starch, protein, amino acids, oligosaccharides and polyphenols in seeds and sprouts. It is also widely used for its medicinal properties. Among several fungal diseases an important fungal disease, the *Cercospora* leaf spot of mungbean, is causing heavy yield losses to the crop in mungbean growing areas of District Faisalabad, Punjab, Pakistan. It affects the leaves by making spots and fruits by rotting them, causing huge production losses. The genus *Cercospora* has a wide range of species making it very difficult to differentiate between species because of so much resemblance in spore shapes and colony colors. The objective of this study was the identification and molecular characterization of the pathogen associated with leaf spot disease of mungbean from different mung bean growing areas of District Faisalabad.

**METHODS:** This study included the collection of diseased samples followed by isolation, morphological identification, molecular characterization, pathogenicity and virulence comparison of the associated fungal pathogen. To identify the causal pathogen of leaf spot disease of mungbean, symptomatic diseased leaves were collected from four different localities of mungbean growing areas of Faisalabad. *Cercospora* spp. was isolated from diseased samples.

**RESULTS:** Preliminary identification of isolated fungi was based on morphological and cultural characteristics. For molecular identification and characterization, nucleotide sequences of the ITS region (ITS1-5.8S-ITS2 were targeted). Initial analysis was done by comparing isolated *Cercospora* sequences to the already submitted *Cercospora* sequences to the NCBI database by using the BLAST search tool which showed 99-100% similarity with *Cercospora canesens* species. Phylogenetic analysis was done by using MEGA-X software. MUSCLE alignments were made between six sequenced isolates of *Cercospora* spp. and previously identified reference sequences of *Cercospora* spp. The phylogenetic evolutionary analysis revealed that *C. canesens* is associated with leaf spot disease on mungbean crop in District Faisalabad of Punjab, Pakistan.

**CONCLUSION:** This preliminary research work presents the identification of the pathogen causing mungbean leaf spot disease and opens new frontiers for developing sustainable management strategies for managing the *Cercospora* leaf spot of mungbean disease.



**SPP-PP-210**

**Genetic diversity and Spatio-temporal dynamics of *Irish yellow spot virus* (IYSV) infecting onion and garlic in Pakistan**

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**ABSTRACT**

**BACKGROUND:** Onion (*Allium cepa* L.) and garlic (*Allium sativum* L) used as spice as well as medicine against different human disorders all around the globe. Tospoviruses are a major threat for onion and garlic production and reduced yield up to 50%. The aim of present study was to know the genetic diversity and Spatio-temporal dynamics of tospoviruses infecting onion and garlic crops in Punjab, Pakistan.

**METHODS:** Fresh leaf samples from Punjab, Pakistan showing diamond shape eye spot and straw color leaf spots were tested for genus *Tospovirus* presence using RT-PCR with CP/N gene based degenerate primer pair IYSV-F34/IYSV-R35. Obtained sequences were aligned in ClustalW using BioEdit program MEGA 7 and compared through BLASTn with other reported isolates. Sequence identities were calculated using sequence identity matrix through neighbor joining method and phylogenetic relationship analysis with 1000 bootstraps in MEGA 7. In Silico RFLP based Spatio-temporal analysis of CP/N gene using HinfI restriction enzyme in CLC main workbench 8.0 and gel oriented results were used for isolates serotyping through BioNumerics 7.6.

**RESULTS:** RT-PCR based results revealed two IYSV isolates comprise 1067 bp with GenBank accession numbers MH172159 and MH172160, whereas other two isolates MG676230 and MG676231 consist 1031 bp. Sequence comparison of N gene shared highest nucleotide identity 98-99% with Tajikistan IYSV isolate JQ814629 from onion, while lowest nucleotide identity 80.5-80.6% was shared with Australian isolate AY538778. Amino acid base sequence comparison of Pakistani isolates shared maximum identity 85.7-99.6% with previously reported isolates from Serbia, Japan, Tajikistan, USA and Pakistan. Phylogenetic analysis of Pakistani IYSV isolates based on amino acid sequence showed that three Pakistani isolates (MG676230-31 and MH172159) clustered with Tajikistan isolates, while one Pakistani isolate MH172160 clustered with isolates from Serbia, Japan and USA. In Silico RFLP analysis of Pakistani isolates with reported isolates revealed three groups IYSV<sup>BR</sup>, IYSV<sup>NL</sup> and IYSV<sup>OTHERS</sup>, while Pakistani isolates recognised in BR genotype.

**CONCLUSION:** The study findings will enable breeders to grow IYSV resistant varieties and also lead to forecast the chance of resistance breakdown in future with pathogen mediated resistant transgenic lines of *Allium* crops.

**Keywords:** *Allium* crops, RT-PCR, Genetic diversity, Spatio-temporal dynamics

**SPP-PP-211**

**Bio-chemical Management of Stem end rot Disease of Mango**

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**ABSTRACT**

**BACKGROUND:** Mango, which is also titled as “The King of Fruits”, plays a significant role in the international market for Pakistan. Different plant pathogenic microbes affect mango at various developmental stages thereby reducing fruit yield and quality simultaneously. Stem end rot disease, caused by *Lasiodiplodia theobromae*, is a serious threat in mangoes affecting mangoes in the orchard as well as fruits after harvest. It damages fruit quality, taste and reduces 30-40% yield.

**METHODS:** The study was aimed to evaluate the efficacy of fungicides and biocontrol agents against stem end rot disease of mango to reduce losses. In preharvest treatment, Mosami Chaunsa and Black Chaunsa were treated thrice in mango orchard with fungicides (0.5 ml/L and 0.6 ml/L Amistar Top: Azoxystrobin + Difenoconazole, 0.3 ml/L and 0.4 ml/L Score: Difenoconazole) and biocontrol agents (*Trichoderma harzianum* and *Bacillus subtilis* at concentrations  $1 \times 10^3$  and  $1 \times 10^6$  spore/ml). Three plants were maintained as control. For postharvest stem end rot, fruits were inoculated with the pathogen followed by application of above-mentioned fungicides and biocontrol agents. Fruits were kept at room temperature to study disease development and to observe the effect of treatments applied on mango fruit. Preharvest sprays were not able to protect the mango fruit from postharvest symptom production.

**RESULTS:** Protectant application of Score at concentrations 0.3 ml/L and 0.4 ml/L, and Amistar Top at concentrations 0.5 ml/L and 0.6 ml/L limited the pathogen invasion and reduced disease severity by 46% and 58%, 65% and 73%, respectively. Whereas in case of postharvest treatments, both concentrations of Score (0.3 ml/L and 0.4 ml/L) and *Trichoderma harzianum* at concentration  $1 \times 10^6$  performed well and increased shelf-life of mango from 3 to 6 days. *Trichoderma harzianum* ( $1 \times 10^6$ ), Score 0.3 ml/L and 0.4 ml/L reduced the disease mean by 69%, 63% and 75%, respectively.

**CONCLUSION:** Better disease management will help to increase disease free mango production, quality and consumer acceptance thereby playing a role in generating revenue for Pakistan.



**SPP-PP-212**

**Biological control of *fusarium* wilt of chilli through *Trichoderma* spp.**

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**ABSTRACT**

**BACKGROUND:** Chili is an important cash and spice crop of Pakistan, comprising vitamins and phenolic compounds.

**METHODS:** In this work, the effect of *Trichoderma* spp. were evaluated to check in vitro antagonistic potential against *Fusarium oxysporum f. sp. capsici* using the dual culture technique. The effect of *Trichoderma* isolates was also checked on plant health and on seed germination percentage of chili seeds. Isolates were also screened for the production of extracellular enzymes to identify its potential against *F. oxysporum f. sp. capsici*.

**RESULTS:** Dual culture result showed that AM3 *Trichoderma* isolate was the most influential in reducing the mycelial growth of pathogen *F. oxysporum f. sp. capsici* with 45.78% mycelial inhibition following by AM2 45.04% and AM1 with 45.0%. These *Trichoderma* spp. were also tested in the greenhouse where AM3 was also more potent than others by applying spore suspension in soil. Effect of *Trichoderma* isolates on Chili plants health were also evaluated results reveal that pot soil having spore suspension of AM3 isolate was healthy than AM2, AM1 and control showing lesser effect. Percentage seeds germination of chili showing more germination treated with AM3 isolates than other isolates and control. The AM3 was positive for cellulase and protease activity as compared to control.

**CONCLUSION:** The excretion of extracellular lytic enzymes reveals its usefulness in the application of *Trichoderma* species as biocontrol strains in agricultural soils.

**Keywords:** Tricoderma isolates, extracellular enzyme, seed germination

**SPP-PP-213**

**Assessment of Wheat germplasm against *Puccinia striiformis f. sp. tritici* and its management through botanicals**

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**ABSTRACT**

**BACKGROUND:** In Pakistan, wheat is the staple food that provides essential calories and main diet of the people. Country is continuously facing wheat shortage during recent years leading to food security issue. Rust diseases of wheat are one of the important factors causing dent in wheat production during last season's due to drastic climate change. Excessive use of pesticides has a negative impact on humans, animals, and the environment. Plant extracts and organic materials affect plant pathogens directly or indirectly.

**METHODS:** Wheat germplasm was screened against stripe rust for two consecutive years. Disease severity was recorded on the 0-6 disease rating scale. Plant extracts were evaluated as seed-soaking treatment to evaluate their response in reducing stripe rust disease. Seeds of Morocco genotype were soaked for 24 h in each plant extract at conc. of 3% (v/v).

**RESULTS:** Out of one hundred and five genotypes during 2018-19, 22 genotypes showed highly resistant response, 19 showed resistance response, 17 showed susceptible response. Likewise, during 2019-20, 18 genotypes showed highly resistant response, 23 showed resistant response, 21 genotypes showed susceptible response. Out of four plant extracts (neem, garlic, ginger and bell pepper) in both years, minimum disease was observed in case of garlic bulb extract followed by neem leaves extract.

**CONCLUSION:** Screening of wheat germplasm should be carried out on a regular and regional basis under the current climate change scenario. Germplasm screened during the current study showed low resistance level against stripe rust. However, botanicals used as seed priming gave suitable results for disease management, and this approach could be further tested for field purpose.

**SPP-PP-214**

**Mapping the *Ascochyta rabiei* pathogenicity threat within the Australian chickpea growing regions**

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**ABSTRACT**

**BACKGROUND:** Blight caused by *Ascochyta rabiei* is a devastating disease on chickpeas in Australia. Complete yield losses have been reported, and the seed quality can also be affected, with the seed sometimes becoming unmarketable. Knowledge of isolated population variation within and among chickpea growing regions is required to determine the risk for the pathogen to potentially overcome disease management and control strategies. In particular, it is important to determine if the pathogen is able to adapt and if so, the rate of that adaptation to cause disease on newly released and widely adopted cultivars from the national resistance breeding program. Understanding the risk that the current and future isolated populations pose to the current resistance sources used in the Australian chickpea industry and the current control methods used, would better inform and prepare breeders and farmers for the best disease management practice, necessary to maintain good crop yields and quality.

**METHODS:** The disease samples were collected from seven chickpea-growing regions of Australia and were isolated and purified with the single spore method. The aggressiveness of each isolate was determined using a differential host set that comprised ICC3996, which is used widely as a resistance source in the Australian chickpea breeding program, and Genesis 090, PBAHatTrick and PBA Seamer, which are the most widely grown “resistant” host genotypes in southern and northern regions, respectively. The set also included Kyabra, which remains a widely-grown host genotype in the harsher regions of New South Wales and southern and central regions of Queensland due to high yield and quality but is considered “susceptible” and used as a disease check in National Variety Trial sites. Seedlings were grown in 15 cm diameter pots containing commercial-graded mix. Two replicates were sown for each genotype x isolate combinations assessed, with five plants grown per pot/rep. All plants were grown

and maintained in the glasshouse facility at  $22\pm 5^{\circ}\text{C}$  under 16h/8h a day/night photoperiod. The inoculum was prepared as described in Sambasivam et al. (2016) and the mini-dome technique of Chen et al. (2005) was used to initiate disease. The disease symptoms were measured for both leaf and stem separately, and the disease severity of each isolate was assessed using the qualitative 1-9 scale of Singh et al (1981) at 21 days after inoculation (dai). Each isolate was subsequently categorized as low, medium or highly aggressive using the parameters described in Mehmood et al., 2017. Isolates identified as highly aggressive produced a cumulative leaf score of at least 7 on > 80% and a stem score of at least 7 on > 10% of all of the host plants assessed. Subsequently, this sub-set of highly aggressive isolates were placed into “pathogenicity groups” based on their ability to cause low, moderate or high disease severity independently on ICC3996, Genesis 090, PBA HatTrick and PBA HatTrick.

**RESULTS:** Isolates of high risk were identified based on a cumulative dataset comprising phenotypic/genotypic of 998 isolates, which were collected from six different chickpea growing regions. Among these isolates, 642 were genotyped, and 998 were phenotyped. Based on this study, the isolates were divided into five pathogenicity groups. Among these isolates, 145 isolates belonging to pathogenicity group V were considered the high-risk isolates in the Australian *A. rabiei* population. This group had the capacity to wipe out resistance in all available resistance sources, i.e. ICC3996, Genesis090, PBA HatTrick and PBA Seamer. While 110 isolates belonged to pathotype type IV, which were medium aggressive on ICC3996 but highly aggressive on Genesis, PBA HatTrick and PBA Seamer. These pathotype groups and other pathotype groups I, II and III were mapped on google Maps from where they were collected. This information would play an important role for the chickpea growers of respective regions to cope with this destructive pathogen more economically.

**SPP-PP-215**

**Effect of different types of biochar on soil chemical properties, microbial community, pathogenic fungi and faba bean productivity**

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**ABSTRACT**

**BACKGROUND:** This experiment was carried out in sandy loam soil of private farm at Romana, North Sinai Governorate, Egypt during two successive winter seasons 2017 / 2018 and 2018 /2019.

