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Efficacy of Different Botanicals against Aphid on Wheat Crop

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ABSTRACT

Wheat is the main cereal crop of Pakistan and more than half of the population consume as primary food throughout the world. In contrast, wheat production is very less because of the attack of wheat aphid. There is a dire need to develop the potential control to reduce aphid infestation in wheat crops. Therefore, a field investigation was conducted to determine the comparative efficacy of different botanical ingredients against wheat aphid. The data showed in the first spray of botanical pesticides the that maximum mortality percentage was observed in the application of synthetic insecticide Matoi (87.49%) followed by Neem (83.96%), Trooh (78.57%), Conocarpus (71.53%) and Eucliptus (65.67%) compare with control respectively. Similarly, after second spray the maximum mortality was recorded in synthetic

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pesticide Matoi (90.76%) followed by Neem (87.82%), Trooh (83.72%), Conocarpus (75.51%) and Eucliptus (70.01%), respectively. The overall results showed that there is no any significant difference was recorded in both treatment matoi synthetic pesticides and Neem. The finding of current study the maximum reduction percentage at different time intervals against wheat aphid in both sprays were recorded after 72h in all treatments followed by 48h and 24hrs.Therefore, it is suggested that synthetic pesticides Matoi and Neem leaf extracts may be sprayed against wheat aphid due to its maximum reduction population.

Keywords: wheat, wheat Aphid, Botanicals pesticide, synthetic insecticide

Introduction

One of the main food grain crops in the world including Pakistan is wheat (*Triticum aestivum* L.) which is consumed as a staple diet by one third of the world's population. Wheat is cultivated in Pakistan over an area of 8734 thousand hectares, producing 25492 thousand hectares of grain year with an average yield of 2919 kg ha-1 (Hazra, 2000). Despite having a larger production potential, Pakistan's average yield is substantially lower than that of the majority of other nations. For a large portion of the world's population, wheat serves as their primary source of food. According to Muhammad et al. (2016) it is the most important cereal crop in Pakistan and takes up around 66% of the total annual food grown area**.** It is a staple meal in Pakistan and satisfies most nutritional needs. It also provides around 60% of the calories and protein in a typical diet (Khalil & Jan, 2012). Although the country has extensive wheat production, the yield of wheat per hectare is still poor when compared to other nations. This is caused by several abiotic and biotic causes, including the use of nitrogenous fertilizers carelessly, the infestation of weeds, notably Phalaris minor Retz., the lack of manganese and zinc in the soil, and insect-pest and disease attacks (Noori et al., 2011).Wheat crops are basic need for diet and in opposite the yield of wheat are significant depriving by the several factors. Wheat is a very sensitive crop which faces the many abiotic stress which effect on the yield quantity and quality (Akhtar et al., 2010). These elements for the most part incorporate the administration of soil, water, bugs, and advertising, every one of which has its own concerns and difficulties. Further biotic factors also had great threat for wheat low yield in every season. Several numbers of insects are infesting the wheat crop from germination to harvest particularly in field standing position, few of them cause great yield losses to wheat up to 50% (Iqbal et al., 2007).

Further wheat crop is attacked by several insect pests from sowing to harvesting viz. complex species of aphids *Rhopalosiphummaidis*, *R. padi*, *Sitobionavenae*, *S. miscanthi* and *Aphis fabae* (Srivastava et al., 2016; Shah et al., 2007), pink stem borer *Sesamiainferens* army worm, *Mythimnaunipuncta*, termites *Microtermesobesi*, *Odontotermisobesus* and gramme pod borer *Helicoverpa armigera*, Brown mite *Petrobia latens* (Singh, 2003).According to Singh and Deol (2003) the wheat aphid complex reduces wheat yields by 3.53 to 11.05% worldwide, including in Sindh Province. Wheat aphid directly harms plants by sucking out the cell sap, especially when the grain is still milky, and also by causing sooty mould to grow on the leaves of the plant (Kannan, 1999; Aziz et al., 2013). According to the current climatic conditions and wheat cultivars, aphid population changes annually, necessitating year-round monitoring (Shafique & Ahmed, 2016). Host plant resistance, the preservation of bio-control

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agents, cultural, mechanical, physical, and chemical control is only a few of the control strategies used to maintain the aphid population below the economic threshold level (ETL).
Further low to moderate number of wheat aphid normally could not cause significant damage to the wheat crop. Sever invasion causes leaves and shots to curl, wilt, or yellow and stunt plant growth. A general decline in plant vigor was noticed. Aphids produce honeydew that can cause an additional infection by opportunistic fungi, indicated by the development of mold on the leaves. The honey dew also fascinates to the ants which feed the sweaty material which laid by aphids on leaves, this will overcome the further infestation rate of plant. However, a smaller number of aphids could be capable of transferring viral diseases to healthy plants. Aphids can affect the wheat crop in different ways, direct and indirect. Suck the sweaty material from lower side of leaves via with the assistance needle like injection and result to destroy the green matter of leaves and besides direct damage also transfer the diseases to plant (Dixon, 1987; Aslam, 2005). However, to overcome those factors which are responsible tolow yield of wheat of crop, their management plays essential role to getting the high yield (Noori et al., 2011).
One of the control strategies is IPM, which is safe and secure to the ecosystem approach for the manager of these noxious pests. Few practices need to be imposed in wheat crops to decrease the insect infestation levels in wheat crops. Control the insecticides use to not to affect the beneficial insects and spray the relevant chemicals if is necessary. IPM techniques utilize thorough and current data on the existence pattern of insects and their collaborations with the climate conditions (Aheer et al., 2008). The development of IPM requires recognizing the significant parts of IPM with the end goal of strategy making and pragmatic preparation with the support of farmers. Despite broad endeavors for the preparation of ranchers in the last many years, numerous ranchers are yet uninformed by and large of the IPM as a nuisance control approach in their present bug control (Aheer et al., 2006).Due to their low cost, lack of side effects, environmental friendliness, and high toxicity against significant pests like thrip, aphid, Jassid, whitefly, and mite, and botanical pesticides have gained significant importance in agricultural fields in recent years (Stumpf &Nauen, 2001). A variety of insect pests have been proven to be susceptible to the extract of *Annona squamosa* L., also known as Sita phal, and the plants sweetsop and custard apple. Custard apple extract was found to be an effective control for a variety of field crop pests and stored grain pests in laboratory and field trials (Misra, 2000).Synthetic pesticides have several disadvantages, including persistence, the development of pest resistance, and effects on non-target creatures like natural enemies. Biopesticides are more environmentally benign than chemical pesticides since they have less of an impact on humans and non-target creatures (Begum et al., 2013). Few neonicotinoid-class pesticides, which have systemic and translaminar action, have been suggested for the control of aphids. By interfering with impulse transmission in the nervous system, these pesticides quickly bring down the target pest. Additionally, applying pesticides from the neonicotinoid family to wheat decreases aphid infestation and inhibits the spread of several crop viruses (Bethke et al., 2001; Elzen, 2001).
Additionally, Sophora flavescent dried roots contain the alkaloid marine, which is abundant in the roots of a select few species of the genus Sophora and is the active component (Mao & Henderson 2007; Marcic et al., 2012). Because they are safe for beneficial organisms, target-specific, and compatible with biological control agents, neem oils and other plant-based extracts are regarded as the best alternative for insect pest management programs in

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vegetables (Tang et al., 2002). Keeping in view of different threats to nature environment and health extensive range of chemical insecticides. Bio-pesticides are being held attention by scientists and researchers to safe and environmentally friendly (Sharma et al., 2002). The present study demonstrates the efficiency of different botanical pesticides against aphids in Tandojam vicinity.

