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Using plant extracts to control the sucking insect pests of Brinjal

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Abstract
The present experiment was carried out at Khanzada Agriculture Farm Nasarpur, Dist. Tando Allahyar. Before fruiting stage, the lowest number of aphid (5.33) was observed in neem seed kernel extract, which was significantly lower than rest of the treatments. In contrast, significantly higher number of aphid (11.33) was recorded in control plots followed by mustard extract. The highest reduction of population over control (50.64%) recorded in neem seed kernel extract treated plots followed by Garlic extract at fruiting stage as against the lowest reduction of aphid population over control was recorded in mustard seed extract treated plots. Moreover, the highest reduction of population over control (54.92%) recorded in neem seed kernel extract treated plots followed by Garlic extract at fruiting stage as against the lowest reduction (22.56%) of jassid population over control was recorded in mustard seed extract treated plots. On the other hand, significantly higher number of whitefly was observed in untreated control. No significant difference was observed between whitefly treated with Pyrethrin extract and Datura extract (16.67 and 17, respectively). The highest reduction of population over control (57.36%) recorded in neem seed kernel extract treated plots followed by Garlic extract treated plots (54.43%) at fruiting stage as against the lowest reduction (23.58%) of mealybug population over control was recorded in mustard seed extract treated plots.

Keywords: brinjal, sucking insects, plant extracts

1. Introduction
Brinjal (*Solanum melongena*) also known as egg plant, is one of the most popular and principal vegetable crops grown in Bangladesh, Pakistan and other parts of the world. It is the second most important vegetable crops after potato in relation to its production and consumption. Brinjal is well known for its nutritive value as a source of carbohydrate, proteins, minerals and vitamin (FAO, 1995). Bangladesh produced 382 thousand tons brinjal which was approximately 17% of the total vegetable production of the country during the year of 2000-2001 [1]. Brinjal is one of the three most important vegetables in South Asia (Pakistan, Nepal and Srilanka). This region of South Asian accounts for almost 50% of the world area under brinjal cultivation [2].

Brinjal is practically the only vegetable that is available at an affordable price for rural and urban consumers. It is cultivated largely on small family owned farms, where weekly sales of it brings in a readily cash income. The crop is infested by various arthropods pest species in the field [3] recorded 28 species of insect pests under 7 different insect orders from the brinjal ecosystem in Sudan. [4] Observed 20 species of pest under 6 different orders, jassid (*Amrasca biguttula biguttula*) was the second most common in the field after brinjal shoot and fruit borer [5] reported that it was attacked by 53 species of insect pest among them, jassid (*Amrasca biguttula biguttula*) was the second major pest [6] reported that, eggplant production is severely constrained by several insect and mite pests. The major pests include eggplant shoot and fruit borer, leafhopper, whitefly, thrips, aphid, spotted beetles, leaf roller, stem borer, blister beetle, red spider mite, and little leaf disease. Both nymph and adult of jassid affect host leaves at all stage of development and suck the sap from lower surface of the leaves [7]. It also transmitted viral disease like mosaic virus. The younger plants were found susceptible to jassid attack than the older plants. As the plants grew older, they become less susceptible to jassid infestation [8]. This pest also attacks cotton, okra, potato, pea and other solanaceous crops and also some wild plants, like hollyhock, kangi buti (*Abutton indicus*) etc [9]. It is also one of 3 the key pests of cotton and causes major damage every year [10] reported that jassid caused more than 50% reduction of seed cotton yield in some cotton genotypes. The management of jassid (*Amrasca devastans*) through various non-chemical method namely, cultural, mechanical, biological and host plant resistant etc. was limited throughout the world [11].

Management practices of jassid in Bangladesh and other countries are still limited to frequent spray of toxic chemical pesticides [12]. There are various insecticides that can be used to control aphids. Nowadays, there are many plant extracts and plant products that are eco-friendly and control aphids as effectively as chemical insecticides [13] suggested use of neem products and lantana products to protect plants against aphids. For small backyard infestations, simply spraying the plants thoroughly with a strong water jet every few days is sufficient protection for roses and other plants. Nicotine (tobacco) concentrate is very poisonous if inhaled. It is derived from tobacco and is commonly sold as a 40 percent nicotine sulfate concentrate. Nicotine is a fast acting contact killer for soft bodied insects, but does not kill most chewing insects [14]. It is less effective when applied during cool weather. Do not spray

within 7 days of harvest. The main objective of the study was to evaluate the effectiveness of some selected botanicals against the sucking insect pests [15].