**Methods:** The study was designed to study the effect of three types of biochar, (A) produced from corn stalk, straw rice , straw of faba bean and cotton stalk, (B) produced from trees stalk and (C) town refuse, with three levels from Urea fertilizer (0, 20, 30 Kg N/fed), plus control treatment which received the recommended dose of urea (46 %N), to examine the effects of biochar types combined with or without nitrogen fertilizer on faba bean productivity under saline soil conditions. Faba bean variety Giza 843 were sowed on 12 November 2017 and 2018. The experiment was carried out in a split plot design with three replicates.

**RESULTS:** Results obtained that, the combination between biochar types with different levels of N fertilizer enhanced all tested parameters. Moreover, biochar type (C) with level 30 Kg N/fed recorded the highest values of all tested parameters. On the other hand, the same treatment was the most effective on the root rot and wilt incidences, where the survival plants was 97.9 % and 93.4% respectively and decreased the number of the pathogenic fungi.

**CONCLUSION:** The study would help to determine the effect of different biochar types on the soil chemical properties and pathogenic fungi

**Keywords:** faba been, biochar, N fertilizer, and pathogenic fungi.

**SPP-PP-216**

**Wheat Leaf Spot: An Invasive Disease in Southern Punjab**

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**ABSTRACT**

**BACKGROUND:** Wheat (*Triticum aestivum* L.) is a typical small-grain cereal from the poaceae family. It is estimated that, 783 million metric tonnes of wheat is consumed globally. Pakistan's wheat yield is quite lower than the developed countries. Among the wheat diseases, leaf spot (LS) is a serious disease and it reduces the yield of wheat by 10% to 50%. Wheat leaf spot disease (WLS) is an emerging disease in Pakistan and there is need to identify and characterize the pathogen (s) involved in inducing WLS and catalogue wheat cultivars against WLS.

**METHODS:** The aim of my study was to characterize the WLS pathogen and its management through identification of resistant cultivars. The Multan district was surveyed and wheat cultivars were rated against WLS. The disease samples were collected and WLS associated pathogen was isolated on PDA media followed by morphological and molecular characterization using microscopy and ITS region amplification by PCR and sequencing. The obtained sequences were analyzed by BLAST, Sequence demarcation tool and MEGA-X software packages for construction of similarity index matrix and phylogenetic tree.

**RESULTS:** The survey revealed the disease incidence, due to presence of leaf spot disease, was highest in Ujala-2016 (45%) and minimum ckwal (9.7%). The genetic analysis showed that WLS-isolate Multan proved to be an isolate of *Alternaria alternata* and showed maximum homology 99.64% with china and accession (MT446076). The phylogenetic analysis clustered the WLS-isolate wheat Pakistan Islamabad 2018 Multan with (99.29%). The phylogenetic analysis clustered the WLS-isolate shujabad with (33%).

**CONCLUSION:** The present study has increased our understanding about WLS, its associated pathogen and resistant cultivars in Multan which could help the pathologists to devise suitable management practices for this emerging disease and breeders to develop resistant varieties against wheat leaf spot disease.

**Keyword:** Leaf spot, molecular characterization, wheat, *Alternaria*



**SPP-PP-217**

**Application of *Trichoderma harzianum*; its comparison with synthetic chemicals and biochemical analysis in maize**

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**Abstract**

**BACKGROUND:**

Maize (*Zea mays* L.) is a significant cereal crop. Sudden wilting in maize impacting serious damage to its production in Pakistan. Infected plants showed rotting on lower nodes resulting color change from green to grayish that lead plant to the wilting. The research was planned to determine the cause of sudden wilting in maize and study of *Trichoderma harzianum* efficacy against disease. The sampling was done from maize fields and subjected to morpho-molecular characterization. *In vitro* management was done by application of *T. harzianum* and compared with synthetic fungicides (i.e. Thiophanate methyl, Mancozeb + Metalaxyl, Fosetyl aluminum, Difenoconazole and Sulphur) at five concentrations (i.e. 100ppm, 200ppm, 400ppm, 800ppm and 1000ppm) using dual culture and food poison methods under complete randomized design, with four replications. Data were taken after 3, 5, 7 and 10 days. Pot experiment was conducted to study biochemical analysis of maize plants treated with *T. harzianum* with five treatments i.e. T<sub>1</sub> (Pathogen+*Trichoderma harzianum*), T<sub>2</sub> (Pathogen+ *Trichoderma harzianum* formulation), T<sub>3</sub> (Pathogen+Mancozeb and Metalaxyl), T<sub>4</sub> (Pathogen + Thiophanate Methyl) and T<sub>0</sub> (Control). Catalase, peroxidase, superoxide dismutase, phenol and protein contents were taken as biochemical parameters. Morpho-molecular identification and pathogenicity testing proved the presence of *Fusarium* sp. *T. harzianum* showed maximum inhibition, 88.69%, against pathogen after 10 days. In synthetic chemicals, Thiophanate methyl showed maximum inhibition, 100%, at 100ppm, Difenoconazole showed maximum inhibition, 100%, at 400ppm and Sulphur showed maximum inhibition, 76.17%, at 1000ppm after 3 days that reduced gradually after 5,7 and 10 days as compared to *T. harzianum*. Maximum readings of catalase, superoxide dismutase, peroxidase, protein and phenols were recorded in plants treated with biofungicide. The formulation of biofungicide was developed in the laboratory and could be used as compared to synthetic chemicals for the management of maize stalk rot.

**Keywords:** Stalk rot of Maize, *Trichoderma harzianum*, Synthetic chemicals



**SPP-PP-218**

## **Appraisal of Synthetic Fungicides and Phyto-Extracts against Guava Anthracnose caused by *Colletotrichum* spp.**

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### **ABSTRACT**

**BACKGROUND:** Guava (*Psidium guajava* L.) is a popular tropical and subtropical perennial fruit crop. Guava fruit is facing a number of fungal, bacterial and viral diseases causing severe production losses. Guava anthracnose caused by *Colletotrichum* spp. is also one of them causing 30% weight reduction.

**METHODS:** Current study was designed to evaluate synthetic chemicals and plant extracts against guava anthracnose under *in vitro* and *in vivo*. Five fungicides (Kasumin, Novice, Bloom, Tilt and Evito) at three (50, 100, 150 ppm) concentrations and six plant extracts (Ficus, Neem, Turmeric, Eucalyptus, Garlic and Clove) at (5, 10, 15%) concentrations were evaluated under lab conditions by using poisoned food technique.

**RESULTS:** The minimum fungal growth was expressed by Tilt (9.46mm) and Garlic (12.26mm). For *in vivo* trail, best performed fungicide and plant extract (Tilt and Garlic) were used as solo application and in combination, results indicated that combination treatment showed effective control against guava anthracnose with least disease incidence (7.66%).

**CONCLUSION:** Our study concluded that guava anthracnose can be efficiently controlled by using Tilt fungicide (Propiconazole).

**Keywords:** *In vitro*, *In vivo*, Tilt, Garlic, Losses

**SPP-PP-219**

## **Evaluation of Rice Germplasm against Brown Leaf Spot Disease and its Management through Chemicals and Phytoextracts**

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### **ABSTRACT**

**BACKGROUND:** Rice belongs to family *Poaceae*, it is an important cereal crop grown in all over the world. It has a great economic and consumption significance. Rice is susceptible to a number of biotic and abiotic stresses. Among the stresses caused by microorganisms, brown leaf spot disease of rice caused by *Bipolaris oryzae* is the chaotic disease, causing severe yield losses.

**METHODS:** The current study was focused on the screening of available (14) varieties against BLS of rice and its management through chemicals and phyto-extracts under *in vitro* and *in vivo* conditions. Results of screening trail indicated that PK-386 was the only variety showed resistant response against BLS, while four varieties including Basmati Super, Basmati-2000, Basmati-515 and KSK-133 showed highly susceptible response with disease incidence more than 50%. Five fungicides (Recado, Cabrio-top, Polyram-df, Curzate-M and Aliette) and five phyto-extracts (Aloe vera, Mint, Chilli, Onion and Aak) were evaluated against *B.oryzae*.

**RESULTS:** Among chemicals and phyto-extracts Recado and Aloe vera showed highly significant effect with minimum fungal growth 1.015 and 6.89 mm under *in vitro* conditions respectively. While, the mixture of Recado+Aloe vera was found effective against BLS under *in vivo* conditions with least disease incidence (25.45 %).

**CONCLUSION:** It is concluded that PK-386 variety of rice can be grown as a resistant variety against BLS, whereas Recado fungicide can be used for the better management of the disease.

**Keywords:** *Bipolaris oryzae*, screening, fungal growth, biotic, abiotic

**SPP-PP-220**

**CRISPR/CAS genome editing technology for global food security**

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**ABSTRACT**

**BACKGROUND:** As the global population marches toward 10 billion mark increasing crop productivity is a major challenge for the modern-day world. For this scientist are making great efforts to improve the yield and quality of major food crops to avoid food insecurity. Agriculture sector faces major challenges in form of climate change, loss of agricultural land, climate shift, prevailing disease and pest infestations. Under severe conditions factor like phyto-pathogens tend to reduce yield outputs by nearly 40% before final harvest. Developing disease resistant crop varieties and improving other yield related traits is critical to meet the increasing food demands. Traditional breeding techniques are unable to keep up with these issues, which demands for a more swift and robust approach in order to deal with these challenges. Introduction of the CRISPR/CAS9 (Clustered Regularly Inter-Spaced Short Palindromic Repeats/ CRISPR Associated Protein 9) based Site-specific genome editing technology is proving a viable approach to coup up these modern challenges.

**CONCLUSION:** The CRISPR/CAS9 is a versatile tool for genetic editing and manipulation and has overtaken all other genetic editing (GE) approaches owing to its simplicity, effectiveness, and low cost. Modern sequencing technologies is adding more data regarding genetic mysteries of plant and combined with CRISPR based GE approach several key traits including; disease resistance, yield betterment and stress tolerance are being enhanced in various crop plants (i.e. wheat, rice, maize, potato etc.). CRISPR/CAS9 technology has resulted in some major contributions to agriculture sector and have a strong future perspective for global food security.

**SPP-PP-221**

**Remote sensing and Machine learning based smart phyto-protection**

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**ABSTRACT**

**BACKGROUND:** Food is among the basic necessity of human life and over the last decade global food supplies are facing severe challenge in form of growing population, increasing disease infestation, resource constraint and climate change. At the same time Global food demands are expected to increase by around 35-56% by the middle of century. All this forecast a dark image for global food security in coming decades. Plant pathogens are responsible for significant losses in major crops including wheat, rice, maize, soybean and potato (up to 41% losses). Plant diseases are often detected at late stages when the disease has shown some severe infestation symptoms. In this regard early disease detection systems can be a game changer in combating disease prevalence at early stages.

**CONCLUSION:** Recent remote sensing and Hyperspectral imaging are robust and nondestructive technologies that have achieved remarkable results in plant disease identification. Furthermore, application of machine learning algorithms on collected image data set enables better spatial-temporal identification of disease enabling in time detection, predictive modelling of disease promulgation and management of disease without much fitness or climatic penalty. A combination of these modern technologies and data-based decision making can enable growers to reduce their input cost with adequate increase in yields ultimately abetting in global efforts to ensure food security in face of climate change risk.

**SPP-PP-222**

**Mineral assessment of chilli pepper (*Capsicum annuum* L.) inoculated with *Leveillula taurica***

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**ABSTRACT**

**BACKGROUND:** Chilli peppers are the third most common vegetable crop in the world, after potato and tomato. Powdery mildew, caused by *Leveillula taurica* causes significant chilli losses.

**METHODS:** Experiments were carried out to see if powdery mildew infection had an impact on the mineral status of chilli.

**RESULTS:** Six varieties/lines of chilli pepper plants, including resistant and susceptible cultivars, were inoculated and uninoculated, and their fruits were harvested in 2020 and 2021. Their mineral/nutrient content was then analysed using a nested design. Due to the infection by powdery mildew disease, there was variance ( $p < 5$ ) in the mineral status across treatment groups (inoculated & un-inoculated), types (resistant & susceptible), and in varieties/lines of the chilli plants. The variation in the concentrations of nitrogen (N), phosphorous (P) (%), potassium (K), calcium (Ca), magnesium (Mg), zinc (Zn), sodium (Na), iron (Fe), and copper (Cu) in the resistant type of plants was 2.61, 2.12, 21891, 1015.50, 51.35, 161.60, 411.63, 123.32 and 101.11, while the susceptible type showed 1.21, 1.32, 2412.41, 891.12, 25.20, 111.24, 129.61, 171.53 and 119.21 in parts per million respectively. When compared to susceptible cultivars, resistant cultivars collected higher concentrations of these minerals.

**CONCLUSIONS:** By enhancing the physiological and biochemical functions of the host plant, this increase in minerals in resistant host plants may help prevent the spread of pathogens.

**SPP-PP-223**

## **IDENTIFICATION OF STRIPE AND LEAF RUST RESISTANT PROGENIES FROM BIPARENTAL AND MULTIPARENTAL WHEAT POPULATION**

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### **ABSTRACT**

**BACKGROUND:** The wheat rust diseases are considered the serious threat to global wheat production and since last decade, the rust pathogens especially, *Puccinia striiformis* f. sp. *tritici* (*Pst*) and *P. triticina* spread throughout wheat producing regions of Pakistan and continues to evolve new races and break prevailing host rust resistance to pathogens. In past, the stripe rust poses a serious threat only to the cooler wheat producing areas of country but now this destrive pathogen is also adopted to the warmer regions of the country and under epidemic situation, about the 70% area of wheat in the country is prone to stripe rust. Under this situation, the genetic improvement of host resistance is a key to combat both stripe and leaf rust dilemma in wheat crop. The biparental and multiparental population was developed at Wheat Research Institute, Faisalabad, by the crossing of adult plant resistance (APR) gene Lr34 alone or in combination with the major stripe rust resistance gene Yr10 in order to improve the rust resistance of locally susceptible varieties of wheat and the desirable progenies were selected in filelial generations. In current study, two hundred and sixty single plant F5 progenies were planted at the research area of wheat research institute, Faisalabad as well as at adoptive research farm Kot nina for screening against both stripe and leaf rust. The progenies showing rust severity up to 30MRMS as well as showing flag leaf tip necrosis at adult plant stage were selected for the purity of lines and multilocation yield testing. The phenotypic observation of flag leaf tip necrosis in selected progenies as well as plant's resistant to moderately resistant response to both leaf and stripe rust infections at adult plant stages, confirms the presence of pyramided genes.