Review of Literature

In wheat, aphids may be a serious pest. Aphids of several kinds can be found in wheat crops. These include the Bird-cherry oat Aphid and the English grain Aphid. The life cycles of various animals vary. Although aphids cause minimal direct harm to Wheat plants, they can be troublesome because they spread viruses (Afshari, 2009). As grain starts to fill, English grain Aphid (EGA) starts to emerge in cereals, notably Wheat. In the past, 25 aphids per grain head have been observed to cause economic loss. There are 50 aphids per tiller before and throughout the milk stage of grain fill, according to more recent estimates of EGA damage. After the soft dough stage, there is no financial loss. There are often several different color options. In the same field population, some are green, some are light green, some are red, and others are nearly black (Aziz et al., 2013). Due to the spread of the barley-yellow dwarf virus, the bird-cherry oat aphid can be a significant pest of wheat and barley. They consume a variety of hosts, and mobility between crops keeps aphid and virus populations in check (Bethke et al., 2001).

According to Feistein (1952) plant-based extracts with insecticidal capabilities are widely accessible in the country and are regarded as being quite safe for the environment and public health. More than 2000 plant species, spread over around 170 natural groups, have been found to possess insecticidal qualities.

Wheat *Triticum aestivum* is a significant winter grain crop, according to Matharu and Tanwar (2019) reported that various species of aphid attack on wheat crop and managed by the applications of insecticides. Thus,to determine the effectiveness of several insecticides such as Confidor, Monocil and biopesticideIndoneem against wheat aphid during the Rabi season was used. The aphid infestation was greatly decreased by all insecticides and biopesticides, however Confidorchemical stood as most effective with the least amount of infestation (0.67 aphid /ear).

Additionally, because essential oils, which extracted from different parts of plants, may have multiple active components and different modes of actions, they may indicate potential compounds for new biopesticidal agents (Adenubi et al., 2018) and have been used in integrated management programmes of several insects, which may slow the development of resistance. Plant based essential oils have the ability to induce death, repellency, detergency in feeding and oviposition, impacts on development, decrease in oviposition and the emergence of adults by touch, ingestion, and fumigation (Kanda et al., 2017).

According to Carl et al. (2016) farmers or lift managers should base their management of stored-grain insect pests on their understanding of the environment around grain storage and the ecology of insect pests. As elements impacting stored-grain insect pest control choices in the United States, geographic location, government legislation, and marketing needs for grain quality are examined. A few grain samples are often taken to offer information on grain quality for segregation, blending, and marketing. Due of the low sampling rate, insect-related quality criteria are subjectively assessed and penalized inconsistently. Specifically, for farm-

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stored wheat, information on the effectiveness of insect pest control techniques is reviewed. Stored-grain integrated pest management (IPM) is contrasted with field-crop IPM. It will be necessary to place more emphasis on sampling to estimate insect densities, develop sound economic thresholds and decision-making strategies, use pesticides more selectively, and use nonchemical methods like aeration more frequently as we move from traditional stored-grain insect pest control to IPM. Future research requirements are looked at while reviewing recent advancements in insect monitoring, predictive computer models, and grain cooling via aeration, biological control, and fumigation. These advancements have the potential to improve insect pest management.

According to Thomas et al. (2016) one of the most widely grown crops in temperate areas is wheat. Alternative techniques like intercropping have been researched for their potential to support biological management as its pests are often treated with pesticides that are damaging to the environment and human health. This study aims to assess the impact of wheat-based intercropping systems on insect pests and their natural enemies based on existing literature. However, neither the prevalence of their natural adversaries nor the rates of predation or parasitism were noticeably elevated. These findings were significantly influenced by the nation where the research was conducted, the method of intercropping used, and the crop that was the subject of the connection.

In a wheat agroecosystem, Mohammad et al. (2016) investigated the effects of integrated pest control. Currently, pesticides are used by more than 80% of farmers. The number of wholesome tillers, hills, and grain weight were all impacted by the IPM techniques used in our study. The IPM-treated plots had the lowest percentages of dead heart (1.03) and white head (2.00). The yield for these plots was 7.4 tonnes/ha on average. We discovered that the therapy had a substantial impact on the observed proportion of dead heart, grain weight, and yield. We come to the conclusion that IPM practises are a successful method for increasing wheat yields while preserving the environment and developing a more resilient agroecosystem.

According to Hossard et al. (2014). organic and integrated cropping systems have been suggested as potential options for lowering pesticide use, although it is yet unknown how this would affect crop output. Here, we estimate the production losses brought on by a decrease in pesticide use for winter wheat in France using a set of cropping system trials. We calculated that a 50% reduction in pesticide usage would result in yield losses ranging from 5 to 13% of the present pesticide use yield. In terms of the entire nation, these losses would result in a 2–3 million tonne (or 15%) reduction in French wheat exports, in terms of output.

The improvement of IPM requires distinguishing the significant parts of IPM with the end goal of strategy making and commonsense preparation with the support of farmers. Notwithstanding broad endeavors for the preparation of ranchers in late many years, numerous ranchers are yet uninformed by and large of the IPM as a vermin control approach in their present nuisance control rehearses. The present circumstance suggests failure of the utilized dispersal rehearses at the ranchers' level (Anjan et al., 2012). Further according to Nawaz and Javaid (2011) the impact of six different botanical extracts orange peel (*Citrus sinensis*), bitter gourd (*Momordica dioica*), garlic (*Allium vineale*), marigold, hot pepper (*Capsicum frutescens*) and tobacco (*Nicotiana tabacum*)on wheat aphid was evaluated in the field. The number of living and dead wheat aphids was counted in a meter square ring on spikelets that had been marked, after which wheat aphids had been purposefully exposed to

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the botanical extracts. The effects of the botanical extracts on the aphid population varied. The highest amount of aphid death (65.69%) was regularly caused by Orange Peel extract (T1) application, followed by Garlic (57.91%) and Tobacco (57.90%).