2. Material and method

2.1 Experimental design and layout

The study was conducted considering eight treatments including a control for controlling sucking pest at seedling to harvesting stage. The experiment was laid out in a Randomized Completely Block Design (RCBD) with three replications in the field of the Entomology Department Tandojam. The whole field was divided three blocks of equal size and each block was sub divided into nine plots. The unit plot size was 3m × 2m accommodating eight pits per plot. The distance between rows to row was 100cm and that of the plants to plants was 70cm.

2.2 Treatments for sucking insects

- **T1** Neem (*Azadirachta indica*) seed kernel extracts (20g)
- **T2** Pyrethrin (*Chrysanthemum cinerariifolium*) flower extracts (20g)
- **T3** Datura (*Tamarindus indica*) fruit extract (20)
- **T4** Chilli (*Ipomoea carnea*) extracts (10g)
- **T5** Garlic (*Allium sativum* L.) extracts (10g)
- **T6** Tobacco (*Nicotiana tabacum*) leaf extracts (10g)
- **T7** Mustard (*Brassica nigra*) seed extract (20g)
- **T8** Untreated control

2.3 Application of insecticides

The plant extracts were applied with the help of knapsack sprayer. The first application was initiated after 4th week of transplantation and subsequent applications in each treatment were made at seven days intervals.

Observation of the symptoms developed on the leaves and number of branches/plant was recorded at an interval of 7 days starting from 3rd week after transplanting and was continued up to 8th week. Five plants were randomly.

2.4 Data collection

Data were collected some pre-selected parameters like number of leaves and branches per plant, number of fruits/plant, fruit length and diameter, weight of individual fruits and fruit yield of brinjal. The number of aphid, jassid, whitefly and mealybug was counted from treated and untreated plots of brinjal throughout the cropping season starting from 30 days after transplantation. Adults and nymphs of sucking insects were counted from a 30 random sample of five plants taken from each plot. Five leaves were chosen randomly from each plant, two from the bottom (older leaves), one from the middle and two from the top (younger leaves). The lower surface of the leaf was thoroughly examined for the presence of insects.

3. Results and Discussion

3.1 Effect of different treatments on sucking insect pest population

The effect of different treatments on of sucking pests was evaluated before fruiting and fruiting stage of brinjal.

3.2 Effect on aphid population

Before fruiting stage, the lowest number of aphid (5.33) was observed in neem seed kernel extract, which was significantly lower than rest of the treatments. In contrast, significantly higher number of aphid (11.33) was recorded in control plots followed by mustard extract plot in (Table 1). Accordingly to a researcher there are various insecticides that can be used to control aphids, but nowadays, there are many plant extracts and plant products that are eco-friendly and control aphids as effectively as chemical insecticides. Although [16] suggested use of neem products and mustard extract to protect plants against aphids. On the other hand, the highest percent reduction (52.93%) of population over control was obtained by application of neem seed kernel extract followed by Garlic extract.

The highest reduction of population over control (50.64%) recorded in neem seed kernel extract treated plots followed by Garlic extract at fruiting stage as against the lowest reduction of aphid population over control was recorded in mustard seed extract treated plots. The moderate effect of neem seed kernel extract against aphid population in the present investigation confirms the findings reported by Mote and [17, 18] who observed that aqueous neem seed kernel extract was moderately effective against aphid. Among the different treatments, mustard had the lowest effectiveness in reducing the population (17.63%). During the fruiting stage, the lowest number of aphid per plant (12.67) with neem seed kernel extract, which was significantly lower than all the treatments [19] recorded that neem extract most effective to reduction aphid population which was similar to the findings of present study.

3.3 Effect on jassid population

Before fruiting stage, the lowest number of jassid (3.33) was observed in neem seed kernel extract, which was significantly lower than rest of the treatments. In contrast, significantly higher number of jassid (9.33) was obtained in control plots followed by mustard seed extract, Garlic extract, which was significantly lower than control (Table 2). These results also agreed with those of [20] who reported the highest efficacy of neem seed kernel extract in controlling okra jassid. Consequently, the difference of the results is logical because effectiveness of any insecticides may vary with crop canopy, spraying methods and ecological variations. In tha present results, the maximum percent reduction (64.28%) of population over control was obtained by application of neem seed kernel extract followed by 57.13% in Garlic leaf extract, and among the different treatments, mustard seed extract had the lowest effectiveness in reducing the jassid (21.40%). [21] Also agreed with these results, and he reported that, plant extracts were of particular value in controlling the sucking and chewing pests.

