

**Field assessment of synthetic and botanical insecticide against sucking insect pests and their associated predators in cotton**<sup>a</sup> Abdul Wahab, <sup>a</sup> Arif Ali\*, <sup>a</sup> Ghulam Ali Bugti, <sup>b</sup> Shafque Ahmed Memon, <sup>a</sup> Abdul Hafeez Mastoi, <sup>b</sup> Imran Ali Rajput, <sup>a</sup> Moheem Khan, <sup>a</sup> Muhammad Abid Roonjha, <sup>a</sup> Mehar-Un-Nisa, <sup>a</sup> Sumaira Roonjha<sup>a</sup>Department of Entomology, Faculty of Agriculture, Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS) Uthal, Balochistan, Paksitan,<sup>b</sup>Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam, Sindh, Pakistan.\*Corresponding Author's EmailAddress: [arifalirao@gmail.com](mailto:arifalirao@gmail.com)

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**ABSTRACT**

Cotton is an economically important crop which is highly susceptible for sucking insect pests. Farmer community mostly depend on synthetic insecticides for quick management of sucking insect pests of cotton, however their continuous uses cause serious concerns regarding environmental pollution, pest resistance, and harmful effects on beneficial insects. Keeping in view these threats, present study was conducted to compare the effects of selected botanical insecticides with commonly used synthetic insecticides against major sucking insect pests of cotton crop and their natural enemies on the field conditions. In Present result, maximum pest population reduction of cotton sucking insect pest such as White fly, Jassid, Aphid, Thrips, Mealy bug and dusky cotton bug was observed on Synthetic pesticides Imidacloprid, Dimethoate, Acetamiprid and in Botanical pesticides, Neem seed, Tobacco, Eucalyptus, Garlic and Ginger respectively. While a minimum pest population of sucking insect pests was noticed in control group, similarly maximum reduction of natural enemies such as green lacewing and Lady Bird beetle was found on Synthetic pesticides, while a minimum reduction of natural enemies green lacewing and Lady Bird beetle was found on botanical pesticides. It was concluded that synthetic pesticides are more effective for sucking insect pests and caused lethal impacts on the population of natural enemies. Similarly, botanical pesticides were also found lethal on sucking insect pest but their effects on natural enemies was found less lethal as compared with syntactic pesticides. Therefore, uses of botanical pesticides can minimize the uses of synthetic pesticides and which also safe guard natural enemies.

**Keywords:** Synthetic pesticides, botanical pesticides, natural enemies, sucking insect pests and cotton crop.

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**INTRODUCTION:** Cotton is most important agricultural crop that are Broadly cultivated and traded globally, as noted by Zia *et al.* (1998). The plant typically grows between 80 and 120 cm in height, with separate boll branches. It develops a prominent taproot that has a prolonged period of flowering and harvest. Cotton is a annual crop that thrives in temperate climates and can be grown with irrigation, as stated by Brader (1979). An estimated 3% of the total agricultural land in Emerging economical countries are used for cotton farming. This crop is a significant source of income for millions of farmers worldwide, helping them meet their basic needs. The revenue from cotton plays a vital role in improving the standard of living for rural households, particularly in developing nations. Cotton is also important for countries as it serves as an export crop, contributing to foreign exchange earnings and acting as a raw material for the textile industry, according to Muthu (2014). Cotton is predominantly grown in Asia, where about 69.87% of the world's cotton is produced. America, Africa, Europe, and Australia follow with shares of 22.53%, 5.81%, 1.34%, and 0.45% respectively. During the 20/20 season, around 29 million farmers across 83 countries cultivate cotton. About 84% of the global cotton production comes from seven countries, namely India, China, America, Brazil, Pakistan, Türkiye, and Uzbekistan, as reported by Singh *et al.* (2016). Cotton insect pest study is crucial for optimizing pesticide use because cotton, despite covering only 2.5% of global cropland, accounts for 16%–25% of the world's pesticides, leading to high environmental, health, and economic risks. Research is vital to combat pest resistance, manage secondary outbreaks, protect natural predators, and adopt sustainable, cost-effective Integrated Pest Management (IPM) strategies (Malinga and Laing, 2024). However, insect infestations remain one of the major concerns on cotton production in Pakistan (Nagrareet *et al.*, 2009). The main problems to Pakistan's high cotton yield are sucking insects (Javedet *et al.*, 2020). Jassid is the polyphagous insect pest of many crops and commonly known as a devastator due to adverse damaging nature. The plant becomes stunted by sucking cell sap (Asiet *et al.*, 2008), it also transmits the toxin into the plant and seriously disturbs the process of photosynthesis (Bhatnagar and Sharma, 1991).