Neem and eucalyptus oils found very effective against army worm as repellent and showed more consistency and solidity, also it was observed that these plant extract also affect the adult stage of the fall army worm, toxicity of the bio product relates to their chemical composition. Neem products are also effective against sucking insects' pests and some phytopathogens (Jiang et al., 2011). Eucalyptus sp. has antimicrobial, antifungal, antiviral, and insecticidal properties, according to Kassimiand Lahcen, (2012). Biopesticides such neem kernel powder and neem oil effectively control brinjal major sucking insect pests (Jarwar et al., 2014).

Combined approach is a harmless to the ecosystem method for bug control that depends on a variety of traditional practices. In IPM based study, utilize exhaustive and current data on the existence pattern of bugs and their collaborations with the climate (Ofuoku et al., 2009).Further, essential oils were purified using the hydro distillation process using the Clevenger equipment, according to Chaubey et al. (2008). When fumigated, these essential oils killed *Callosobruchus chinensis* adults and larvae. The essential oils of *Anethum graveolens*, *Cuminum cyminum*, Illicium verum, *Myristica fragrans*, *Nigella sativa*, *Piper nigrum*, and *Trachyspermumammi* were shown to be the most efficient against all the different stages of the *C. chinensis*. It was discovered that every reaction was concentration dependent. The suffocation and inhibition of numerous insect biosynthetic processes at different developmental stages may be the cause of the toxic and developmental inhibitory effects. We highlight the use of botanical pesticides like essential oils as one of the methods with promise for application in the management of this pest since they are often effective and less harmful.

In addition to appropriate seed, healthy soil, irrigation water management, and fertilizer management, according to Iqbal et al. (2007) plant protection is crucial for maximizing productivity. Despite the creation of several sophisticated synthetic pesticides, pests and illnesses still cause significant crop and stored grain losses. The usage of pesticides, especially insecticides, has increased significantly in recent years. The risks associated with using these harmful substances excessively and carelessly for people and any naturally expanding population are endless.

Materials and Methods

Trial Site

Current research was performed to evaluate the efficacy of different botanicals against aphid on wheat crop. A field trial was conducted at research area of Plant Protection Research Institute Tandojam during the 2022-23.

Experiment design and crop information

For this purpose, variety "TD-1" was planted in the month of October and followed all the standard agronomic exercise except control measures. Experiment trial was designed with randomized complete block design (RCBD). The total plot size 30 m^2 which was further divided into sub-plot size 5 m^2 with three replications was arranged to determine the aphid population trend on wheat crop. Further to evaluate the efficacy of different botanicals

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against aphid on wheat crop. The following different botanicals pesticides were used against aphid on wheat crop.

Detail of treatments

T1= Neem Leaf Extracts *(Azadirachta Indica)*
T2= Bitter Apple (Trooh) Leaf Extracts
T3= Conocarpus Leaf Extacrs
T4= Eucliptus Leaf Extracts
T5= Matoi (Pyrifluquinazon) synthetic insecticide
T6= Untreated Control

Preparations of botanicals leaf extract solutions

For preparation of all kinds of leaf extracts solution such as Neem, Bitter Apple*Conocarpus* and *Eucliptus*approximately, 5.0-kilogram fresh leaves of each plant species were collected and washed with tap water to remove dustand cut into small pieces separately and boiled in 10-liter water up to the final volume remained 8 litters. After cooling solutions were filtered through muslin cloth and kept it in glass gars. Next day, stock solution is diluted and applied in the targeted field.

Sprays procedure and data observation

After the arrangement of botanical leaf extract solutions and synthetic insecticides sprays were arranged under field conditions. Total two sprays were done; first sprays were applied on the dated 25th January 2023 when aphid was appeared on wheat crop and the population limit was crossed the economic injury level. However, second spray wad doneat the 15 days'interval of first spray.To the determine efficiency of the treatments, randomly 10 tillers from each treatment from the threereplication were observed to determine the population of aphid on wheat crop.Data was taken as pre spray one day before spray and post spray as 24 hours, 48 hours, 72 hours, 96 hours and1week after each spray. To determine the efficiency of the botanical pesticidesthe average reduction will be calculated according to Abbot (1925) Formula.

$$\text{Corrected (\%)} = \left(1 - \frac{\text{n in T after treatment}}{\text{n in Co after treatment}}\right) \times 100$$

Where n = Insect population, T = Treated, Co = control

***3.6 Statistically d*ata analysis**

Data will be statistically analyzed by using formula Analysis of variance (ANOVA) and Least Significant Difference (LSD) test through computer software (Statistix 8.5)

Results

Current research was performed to evaluate the efficacy of different botanicals against aphid on wheat crop during the 2022-23. A field trial was conducted at research area of Plant Protection Research Institute Tandojam. Five bio pesticideplant-based products were used such as (T1Neem Leaf Extracts,T2Bitter Apple (Trooh) Leaf Extracts,T3Conocarpus Leaf Extracts, T4Eucliptus Leaf Extracts, T5Pyrifluquinzon (Matoi) synthetic insecticide andT6 Control (untreated) to compare the efficiency of treatments. The main results are presented as under.

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Pre and post average population of aphid on wheat crop

The data in Table 4.1 showed that average pre and post population of aphid/10 tillers of wheat crop after the first spray of different botanical pesticides against aphid on wheat crop. The initially average population of nymphal and adults ofaphid (8.533/10 tillers) was recorded before the imposition of Neem leaf extracts and post average population was recorded(1.67/10 tillers), (1.067/10 tillers), (1.66/ 10 tillers), (2.06/10 tillers) and (4.2/10 tillers)were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively. The primarily average population of nymphal and adults of aphid (6.400/10 tillers) was recorded before the imposition of Trooh leaf extracts and post average population was recorded (2.27/10 tillers), (1.933/10 tillers), (2.06/ 10 tillers), (3.06/10 tillers) and (5.06/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively.The primarily average population of nymphal and adults of aphid (8.067/10 tillers) was recorded before the imposition of Conocarpus leaf extracts and post average population was recorded (3.13/10 tillers), (2.067/10 tillers), (2.93/10 tillers), (4.26/10 tillers) and (6.73/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively.The initially average population of nymphal and adults of aphid (10.867/10 tillers) was recorded before the imposition of Eucliptusleaf extracts and post average population was recorded (4.26/10 tillers), (3.133/10 tillers), (3.93/10 tillers), (4.33/10 tillers) and (7.13/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively.The initially average population of nymphal and adults of aphid (9.40/10 tillers) was recorded before the imposition of Synthetic insecticides Matoi and post average population was recorded (0.867/10 tillers), (0.66/10 tillers), (1.13/10 tillers), (1.86/10 tillers) and (3.93/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively. The initially average population of nymphal and adults of aphid (10.93/10 tillers) was recorded one day before of spray (control) and post average population of control was recorded (11.13/10 tillers), (12.93/10 tillers), (13.13/10 tillers), (14.6/10 tillers) and (14.4/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray in the plots, respectively, as depicted in (Table 4.1). Further, data showed that overall reduction percentage of revealed that maximum mortality exhibited by the application of Chemical Matoi (87.49%) followed by Neem (83.96%), Trooh (78.57%), Conocarpus(71.53%) and Eucliptus (65.67%), respectively.