The neem seed kernel extracts, neem oil, extracts from the leaves and barks had all been used since ancient times to keep scores of insect pests away. Whereas, during the fruiting stage, the lowest number of jassid per plant (10.67) with neem seed kernel extract, this was significantly lower than all the treatments. On the other hand, significantly higher number of jassid (23.67) was observed in untreated control. No significant difference was observed between jassid treated with pyrethrin extract and tobacco leaf extract (15.67and 14.33 respectively). Furthermore results discussed by [22]

reported that application of Quinalphos and Triazophos resulted in a resurgence of *A. biguttuta* on okra and abergine (Brinjal), while Endosulfan at 0.07% and Repelin (based on *Azadirachta indica*) l% were highly effective. Indigenous plant materials were cheaper and hazard free in comparison to chemical insecticide (Saxena *et al.*, 1992).

Moreover, the highest reduction of population over control (54.92%) recorded in neem seed kernel extract treated plots followed by Garlic extract at fruiting stage as against the lowest reduction (22.56%) of jassid population over control was recorded in mustard seed extract treated plots. Similar observation was made by [23] reported that acetylic, aqueous neem seed extract reduced the *Amrasca biguttula* on okra at fruiting stage, and lowest reduction was noted for mustard, respectively.

3.4 Effect on whitefly population

Before fruiting stage, the minimum number of whitefly per plant (4.33) was observed in neem seed kernel extract, which were significantly lower than rest of the treatments in (Table 3). Furthermore, neem products appeared to be environmentally safe and IPM compatible and had the potential to be adopted on a broad scale, together with other measures, to provide a low cost management strategy [24]. However, the maximum percent reduction (58.05%) population over control was examined by application of neem seed karnel extract followed by Garlic extract. Mote and Bhavikatti, 2003, recorded that the, *Azadirachtin* was moderately effective against the sucking pest including *Bemisia tabaci*, *Aphis gossypii*, as observed in the present study.

From the above findings it was revealed that the different treatments, mustard seed extract had the lowest effectiveness in reducing the whitefly (19.33%). On the other hand, significantly higher number of whitefly was observed in untreated control. No significant difference was observed between whitefly treated with Pyrethrin extract and Datura extract (16.67 and 17, respectively). But unfortunately present findings do not agree by [25] whom noted that neem oil was least persistant insecticides and caused >50% mortality of whitefly, and also Pyrethrin extract and Datura extract was recorded maximum reduction. However, the highest reduction of population over control (52.03%) recorded in neem seed kernel extract treated plots followed by Garlic extract treated plots (49.32%) at fruiting stage as against the lowest reduction (20.5%) of whitefly population over control was recorded in mustard seed extract treated plots. Similar trend was recorded during 24 hour of release also as the dose increases the repellent effect also increased irrespective of the native botanical extracts against mealybugs [26].

3.5 Effect on mealybug population

In case of mealybug, before fruiting stage, the lowest number of mealybug (2.33) was observed in neem seed kernel extract treated plots, which was significantly lower than rest of the treatments. On the other hand, the highest percent reduction (72.00%) of population over control was obtained by application of neem seed kernel extract followed by 64.00% in Garlic extract treated plots in (Table 4). The current results also supported by the [27] recorded that neem seed kernel extract had a moderate repellent effect against mealy bugs. John and Immaraju, 1997 also had been exempted *Azadirachtin* from residue tolerance requirements by the US environmental protection agency for food crop applications. It exhibited good 20 efficacy against key pests with minimal to no impact on non-target organisms.