White fly is a vector to transmit the yellow vein mosaic disease (YVMD) in okra (Salim, 1999) and Numbers of arthropods are controlling with pesticides because of their dependency on chemical which suppress the pest population of various insects (Naranjo, 2001). These chemicals lead to cause various harms such as water, food and air contamination with toxin that influence on insects natural enemies and many others organism. Current

insect resurgence happening because of regular use of pesticides that make resistance among insects against these chemical insecticides (Naranjo, 2001). Numerous lethal and non-lethal coincidences occur in human beings by mishandling highly toxic synthetic chemicals. It is compulsory to create awareness among the peoples of developed and developing countries about these pesticide hazards for the safe use of synthetic pesticides (Uverskyet *al.*, 2002). World Health Organization (WHO) has estimated that every year 20000 peoples are dying from insecticide poisoning and almost three million people are facing acute health issues due to insecticides (Uverskyet *al.*, 2002).

Botanical pesticides are Compatible alternatives to synthetic pesticides and subgroup of biopesticides for agricultural pest control. Significant research has been done on botanical pesticides derived from various plant sources as a result of their distinctive characteristics, which include Low risk to humans' high selectivity toward the nontarget beneficial organisms and negligible environmental persistence and bioaccumulation (Grdisa and Grsic, 2013). Compared to traditional chemical pesticides, they are typically less harmful to both people and the environment (Dimetry, 2014). Natural enemies that are good for the environment and the environments in habitants are not destroyed by botanical insecticides, which only kill the targeted insects. Neem is the most trustworthy source of eco-friendly bio-pesticides, topping the list of 2,400 plant species with documented pesticide abilities. More than 350 species of arthropods, 12 nematode species, 15 fungal species, 3viruses, 2 species of snails, and 1 species of crab are all susceptible to neem. Neem extracts have an impact on over 195 different insect species, and they can also be used to manage pests that have developed a resistance to chemical pesticides. Neem bio-pesticides are systemic in action and offer plants long-term defense against pests. Neem-based herbicides have no effect on insects, bees, or other beneficial organisms. There are several different ways that botanical pesticides are processed, including preparations made from raw plant material, plant extracts or resins, and pure compounds separated from plants (Siddiqui *et al.*, 2003; Tomlin; 2000). *Azadiractin* is a unique bio-pesticide compound in neem *Azadirachtaindicat* that has been reported many years ago (Hari Krishnan *et al.*, 2003). Neem composed of limonoidsterpenoids flavonoids, and alkaloids, which influence the insect pests via diverse modes of action such as antecedency, repellency, the growth regulation, and oviposition deterrence More than 100 protolimonoids, limonoids and few non terpenoids have been identified from different plant parts (Koul and Walia, 2009) and 57 compounds have been identified from neem seed (Jacobson, 1988). Tobacco plant *Nicotania tabacum*, has

a nicotine that has very toxicity not only for lepidopteran, dipteran and many of the soft body insects pests (Endersby and Morgan, 1991), but also harmful for mammals but degraded within 48 hours in the mammalian body (Conacher, 1986). Natural Enemies in the cotton ecosystem, such as ladybird beetles, green lacewings, spiders, and minute pirate bugs, play a critical, sustainable role in suppressing the population of key cotton insect pests to keep them below the economic threshold level. They function as natural enemies that provide biological control, often reducing the need for chemical insecticides, particularly against soft-bodied sucking pests and small larvae (Soomro *et al.*, 2025).

**OBJECTIVES:** The purpose of present research objective was to find out the influence of botanical plant extract pesticides and synthetic pesticides on sucking insect pest of cotton crop and their impact on natural enemies under field condition.

**MATERIALS AND METHOD:** The present research was conducted in the cotton field at the experimental farm of Lasbela University of Agriculture, Water and Marine Science (LUAWMS). Cris- 628 Non BT- cotton was used for the current experiment.

**Treatment layout:** Treatments layout in present study five botanicals' plants extract, and three synthetic Insecticides were applied in current study, and one control was used to compare with both pesticides. In control group no any pesticides was used. The pesticides applications were applied, when the pest population of sucking insect pest reached at the economic threshold level (ETL). The pesticides application was conducted, using 2L knapsack sprayer.