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Table 4.1 Efficacy of different botanical pesticides against aphid on wheat crop during 1st spray

Treatments	Dose	Pre-Treatment Population	Post treatment population					Overall Reduction Percentage%
			24hrs.	48hrs.	72hrs.	96hrs.	1Week	
Neem	25 ml	8.53±1.30	1.67±0.70	1.06±0.31	1.66±0.33	2.06±0.45	4.2±0.895	84.29%
Bitter Apple (Trooh)	25 ml	6.40±0.67	2.27±0.35	1.93±0.32	2.06±0.37	3.06±0.47	5.06±0.80	78.714%
Conocarpus	25 ml	8.06±1.04	3.13±0.60	2.06±0.31	2.93±0.45	4.26±0.64	6.73±0.94	71.894%
Eucliptus	25 ml	10.86±1.92	4.26±0.89	3.13±0.54	3.93±0.57	4.33±0.78	7.13±1.31	65.88%
Matoi (Pyrifluquinzon)	25ml	9.40±1.43	0.86±0.40	0.66±0.18	1.13±0.33	1.86±0.60	3.93±1.01	88.056%
Control	-------	10.9±1.53	11.13±1.15	12.93±1.63	13.13±1.39	14.6±1.74	14.4±2.18	------
LSD value @ P< 0.05	-------	3.9455	2.1464	2.1000	1.9963	2.4893	2.4803	……

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Reduction percentage % of first spray against aphid on wheat crop

Results revealed in Figure 4.1 reduction percentage of aphid on wheat crop at different time intervals after usage if various botanical pesticides after first spray. The maximum reduction after the 24 hours in the plots treated with Matoi (92.21%) followed by Neem (83.98%), Bitter Apple (79.60%), Conocarpus (71.87%) and Eucliptus (61.72%) was recorded respectively. The maximum reduction after the 48 hours in the plots treated with Matoi (94.89%) followed by Neem (91.74%), Trooh (85.05%), Conocarpus (84.01%) and Eucliptus (75.762%) was recorded respectively. The maximum reduction after the 72 hours in the plots treated with Matoi (87.35%) followed by Neem (91.39%), Trooh (84.31%), Conocarpus (77.68%) and Eucliptus (70.06%) was recorded respectively.The maximum reduction after the 96 hours in the plots treated with Matoi (85.26%) followed by Neem (85.89%), Trooh (79.04%), Conocarpus (70.80%) and Eucliptus (34.06%) was recorded respectively.The maximum reduction after the1st week in the plots treated with Matoi (71.71%) followed by Neem (70.83%), Trooh (64.86%), Conocarpus (53.26%) and Eucliptus (50.48%) was recorded respectively

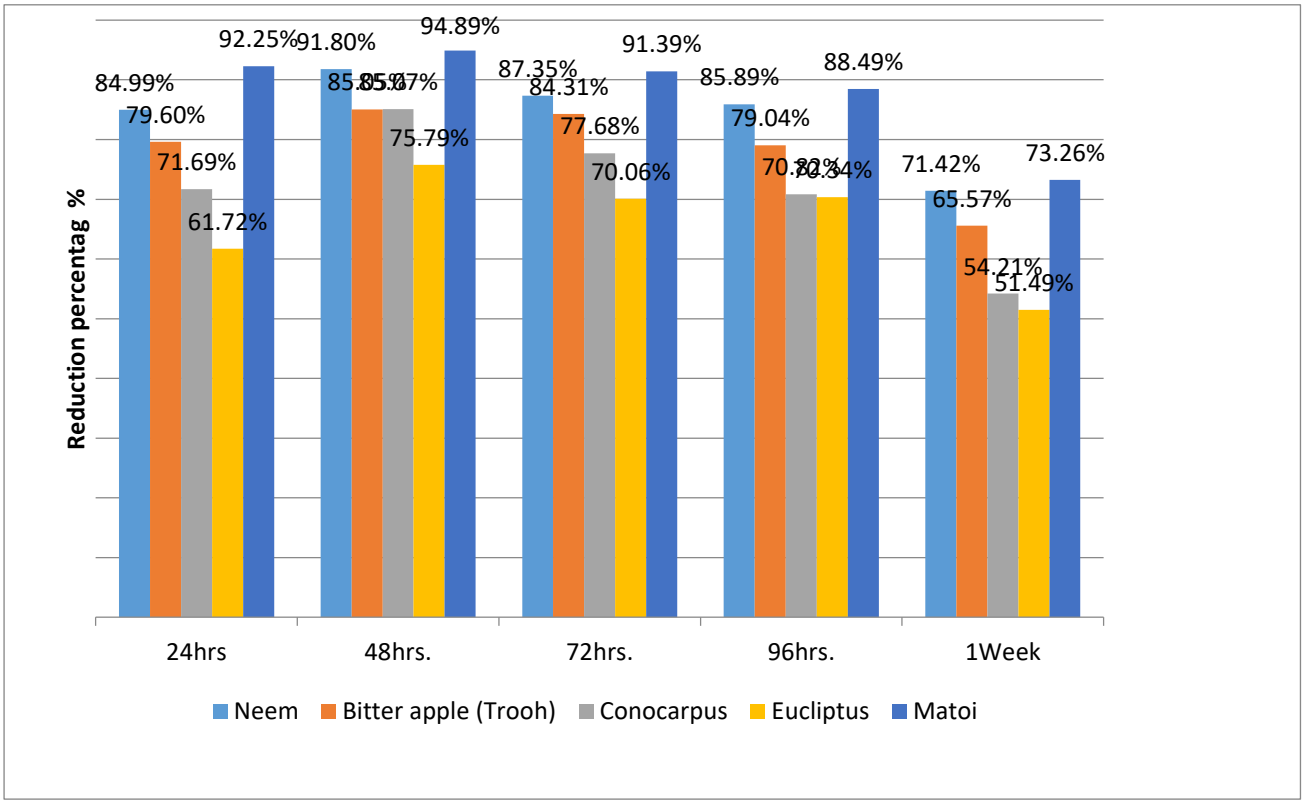


Figure 4.1 Corrected percentage population of aphid on wheat crops after 1st spray

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Pre and post average population of aphid on wheat crop.