**CONCLUSION:** This preliminary study will help us to advance the resistant lines for further screening and multi-site testing as well as for the release of durable, multipathogen-resistant varieties for general cultivation in farmer's fields.

**Keywords:** Rust epidemics, bread wheat, rust pathogens, rust resistance breakup, APR genes, Lr34, R genes, Yr10, multilocation testing.

SPP-PP-224

## **Dothiorella sarmentorum Causing Branch Dieback of English Walnut in Maule Region, Chile**

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### **ABSTRACT**

**BACKGROUND:** English walnut (*Juglans regia*) cv. Chandler is the most cultivated in Chile, with 43,734 ha among the species that produce nuts. In the Maule Region, central Chile, walnut groves have expanded to more than 7,000 ha in the last 10 years. In Chile, Botryosphaeriaceae have recently been described causing regressive death in Chile, reporting *D. mutila* and *Neofusicoccum parvum*.

**METHODS:** In the 2019 season, in two commercial orchards, symptoms of dieback of arms and branches located in the Maule Region were observed. Therefore, the objective of this study was to isolate, identify and characterize the Botryosphaeriaceae species associated with the dieback of arms and branches in the Maule Region, Chile. For this, symptomatic arms and branches (n = 20) were collected from two commercial orchards.

**RESULTS:** According to our results, the twig samples revealed brown to dark brown wedge-shaped cankers. Seven isolates were isolated and tentatively identified as *Dothiorella* sp. Molecular identification using the ITS region and part of the EF1-a genes showed 100% similarity with CBS 115038 ex-type of *Dothiorella sarmentorum*. Twigs of adult plants and rooted cuttings of walnut cv. Chandler, after seven and four months of inoculation with conidial suspension, developed symptoms of regressive death and necrotic streaks of 81.3 mm in twigs and 44.5 mm in cuttings. The *D. sarmentorum* isolates were 100 % reisolated only from the inoculated walnut twigs and cuttings.

**CONCLUSION:** To the best of our knowledge, this is the first report of *D. sarmentorum* causing dieback of walnut trees in Chile.



**SPP-PP-225**

### **Rice blast pathogen genetic diversity and management**

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#### **ABSTRACT**

**BACKGROUND:** Rice blast is the most devastating disease of rice that is responsible for substantial production decline globally.

**METHODS:** One hundred twenty-five *P. oryzae* isolates were collected in 2018 and 2019 from afflicted rice plants in various areas of Punjab Province, Pakistan, to determine the pathogenic diversity. The potato dextrose agar nutrient medium was utilized throughout the process of isolating, purifying, and multiplying the related pathogen.

**RESULTS:** Four morphologically different sub-specific groups were identified. One of these clusters (G-I) was shown to be extremely pathogenic, with a 47% increase in disease severity at week four after inoculation, according to pathogenicity testing. The MUSCLE alignment of DNA sequences from the internal transcribed spacer (ITS) region revealed that 35 isolates had a single-base-pair substitution. Maximum parsimony (MP) with tree bisection reconnection (TBR) analysis of the ITS region,  $\beta$ -tubulin, actin, and calmodulin genes supported the identification of all the isolates as *P. oryzae* when compared to the available data set of *P. oryzae* on NCBI with a bootstrap value of 100%. Bootstrap values ranging from 95% to 100% indicated that the diverse *P. oryzae* isolates from Punjab, Pakistan were sister to the main *P. oryzae* clade.

**CONCLUSION:** We found that in various parts of Punjab, Pakistan, a new ecotype of *P. oryzae* predominated.

**Keywords:** *Oryza sativa*; rice blast; morphology; genetic diversity and molecular markers.

**SPP-PP-226**

**Impact of different diseases on Rice production in Dera Ghazi Khan**

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**ABSTRACT**

**BACKGROUND:** Rice (*Oryza sativa* L.) is a major grain and staple food which is the third largest crop growing after wheat and cotton in Pakistan. Numerous biotic and abiotic factors threaten the production of the rice crop and are responsible for low yield. Bacterial leaf blight and stem blight are the most detrimental diseases to rice productivity.

**METHODS:** The objective of the current study was to determine the incidence and severity of rice diseases in nurseries. A survey was carried out in Dera Ghazi Khan region, during kharif season 2021 and the locations of choti zeren, kot chutta, kot mobarak and chak buzdar were determined.

**RESULTS:** From 70 fields, mostly the Blight and leaf spot prevalent the disease incidence of 20-30% and severity 22-25%. Among five varieties, the Tara had the most resistance and the diamond-121 had the lowest susceptibility. T

**CONCLUSION:** The result of this study suggested that disease resistant cultivars should be cultivated to maintain a healthy crop.

**Keywords:** Rice; Pathogens; Incidence; screening

**SPP-PP-227**

## **Development of prediction model against citrus canker under changing climate**

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### **ABSTRACT**

**BACKGROUND:** Citrus canker caused by a notorious bacterium *Xanthomonas citri* pv. *citri* (*Xcc*) is one of the major threats being faced by citrus industry. Ecosystem of crops changing in most of the world due to the climatic effect.

**METHODS:** In present study, impact of environmental parameters (Max. and min. temperature, rainfall, relative humidity and wind speed) were examined in the major citrus growing areas of Punjab, Pakistan.

**RESULTS:** Significant positive correlation was observed on all varieties between environmental variables and citrus canker. A multiple regression model ( $Y=+24.02+0.5585X_1+0.2997X_2+0.3534X_3+3.590X_4+1.639X_5$ ) was also developed to find out the relationship between environmental parameters and disease projection. Goodness of model on statistical ground is indicated by coefficient determination value (97.5%).

**CONCLUSION:** On conclusion, it was established that all the environmental factors like max. temperature (37°C), min. temperature (27°C), relative humidity > 55%, rainfall (4.7-7.1 mm) and wind speed 8 km/h were the conducive for the development of citrus canker.

**Keywords:** Climate change, Canker, *Xanthomonas citri* pv. *citri*, Environmental variables, Correlation, Multiple regression model

## POSTER PRESENTATIONS



### SPP-PP-228

#### Status of Cotton Cultivars Resistance Against Cotton Leaf Curl Disease in Multan District

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#### ABSTRACT

**BACKGROUND:** Cotton is Pakistan's economically valuable crop and also known as white gold across the globe. Cotton leaf curl disease (CLCuD) is the main limiting factor for cotton yield in Pakistan, which is caused by begomoviruses. The present study was aimed to assess the resistant level of cotton cultivars in Multan district and to identify resistance sources against CLCuD.

**METHODS:** During cotton season 2018-19 and 2019-20 in district Multan (Multan city, Multan Saddar, Shujabad and Jalalpur Pirwala) different commercial cotton cultivars such as IUB-2013, IUB-2015, IUB-2018, SS-32, BS-15, BS-18, MNH-886 and MNH-992, were mostly cultivated. During the survey commercial cotton varieties against CLCuD were rated according to disease rating scale. The rated genotypes samples were collected and tested for the presence of begomoviruses by specific primer pairs amplifying downstream regions of the coat protein gene.

**RESULTS:** The two cotton varieties IUB-2018 and MNH-992 were rated susceptible during 2018-19 and 2019-20 with mean disease severity index of 38.49% and 35.94%; 47.91% and 47.87% respectively. The seven cotton varieties IUB-2013, IUB2015, MNH-886, BS-15, BS-18, SS-32 and FH-142 were rated susceptible to highly susceptible during 2018-19 and 2019-2020 with a mean severity index of 46.77% and 61.87%; 48.87% and 63.25%; 61.92% and 61%; 58.39% and 67.55%; 60.68% and 67.50%; 51.75% and 49.25%; 48.37% and 50.80 respectively. In 2018-19 and 2019-20, there were no resistant, tolerant or even moderately tolerant commercial cotton cultivars. The rated Cotton cultivars also showed the presence of begomoviruses upon PCR analysis.

**CONCLUSION:** The following study has shown the prevailing resistance level or susceptible level in commercial cotton varieties.

**Keywords:** Begomovirus, Molecular Detection, CLCuD, Resistance

**SPP-PP-229**

### **Serological Based Evaluation Of Chilli Germplasm Against Major Viruses**

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#### **ABSTRACT**

**BACKGROUND:** Chilli (*Capsicum annum*) is an important solanaceous crop that is popular across the globe due to its pungent smell, flavor, colour and taste. Pakistan ranked fifth in the world in terms of exports of chilli. Production of chilli is mainly hampered due to many pathogens. Chilli viral complex causes substantial yield losses of about 53% and most important of them are cucumber mosaic virus (CMV) and chilli veinal mottle virus (ChiVMV).

**METHODS:** In this study, we have screened 12 chilli genotypes against CMV and ChiVMV. Moreover, surveys of different areas of Multan district (Shujaabad, Suraj Miani, Tatay pur, and Qadirpur Raan) were carried out in 2021-22. Every plant sample was assayed serologically with polyclonal antibodies in group specific ELISA kits.

**RESULTS:** Screening of 12 genotypes of chilli revealed that the highest disease incidence was found in genotype 1590 (80%) followed by 222 (75%), 1529 (70%), and Original Jwala (70%). While the lowest disease incidence was found in HHP-1480-A (35%), 1727 (40%), and 1936 (45%). Survey results showed that the highest incidence was recorded in samples collected from Shujabad (71%) followed by Suraj Mirani (67%), Tatypur (56%) and Qadirpur Raan (52%). A total of 500 samples were collected and ChiVMV was the most prevalent with 34% infected samples followed by CMV with 28.2% infected samples. The present study showed that no field in the visited area was free of CMV and ChiVMV. Moreover, the screening of 12 genotypes under field conditions revealed that only the HHP-1480-A genotype was resistant.

**CONCLUSION:** There is a need to screen available chilli germplasm against CMV and ChiVMV to find out the resistant source. Plant breeders may include HHP-1480-A in their breeding programs to develop long-term resistant chilli genotypes.

**Keywords:** CMV, ChiVMV, DAS-ELISA, PTA-ELISA

**SPP-PP-230**

### **Management of Chili Root-Rot Pathogen(s) with Potential Rhizobacteria**

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#### **ABSTRACT**

**BACKGROUND:** Chili (*Capsicum annum* L.) is a plant of the Solanaceae family. It is a major vegetable crop grown on a wide scale in Asia. Nearly 20% of Pakistan's total vegetable producing land is used for cultivating chili. Many plant pathogens like viruses, fungi, bacteria and nematodes cause disorder in chili metabolic pathways and cause many diseases. Among fungal diseases, root rot is an important fungal disease in chili crops which is caused by *R. solani*.

**METHODS:** In the present study, infected plants with root rot symptoms exhibited by *R. solani* for isolation of fungal pathogen rhizosphere soil samples were collected as well as disease incidence and disease prevalence was observed. Morphological identification of *R. solani* was performed on the basis of growth, shape, color, and hyphae structure when isolated from infected plants. Pathogenicity test was performed to check the ability of *R. solani* to cause disease. Mycelial growth of *R. solani* was managed under *in-vitro* conditions using rhizobacteria by dual culture method.

**RESULTS:** Highest disease incidence i.e., 20.77% was evident in samples collected from Tatay pur and lowest disease incidence i.e., 7.59% was observed in samples of Suraj miani. Microscopic results confirmed that colony morphology, shape of spores and color were similar to *R. solani* fungus. Koch's postulates were confirmed after a pathogenicity test which was performed by stem application method. *In-vitro* management of *R. solani* through potential rhizobacteria revealed that Rhizobacteria 7 (RB7) exhibited highest inhibition percentage i.e., 54.81% while lowest inhibition percentage i.e., 40% was evident using Rhizobacteria 4 (RB4) compared to control.

**CONCLUSION:** This study helped us to provide the alternatives to the chemical fungicides that could be explored under field conditions against root rot disease as they are eco friendly and have less impact on human life. In which Rhizobacteria 7 is the most efficient while Rhizobacteria 4 is less efficient.

**Keywords:** Chili, *Rhizoctonia solani*, *in-vitro*, Inhibition percentage, rhizobacteria.

**SPP-PP-231**

**Management of root rot disease by some local tree seeds having fungicidal potential**

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**ABSTRACT**

**BACKGROUND:** Effects of three different plants seed powder ( *Azadirachta indica* (neem), *Adenantha pavonina* L. (saga), and *Leucaena leucocephala* (Kubabhal) ) against root rot diseases caused by *Macrophomina phaseolina*, *Rhizoctonia solani*, and *Fusarium spp.* on mung bean (*Vigna radiata* L.) plants.

**METHODS:** In this method the efficacy of three tree seeds powder is assessed against root rot disease by a well diffusion method.

**RESULTS:** The application of *A. indica*, *A. pavonina* L., and *L. leucocephala* at the concentrations of 0.2 and 2% w/w significantly reduced the number of root rot fungi, including *M. phaseolina*, *R. solani*, and *Fusarium* species in screen house experiment. Furthermore, plant growth was also found to be increased in terms of shoot length, shoot weight, root length, and root weight on mung bean and chickpea. When soil was treated with seeds powder of *A. indica* @ 2% w/w, *Fusarium spp.*, and *R. solani* infection on mung beans were completely suppressed. *A. pavonina* and *L.leucocephala*. @ 0.2 and 2% w/w of the indigenous tree seed powders also showed promising results in reducing root infection, followed by *A. indica*.

**CONCLUSION:** Among these three plant seed powders that are discussed earlier, *A. indica* at the concentration of 2 % w/w completely suppressed the *Fusarium* species and *R. solani*.