**Botanical pesticides (30%):** Eucalyptus, tobacco, neem seed, garlic, ginger and Control.

**Eucalyptus, neem seeds and tobacco extract:** Fresh leaves of eucalyptus (*Eucalyptus sp.*) and neem (*Azadirachta indica*) seeds were collected from the vicinity of the University main campus and Uthal city. While tobacco (*Nicotine*) leaves were purchased in Uthal local market. After that eucalyptus and tobacco leaves and seed dried under the shade of Entomology Laboratory. After dried leaves and seed converted with powder form with the help of electrical power machine. About 3 Kg of both leaves and seed powder was used to make 30% concentration eucalyptus leaves and neem seed water extract. Both plants powder Boiled in 3 liter of water until half liters boiled water left that was drained with muslim cloths and prepared it to use against cotton insect pest.

**Garlic and ginger extract:** Five (5) kg of garlic (*Allium sativum*) and ginger (*Zingiber officinale*) were purchased from local market and ground with the help of juicer machine for making garlic and ginger extracts. To make a 30% concentration of garlic and ginger extract 300mL pure garlic and ginger extract were mixed in 1L water for the preparation of 30% concentration of garlic and ginger extract. Preparation of all these extract method was used according to (Rajput *et al.*, 2017, Magsiet *al.*, 2022) and doses 37.9 mL was used in 2L water through hand knapsack sprayer at until harvested crop and data was noticed between 24 to 48 hrs.

**Synthetic insecticides:** The insecticides were Imidacloprid (25% WP), Dimethoate (40% EC), Acetamiprid (20% SP) and Control. Three Synthetic insecticides, imidacloprid, dimethoate and acetamiprid were used in present experiment. All synthetic pesticides were used according to company recommendation and compared with control group.

**Sampling method for sucking insects and their natural enemies:** Sampling for the occurrence of sucking insect pests of cotton crops and their associated natural enemies from each 4 blocks, 3 inner rows were selected for sampling. To observe the insect pests and their predators, 10 plants randomly were selected before pesticides application and then pesticides were applied on selected cotton plants and data was recorded after between 24 to 48 hrs. The data was observed on major sucking insects' pests of cotton such as, aphid, jessed, white fly, thrips, red cotton bug and dusky cotton bug, while in natural enemy's lady beetles and green lacewing also were observed during experiment. Each treatment was replicated 10 times and experiment was conducted Randomized Competed Block Designed (RCBD).

**Statistical data analysis:** Collected data was analyzed with the help of SPSS 24 VESRION and One way analysis of variance (ANNOVA) was used in present experiment. While treatment means were compared using Tukey Test at  $P < 0.05$  probabilities values.

**RESULTS:** A maximum pest population reduction of white fly (96.35) was observed on synthetic pesticides Imidacloprid (96.35)

followed by acetamiprid(93.72), dimethoate(89.10), neem seed (52.54), tobacco (47.40), eucalyptus (44.73), ginger (24.35) and garlic (23.95), while a minimum pest population reduction of white fly was observed in control groups (8.37). A Statistically significantly ( $P < 0.05$ ) difference was observed on synthetic and botanical plant extract pesticide as compared with control groups. While no statistically significant difference was observed between Garlic and Ginger plant extract (table 1). A maximum pest population reduction of jassid (92.00) was observed on synthetic pesticides acetamiprid(92.00) followed by dimethoate(87.98), imidacloprid(87.41), neem seed (52.82), tobacco (52.42), eucalyptus (27.77), garlic (19.44) and ginger (15.50), while a minimum pest population reduction of jassid was observed in control groups (3.11). A statistically significant ( $P < 0.05$ ) difference was observed on synthetic pesticides and botanical plant extract treatments as compared with control groups. While no statistically significant difference was observed between Dimethoate and Imidacloprid(table 1)