The data in Table 4.2 showed that average pre and post population of aphid/10 tillers of wheat crop after the second spray of different botanical pesticides against aphid on wheat crop.The initially average population of nymphal and adults of aphid 7.067.06/10 tillers) was recorded before the imposition of Neem leaf extracts and post average population was recorded (1.93/10 tillers), (1.467/10 tillers), (1.26/10 tillers), (1.133/10 tillers) and (1.067/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after second spray, respectively.The primarily average population of nymphal and adults of aphid (9.53/10 tillers) was recorded before the imposition of Trooh leaf extracts and post average population was recorded (2.86/10 tillers), (1.667/10 tillers), (1.93/ 10 tillers), (1.267/10 tillers) and (1.333/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively.The primarily average population of nymphal and adults of aphid (8.86/10 tillers) was recorded before the imposition of Conocarpus leaf extracts and post average population was recorded (4.26/10 tillers), (4.067/10 tillers), (3.53/10 tillers), (2.067/10 tillers) and (1.933/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively.

The initially average population of nymphal and adults of aphid (9.66/10 tillers) was recorded before the imposition of Eucliptus leaf extracts and post average population was recorded (5.73/10 tillers), (4.133/10 tillers), (3.66/10 tillers), (3.267/10 tillers) and 2.733/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively.The initially average population of nymphal and adults of aphid (8.52/10 tillers) was recorded before the imposition of Synthetic insecticides Matoi and post average population was recorded (1.53/10 tillers), (1.133/10 tillers), (1.06/10 tillers), (0.867/10 tillers) and (0.933/10 tillers) were recorded after 24hours, 48 hours, 72 hours, 96 hours and 1 week after first spray, respectively.The initially average population of nymphal and adults of aphid (8.33/10 tillers) was recorded one day before of spray (control) and post average population of control was recorded (9.93/10 tillers), (10.66/10 tillers), (11.66/10 tillers), (12.33/10 tillers) and (13.33/10 tillers) were recorded after 24hours, 48 hours, 72hours, 96 hours and 1 week after second spray in the plots, respectively as depicted in (Table 4.2). Further, data showed that overall reduction percentage of revealed that maximum mortality exhibited by the application of Chemical Matoi (90.762 %%) followed by Neem (87.826%), Trooh (83.724)%, Conocarpus(71.518%) and Eucliptus (65.018%), respectively.

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Table 4.2Efficacy of different botanical pesticides against aphid on wheat crop during 2nd spray

Treatments	Dose	Pre-Treatment Population	Post treatment population					Overall Reduction Percentage%
			24hrs.	48hrs.	72hrs.	96hrs.	1Week	
Neem	25 ml	7.06±1.25	1.93±0.85	1.46±0.52	1.26±0.27	1.13±0.38	1.06±0.29	87.826%
Bitter Apple (Trooh)	25 ml	9.53±0.64	2.86±0.84	1.66±0.33	1.93±0.46	1.26±0.20	1.33±0.48	83.724%
Conocarpus	25 ml	8.86±2.08	4.26±1.07	3.99±1.20	3.53±1.49	2.06±0.95	1.93±0.75	75.518%
Eucliptus	25 ml	9.66±2.28	5.73±0.72	4.13±0.35	3.66±0.38	3.26±0.45	2.73±0.45	70.018%
Matoi (Pyrifluquinzon)	25ml	8.52±1.49	1.53±0.28	1.13±0.15	1.06±0.25	0.86±0.15	0.93±0.54	90.762%
Control	-------	8.33±2.11	9.93±2.14	10.66±1.56	11.66±1.84	12.33±2.0	13.33±1.18	……
LSD value @ P< 0.05	-------	5.1263	3.4955	2.4790	2.8500	2.8082	1.9686	……

Reduction percentage % of second spray against aphid on wheat crop

Results revealed in Figure 4.2 reduction percentage of aphid on wheat crop at different time intervals after usage if various botanical pesticides after first spray. The maximum reduction after the 24 hours in the plots treated with Matoi (84.59%) followed by Neem (80.56%), Bitter Apple (71.19%), Conocarpus (57.15%) and Eucliptus (42.19%) was recorded respectively. The maximum reduction after the 48 hours in the plots treated with Matoi (92.25%) followed by Neem (86.30%), Trooh (84.42%), Conocarpus (61.91%) and Eucliptus (61.22%) was recorded respectively. The maximum reduction after the 72 hours in the plots treated with Matoi (90.90%) followed by Neem (89.19%), Trooh (83.44%), Conocarpus (69.72%) and Eucliptus (68.61%) was recorded respectively. The maximum reduction after the 96 hours in the plots treated with Matoi (90.60%) followed by Neem (90.88%), Trooh (83.29%), Conocarpus (89.68%) and Eucliptus (73.56%) was recorded respectively. The maximum reduction after the 1st week in the plots treated with Matoi (95.47%) followed by Neem (92.25%), Bitter Apple Trooh (89.79%), Conocarpus (85.52%) and Eucliptus (79.51%) was recorded respectively.

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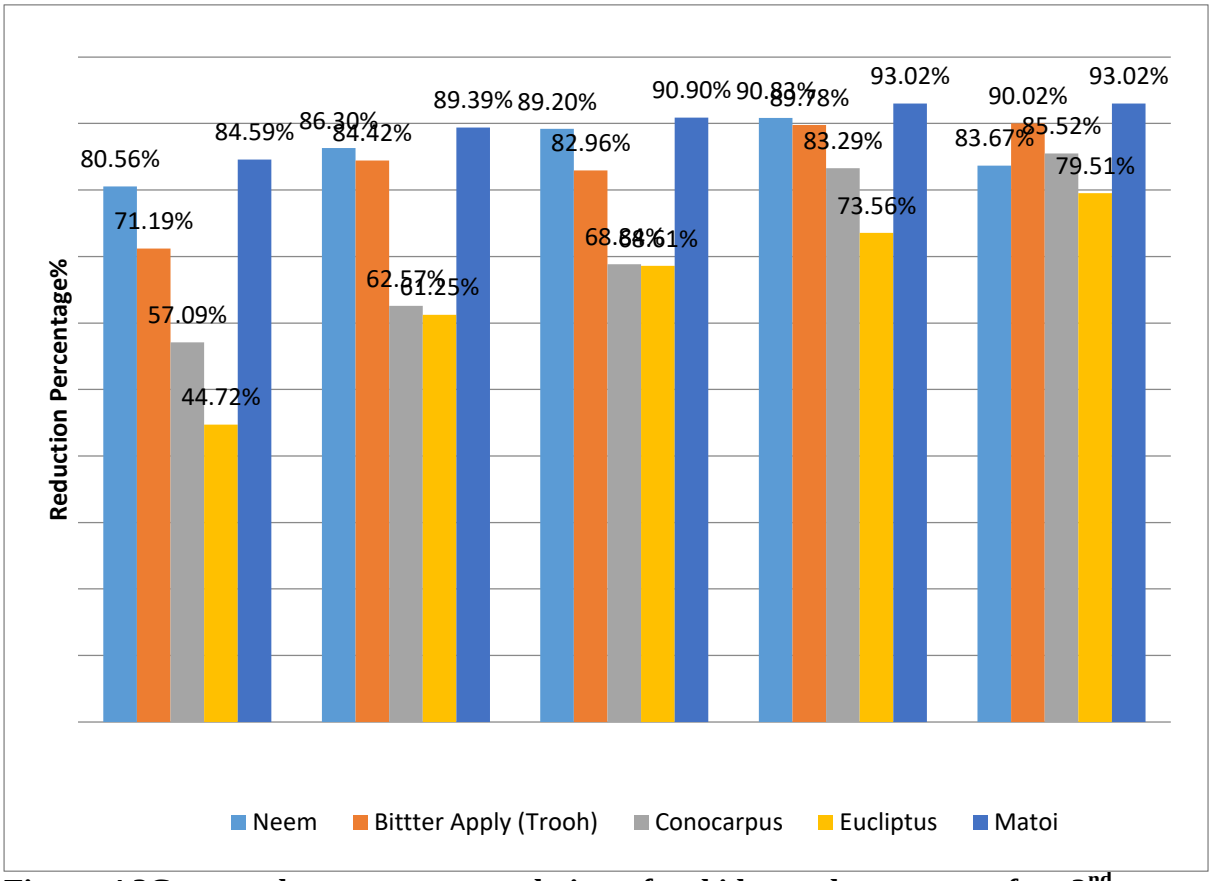