**Keywords:** *Azadirachta indica* @ 2% w/w, *Adenantha pavonina*, *Leucaena leucocephala*, *M. phaseolina*, *R. solani*, *Fusarium* species



**SPP-PP-232**

**In vitro evaluation of plant extracts against colony growth of *Xanthomonas axonopodis* pv. *malvacearum* causing bacterial blight of cotton**

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**ABSTRACT**

**BACKGROUND:** Pakistan's cash crops include cotton (*Gossypium hirsutum* L.), which holds a considerable position. The most harmful condition that can affect cotton is bacterial blight. To control the bacterial blight ten plants extract (*Calligonum polygonoides* (phog), *Syzygium cumini* (L.) Skeels, *Eucalyptus citriodora* Roxb (family Myrtaceae), *Cassia Fistula* Linn (amaltas), *Acacia nilotica* (desi kikar), *Azadirachta indica* L., *Prosopis cineraria* (jhand), *Melia azedarach* L. (family Meliaceae), *Sporobolus ioclados* (grass), *Cactaceae* (cactus) were used.

**METHODS:** In vitro experiment was done by using well diffusion technique against colony growth of *Xanthomonas axonopodis* pv. *Malvacearum*.

**RESULTS:** Leaf extracts of 2% w/v concentrations were used in antifungal bioassays. Five different concentrations of 200 ppm, 400ppm, 600 ppm, 800 ppm, 1000 ppm were used to check the antifungal activity against bacterial growth. *Cassia Fistula* Linn (amaltas) was found most effective at 1000 ppm after 72 hours of treatment.

**CONCLUSION:** *Cassia Fistula* Linn (amaltas) extract shows most significant results.

**Keywords:** *Gossypium hirsutum* L, *Cassia Fistula* Linn (amaltas), *Xanthomonas axonopodis* pv. *Malvacearum*

**SPP-PP-233**

**Integrative impact of nematicides and phytoextracts against *Meloidogyne incognita* on spinach**

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**ABSTRACT**

**BACKGROUND:** Spinach (*Spinacia oleracea* L.) is an important leafy vegetable crop that is a rich source of vitamins, proteins, minerals, and chemicals. The root-knot nematode, *Meloidogyne incognita* is among the most damaging agricultural pests, attacking a wide range of crops keeping in view the above fact, the present investigation was planned to access the effectiveness of different Phyto-extracts (Azadirachtin, Eucalyptus, and garlic) and nematicides (Confidor, Praxis, Pirate, Match, Nova star and Proclaim) on the reproduction of *Meloidogyne incognita* on spinach.

**METHODS:** Effect of all treatments was checked on egg hatching and juvenile mortality under *in vitro* conditions. A desi variety of spinach was evaluated and the plant growth parameters (root length, root weight, shoot length and shoot weight) and reproduction parameters (number of galls, number of females, number of egg masses and number of nematodes) of *M. incognita* were accessed. The soil drench method was used for the application of treatments. After one week of application of treatments, the plants were inoculated with one thousand freshly hatched juveniles.

**RESULTS:** Results of *in vitro* experiment exploited that among all nematicides Confidor and Nova star and from Phyto-extracts Azadirachtin and garlic increased the mortality and decreased the egg hatchability rate. Harvesting was done after 60 days of inoculation. Among the nematicides (Confidor and Nova star) and the Phyto-extracts, Azadirachtin was found to be the most effective in reducing nematode population.

**CONCLUSION:** Results of the present investigation would help use Phytoextracts and nematicides at accurate doses for the management of nematodes.

**SPP-PP-234**

***Trichoderma harzianum*: A Potential Biocontrol Agent against Fusarium Wilt of Cotton under In vitro Conditions**

Muhammad Mahmood<sup>1</sup>, Muhammad Naveed Aslam<sup>1</sup>, Atta-ur-Rehman Khan<sup>1</sup>, Waqas Ashraf<sup>1</sup>, Roshaan Ahmed<sup>1\*</sup>, Tayyaba Afzal<sup>1</sup>

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**ABSTRACT**

**BACKGROUND:** Cotton is a major cash crop of the world. It produces cash and raw material for the textile industry, cottonseed oil and other beneficiary products for farmers. But recently many biotic factors including fungi, virus, bacteria and nematodes influence the yield of cotton. Among them Fusarium Wilt is a major disease of cotton caused by *Fusarium oxysporum* f.sp *vasinfectum*.

**METHODS:** In recent studies, the biological and enzymatic activity of *Trichoderma* spp. (*Trichoderma harzianum*) was observed under in vitro conditions. *T. harzianum* was isolated from the rhizosphere of the plant and *Fusarium* was observed in diseased plants of cotton. Both were isolated and identified in the laboratory. Two techniques (direct antagonist, volatile and non-volatile) were applied to identify their antagonist effect. It was observed that *Trichoderma* inhibits the growth of *Fusarium*, because *Trichoderma* is free living in soil and grows more rapidly as compared to *Fusarium*. *T. harzianum* can be applied through three methods by direct broadcasting to soil with mixture of wheat bran, seed coating and making conidial mixture of *T. harzianum* and applied to the soil.

**RESULTS:** In dual culture technique, *Trichoderma* inhibits the growth of *Fusarium* at 68%. In another, volatile method, growth of *Fusarium* was restricted by *Trichoderma* at 38%. In a non-volatile metabolite method, it reduces the growth of *Fusarium* at 55.21% by *T. harzianum*.

**CONCLUSION:** Hence proved that, *T. harzianum* is a potential biological control agent against *F. oxysporum* f.sp *vasinfectum*. Both are soil borne fungi. By using the techniques of direct broadcast and seed coating, the loss of crop through *Fusarium* wilt of cotton can be retarded at tolerant level.

**SPP-PP-235**

**Analysis and Comparison of Integrated Plant Disease Management Techniques for the control of Late Blight of Tomato**

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**ABSTRACT**

**BACKGROUND:** Tomato is an economically very important crop and due to its so much business worth, its production is also increasing day by day. With the rapid growth rate of tomatoes, the diseases of tomatoes are increasing gradually.

**METHODS:** To overcome this, plant pathologists are also working to combat its diseases. In this study, practical attempts were performed to compare and analyze the impact of Integrated Plant Disease Management strategies for the effective control of late blight of tomato caused by *Phytophthora infestans*. Loamy soil was collected and sterilized with 75% ethanol. Soil was then kept under sunlight covered with a polythene sheet for 6 hours. 27 pots were taken and filled with that soil. Tomato hybrid F1 seeds were sowed in the pots. 4 IPDM strategies (*Bacillus subtilis* as a biological control, cultural control, Mancozeb at the rate of 100 ppm, 150 ppm, 200 ppm as a chemical control), Neem extract as a botanical control @ 10%, 20%, & 30%) were implemented with three replications.

**RESULTS:** After careful analysis, results showed that biological control by *Bacillus subtilis* and chemical control by Mancozeb at the rate of 150 ppm showed the optimum control against late blight of tomato as compared to the plant extracts.

**CONCLUSION:** To control the late blight of tomato a biological control agent *Bacillus subtilis* shows noticeable results without harming the soil nature and environment

**SPP-PP-236**

**Induction of defense-related enzymes in cotton inoculated with virulent *Xanthomonas citri* pv. *Malvacearum***

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**ABSTRACT**

**BACKGROUND:** The defence-related anti-oxidative response is a critical plant defence mechanism against pathogen invasion. Cotton is an economically important crop in Pakistan, and suffers substantial losses due to the most damaging disease, bacterial blight, which is caused by *Xanthomonas citri* pv. *malvacearum*.

**METHODS:** The experiment was designed in the field and the bacteria inoculated on the plants. Each cotton plant was separated into two parts, the upper half (top, leaves numbered from 7 to 12) and the lower part (bottom, leaves numbered from 1 to 6). Each part was further segregated into two tissues: leaf and stem. Leaves and stems (upper/lower, 0.2 g) were well-homogenized in a homogenizer in sodium phosphate buffer for POD, PPO, and SOD assay.

**RESULTS:** The defence response of cotton infected with virulent *X. citri* was assessed in the current investigation. The basic enzymatic activity of cotton differed not only between the leaves and stems but also between the upper and lower regions of the same organ. POD, SOD, PPO, and PAL enzymatic activities were considerably higher in cotton leaves and stem inoculated with *X. citri* compared to controls. In cotton inoculated with *X. citri*, the amplitude and rate of POD, PPO, and PAL activities varied more than SOD. PAGE enzymatic findings show that one new POD band and two new SOD bands were elicited, as well as at least two isoforms POD bands and two SOD bands that were noticeably intensified when compared to the corresponding control.

**CONCLUSION:** Our findings indicate that not only were defense-related enzymatic activities increased, but novel isoenzymatic isoforms were also induced in cotton infected with *X. citri*.

**SPP-PP-237**

**Implementation of different Integrated Plant Disease Management strategies against *Alternaria* leaf spot of spinach**

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**ABSTRACT**

**BACKGROUND:** A major leafy crop growing in important agricultural regions is spinach (*Spinacia oleracea* L.). Spinach may be grown all year round in this coastal region due to the temperate environment. In order to produce spinach, extremely high seeding rates are required. Spinach is planted at a million viable seeds per hectare, respectively, for processed frozen, normal fresh market, and fresh market "baby leaf" (harvested at the four- to five-leaf stage). Such high plant densities can foster the growth of a number of foliar diseases, including anthracnose, leaf spot, and downy mildew.

**METHODS:** The current study's objective was to control the disease using various Integrated Plant Disease Management strategies. Strategies were used individually and in random combinations. The strategies were cultural control (Fertilizer application rate, Amount of irrigation), chemical control (Carbendazim, Mancozeb 50 ppm 100 ppm 150 ppm each), botanical control (Neem, Olive, Moringa 20%, 30% & 40% each) biological control (*Bacillus subtilis*, *Trichoderma harzianum*). Three replicates of each concentration were applied.

**RESULTS:** Overall, the biomass of desired fungal species was dramatically reduced in all strategies used. However, they differ significantly from one another. Biological control of (*Trichoderma harzianum*) was significantly observed in managing the disease, securing 80% disease management rate. *Bacillus subtilis* were not shown the results in controlling leaf spot of spinach. However the extract of Olive at the concentration of 40% shows good results as compared to the other concentrations as well as other plant extracts. Carbendazim show the effective results at the rate of 100 ppm. The current study comes to the conclusion that biological control by *Trichoderma harzianum*, Olive in plant extracts @ 40% plays a particular role in managing the *Alternaria* leaf spot of spinach crop.

**CONCLUSION:** *Trichoderma harzianum* was significantly observed in managing the disease, securing 80% disease management rate. On the other hand in plant extracts Olive @ 40% plays a particular role in managing the *Alternaria* leaf spot of spinach crop.

**SPP-PP-238**

**Biochemical characterization and integrated management of blue mold of lemon**

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**ABSTRACT**

**BACKGROUND:** Citrus is a globally significant economic and nutritional crop, particularly in tropical and sub-tropical regions and citrus fruit has several important nutrients. Lemon (*Citrus limon*) is the third most significant species of citrus after orange and mandarin. Around the world, citrus fruits have significant economic losses both before and after harvest, particularly as a result of postharvest deterioration. *Penicillium italicum* is the most destructive species of penicillium which causes Blue mold disease in citrus species. Disease may be present in abundance everywhere in the world wherever citrus is cultivated, so they are responsible for significant yield loss each year.

**METHODS:** By inhibiting or eliminating pathogens, a growing range of techniques have been developed to control citrus diseases. The most popular and efficient of these tactics is chemical control. To control citrus diseases, synthetic fungicides are used. Although these fungicides are used to treat diseases, there is a high probability that the toxins inside the fruits are hazardous to human health, animal health, and the environment. With significant efficiency, several alternative management techniques have been tried to reduce *Penicillium* decay including Plant extract, resistance-inducing compounds. Biological control agents, and salts made from biological and inorganic substances. The typical antagonistic bacteria or *Bacillus* species have been extensively researched as has been documented in citrus. By developing resistance against post-harvest infections, the fruit's natural defensive system can be boosted. The use of natural plant resistance has been established to be one of the better approaches to the widespread use of chemical additives.

**RESULTS:** SA boosts post-harvest resistance to disease against a variety of fruit crop diseases, including citrus, apple, and mangoes diseases. It is organic and a potential inhibition factor. Recent publications suggest that the SA applied artificially has significantly increased resistance to a number of post-harvest pathogens. However, the effectiveness of the separate treatment of resistant stimulants is much lower than that of organic insecticides, and it does not offer post-harvest decay management that is commercially adequate.

**CONCLUSION:** *Bacillus* strain CHGP13 gives the best result to control the post-harvest disease of lemon caused by blue mold. Among Salicylic acid and benzoic acid, 8mM Salicylic acid showed positive results in prohibiting the blue mold.



**SPP-PP-239**

**Managements of fruit rot of tomato in vitro caused by *Alternaria alternata***

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**ABSTRACT**

**BACKGROUND:** Among post-harvest diseases of tomatoes, fruit rot is the most damaging disease induced by *Alternaria alternata*. Antifungal medications were frequently used to regulate post-harvest diseases of tomato fruit. However, it is impossible to deny the adverse effects of fungicidal residues in consumable fruits and vegetables on human health. An innovative approach to managing tomato rot is to use environmentally friendly methods to eliminate *Alternaria* rot on tomato fruits. The current study suggests using essential oils to prevent tomato fruit rots.

**METHODS:** At varying concentrations (100-500 ppm), the inhibitory effects of four essential oils (thyme, nutmeg, eucalyptus, and cassia) on *A. alternata* were studied in vitro. Both cassia oil and thyme oil have antifungal effects on *A. alternata*. At 300–500 ppm, cassia oil entirely prevented the growth of *A. alternata*. At 500 ppm, the thyme oil showed a lower level of inhibition (62.0%). The application of 500 ppm cassia oil effectively suppressed pathogen spore germination and germ tube elongation in potato dextrose broth.

**RESULTS:** Exposure to 300 ppm and 400 ppm cassia oil for 6 days and 500 ppm cassia oil for 3 days could result in irreversible inhibition of fungal growth. The proportion of rotting tomatoes was decreased by cassia oil at 500 ppm.