A maximum pest population reduction of thrips (94.92) was observed on synthetic pesticides acetamiprid(94.92) followed by dimethoate(89.75), imidacloprid(74.88), tobacco (69), eucalyptus (56.20), neem seed (42.73), garlic (31.36) and ginger (10.73), while a minimum pest population reduction of thrips was observed in control groups (6.00). A statistically significant ( $P < 0.05$ ) difference was observed on synthetic pesticides and botanical plant extract treatments as compared with control groups (table 1). A maximum pest population reduction of aphids (92.38) was observed on synthetic pesticides acetamiprid(92.38) followed by dimethoate(88.90), imidacloprid(73), neem seed (51.71), ginger (50), garlic (49.00), eucalyptus (47.20) and tobacco (32.48), while a minimum population reduction of aphids was observed in control groups (3.41). A statistically significant ( $P < 0.05$ ) difference was observed on synthetic pesticides and botanical plant extract treatments as compared with control groups. While no statistically significant difference was observed among Naseem seed, Garlic and Ginger plant extracts (table 1). A maximum pest population reduction of mealybug (84.68) was observed on synthetic pesticides acetamiprid(84.68) followed by dimethoate(78.97), imidacloprid(52.32), eucalyptus (36.27), tobacco (32.87), garlic (31.98), ginger (30.63) and neem seed (15.17) while a minimum pest population reduction of mealybug was observed in control groups (2.40). A statistically significant ( $P < 0.05$ ) difference was observed on synthetic pesticides and botanical plant extract treatments as compared with control groups. While no statistically significant difference was observed among Tobacco, Ginger and Garlic plant extracts (table 1). A maximum pest population reduction of dusky cotton bug (81.36) was observed on synthetic pesticides acetamiprid(81.36) followed by dimethoate(69.95), eucalyptus (66), garlic (55.91), tobacco (51.18), imidacloprid (45.79), neem seed (37.54) and ginger (19.30), while a minimum pest population reduction of dusky cotton bug was observed in control groups (3.86). A statistically significant ( $P < 0.05$ ) difference was observed on synthetic pesticides and botanical plant extract treatments as compared with control groups. (table 1). A maximum pest population reduction of green lacewing (85.49) was observed on synthetic pesticides acetamiprid (85.49) followed by imidacloprid (78.69), dimethoate (75.53), neem seed (48.39), garlic (31.00), ginger (18.00), eucalyptus (11.52) and tobacco (11.3), while a minimum pest population reduction of green lacewing was observed in control groups (5.71). A statistically significant ( $P < 0.05$ ) difference was observed on synthetic pesticides and botanical plant extract treatments as compared with control groups. While no statistically significant difference was observed between Eucalyptus and Tobacco extracts (table 1). A maximum pest population reduction of lady bird beetle (82.65) was observed on synthetic pesticides dimethoate(82.65) followed by acetamiprid (70.25), imidacloprid(56), garlic (35), ginger (32.21), eucalyptus (24.77), neem seed (24.44) and tobacco (23.5), while a minimum pest population reduction of lady bird beetle was observed in control groups (8.67). A statistically significant ( $P < 0.05$ ) difference was observed on synthetic pesticides and botanical plant extract treatments as compared with control groups. While no statistically significant difference was observed among Eucalyptus, Tobacco and Neem Seed plant extracts (table 1).

**DISCUSSION:** To manage insect pests of cotton crops growers commonly depend on inorganic and non selective pesticides.