Figure 4.2Corrected percentage population of aphid on wheat crops after 2nd spray

Discussion

Wheat is the one of the most essential and significant sources for cereal crop and grain production and fit for human consumption in every aspect and utilization and provide a natural grazing food for several animals and considered the most essential cereal crop throughout world and 90% peoples consume as food in daily life. Wheat also used in different products such as bakeries. Wheat is one of the significant food grain harvests of the world including Pakistan being devoured as staple food of the 33% total populace. In Pakistan, wheat is developed on large scale and generate the significant grain production 8734 thousand hectares with a yearly creation of 25492 thousand hectare having a normal yield of 2919 kg ha-1 (GOP, 2018). Further biotic factors also had great threat for wheat low yield in every season. Several numbers of insects are infesting the wheat crop from germination to harvest particularly in field standing position, few of them cause great yield losses to wheat up to 50% (Bartlett et al., 2011). On the other hand, the production of wheat is highly deprived by the few insects, among them wheat aphid considered one of the major and key factors to reducing the grain production of wheat (Biswas, 2012). For example, wheat aphid, fall army worm, cereal leaf beetle and violet wheat stem borer. Wheat aphid is the soft bodied insect which sucks cell sap from leaves, stems, inflorescence and even from grain. As a result, plants show yellowing, rolling and dehydration of leaves. Aphids

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also produce honeydew which results in the presence of black spots on leaves and stems due to the growth of sooty molds that hinders the photosynthesis process (Begum, 2018). Aphid usually secrete the honey dew on plant parts (leaves, stem buds etc.) after suck the cell sap or feeding. As result leaves showing black appearance which ultimately disturbs the photosynthetic process in plant, and which lead to poor growth and development of plant. Therefore, proper management is needed to decrease the aphid infestation on wheat crop. To overcome the number of aphids from wheat crop the present field trial had performed to manage the aphid on wheat crop.

Botanical substances are relatively less harmful, more affordable, and furthermore acceptable for other biological creatures. The neem tree, Azadirachtin indica, a source of several alkaloids and belongs to hot and semi hot regions, local to the dry areas of Asia (Saha et al., 2006). Azadirachtin is the principle pesticidal part of neem. Neem items are normally accessible materials, less expensive, and furthermore alright for other benefic predators. It is offensive and repels bugs and may decrease the bug invasion (Sarode et al., 2012). It is important to decide the best portion of neem tree for the control of wheat aphid. Data utilizing various parts neem tree separate for the control of wheat aphid and in this way, the current study was embraced to figure out the best botanicals against wheat aphid.

The findings of the study showed that maximum reduction was recorded up to 72 hours in all five treatments followed by 48, 96 and 24 hours in both sprays against wheat aphid. This is the agreed with Biswas, (2002 and 2008) who earlier stated the toxicity of botanical compounds effects are stable in the environment. Thus, this evidence supported to the study of (Dewar, 1992), who stated that few synthetic compounds had ability to prissiest in the field for long time and showed their affects against broad window of animals. Few studies revealed that maximum reduction was recorded up to 72 hours in all three treatments followed by 48 and 24 hours in both sprays against wheat aphid. This is the agreed with Biswas, (2002 and 2008) who earlier stated the toxicity of botanical compounds effects are stable in the environment. Further, synthetic compound Matoi showed higher mortality percentage followed by Neem leaf extracts, Trooh leaf extracts, Conocarpus leaf extract, Eucliptus leaf extract. Thus, phenomena are similar with Saha et al. (2006) suggested that inorganic material possess highly effective as compared plant material, because the synthetic compound and other toxic substance percentage exist in more proportion,similar finding was also reported (Mondal & Wahhab,2001).

Further, consequences of present study showed that overall reduction percentage of different time intervals of both sprays after usage of various plant-based ingredients and neem leaf extract against wheat aphid and as results revealed that the maximum reduction % was recorded in the plots which treated with Matoi followed by Neem, Bitter AppleTrooh, Conocarpus,*Eucliptus*, respectively. These are strongly agreed with Ali, (2011) and Das, (2013) they suggest suggested that inorganic material possess highly effective as compared plant material.

All material based on plant origin or synthetic substance and mixed as well as alone used in the current study could be great options to reduce the population of aphid on wheat crop on urgent basis. Further investigations are important to assess the viability of these chemicals before they can be suggested as part of IPM against aphid. It is modest and alright for pollinators and regular foes, particularly coccinellid hunters

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assaulting aphids and furthermore ok for the climate. This data would be useful to the wheat producers in Pakistan.

Conclusions and Recommendations

Conclusions

Wheat aphid is a serious sucking insect pest and cause significant losses in the grain production by damaging different ways (directly feeding and indirectly reducing the photosynthesis activity of the plant. Therefore, current research was performed to evaluate the efficacy of different botanicals against aphid on wheat crop during the 2022-23 at the research area of Plant Protection Research Institute Tandojam.

Five biopesticide plant-based products were used such as (T_1 Neem Leaf Extracts, T_2Bitter Apple (Trooh) Leaf Extracts, T_3Conocarpus Leaf Extracts, T_4Eucliptus Leaf Extracts, T_5Pyrifluquinazon (Matoi) synthetic insecticide and T6 Control (untreated) to compare the efficiency of treatments.