**CONCLUSION:** Experiments on decreasing natural decay development in tomatoes produced consistent results. As a result, essential oils could be used instead of chemicals to control postharvest phytopathogenic fungus on fruits and vegetables

**SPP-PP-240**

**Morphological and biochemical characterization of *Xanthomonas citri* pv. *malvacearum* isolates collected from Bahawalpur during 2022**

Muneeb Anwer<sup>1</sup>, Muhammad Naveed Aslam<sup>1</sup>, Taimoor Shakeel<sup>1</sup>, Roshaan Ahmed<sup>1</sup>, Nida Amin<sup>1</sup>, Abdul Majid<sup>1</sup>

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**ABSTRACT**

**BACKGROUND:** Bacterial leaf blight (BLB) of cotton occupies the most significant position among various potentially important bacterial diseases all over Pakistan. The characterization of the pathogen is an essential initial step in the management of this disease.

**METHODS:** A survey was carried out, and disease samples were collected from five different Bahawalpur locations. Under standard lab conditions, diseased samples were isolated and characterized by performing biochemical tests. All isolates were inoculated on SS-32 cultivars for pathogenicity and virulence characterization. After three weeks of inoculation, data was collected.

**RESULTS:** 9 isolates of *Xanthomonas citri* pv. *malvacearum* were isolated from infected plants from various geographical origins, and they all showed extremely similar morphological and biochemical properties. The isolate from Yazman was determined to be the most virulent for SS-32 varieties, resulting in 51.35% leaf damage.

**CONCLUSION:** The existence of highly virulent isolates in Yazman is concerning, and new resistance genes must be included into commercial cotton cultivars to combat BLB.

**SPP-PP-241**

**Investigating the impact of Neem extract with chemical on disease complex of tomato by *Fusarium oxysporum* and *Meloidogyne incognita***

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**ABSTRACT**

**BACKGROUND:** In Pakistan, there are two main tomato diseases known as Fusarium wilt and root-knot nematode. *Fusarium oxysporum f.sp. lycopersici* is often found in a synergistic relationship with *Meloidogyne* spp. The management of disease complexes seems to be more complicated than one might assume. Chemical use is becoming less acceptable due to the risks to human and environmental health. Furthermore, the chemicals required are frequently out of reach for farmers in the majority of the world. The goal of this research is to find an alternative method of controlling the pathogen.

**METHODS:** In the glass house, *Meloidogyne* and fusarium-inoculated tomatoes were treated with 50 g/kg soil neem seed powder. Sixty days following inoculation, the plants were pulled to assess root gall indices, Fusarium disease severity, and tomato growth parameters.

**RESULTS:** According to the findings, neem seed powder greatly reduced the severity of Fusarium and root-knot nematode infection. When compared to untreated inoculation plants, all treatments significantly improved plant growth. Carbofuran was highly efficient against nematodes, Bavistin was effective against fungus, and *A. indica* seed powder was effective against both infections. Neem reduces root knot index from 4.7 in the control treatment (fungi +nematode) to 0.25 and disease severity from 85% to 12% in the control treatment. Neem not only controls these diseases, but it also promotes growth characteristics such as plant weight and length to rise.

**CONCLUSION:** The findings imply that neem seed powder could be used to suppress the root-knot nematode-Fusarium wilt disease combination.

**SPP-PP-242**

**Comparison of different Integrated Plant Disease Management strategies against grey mould of strawberry caused by *Botrytis cinerea***

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**ABSTRACT**

**BACKGROUND:** A fungus called *Botrytis cinerea* infects both the blossoms and the fruits, which results in grey mould on strawberries. Because of this, *Botrytis* is one of the most harmful diseases to strawberry plants and can significantly lower fruit output. *Botrytis* is most common during extended periods of chilly, rainy weather during bloom and close to harvest.

**METHODS:** The current study was designed to control the disease using various Integrated Plant Disease Management strategies. Strategies were used individually and in random combinations. The strategies were cultural control (Soil sterilization with formalin 25%, 50% & 75%), chemical control (Carbendazim, Mancozeb 50ppm 100ppm 150 ppm each), botanical control (Neem, Moringa 15%, 30% & 45% each) biological control (*Bacillus*, *Trichoderma viride*). Three replicates of each concentration were applied.

**RESULTS:** Overall, the biomass of desired fungal species was dramatically reduced in all strategies used. However, they differ significantly from one another. Cultural control @ 50% formalin was significantly observed in managing the disease securing 80% disease management rate. The remaining concentrations 15% and 45% were not shown the results. However, the extract of neem at the concentration of 30% shows good results as compared to the other concentrations as well as other plant extracts.

**CONCLUSION:** The current study comes to the conclusion that cultural control soil sterilization with formalin @ 50% and neem in plant extracts @ 30% plays a particular role in managing the gray mold of strawberry crop.

**SPP-PP-243**

**Biological And Chemical Control of Grey Mold of Tomato Caused By *Botrytis cinerea***

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**ABSTRACT**

**BACKGROUND:** Tomato is a member of the Solanaceae family and ranks second being the most important vegetable after potato in the world. Pakistan spends much foreign exchange on the importing of seed and fresh tomatoes. Number of bacterial, viral and fungal diseases attack on the tomato crop during growth stages and also during storage period which not only cause yield reduction but also damage the quality. Among all these diseases, the gray mold of tomato is the most devastating one which is caused by the fungus *Botrytis cinerea*.

**METHODS:** Current study was planned to evaluate biological and chemical agents for the management of *Botrytis cinerea*. Lab Experiments were done using complete randomized design (CRD).

**RESULTS:** Fungicidal evaluation Amister shows maximum disease control against *B.cinerea* and Manoxil shows minimum disease control against pathogen. Among the different plant extracts, garlic extract showed the best result in inhibition of mycelial growth of *B. cinerea*. All the concentration of garlic extract was most effective to overcome infection. Neem extract was second most effective.

**CONCLUSION:** Among chemical fungicides Amister and among biological agents garlic extract can be used for the management of *B. cinerea*.

**Keywords:** *Botrytis cinerea*, Grey mold, tomato mold, tomato diseases, tomato diseases

**SPP-PP-244**

## **Evaluation of Different Antibiotics for Management of Bacterial Fruit Blotch of Watermelon**

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### **ABSTRACT**

**BACKGROUND:** Watermelon (*Citrullus lanatus* T) belongs to the family *Cucurbitaceae*, and is very significant among juicy fruits because of medicinal, nutritional, and industrial value. The present research was conducted to characterize and manage the BFB disease in both *in-vitro* and *in-vivo* conditions through different antibiotics.

**METHODS:** Bacterial fruit blotch is one of the major and potential threats to watermelon (*C. lanatus*) fruit production. It is conventionally handled by different chemicals but it causes human health hazards and environmental pollution, so the present research has been conducted to evaluate nine different antibiotics against phyto-bacteria (*Acidovorax avenae* subsp. *citrullii*) under Lab. Conditions to resolve this problematic issue. The inhibition zone technique was applied to find the best result among nine different antibiotics at different concentrations (300, ppm 500 ppm and 700 ppm) respectively.

**RESULTS:** Results were obtained through statistical analysis. Among all treatments (T) maximum inhibition zone (I.Z) was expressed by (antibiotics) as Enco-mix 48.37 mm followed by Enrofloxacin (45.65), Benzyl Penicillin sodium (43.89), Streptomycin sulfate (43.42), Sinobiotic (35.14), Gentum 20% (34.70), Kanamycin sulfate (34.26), Penivet-5 (26.08) and Tylofurcin 15.8 mm respectively as compared to control. All these antibiotics were applied under controlled conditions against bacterial fruit blotch pathogens.

**Keywords:** Inhibition zone technique, antibiotics,

**SPP-PP-245**

**Application Of Advance And Innovative Techniques In Plant Protection**

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**ABSTRACT**

**BACKGROUND:** The application of “Omics” techniques in crop protection, that has been expressed the potential for “omic” based technologies derive innovation in crop protection is powerful when applied to understanding plant pathogen interactions and genetic variation among crop genotypes and populations of target organisms (pathogens, weeds and microbes). Few advance ideas on using “omics” more extensively in conventional crop protection strategies that includes, using molecular approaches to optimize the integrated use of agrochemicals with crop varieties of differing genetic background (matching fungicides mode of action with host resistance). Identification of new crop protection targets for intervention in pathogens, pests, and weeds which may provide the basis for screening chemical and biological agents. Beneficial endophytes and resistance elicitors enhance crop protection and improve its efficacy. Exploiting natural “plant protection strategies” including pest and disease resistance, as well as embracing less studied interactions such as allelopathy.

**CONCLUSION:** Developing synergistic mixes and formulations of pesticides, and directly identifying novel bioactive natural products through bioprospecting.



**SPP-PP-246**

**Role of Significance of Resistance in Plants**

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**ABSTRACT**

**BACKGROUND:** In the 21st century one of the greatest challenges is to develop resistant crops. The Plants are exposed to pests, pathogens, bacteria and viruses etc., and face many issues due to lack of resistance. About 1/4 Part of total yield is lost due to pre-harvest pests and pathogens. We need climate-resilient crops. Genetic resistance in crops is necessary to avoid chemical control of pathogens. Heavy doses of chemicals also create resistance in pathogens and kill beneficial insects also which create problems.

**CONCLUSION:** Resistance can be introduced in many ways like breeding & genetic engineering technologies, resistance also introduced in plants against certain disease and targeted pathogens to control such types of threats.

**SPP-PP-247**

**Advance Integrated Pest Management (IPM) Approach and its Adaptations**

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**ABSTRACT**

**BACKGROUND:** Integrated pest management (IPM) chains the use of biological, chemical, and cultural practices to control insect pests in agricultural productions. It tries to find the use of natural predators/ parasites to control pests, using selective pesticides for back-up only when pests are able to be controlled by natural sources. The IPM clarifies to identify different techniques/ methods of pest management and their benefits and limitations. Analyze pest issues, determine if management is necessary, and make appropriate recommendations using integrated pest management techniques and describe the worth of beneficial insects. When advanced pesticides were 1<sup>st</sup> developed, they were used extensively. Pests susceptible to a pesticide were quickly killed, leaving resistant ones to breed and multiply. It becomes clear that pesticide alone would not solve all pest problems. Instead, overuse of pesticides caused the development of resistant pests. Scientists began to develop a new approach to pests' control. This new approach was termed as integrated pest management (IPM), integrated denoting the fact that all control measures (cultural, mechanical, chemical and biological) are considered and its suitable use. IPM plan allows some level of pests in the environment. Pests are much likely to survive a program, which uses several different methods of reducing their populations. IPM was first suggested by agricultural entomologists because insects were the 1<sup>st</sup> group of pests to prove difficult to manage with chemicals alone. Early proponents of IPM suggested using basic strategies to improve the insect management through following steps:

**CONCLUSION:** Monitor and scout insects to recognize insect types and population levels. Assess and consider economic/ aesthetic injury thresholds. A threshold is the point at which action should be taken. Implement a treatment strategy using cultural, mechanical, biological and chemical controls and combination of these strategies. Evaluate success of treatments.

**SPP-PP-248**

**Impact of Climate Changes on Plant Diseases and Their Management Strategies**

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**ABSTRACT**

**BACKGROUND:** Climate change will cause alterations in the disease geographical and temporal distributions and consequently the control methods will have to be adapted to this new reality. The efficacy of current physical, chemical and biological control methods under changing climatic conditions and research concerning new tools and strategies (including plant breeding) for coping with the predicted changes will be of great strategic importance. Fungicides may continue to serve as common disease suppression agents, although alternative measures, such as cultural methods and biological control, should be developed. There are few discussions on how chemical control will be affected by climate change, despite the importance of this subject. Changes in temperature and precipitation can alter fungicide residue dynamics in the foliage, and the degradation of products can be modified. The persistence of plant protection chemicals in the phyllosphere is highly dependent on weather conditions. Changes in duration, intensity and frequency of precipitation events will affect the efficacy of chemical pesticides and how quickly the active molecules are washed away. Temperature can directly influence the degradation of chemicals and alter plant physiology and morphology, indirectly affecting the penetration, translocation, persistence and modes of action of many systemic fungicides, **CONCLUSION:** Indigenous microbial communities play an important role in maintaining plant health. There is a need to promote these beneficial communities. Recent technological advances, such as meta-genomic analyses will increase our understanding of microbial dynamics in soil and other environments and further advance the establishment of plant pathogen suppressive microbial populations.

**Keywords:** Climate Change, Management of Plant Diseases



# **THEME-3: WEED MANAGEMENT**

# ORAL TALKS

## THEME-3: WEED MANAGEMENT

### SPP-WM-301

#### Determination of Critical Period for Weed Control in Lentil under Semi-arid Conditions of Faisalabad

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#### ABSTRACT

**BACKGROUND:** Weeds are the major threat to global crop productivity and food security. Weeds compete with plants for resources and cause a significant reduction in final productivity. Lentil is a poor competitor of weeds owing to its slow growth rate.

**METHODS:** Present study was conducted at the Agronomic Research Farm, University of Agriculture, Faisalabad, to determine the critical period for weed control (CPWC) in lentil. The treatments were comprised of weed competition periods for 20, 40, 60, and 80 days after sowing (DAS) and weed-free periods for 20, 40, 60, and 80 DAS, along with weedy check and weed-free controls. Treatment means were differentiated using Tukey's HSD at 5% probability level. Logistic and Gompertz equations were employed for the computation of CPWC. **RESULTS:** The results indicated that different weed competition and weed-free durations significantly impacted lentil growth and yield parameters. Weed species composition in weedy check plots was as follows: *Phalaris minor* (58.68%), *Rumex dentatus* (26.09%), *Convolvulus arvensis* (9.59%), and *Chenopodium album* (5.63%). Crop growth rate and net assimilation showed a decreasing trend with the increase in weed competition periods and *vice versa*. Crop yield parameters were directly proportional to the increase in weed-free periods and inversely proportional to the increase in weed competition periods. Plant height, number of pods per plant, number of seeds per pod, 1000 seed weight, seed yield, biological yield, and harvest index in weed-free plots were 27.99, 43.58, 32.14, 28.86, 64.94, 48.77, and 31.57% higher than weedy check, respectively. The critical period of weed control (CPWC) in lentil was observed at 0 to 85 DAS and 20 to 71 DAS at 5% and 10% acceptable yield loss levels, respectively.