Though, among the different treatments, mustard seed extract had the lowest effectiveness in reducing the mealybug (24.00%). During the fruiting stage, the lowest (9.67) number of mealybug per plant in plots treated with neem seed kernel extract, which was significantly lower than all the treatments [28] determined the efficacy of neem based pesticide against the cotton mealybug, treatments comprised Endosulfan at 0.07%, neem seed kernel extract (NSKE) at 1%, with an untreated control. Endosulfan followed by neem (3%) was most effective in controlling the mealybug. On the other hand, significantly higher number of mealybug/plant (22.67) was observed in untreated control. No significant difference was observed between mealybug treated with pyrethrin extract and tamarind fruit extract (14.67 and 15.00, respectively). Botanical pesticides are the most cost effective and environmentally safe inputs in integrated pest management [IPM] strategies. There were about 3000 plants and trees with insecticidal and repellant properties in the world, [29, and 30]. The highest reduction of population over control (57.36%) recorded in neem seed kernel extract treated plots followed by Garlic extract treated plots (54.43%) at fruiting stage as against the lowest reduction (23.58%) of mealybug population over control was recorded in mustard seed extract treated plots.

Table 1: Incidence of aphid under different treatments at two different stages of brinjal

Treatments	Before fruiting stage		Fruiting stage	
	Aphid incidence (5 leaves/plant)	Percent reduction over control	Aphid incidence (5 leaves/plant)	Percent reduction over control
T1 Neem	5.33f	52.93	12.67f	50.64
T2 yrethrin	8.33c	26.45	17.67c	31.16
T3 Datura	8.00c	29.39	18.00c	29.88
T4 Chilli	7.33e	35.28	14.67e	42.85
T5 Garlic	6.00f	47.04	13.33e	48.07
T6 Tobacco	7.66d	32.33	16.33d	36.38
T7 Mustard	9.33b	17.63	20.33b	20.80
T8 Control	11.33a		25.67a	
LSD	1.18		1.155	
CV%	8.55		3.80	

Table 2: Incidence of Jassid under different treatments at two different stages of brinjal

Treatments	Before fruiting stage		Fruiting stage	
	Jassid incidence (5 leaves/plant)	Percent reduction over control	Jassid incidence (5 leaves/plant)	Percent reduction over control
T1 Neem	3.33d	64.28	10.67f	54.92
T2 Pyrethrin	6.33c	32.12	15.67c	33.80
T3 Datura	6.00c	35.69	16.00c	32.40
T4 Chilli	5.33c	42.84	12.67e	46.67
T5 Garlic	4.00d	57.13	11.33f	52.13
T6 Tobacco	5.66c	39.26	14.33d	39.46
T7 Mustard	7.333b	21.40	18.33b	22.56
T8 Control	9.333a		23.67a	
LSD	1.185		1.155	
CV%	11.44		4.30	

Table 3: Incidence of Whitefly under different treatments at two different stages of brinjal

Treatments	Before fruiting stage		Fruiting stage	
	Whitefly incidence (5 leaves/plant)	Percent reduction over control	Whitefly incidence (5 leaves/plant)	Percent reduction over control
T1 Neem	4.33d	58.05	11.67f	52.03
T2 yrethrin	7.33c	29.01	16.67c	31.48
T3 Datura	7.00c	32.24	17.00c	30.13
T4 Chilli	6.33c	38.69	13.67e	43.81
T5 Garlic	5.00d	51.40	12.33f	49.32
T6 Tobacco	6.66c	35.46	15.33d	36.99
T7 Mustard	8.33b	19.33	19.33b	20.5
T8 Control	10.33a		24.33a	
LSD	1.185		1.155	
CV%	9.79		4.05	

Table 4: Incidence of Mealybug under different treatments at two different stages of brinjal

Treatments	Before fruiting		Fruiting stage	
	Mealybug incidence (5 leaves/plant)	Percent reduction over control	Mealybug incidence (5 leaves/plant)	Percent reduction over control
T1 Neem	2.33d	72.00	9.66f	57.36
T2 Pyrethrin	5.33bc	36.00	14.67c	35.29
T3 Datura	5.00c	40.00	15.00c	33.83
T4 Chilli	4.33c	48.00	11.67e	48.52
T5 Garlic	3.00d	64.00	10.3f	54.43
T6 Tobacco	4.66c	43.99	13.33d	41.20
T7 Mustard	6.33b	24.00	17.33b	23.58
T8 Control	8.33a		22.67a	
LSD	1.185		1.155	
CV%	13.77		4.60	

4. Conclusion

The population of aphid, jassid, whitefly and mealybug were gradually decreased with the age of the plant. The highest population of all the sucking insect pests was observed in control plots in comparison to the lowest in neem treated plots.

Based on the above result it can be concluded that, neem seed kernel extract and garlic extract may have good impact for the management of sucking insect pests of brinjal.

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6. References

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