Further, data showed that after first spray overall reduction percentage of revealed that maximum mortality exhibited by the application of Chemical Matoi (87.49%) followed by Neem (83.96%), Bitter AppleTrooh (78.57%), Conocarpus(71.53%) and Eucliptus (65.67%), respectively.

Further, data showed that after second spray overall reduction percentage of revealed that maximum mortality exhibited by the application of Chemical Matoi (90.762%) followed by Neem (87.826%), Bitter AppleTrooh(83.724%), Conocarpus(75.518%) and Eucliptus (70.018%), respectively.

Recommendations

Wheat crops are economically damaged by aphidspecies during the cropping seasons; sthusneed proper management.

Further, based on the consequences of present study it is proposed that synthetic chemical Matoi and bio pesticide Neem leaf extracts is recommended on urgent basis against wheat aphid due to its maximum reduction in the present trial.

References

Abbott, W., S. (1925). A method of computing the effectiveness of an insecticide. *Journal. Economies. Entomology*, *18*(2), 265-267

Adenubi, O.T., Mc-Graw, L.J., Eloff, J.N. & Naidoo, V. (2018). In vitro bioassays used in evaluating plant extracts for tick repellent and acaricidal properties: A critical review. *Veterinary parasitology*, *254*, 160-171.

Afshari, A, Soleiman-Negadian, E. & Shishebor, P. (2009). Population density and spatial distribution of *Aphis gossypii* Glover (Homoptera: Aphididae) on cotton in Gorgan, Iran. *Journal of Agriculture Science Technology*, 11(2), 27–38.

Aheer, G.M., Ali, A. &Ahmad, M. (2008) Abiotic factors effect on population fluctuation of alate aphids in wheat. *Journal of Agriculture Research*, *46*(2), 367–371.

Aheer, G.M., Munir, M. & Ali, A. (2006). Screening of wheat cultivars against aphids in ecological conditions of district Mandi Bahauddin. *Journal of Agriculture Research*, *44*(1), 55-58.

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 9 (2025)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Akhtar, L.H., Hussain, M., Iqbal, R.M., Amer, M. & Tariq, A.H. (2010). Losses in grain yield caused by Russian wheat aphid *Diuraphisnoxia* (Mordvilko). *Sarhad Journal of Agriculture 26*(4), 625-629.

Ali, I., Khan, B.S., Sagher, M. & Ali, A. (2011). Determination of varietal resistance for and

Anjan K.N., Sarkar, A. & Bala, S.C. (2012). Studies on population fluctuation and effect of biotic and abiotic stresses on the population of *Myzuspersicae* (Sulz.) infesting potato in the gangetic basin of West Bengal. *Journal of Entomology and Zoology Studies, 7*(1), 14-20

Aslam, M., Razaq, M, Akhter &, W., Faheem, M. & Ahmad, F. (2005). Effect of sowing date of wheat on aphid (*Schizaphis gramium* RONDANI) population. *Pakistan Entomology, 27*, 79–82.

Aziz, M.A, Ahmad, M., Nasir, M.F, & Naeem, M. (2013). Efficacy of different neem (*Azadirachta indica*) products in comparison with imidacloprid against English grain aphid *(Sitobionavenae*) on wheat. *International Journal of Agriculture & Biology. 15*(2). 279-284.

Bartlett, J.E, Kotrlik, J.W. & Higgins, C. (2011). Organizational research: Determining appropriate sample size in survey research. *International Journal of Science*, 19(2), 43-50.

Begum, S. (2018). Observations on the economic threshold level of the mustard aphid, *Lipaphiserysimi* (Kaltenbach) on mustard in Bangladesh. *Bangladesh Journal of Zoology, 23*(1), 13-16.

Begum. N., Sharma, B. & Pandey, R.S. (2013). *Calotropisprocera and Annona squamosa*: potential alternatives to chemical pesticides. *British Journal of Applied Science Technology, 3*(2), 254.

Bethke, J.A., Blua, M.J. &Redak, R.A. (2001). Effect of selected insecticides on *Homalodisca coagulate* (Homoptera: Cicadellidae) and transmission of oleander leaf scorch in a greenhouse study. *Journal of Economic Entomology, 94*,1031-1036.

Biswas, G.C. (2012). Efficacy of some plant materials against the mustard aphid, *Lipaphiserysimi (Kalt.) Journal Asiat. Soc. Bangladesh Science, 34*(1), 79-82.

Biswas, G.C., & Das, G.P. (2008). Population dynamics of the mustard aphid, *Lipaphiserysimi (Kalt.) (Hemiptera: Aphididae)* in relation to weather parameters. *Bangladesh Journal of Entomology, 19*(2), 15-22.

Carl, R., Reed, O. & Kenkel, P. (2016). Management of Stored Wheat Insect Pests in the *USA. Journal of Integrated Pest Management Reviews, 4*(2), 6127-143.

Chaubey, M.K. (2008). Fumigant toxicity of essential oils from some common spices against

Das, G. (2013). Efficacy of imidacloprid, a nicotinoid group of insecticide against the infestation of chilli aphids, *Myzuspersicae* (Hemiptera: Aphidsidae). *International Journal of Biological Sciences, 11*, 155-159.

Dewar, A.M. (1992). The effects of imidacloprid on aphids and virus yellows in sugar beet *Pflanzenschutz-Nachrichten Bayer,45*,423-442.

Dixon, A.F.G. (1987). Cereal aphids as an applied problem. *Agriculture Zoology Revolution, 2:* 1-5

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 9 (2025)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Dunley, J.F., Doerr, J.E., & Beers, E.H. (2021). Effect of pesticides on *Colpoclypeusflorus*(Hymenoptera: Eulophidae)and *Trichogramma platneri*(Hymenoptera: Trichogrammatidae),parasitoids of leafrollers in Washington. *Journal of Economic Entomology 94*,1075-1084.

Elzen, G. W. (2001). Lethal and sublethal effects of insecticide residues on *Oriusinsidiosus* (Hemiptera: Anthocoridae) and *Geocorispunctipes*(Hemiptera*:* Lygaeidae)." *Journal of Economic Entomology 94*.1 (2001), 55-59.

Feistein L. (1952). Insecticides from Plants Insect, year Book of Agriculture, U.S. D.A Washington, *222*-229

GOP, (2018). Area and production of other major kharif and Rabi crops. Economic survey of Pakistan (2014-15), Ministry of Food and Agriculture; *Federal Bureau of Statistics, Government of Pakistan, Islamabad, Pp.22*

Hazra, C.R. (2000). Food security through accelerated cereals production. *Intensive Agriculture. 7*(8),4-5.