**CONCLUSION:** The result of the present study concludes that weeds are detrimental to the growth and yield of lentil. Lentil, a poor weed competitor, needs to be kept free from weeds from the date of sowing till 85 DAS to minimize the losses caused by weeds and obtain a better yield.

**Keywords:** average yield loss, critical period for weed control, Logistic and Gompertz model, weed crop competition

### SPP-WM-302

#### Influence of *Parthethenium hysterothorus* dry powder contaminated soil on germination indices and growth of maize

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## **ABSTRACT**

**BACKGROUND:** *Parthenium* (*Parthethenium hysterophorus* L.) is one of the most aggressive herbaceous weeds of the Asteraceae family. It is widely distributed, almost across the world and has become the most important invasive weed. These infestations of parthenium have been reported to reduce grain and forage yields by 40-90%. The spread of parthenium has been attributed to its allelopathic activity. Allelochemicals released from parthenium have been reported to decrease germination and growth of agronomic crops, vegetables, trees and many other weed species. Growth promoting effects of parthenium extracts at low concentrations have also been reported in certain crops.

**METHODS:** A laboratory experiment was carried out to evaluate the germination and germination indices of maize with estimation of maize growth infested with *Parthenium allelopathy*. This trial was conducted in CRD designs with 3 replications.

**RESULTS:** *Parthenium* dry powder % mixed with soil produced variable responses regarding seed germination and seedling growth. Emergence index, mean germination time, vigor index was significantly affected by various parthenium dry powder percentages. The smaller amount of parthenium powder (5, 10 and 15%) promoted the maize germination and seedling growth. The highest parthenium dry powder (20%) negatively affects the maize germination and seedling growth. Germination %, time to start germination, time taken to 50% could not be affected by parthenium dry powder. Physiological characteristics, SPAD value, Crop growth rate and plant height are significantly reduced from T1 control from proceeding to T5 (20% dry powder). Similar trends were found in root length, shoot length, plant fresh weight and plant dry weight.

**CONCLUSION:** In light of this study it is recommended that a smaller amount of parthenium dry powder percentage (5, 10 and 15%) promoted the maize germination and seedling growth positively. Therefore the maize can be planted in the field infested with parthenium weed to some extent and its planting should be avoided where the higher population of parthenium precedes the maize planting.

**Keywords:** Allelopathy, *Parthethenium hysterophorus*, Germination, Growth, Development, Maize

**SPP-WM-303**

**Impact of aqueous extract of *Parthenium hysterophorus* on germination and growth of seedlings in six different species of winter plants in vitro condition.**

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**ABSTRACT**

**BACKGROUND:** *Parthenium hysterophorus* is a medium tall, emerging, invasive perennial and dicot weed. It is native to Mexico, USA and Argentina, and has invaded as many as 30 countries around the world. Now it is an important weed in Lahore, Sialkot, Northern and Southern Punjab in Pakistan. It has too much allelopathic potential, grows faster than most other weeds and competes with crops due to rapid growth rate, efficient root system, prolific seed production, aggressive in nature and dissemination potential.

**METHODS:** A laboratory experiment was designed at the department of Agronomy, Faculty of Agriculture, Gomal University, KP., Pakistan during 2021. Leaves of *Parthenium hysterophorus* were collected, cleaned and sun dried in a shady place. After drying, leaves were made into powder with the aid of pestle and mortar. 20% (w/v) concentrated solution were made then filtered through Muslim cloth and watman filter paper and then used two time in a month to wet seeds. *P. hysterophorus* water extract was used against wheat (*Triticum aestivum*), Piazi (*Asphodelus tenuifolius*), Jangli Jai (*Avena fatua*), Jangli Palak (*Rumex dentatis*), Lehli (*Convolvulus arvensis*) and Bathu (*Chenopodium album* L.). Plastic cups 2/3<sup>rd</sup> filled with sandy loam soil is used for media to observe germination and growth.

**RESULTS:** *Parthenium hysterophorus* aqueous extract showed significant results against the six selected species. Wheat and its associative weeds were suppressed against aqueous extract of *Parthenium hysterophorus* than control. Its extracts decreased seed germination, shoot length, fresh and dry biomass and SPAD value as compared to control where only tap water was used for irrigation.

**CONCLUSION:** *Parthenium hysterophorus* leaves extract have a negative effect on wheat and its associated weeds. Thus, there is a possibility of using *Parthenium hysterophorus* for weed management but care should be taken to save the wheat crop. However more field studies are required to identify the allelopathic chemicals responsible for inhibitory effects on seed germination and plant growth.

**Keywords:** Allelopathy, Phytotoxin, Winter weeds, Wheat, Germination physiology



**SPP-WM-304**

**Allelopathic activity of crowfoot grass against early seedling growth and germination of rice**

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**ABSTRACT**

**BACKGROUND:** Detrimental effects of crowfoot grass on rice seedling have rarely been reported in the literature.

**METHODS:** This study evaluates the role of different concentrations viz. 1:10, 1:20, and 1:30 (w/v; ground powder in distilled water) of crowfoot grass allelopathic water extracts on rice seedling. Allelopathic extract from different plant parts (root, shoot, inflorescence, and whole plant) exhibited varied responses in terms of seedling emergence, growth attributes, antioxidants activity, chlorophyll, and total soluble phenolic contents. The highest concentration of allelopathic water extracts was more detrimental.

**RESULTS:** Maximum reduction in emergence index (66%), shoot length (39%), root length (13%), and dry biomass (64%) were recorded by the application of whole plants allelopathic water extracts at 1:10 concentration. The same treatment combination reduced the chlorophyll contents by 58% and increased total soluble phenolic by 25% in rice leaves and 7% in roots, respectively. Antioxidants defense system in rice seedling was activated after the application of allelopathic water extracts. Whole plant water extracts application triggered a maximum increase in SOD (160%), POD (875%), and CAT (185%) activities at the highest concentration. However, these antioxidants were unable to alleviate the phytotoxic effects of phenolics produced after the application of crowfoot grass allelopathic extracts.

**CONCLUSION:** Consequently, suppressed seedling emergence and growth were observed, proving the allelopathic effect of crowfoot grass against rice.

**SPP-WM-305**

### **Critical Period of Weed-Crop Competition in Irrigated Chickpea as a Tool for Judicious Weed Control**

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#### **ABSTRACT**

**BACKGROUND:** Weed infestation comprising of recalcitrant and diverse weed flora remains a challenging task for large scale cultivation of chickpea under irrigated environments.

**METHODS:** Studies to appraise critical period of weed competition (CPWC) in Desi and Kabuli chickpea were undertaken during 2017-18 and 2018-19 growing seasons. Desi (Punjab-2008) and Kabuli (Noor-2009) chickpea crops were subjected to different durations of weed competition [competition for 20 days after sowing (DAS), 40, 60 and 80 DAS] as well as weed-free periods [weed-free till 20, 40, 60 and 80 DAS]. Season-long weed check and weed-free plots were also maintained for both chickpea genotypes. Relative yield data under such treatments were fitted to logistic and Gompertz equations. The experiment was replicated thrice in RCBD under factorial arrangements with a net plot size of 1.8 × 8.0 m.

**RESULTS:** Increasing period of weed competitions (from 20 to 80 DAS) had a diminishing effect on dry matter accumulation and crop growth rate of chickpea. Seasonal crop growth rate was reduced from 6.79 g m<sup>-2</sup> day<sup>-1</sup> to 3.61 g m<sup>-2</sup> day<sup>-1</sup> when weeds competed with crop from 20 to 80 DAS as against 8.51 g m<sup>-2</sup> day<sup>-1</sup> recorded for weed-free crop. Weed competition reduced crop dry matter by 18, 37, 51 and 56% compared to weed-free conditions when weeds competed with chickpea crop for 20, 40, 60 and 80 DAS, respectively. The season-long weed competition resulted in 60% reduction in crop dry matter. Weed competition reduced chickpea yield regardless of genotype by reducing the number of branches per plant, number of pods per plant, number of seeds per pod and 100-seed weight. Results revealed that weed competition even for 20 DAS was detrimental to chickpea crop. The CPWC based on 10% yield loss range from 6-119 and 10-118 DAS for Desi Chickpea, and 5-115 and 8-108 DAS for Kabuli chickpea during 2017-18 and 2018-19, respectively.

**CONCLUSION:** Information on CPWC can be used as a tool for judicious weed control in irrigated chickpea.

**SPP-WM-306**

## **Crop Productivity, Weed Growth and Economic Benefits of Spring Planted Mungbean in Response to Sequential Herbicide Application**

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### **ABSTRACT**

**BACKGROUND:** Weed management in spring crop of mungbean is a challenging task since crop is infested by diverse weed flora comprising grassy, broad-leaved and sedge weeds. Usually, pre-emergence herbicides are used to provide early season weed control. Nevertheless, their narrow application window and limited spectrum necessitates the need for supplementary weed control during later part of the growing season. Sequential herbicide application can provide control of leftover as well late emerging flushes of weeds and thus can reduce buildup of weed seedbank. Moreover, genotypes of a particular crop could also affect herbicide efficacy.

**METHODS:** Study to appraise mungbean productivity, weed growth and economic benefits in response to sole and sequential herbicide application was undertaken during Spring, 2021 at research area of MNS University of Agriculture, Multan. Plots of two mungbean genotypes, i.e., AZRI Mung-2018 and NM-2011 were sprayed with pre-emergence herbicides (pendimethalin, S-metolachlor, and pendimethalin+S-metolachlor at 1137, 2400, and 2400 g a.i ha<sup>-1</sup>, respectively). Some of these plots were treated with post-emergence application of haloxyfop and fomasafen at 94.5 and 125 g a.i ha<sup>-1</sup>, respectively. Data on crop growth, yield attributes, weed dynamics and economic returns were recorded and statistically analyzed following ANOVA technique.

**RESULTS:** Sequential combination of pre-emergence herbicide S. metolachlor at 2400 g a.i ha<sup>-1</sup> and post-emergence application of haloxyfop at 94.5 g a.i ha<sup>-1</sup> was efficient in controlling weed density (66%) and weeds biomass (87%) as compared to weedy check plot and improved yield attributes (grain yield, 100-grains weight, pods per plant and grains per pods) and growth parameters (CGR, plant height, TDM). Grain yield attained in this treatment was 63% higher than the weedy check plots and this treatment combination also recorded highest BCR (3.00) as compared to the control treatment (1.20).

**CONCLUSION:** Moreover, the present research work revealed that mungbean growth and yield can be improved by efficient weed management.

**SPP-WM-307**

**An alien weed *Parthenium*: a boon or curse? a review**

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**ABSTRACT**

**BACKGROUND:** *Parthenium hysterophorus* is an aggressive, fast growing, widespread and invasive weed with allelopathic properties that belongs to the Asteraceae family. It is becoming a serious menace to agriculture, contributing significantly to the degradation of the ecology, biodiversity, and agricultural land. It has been spreading like wildfire in various regions of the world because of its great climatic adaptation, high germination rate, prolific seed production and dynamic seed distribution. The health of the flora and fauna is irreparably harmed because of this weed. It has the potential to reduce crop productivity, posing a serious threat to food security in the long run. Management strategies for this weed are not enough fruitful yet, that is why its population is increasing at an alarming rate. Recent studies have shown that it is a blessing rather than a curse because of its industrial (bioremediation of heavy metals and dyes), agricultural (insecticidal, nematicidal, herbicidal properties, high quality animal feed, composting, etc.), and medicinal (antidiabetic, antioxidant, antitumor, and antimalarial) applications. Despite the fact that many agricultural and environmental experts have highlighted its negative impacts on crops and the ecosystem yet many studies have argued that it has positive impacts on society, crop productivity and ecology.

**CONCLUSION:** Henceforth, one can conclude that abundantly growing weed has considerable benefits for humanity and it should be used after in-depth study and research.