Treatments	White Fly			Jassid			Thrips			Aphids			Mealy Bug			Dusky Cotton Bug			Green Lacewing			Lady Bird Beetle		
	BT	AT	PPR %	BT	AT	PPR %	BT	AT	PPR %	BT	AT	PPR %	BT	AT	PPR %	BT	AT	PPR %	BT	AT	PPR %	BT	AT	PPR %
Eucalyptus	28.23	15.6±0.9	44.73f	25.2	18.2±1.4	27.77d	23.3	10.2±1.2	56.20e	17.9	9.45±2.1	47.20e	24.23	15.44±2.25	36.27d	25.4	8.36±1.32	66.00c	15.1	13.36±1.32	11.52g	20.42	15.36±1.32	24.77g
Tobacco	25.67	13.5±1.3	47.40e	21.23	10.1±1.8	52.42c	25.9	9.8±0.9	69.00d	15.7	10.6±1.5	32.48f	23.6	15.37±1.62	32.87e	28.44	15.44±1.22	51.18e	12.3	10.9±1.22	11.3g	22.8	17.44±1.22	23.50g
Neem seed	26.13	12.4±1.0	52.54d	18.23	8.6±2.1	52.82c	23.87	13.67±2.5	42.73f	18.46	8.9±0.34	51.71d	20.43	17.33±1.2	15.17h	29.38	18.35±0.89	37.54g	23.93	12.35±0.89	48.39d	25.61	19.35±0.89	24.44g
Garlic	24.46	18.6±0.9	23.95g	24.33	19.6±1.23	19.44e	29.43	20.2±1.09	31.36g	22.25	11.33±2.6	49.00d	27.2	18.50±0.55	31.98e	30.1	13.27±1.33	55.91d	19.25	13.27±1.33	31.00e	23.5	15.27±1.33	35.00d
Ginger	22.87	17.3±2.3	24.35g	20.12	17±1.0	15.50f	19.38	17.3±0.67	10.73h	18.64	9.32±1.4	50.00d	21.66	15.24±0.23	30.63e	22.43	18.1±1.23	19.30h	17.44	14.3±1.23	18.00f	28.9	19.3±1.23	32.21e
Imidacloprid	35.65	1.3±0.6	96.35a	25.42	3.2±2.3	87.41b	21.26	5.34±1.6	74.88c	16.32	4.4±0.5	73.00c	19.8	9.44±1.22	52.32c	18.80	10.19±0.45	45.79f	26.24	5.59±1.4	78.69b	22.25	9.79±0.45	56.00c
Dimethoate	28.45	3.1±0.2	89.10c	19.14	2.3±0.2	87.98b	18.55	1.9±0.23b	89.75 b	23.5	2.6±1.2	88.90b	25.3	5.32±1.2	78.97b	25.73	7.73±1.1	69.95b	14.62	3.43±1.1	75.53c	19.2	3.33±1.1	82.65a
Acetamiprid	28.46	1.5±0.2	93.72b	22.5	1.8±0.5	92.00a	29.54	1.5±0.32	94.92a	28.9	1.3±0.7	92.38a	28.33	4.34±0.25	84.68a	30.11	5.61±1.2	81.36a	17.93	2.61±1.2	85.49a	15.5	4.61±1.2	70.25b
Control	31.87	29.2±1.6	8.37h	31.17	30.2±1.6	3.11f	33.2	31.2±1.2	6.00i	31.3	30.23±1.6	3.41g	33.64	32.8±1.2	2.40i	33.1	31.82±1.2	3.86i	28.85	27.2±1.6	5.71i	30.9	28.22±1.6	8.67h

Table 1: Comparative effects of botanical and synthetic insecticides against insect pest on cotton crop.

Values (Mean ± S.E) given in the column letters are significantly different by Tukey test (P<0.05). BT= Before treatment, AT= After treatment, PPR= Pest population reduction

However repeated and prolong application of inorganic pesticides leads to environmental pollution and also harmful for humans and animals (Aslam and Naqvi, 2000). In the present study, two groups of pesticides were evaluated against sucking insect pests of cotton under field conditions. In present results, we observed that all synthetic pesticides significantly reduce the sucking insect pest population as compared with control groups and botanical pesticides (table 1). Comparable results were documented by Roonjho *et al.*, (2025), who recently reported that synthetic pesticides caused highest reduction of the pest population of sucking and chewing insects in cotton crop. Further results agreed with the finding of Hemadri (2018) examined that the good inorganic pesticides have long been considered the most lethal chemicals for controlling both sucking type and chewing type of insect pests. However, the excessive use has resulted in serious concerns due their toxic effects on non-target organisms and environmental contamination. Therefore, there are growing needs to explore safer and eco-friendly alternatives. Many plant populations contain biological active elements and compounds such as alkaloids, phenolics, and terpenoids, which have important role in insect pest management (Banu *et al.*, 2010). Among these, *Azadirachta indica* is widely recognized for possessing multiple biological activities, such as antifeedant action, repellency, regulation of the insect growth and inhibition of oviposition which are effective against broad spectrum of insect pests and mites (Adil and Zaki, 2010). Neem seed extract and other botanical plant extracts have been extensively assessed using both in vivo and in vitro approaches against several arthropod pests (Roonjho *et al.*, 2025). The findings of the present study demonstrated that neem seed, tobacco, eucalyptus, garlic, and ginger extracts exerted significant lethal effects on whitefly, jassid, aphid, thrips, mealy bug, and dusky cotton bug when compared with the untreated control (tables 1). Similar outcomes were reported by Mostafa *et al.* (2018) and Maheswari and Govindaiah (2017), who observed a substantial reduction in vegetable insect pest populations following the application of neem and tobacco extracts under field conditions. Furthermore, Roonjho *et al.*, (2025) also documented the negative impact of botanical pesticides on sucking insects and chewing insect pests of vegetable and cotton crops. The results of the present investigation are consistent with earlier studies, such as Khan *et al.* (2013), who reported a marked decline in populations of jassid, whitefly, and aphid after the application of plant extracts. Likewise, Fiaz *et al.* (2012) confirmed the antifeedant and repellent activity of various plant extract formulations, including *Momordicacharantia* L., *Azadirachta indica*, *Melia azedarach*, and lemon oil. Their findings indicated that lemon oil, followed by neem oil, showed the highest repellency and resulted in a significant reduction of thrips and jassid populations on cotton crops. Similarly, Ambekar *et al.* (2000) reported neem leaf extract as the most effective botanical treatment against okra fruit borer, causing maximum repellency and a considerable reduction in fecundity. War *et al.* (2014) evaluated the bioassay of neem oil in combination with chemical pesticides against *Helicoverpa armigera* and observed a significant reduction in