Hossard, L., A. Philibert, & M. Bertrand, C. C. David, P. Debaeke, N. M. & Jolain, M. H. Jeuffroy, G. Richard & D. Makowski. (2014). Effects of halving pesticide use on wheat production. *Journal of Agricultural Sciences, 10*(1), 103-109.

Iqbal, M. F., Maqbool, U., Asi, M. R., & Aslam, S. (2007). Determination of pesticide residues in brinjal fruit at supervised trial. *Journal Animal Plant Science, 17*(12), 21-23.

Jiang, X. F., Luo, L. Z., Zhang, L., T. W. Sappington & Hu. Y. (2011). Regulation of migration in the oriental armyworm, *Mythimna separata* (Walker) in China: A review integrating environmental, physiological, hormonal, genetic, and molecular factors. *Environmental Entomology, 40*(7), 516-533.

Kanda, D., Kaur, S., & Koul, O. (2017). A comparative study of *monoterpenoids* and phenylpropanoids from essential oils against stored grain insects: acute toxins or feeding deterrents. *Journal of Pest Science, 90*(2), 531-545

Kannan, N.O. (1999). Population dynamics of wheat aphid *(Schizaphisgraminum) (Rondani) (Homoptera: Aphididae)* and its natural enemies in the field. *Sudan Journal of Agriculture Research. 2*, 65-68.

Kassimi, A.& Lahcen, E. (2012). Comparison of insecticide effect of plant extracts on aphids of watermelon and green alfalfa. *Sustainable Agriculture Research, 1*(2): 301-307.

Khalil, I.A. &. Jan, A. (2012). Cereal crops. In: Cropping technology. A textbook of Agriculture New Million Edition. *National Book Foundation. pp. 169*.
losses by aphids in wheat cultivars. *Pakistan Entomology, 33*, 157-160

Mao, L., & Henderson, G. (2007). Antifeedant activity and acute and residual toxicity of alkaloids from *Sophora flavescens (Leguminosae)* against Formosan subterranean termites (Isoptera: Rhinotermitidae). *Journal of Economics Entomology 100*(3),866–870.

Marcic, D., Prijovic M, Drobnjakovic, T., Medo, I., Peric, P. & Milenkovic, S. (2012). Greenhouse and field evaluation of two biopesticides against *Tetranychusurticae*and*Panonychusulmi (Acari: Tetranychidae). Pesticide Phytomed27*(2), 313–320

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 9 (2025)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Matharu, K.S, & Tanwar, P.S. (2019). Efficacy of different insecticides & bio pesticide against wheat aphid. *Journal of Entomology and Zoology Studies, 7*(3), 521-524.

Misra, H. (2000). Effectiveness of indigenous plant products against the pulse beetle, Callosobruchus chinensis on stored black gram. *Indian Journal of Entomology62*(3), 218–220.

mitochondrial electron transport inhibitor- acaricide resistance in Tetranychusurticae (Acari: *Tetranychidae). Journal of Economics Entomology 94*, 1577–1583.

Mohammad, Z.A.S. Islam, E. Hossain, & Hossain, M. S. (2016). Comparative study of integrated pest management and farmer's practices on sustainable environment in the wheat ecosystem. *International Journal of Zoology,15*(2),158-163.

Mondal, M.R.I. & Wahhab M.A. (2001). Production Technology of Oil Crops. Oilseed Research Centre, BARI, Joydebpu, Gazipur. *P.111* Morde, A.J. and K. Blackwell. (1993). *Azadirachtin*: *an update Journal of Insect Physiology,39*(11):903-924.

Morde, A.J. &. Blackwell, K. (1993). *Azadirachtin:* an update *Journal of Insect Physiology, 39*(11), 903-924.

Nawaz, M.R., & Javaid M.I, (2011). Effectiveness of some botanical extracts on wheat aphids. *The Journal of Animal & Plant Sciences, 21*(1), 114-115.

Noori, S, Lasgarara, F. &Shojaye, M. (2011). Affecting factors on adoption of integrated management of *eurygasterIntegriceps* with emphasis on participatory approaches of farmer field school (Case study: Wheat farmers of Kermanshah province). *Journal of Agricultural Extension Education Research,4*(3), 15-29.

Ofuoku, A.U., Egho, E.U., &, Enujeke, E.C. (2009). Integrated Pest Management (IPM) adoption among farmers in central agro-Ecological zone of Delta State, Nigeria. *Advance Biology Research Journal, 3*(1): 29-33.

pulse beetle, *Callosobruchus chinensis* (Coleoptera: Bruchidae). *Journal of Oleo Science, 57*(3),171-9

Saha, B.N., Islam W., & Khan, A.R., (2006). Effect of *Azadirachtin* on the growth and

development of the pulse beetle, *Callosobruchus chinensis* L. *Journal. Asiatic Society of Bangladesh Science,32*(1):69-65

Sarode, M., Kahloon, F.M. H., Nawaz, M. R. & Javaid, M. I. (2012). Effectiveness of some botanical extracts on wheat Aphids. *The Journal of Animal and Plant Sciences, 21*(11), 114-115

Shafique, M.A, & Ahmed, K.S. (2016). Field evaluation of different insecticides against wheat aphid (*Schizaphisgraminum,*Rondani) and comparative yield assessment for different wheat cultivars. *Academic Journal of Entomology.9*(1), 01-07.

Shah, S.I.A, Khan, I.A, & Husain, Z. (2007). Comparing the effectiveness of a biopesticides with three synthetic pesticides for aphid control in wheat. *Sarhad Journal of Agriculture 23*(3), 723-728.

Sharma, D. R. (2002). Bio efficacy of certain insecticide and bio pesticides against

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 9 (2025)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

major pest of brinjal under field condition." M. Sc. (Ag.) Thesis, *Indian Agriculture Research Institute, New Delhi, India 160.*

Singh, B, & Deol, G.S. (2003). Qualitive grain yield losses caused by aphid compels in *wheat. Crop Research, 26* 501- 504.

Srivastava, A, Rana S, &. Rana V, Manuja S., (2016). Efficacy of quinalphos 25 EC for the management of wheat aphid. *Agricultural Science Digest*. *36*(4):337-339."

Stumpf, N., &Nauen, R. (2001). Cross-rsistance, inheritance, and biochemistry of

Symposium, series. & (Eds. Arnason, J. T. and Morand P) *American Chemical Society, Washington DC, USA. Pp.110*, -135.

Tang, Y., Q. Weathersbee. &. A.A., Mayer, R.T (2002). Effect of neem extract on the brown citrus aphid (Homoptera: Aphididae) and its parasitoid Lysiphlebustestaceipes*(Hymenoptera: Aphididae). Environmental Entomology*, *31*(1), 172–176.

Thomas, L., S. Hatt, Q. Xu, J. Chen, Y. Liu &. Francis, F. (2016). Wheat based intercropping systems for biological pest control. *Journal of Plant Protection,88*(2), 154-162.