# THEME-4:

## BIOTECHNOLOGY FOR PLANT PROTECTION

# ORAL TALKS

## THEME-4: BIOTECHNOLOGY FOR PLANT PROTECTION

### SPP-Biotech-401

#### Studies of Molecular Mechanisms leading to Develop Drought Stress Tolerant Plants, The Smart way of Plants Protection from Abiotic Stresses

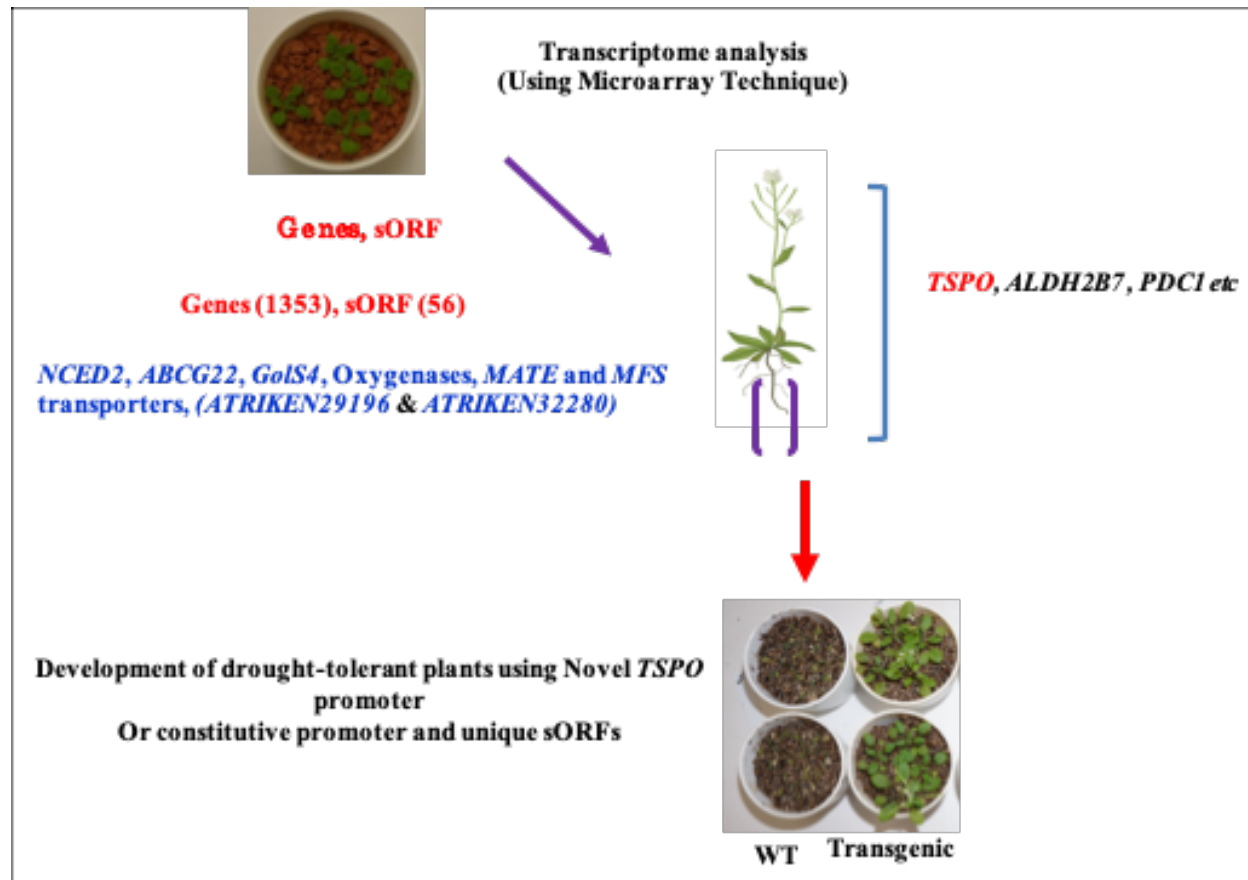
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## ABSTRACT

**BACKGROUND:** Climatic changes such as global surface temperature produce abiotic stresses. So, It's very important to understand the molecular mechanisms of plant response to drought. This research was aimed to develop transgenic plants overexpressing the genes in acetic acid biosynthesis pathway under the control of a promoter with low expression at normal condition and specifically inducible by drought stress in roots and shoots.

**METHODS:** Microarray analysis of *Arabidopsis* roots and shoots was performed at 0, 1, 3, 5, 7 and 9<sup>th</sup> day of drought treatment. stress. Microarray data was analyzed on GeneSpring. Soil moisture content was measured. Root & shoot length and weight was measured. Gene cloning and agrobacterium mediated transformation was performed then homozygous transgenic lines of *pTSPO-PDC1* & *pTSPO-ALH2B7* were selected. RT-qPCR, as well as GUS analysis of the promoter was done. Drought tests were carried out for transgenic lines.

**RESULTS:** In roots, 47 genes were upregulated at least 4 times at 3, 5, 7 and 9<sup>th</sup> day of drought condition. Among these highly upregulated genes, *PDC1* and *ALDH2B7* were found to be good candidates showing inducible expression at early stages as well as during later stages of drought. Expression of drought inducible genes in the early time period of drought is fundamentally important to produce drought-tolerant plants. For this strategy up-regulation of the *TSPO* gene by drought stress was observed. RT-qPCR, as well as GUS analysis of the promoter, confirmed the up-regulation of *TSPO* by drought stress in *Arabidopsis* roots and shoots. Thus, the *TSPO* promoter was used to drive drought-responsive expression of *ALDH2B7* and *PDC1*. It was found that manipulation of acetic acid biosynthesis pathway was effective for enhancing drought stress tolerance. So, transgenic *Arabidopsis* plants expressing the acetic acid biosynthesis genes (*AtPDC1* and/or *AtALDH2B7*) under the control of *TSPO* promoters were developed. These transgenic lines were found to be drought tolerant (Rasheed *et al*, 2018). RT-qPCR analysis confirmed that the expression of *PDC1* and *ALDH2B7* was up-regulated, relative to WT plants, by drought stress in homozygous *pTSPO-PDC1* and *pTSPO-ALDH2B7* plants.

**CONCLUSION:** *pTSPO-ALDH2B7* and *pTSPO-PDC1* transgenic lines showed prolonged survival under drought stress. These results confirmed that *TSPO* promoter can be used to elevate the expression of acetic acid biosynthesis pathway genes, ensuring prolonged survival under drought stress in *Arabidopsis*.

**Keywords:** Abiotic Stress, *Arabidopsis thaliana*, Microarray, Gene Cloning, qPCR



**SPP-Biotech-402**

**Supplementation of D-mannitol mitigates chromium stress in pearl millet (*Pennisetum glaucum*) through incrementation in antioxidative defence system and reduction in stress markers**

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**ABSTRACT**

**BACKGROUND:** Environmental stress, including heavy metal stress, have hampered growth and production of many crops. Current research was designed to evaluate the potential of D-mannitol in the mitigation of chromium stress in pearl miller (*Pennisetum glaucum*).

**METHODS:** Seedlings of *P. glaucum* were exposed to chromium (Cr) stress in potted soil.

**RESULTS:** Chromium toxicity decreased root length, shoot length, fresh weight, dry weight and photosynthetic pigments in exposed seedlings. Application of D-mannitol increased the activity of antioxidant enzymes i.e., superoxide dismutase (SOD), ascorbate peroxidase (APX), catalase (CAT). Moreover, D-mannitol application reduced hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), electrolyte leakage (EL) and malondialdehyde content (MDA) in *P. glaucum*.

**CONCLUSION:** Chromium stress alleviation is credited to increased activity of antioxidative defence system besides decreased in activity of stress markers i.e., hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), electrolyte leakage (EL) and malondialdehyde content (MDA). It is further proposed that D-mannitol may be used to mitigate other abiotic stresses.

**Keywords:** D-mannitol; chromium; Plants; Stress; Antioxidants

### SPP-Biotech-403

#### Identification of Cry1Ac Hot Spot amino acid residues to improve toxicity against mutated cadherin receptor of Bt resistant *Helicoverpa armigera*

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#### ABSTRACT

**BACKGROUND:** *Bacillus thuringiensis* Cry proteins are used for biological control of insect pests; however, insect pests are developing resistance against these proteins especially Cry1Ac. We hypothesized that the problem of resistance development can be overcome by mutating hot spot amino acid residues(s) of Cry1Ac protein conferring enhanced toxicity towards resistant insect pests. Cadherin protein region CD7-CD8 is known to act as primary insect midgut receptor which is involved in binding with Cry1Ac and amino acid mutation in this region is known to cause resistance development in insects.

**METHODS:** In this study we used silico modeling, protein-protein interaction and simulation.

**RESULTS:** In this study, we identified three key amino acid residues A1264, H1436 and L1461 of cadherin receptor protein from *Helicoverpa armigera* genome and *in silico* protein-protein interaction studies revealed their role in development of resistance against Cry1Ac. Three mutations viz A1264P, H1436L and L1461V showed significantly high  $\Delta\Delta G$  values as 9.3, 6.0 and 5.9 respectively indicating destabilization of cadherin protein which will reduce its binding with Cry1Ac that is known to cause resistance development. Further, molecular docking of these mutated amino acids residues revealed lack of interaction with amino acid residues of Cry1Ac viz Q509, Y513, W544, N547 and I585 essential for cadherin-cry1Ac binding in susceptible insects. In second part of our study, we identified two hot spot amino acid residues of Cry1Ac viz S548, I586 whose mutation viz S548H or S548W and I586Y brought about strong interaction with midgut receptors of resistant insects having mutated cadherin.

**CONCLUSION:** Hence, we conclude Cry1Ac hot spot amino acids if mutated can help to overcome resistance mechanisms. The results were further verified by the molecular dynamic simulation, alanine scanning and heatmap using different bioinformatics tools. Here we laid a foundation for further experiments to modify the Cry1Ac hot spot residues which bind with the resistant receptor binding protein (cadherin) more strongly to perform efficient insecticidal activity against resistant strains of *Helicoverpa armigera*.

**Keywords:** Multiple sequence alignment, Cadherin domain, Protein-protein interaction.

## SPP-Biotech-404

### Evaluation of wheat genotypes for drought stress tolerance

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### ABSTRACT

**BACKGROUND:** Drought is one of the most significant constraints to wheat (*Triticum aestivum* L.) crop production worldwide especially in Pakistan. Using unique genetic resources to breed for drought resistance is an important mitigation method.

**METHODS:** The goal of this study was to estimate the relationship and way coefficient of yield and its causative attributes and consequence of dry spell on various genotypes and to determine the level of drought tolerance among different wheat genotypes.

**RESULTS:** Fifty advanced wheat genotypes were tried in randomized complete block design (RCBD) with three replications at test range of BZU Bhadur sub grounds Layyah in 2021 winter season. We considered the impact of two dry season levels on the yield. Dry spell pressure influenced all parameters, all things considered. In any case, blurring of dry season weight on the development execution of genotypes 9181, 9779, 9757, 9727, 9705, 9638, Chakwal 86 were seen as generally tolerant to dry spell pressure. The information demonstrated that the grain yield had huge association with organic yield and huge connection with number of successful tillers (0.39\*\*), peduncle length (0.431\*\*) and number of spikelets (0.193\*\*). Way coefficient investigation uncovered the most extreme positive direct contribution towards yield by bio. Yield (0.165), peduncle length (0.132) and plant tallness (0.136).

**CONCLUSION:** The investigation proposed that these characteristics may fill in as a powerful choice trait during rearing projects for yield improvement in wheat.

**Keywords:** wheat, dry season, relationship, way coefficient, genotypes, grain yield

**SPP-Biotech-405**

**Assessment of *Sargassum* sp. extract on basal stem rot (BSR) disease management on oil palm seedlings**

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**ABSTRACT**

**Background:** Malaysian oil palm industry is facing devastating threats from diseases primarily basal stem rot (BSR) caused by pathogenic *Ganoderma* spp. The common disease management control method is via synthetic fungicide application that contributes harmful effects to the ecosystem and the palm oil products itself. Therefore, this current study explored a sustainable disease control method using *Sargassum* sp. seaweed extract.

**Method:** An array of treatments was designed to evaluate the potential of *Sargassum* sp. extract application in an in vivo greenhouse trial for six months. The effects of the designed treatments on disease severity (DS) and plant growth promotion of oil palm seedlings pre and post applied with seaweed extract prior to artificial inoculation with pathogenic *Ganoderma* that causes BSR infection were determined.

**Results:** In the greenhouse trial, the application of seaweed extract on oil palm seedlings contributed to increased vegetative growth parameters such as plant height, stem diameter, number of leaves, bole diameter, bole weight, top and root weight. Disease reduction (DR) analysis showed reduced disease incidences of BSR disease by 67.6%.

**Conclusion:** In conclusion, the application of seaweed extract managed to enhance the vegetative growth of oil palm seedlings. Nevertheless, reduced disease incidences and severity of infected oil palm seedlings were also noted.

**Keywords:** oil palm; basal stem rot disease; *Ganoderma* spp.; seaweed; *Sargassum* sp.

**SPP-Biotech-406**

**Molecular Characterization of *Gossypium hirsutum* using Serine Hydroxy Methyltransferase for Boll Formation**

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**ABSTRACT**

**BACKGROUND:** Cotton is one of the most important fibre crops due to its high economic importance in the textile industry. It has a major role in the economic development in both agriculture and developmental sectors. The production of cotton is low in Pakistan on per hectare basis. There is a dire need for the improvement of cotton yield and production due to emerging population of Pakistan. Both biotic and abiotic factors affect the cotton production in Pakistan. The improvement in the cotton production can be enhanced by increasing the number of bolls per square meter. Boll yield is affected mainly by boll shedding and there is less research work on genetic expression of boll yield. This research is focused on the expression of genes that are related with boll production from either cotton or model crops.

**METHODS:** Twenty-five cotton genotypes were sown at research area of MNS-University of Agriculture, Multan for the assessment of high, low and moderate boll yield in cotton. For this purpose, data of different morphological parameters such as height of the plant, boll number, number of sympodial and monopodial branches, number of nodes, internodal distance was recorded to assess the yield of cotton genotypes. qPCR was used for transcript abundance analysis of yield related genes in the screened genotypes.

**RESULTS:** Among all genotypes, MNH-1020 and IUB-69 demonstrated significant results for the expression analysis of Serine hydroxy methyltransferase *SHM6* and *SHM7* fruit related genes.

**CONCLUSION:** In future, these results would be helpful in cotton varietal development for fruit retention and development.

**Keywords:** *Gossypium hirsutum*, boll yield, Serine Hydroxy Methyltransferase

## SPP-Biotech-407

### Expression Analysis of CDPK Gene family in *Gossypium hirsutum* for Salinity Tolerance

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#### ABSTRACT

**BACKGROUND:** Among many influential cash crops, cotton is of great importance that is cultivated around the world. Since its cultivation, cotton industry has faced serious biotic and abiotic stress along with climatic change that leads to extensive country economic loss. Cotton moderately shows salt tolerance with salinity threshold of  $7.7\text{dSm}^{-1}$ . Salinity affects all growth phases and has a global impact on agriculture of cotton crop. It particularly effects germination, emergence and seedling, resulting in low photosynthetic ability, delayed flowering which results in less fruiting and high shedding that has a negative effect on production of cotton. In order to develop salt tolerance in cotton varieties, exploration of genetic potential is required.

**METHODS:** This study aimed at the identification and expression analysis of genes that are responsible for the salinity stress tolerance. Both cotton and related species were explored for the presence of genes that control the salinity stress. For this purpose, data of different parameters had been analyzed for 25 cotton genotypes that were sown in 3 replications for the assessment of salinity stress preceded with cDNA extraction for selected genotypes followed by qPCR.

**RESULTS:** Among the selected genotypes, two varieties MNH-1020 and IUB-69 demonstrated significant results in expression profiling of salinity tolerance with Calcium Dependent Protein Kinase family, CDPK6 and CDPK 12.