larval population under laboratory conditions. In the present study, neem seed and tobacco extracts were found to be the most effective among the tested botanicals, significantly lowering pest populations. These findings align with Hussain *et al.* (2017), who reported effective control of whitefly and jassid using tobacco extract under field conditions. Additionally, Ghosh (2022) reported that tobacco extract not only managed pest populations but also contributed to increased yield in brinjal crops. The current results were further supported by Pulvers *et al.* (2021), who observed maximum larval mortality in response to *Ricinus communis* extracts. Keerio *et al.* (2017) also reported that castor bean seeds contain compounds with anti-tryptic activity against *Spodoptera frugiperda*. Neem seed and tobacco extracts exhibit multiple modes of action, including nerve poisoning, stomach toxicity, and repellent effects. Sarkar & Lim (2016) reported the highest larval mortality of *Grapholitamolesta* with *Nicotianatabacum* extract, while both *N. tabacum* and *Allium sativum* extracts were effective in managing male and female populations of the same pest. The findings of the present study are also in agreement with Bhutto *et al.* (2017), who observed that tobacco extract effectively controlled jassid, whitefly, thrips, psyllids, beetles, and lepidopteran pests. Kodjo *et al.* (2011) further documented that *N. tabacum* extract reduced *Plutella xylostella* populations by up to 93% in cabbage crops. In the current study, botanical extracts provided effective control of insect pests without causing any adverse effects on the natural predators of the cotton crop. A higher number of predators were observed in the control treatment, which may be attributed to the increased availability of prey due to higher pest populations. These findings are in line with Kunbhar *et al.* (2018), who reported that botanical insecticides significantly reduced pest populations while having no harmful effects on predator species in cotton fields. Based on the field experiment, it was concluded that all tested plant extracts significantly reduced the population of sucking insect pests in cotton crops. Among the evaluated botanicals, neem seed, tobacco, and eucalyptus extracts were more effective against aphid, jassid, thrips, mealy bug, dusky cotton bug, and whitefly compared to garlic and ginger extracts. Moreover, no significant negative impact on natural enemies was observed compared with the control treatment. However, predator populations tended to migrate toward control plots due to the higher availability of insect prey. Present study evaluated that a maximum population reduction of predators Lady Bird beetle and green lace wing was noticed on synthetic pesticides, while a minimum reduction of natural enemies Lady bird beetle and green lace wing was noticed on botanical plant extract pesticides. We observed that botanical plant extracts post no adverse effect on natural enemies' population in the field condition. Our result strongly agree with Khan *et al.*, (2024) who observed similar results while testing botanical plant extracts on forth instar predatory bug (*Podisus maculiventris*) and found least lethal to predators. Further agreed with the findings of (Bugti *et al.*, 2023) who reported that botanical plant base pesticides have no lethal effects on natural Enemies of brinjal crop.

**CONCLUSION:** Present results revealed that synthetic insecticides such as Dimethoate and Acetamiprid significantly reduced the pest population of sucking insect pests of cotton and their related natural enemies. Similarly, botanical insecticides also reduced significant pest population of sucking insect pests of cotton and their related natural enemies. However, botanical pesticides were found with minimum lethal effects on natural enemies as compared with synthetic pesticides. The results concluded that botanical pesticides could be considered as an alternative of synthetic insecticides which is safer for the population of natural enemies.

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**LIFE SCIENCE REPORTING:** In current research article no life science threat was reported

**ETHICAL RESPONSIBILITY:** This is original research, and it is not submitted in whole or in parts to another journal for publication purpose.

**INFORMED CONSENT:** The author(s) have reviewed the entire manuscript and approved the final version before submission.

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