**Keywords:** *Gossypium hirsutum*, Salinity, Genetic Expression, CDPK Gene



# MISCELLANEOUS ABSTRACTS



## MISCELLANEOUS ABSTRACTS

### SPP-MISC-501

#### **Improving The Productivity Of Okra (*Abelmoschus esculentus*) by introduction of a new improved variety in South Benin**

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#### **ABSTRACT**

**BACKGROUND:** Vegetables are an essential component of daily diets and sources of income, particularly in urban areas. Okra is one of the well-known fruit vegetables in Benin. Despite Okra's importance in Beninese gastronomy, producers in southern Benin are faced with problems producing productive and profitable seeds to serve the market and make their income good.

**METHODS:** The study aims to introduce a new variety of Okra in the south of Benin to improve productivity. The experimental field was conducted at the Center for Research, Training, Incubation, Technological Innovation and Seed Production for Agricultural Development (BIORAVE-CREFIISDA) in the municipality of Zogbodomey to assess the agronomic performance of four varieties of Okra (T1=BC-VL-01, T2=BC-VL-02, T3=BC-VS-01, and T4=BC-VS-02). Parameters such as plant height plant<sup>-1</sup> (cm), days of first flower appearance plant<sup>-1</sup> (days), the number of fruits plant<sup>-1</sup>, fruit diameter plant<sup>-1</sup> (mm), and fruit length plant<sup>-1</sup> (cm) were determined.

**RESULTS:** The results of the trial showed that the T3 treatment is the best performing and most productive 116.1cm; 57.50; 8.60; 5.80mm; 14.20 respectively for plant height, days to flowering, number of fruits, fruits diameter, and fruit length. However, T3 treatment is recommended to farmers in south Benin to improve their productivity and income.

**Keywords:** Okra, Productivity, Vegetable, Fruit, Variety

## SPP-MISC-502

### Response Of Late Sown Wheat Genotypes To NPK

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#### ABSTRACT

**BACKGROUND:** The application of inorganic nutrient sources is widely accepted and recommended for sustaining crop productivity with the sustainability of cereal-based food production systems. The objective of this research was to determine “Response of late sown wheat genotypes to nitrogen, phosphorous, and potassium (NPK) at different growth stages on yield and nutrient contents of spring wheat (*Triticum aestivum* L.) And to reveal the different genotypes of wheat.

**METHODS:** The field experiment was conducted according to randomized plot design with three replications with a seeding rate of 120 kg ha<sup>-1</sup> having a size of 4 m length and 1.5 m width. The fertilizer at T1 (control), T2 (90-60-30 kg ha<sup>-1</sup>), T3 (120-75-45 kg ha<sup>-1</sup>), T4 (150-90-60 kg ha<sup>-1</sup>), T5 (180-105-75 kg ha<sup>-1</sup>) N-P-K rate were done at different growth stages at sowing and booting stage.

**RESULTS:** Wheat yield values varied between the lowest 1191.8 kg ha<sup>-1</sup> in the control and the highest 1759.1 kg ha<sup>-1</sup> in the treatment of fertilization done at tillering and steam elongation stages (T+S). According to control treatment, increases in grain yields by the treatment N-P-K T5 (1759.1 kg ha<sup>-1</sup>) fertilization done at the different growth stages were determined as follows; T4 (1718.3 kg ha<sup>-1</sup>) > T3 (1525.2), and minimum was recorded in T1 (1191.8). There was no significant difference among the treatments' effect and genotype at the different growth stages of leaf area and leaf width. The results revealed that maximum growth parameters responded significantly to NPK fertilizers. This results indicated that the treatment T5 (180- 105-75 kg ha<sup>-1</sup>) fertilization should be applied at the tillering stage and the best fertilization management for high grain yield and nutrient uptake should be done two times at the combination of tillering stages. The wheat genotype PR-137 (1904.2) showed high yield followed by PR-135 (1687.5), while minimum was shown by PR-144 (1241.7).

**CONCLUSION:** The NPK and wheat genotype interaction showed significant effect on Spikelet per Spike, Thousand Grains Yield, Biological Grain Yield, Grain Yield, Days to Physiological Maturity, Plant Height, Productive Tillers, Spike Length while leaf width and leaf area were non-significant.

**Keywords:** Wheat, grain yield, N, P and K fertilization, Genotype.

**SPP-MISC-503**

### **Response Of Wheat Varieties To Zinc Application**

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#### **ABSTRACT**

**BACKGROUND:** A field experiment entitled “Response of wheat varieties to zinc application was conducted in 2021-2022 at Cereal Crops Research Institute (CCRI), Pirsabak, Nowshera, Khyber Pakhtunkhwa, Pakistan.

**METHODS:** The experiment was conducted in triplicate according to a Randomized Complete Block Design (RCBD) with split plot arrangement. This field experiment was conducted during the Rabi season to check the effect of Zinc (Zn) fertilizer (0,5,10,15 kg ha<sup>-1</sup>) on the different wheat varieties.

**RESULTS:** The result of my study was the day to booting and days to heading results among the treatments effect are non-significant with each other, while varieties shows significant difference but the days to anthesis, leaf length, leaf width, leaf area, spike length, spikelets per spike, days to maturity, plant height, productive tillers, no. of grain per spike, biological yield, grain yield and 1000 grain weight were found among the interaction effect of Zn levels and wheat varieties were significant.

**CONCLUSION:** In conclusion, the effect of Zn on different treatments show significant effect on yield and yield components at 15 kg Zn ha<sup>-1</sup>. The wheat varieties Paseena-17 and Zincol-16

showed best results and the interaction effect of treatment and wheat varieties were significant.

**Keywords:** Wheat, Yield, Yield components, Zinc, Varieties...

**SPP-MISC-504**

**Effect of sulfur on the agronomic traits of wheat**

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**ABSTRACT**

**BACKGROUND:** Crop productivity is highly emphasized by effective crop stand and fertilizer management. Fertilizer has gained supreme importance in the Pakistani cropping system because of the increasing demand for food day by day. Sulfur fertilizer management is the key to the prevailing conditions. Sulphur is an essential element for both plants and animals. The study titled “Effect of sulfur on the agronomic traits of wheat”.

**METHODS:** The experiment was laid out at Cereal Crop Research Institute, Pirsabak during Rabi under irrigated conditions from during 2021-22 in a randomized complete block design with a split-plot arrangement replicated thrice and the plot size was 4.8m<sup>2</sup>. In a trial five different genotypes including PR-135, PR-137 PR-139, PR-141, and Abaseen-21. Similarly, Five different rates of sulfur (control: no sulfur application, 15, 30, 45, and 60 kg ha<sup>-1</sup>) were applied to these genotypes.

**RESULTS:** Wheat grain yield values varied between the lowest 1493.0 kg ha<sup>-1</sup> at control and the highest 2250.7 kg ha<sup>-1</sup> at S5 (60kg ha<sup>-1</sup>) followed by 2125.0 kg ha<sup>-1</sup> recorded at S4 (45 kg ha<sup>-1</sup>) .while at genotypes the maximum grain yield was 2370.5 kg ha<sup>-1</sup> at PR-135 followed by 2109.2 kg ha<sup>-1</sup> recorded at PR-139. There was a significant difference between the treatment effect and genotype at the different growth stages flag leaf area and leaf width, leaf length, and productive tillers. The results revealed that maximum growth parameters responded significantly to S fertilizers levels.

**CONCLUSION:** Based on the experimental facts, treatment S5 (60kg ha<sup>-1</sup>) fertilization should be applied and the wheat genotypes PR-135, and PR-139 give higher grain yield recommended for valuable crop stand. The S fertilizer and wheat genotype interaction showed a significant effect on Spikelet per Spike, Thousand Grains Yield, Biological Yield, and Grain Yield, Days to Physiological Maturity, Plant Height, Productive Tillers, Spike Length, flag leaf width, and leaf area.

**Keywords:** Wheat, grain yield, Sulphur (S) fertilizer, Genotype

**SPP-MISC-505**

**Food Security: Stagnate Salinized Soil through Organic Fertilization**

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**ABSTRACT**

**BACKGROUND:** Pakistan, being an irrigated country, loses cultivated lands every year due to salinization. According to FAO (2008), a global land area of approximately 800 Mha (6%) has been affected by salinity or sodicity, with the problem worsening with each passing year. The causes of this increased salinized land area include deforestation and poor irrigation water quality, as well as changing climatic conditions (increasing temperature and low precipitation), which exacerbate the problem and ultimately increase evapotranspiration rates, resulting in less salt leaching and salt accumulation in the rhizosphere. This high level of salt accumulation in the root zone has deleterious effects on the physiochemical properties of soil, microbial activities, and diversification that ultimately cause poor soil health and a reduction in crop yield. Organic fertilization can improve soil fertility and productivity and protect the soil from erosion, degradation, and pollution. Use of farm yard manure or crop residues will help in the improvement of soil structure, which in turn reduces soil bulk density and increases soil porosity, hydraulic conductivity, and soil fertility. Application of compost, poultry manure or biosolids can significantly lower EC (< 4dS/m) and ESP (>80%) of soil in contrast to unamended soils. Organic fertilization also increases CEC and the adsorption of ions from saline, which ultimately reduce the concentration of salts in the soil solution by retaining those salts in the soil, as well as adding carbon to the soil, which is a source of energy for microbial biomass, which in turn enhances enzymatic activities, thus improving the quality and health of the soil. With limiting land resources, saline soils are an important resource for agriculture; therefore, it is important to stagnate salinized soils and improve soil health for better productivity.

**CONCLUSION:** Organic fertilization can improve the physical, chemical, and biological properties of soils by improving soil health and increasing soil organic matter content. FYM, compost, crop residues, vermicompost, etc. could be a possible solution to stagnate salinized soil for the development of a sustainable agriculture ecosystem through the conservation of organic matter in soil as well as to halt global warming through carbon sequestration.

**Keywords:** Soil salinity, Food security, Plant protection, Organic fertilization,

**SPP-MISC-506**

## **An insight into the contamination and risk assessment of micro-plastics in food crops**

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### **ABSTRACT**

**BACKGROUND:** Microplastics are pervasive and are a cause of ubiquitous environmental risks, due to their pliability, validity, and endurance in ecosystems. Microplastics not only influence the physical, chemical, or biological properties of soils but also reduce crop productivity, which could be a threat to our food security. The agroecosystems reportedly receive an estimated 1.15 to 2.41 million tonnes of plastic waste annually. They can alter plants' growth and development, block organisms' digestive and root systems, create attachments for multiplying organisms and vectors of toxic compounds, and disrupt the activities of microbial decomposers and nutrient cycles. Due to their large size and high molecular weights, microplastics are unable to enter the cell walls of plants, although they probably can cross plant cell walls in their nanoforms. The interaction of microplastics with plants has two first and foremost concerns when plants uptake them: either they may be accumulated in plant organs or they may cause deleterious effects on plant growth, phytotoxicity, and the quality of produced food. The contamination of agroecosystems with microplastics reduces food yields and has a negative impact on food chain components, food security, and human health. Micro-plastics' exposure to humans is caused by foods of both animal and plant origin, food additives, drinks, and plastic food packaging. Micro-plastics are responsible for many changes in the soil's physicochemical characteristics, including porosity, enzymatic activities, microbial activities, plant growth, and yield. Microplastics are ingested by animals.

**CONCLUSION:** Those microplastics are also swallowed when they are consumed. Contaminants can bind to plastics in a manner similar to a magnetic attraction, which can lead to a toxic buildup. Additionally, contaminants may travel for free on plastics and maybe into plants. Because of the threat that micro-plastics pose to human health, it is essential to ensure food safety. Thus, it is needed to highlight the probable sources and reciprocity of microplastics with plants and agroecosystems, in relation to their potential strategies of remediation.

**Keywords:** Microplastics, Water contamination, Food crops, Risk assessment

**SPP-MISC-507**

### **Date Fruit Valorization by Smart Plant Protection**

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### **ABSTRACT**

**BACKGROUND:** Pakistan is the 6th highest date producing country, but in 2020 it was on 7th number with date export of 0.116 MT, and on number 13th world widely in terms of export value. The reason, low-quality value addition (90% produce converted into chohara) has been done in date producing areas which ultimately fetch low market and international price. This had been done to avoid fruit damage due to monsoon season as well as other on plant problems that damage fruit until it ripe, therefore farmers harvest in early stage and make Chohara. There is sufficient room to research for reducing fruit damage on the plant due to season, diseases and insect attack and maximize the ripened fruit production through smart integrated plant protection. Using Surveillance drones probable infestation could be assessed and using sparying drones eradication of fungal attack and bacterial blight could be ensured. Moreover different horticultural practices like using tyvek bags to protect the date plant can doubled the production in terms of harvesting at maturity stage which are ultimately has double price than dried dates.

**CONCLUSION:** Complete possible range of value-added products could be developed from ripened dates through recipes standardization, which further help to flourish dates industry and export of these value-added products and premium quality dates help to earn more foreign exchange.

**Keywords:** Drones, Tyvek Bags, Dried Dates, Recipes Standardization, Value Added Products



# RECPMMENDATIONS OF THE CONFERENCE

- Artificial intelligence-based systems are necessary for identification and management of diseases under changing climate.
- Integration of biological and chemicals approaches for sustainable plant protection.
- Development and utilization of disease predictive models for real time monitoring.
- Intensive need to explore pesticide resistance mechanisms and its alternatives
- Need for development and formulation of biopesticides
- Conduct on-site research and solutions through interactive sessions with stakeholders
- To develop transgenic-based resistance against pests
- Development of New Pest Management Paradigms for Key Pest Species of crops/fruits/household
- Incorporation of Flowering Plants within Cropping Pattern to Conserve Honey Bees and other Pollinator Species
- Exploration of Insect Biodiversity through Advanced Taxonomic Techniques
- Development of Economic Threshold Levels under changing climate scenario
- Development of Green Technologies for sustainable pest management:
  - Molecular pesticides, nan-pesticides, drones, ai based tools
  - Conservation of biological control agents through refugia
  - Green synthesized nanoparticles as future pesticides
  - Plant-based and microbial pesticides
  - Artificial intelligence-based Image tool processing for insect pest management