COMPARATIVE EFFICACY OF LEAF EXTRACTS OF TOBACCO VARIETIES AGAINST CABBAGE APHID *BREVICORYNE BRASSICAE* LINNAEUS (*HOMOPTERA: APHIDIDAE*)

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ABSTRACT: *To compared the efficacy of leaves extracts of tobacco varieties adjacent to cabbage aphid the experiments were conducted on a private agriculture farm near Sindh Agriculture University Tandojam in winter 2014-15. The leaves of tobacco varieties namely beeri wala tobacco, pattay wala tobacco and desi tobacco were selected for their extracts. The experiment was laid out in RCBD with 7 treatments, each were replicated 4 times. Extracts of all 3 tobacco varieties were used as pure and mixed with detergent; their effectiveness was also compared with control (untreated population) Crop was sprayed twice at the interval of 20 days, results showed the leaves extracts of the tobacco varieties used with and without detergent performed well against the aphid population on cabbage. Overall performance of both the sprays revealed that Pattay wala tobacco + detergent reduced maximum aphid population (95.79%) followed by Beeri wala tobacco + detergent 88.94%), Desi tobacco + detergent (79.94%), respectively that brought 13.10%, 13.05% and 11.07% more reduction in aphid population when extracts of these varieties were used without detergent, respectively. Result further revealed that maximum crop yield (320 kg/plot) was recorded of the plots sprayed Pattay wala tobacco + detergent followed by Beeri wala tobacco + detergent (300 kg / plot), Desi tobacco + detergent (291 kg / plot) T3 (249 kg / plot), T2 (254 kg / plot), T1 (270 kg / plot), and T7 (224 kg / plot), respectively. It's concluded that the treatment pattay wala tobacco variety + detergent was the most effective against B. brassicae on cabbage crop in winter season.*

Key words: Cabbage, Cabbage Aphid, Leaf Extracts, Tobacco.

INTRODUCTION

Cabbage (*Brassica oleracea*) is a leafy green or purple plant in the right place to the Cruciferae family. It contains vitamins K, C, B6 and B1 and numerous anti-cancer and antioxidant compounds. Cabbage is mostly well-liked vegetable grown and consumed in Pakistan [1]. Cabbage aphid, *Brevicoryne brassicae* L., is prominent insect that damages the crop regularly and reduces its yield to great extend [3], [19]. Infested plants bear 10-90% yield loss depending upon severity of damage and crop stage [20]. To reduce yield losses, the growers are predominantly use synthetic pesticides e.g. dimethoate to control aphids [4], however, these are expensive especially to poor smallholder farmers. Many pests including aphids have also developed resistance to organophosphates, carbamates and pyrethroids insecticides [5]. Use of synthetic insecticides has created many agro-ecological complexes such as development of resistance against insecticides in insect pests, environmental pollution, lethal to the population of beneficial insects, etc. [6]. That prompted the researchers to adopt other measures of insect control. The use of botanical pesticides are naturally occurring [7] and are progressively becoming a recognized and one of the options to save yield losses [8,9]. Botanical pesticides have a range of properties such as toxicity, repellency, anti-feedance, insect growth regulatory effects [10]. The extracts of Neem, bael, senwar, pyrethrum, tobacco, karanj, mahua and sweet flag *etc*. are frequently being used as pesticides of plant origin as one of the insect control tools in integrated pest management of many field crops [11]**.** These have shown a little impact on natural enemies of pests [12], are easily biodegradable [13], and have low toxicity to mammals [14,15,16], hence, their use in crop protection is noted as a practically sustainable alternative. Tobacco leaves are economically valuable because of abundant bioactive compounds in them, such as polyphenols, proteins and aromatic compounds. The significance of tobacco extracts is highly recognized in the field of agriculture as botanical pesticides, it is cheap, safe and sound, hazardless, non-residual, and highly effective against various insect pests. It has been used for crops like cotton, rice, okra, chickpea, safflower, sunflower and numerous vegetables against bollworms, fruit borers, aphids, jassids, thrips, whitefly, leaf hopper, diamond back moth etc. It's acts as repellant, anti-feedant and its seed contains certain chemicals, which inhibits the population of insect pests [17]. Since, biopesticides have been used in the field for many years against many insect pests. So, therefore become need to test these extracts against individual insects pest in the field so that to measure their effectiveness against insect pests. Therefore, keeping in view, the economic and nutritive importance of cabbage crop and adverse effects of synthetic insecticides on human health and environment, the present study was undertaken to know the effect of tobacco plant leaf extracts on incidence and population development of *B. brassicae*.

MATERIALS AND METHODS

This study was carried out at village Akk Machi near Tandojam during winter, 2014-2015 to determine the comparative efficacy of leaf extracts of tobacco varieties against cabbage aphid, *Brevicoryne brassicae* Linnaeus (Homoptera: Aphididae). The experiment was laid out in a randomized complete block design with 7 treatments and 4 replicates. The seeds of cabbage shahzadi hybrid variety were sown on 15th Nov., 2014. Each sub-plot size was measured as 12x12 feet and transplanted on well prepared ridges with one foot row to row distances. The crop was sprayed twice at 20 days' interval. First spray was done on 23rd Dec. when the aphid population was acceded beyond EIL. The following were the treatments.

Treatments

T_1= Pattay wala tobacco
T2= Beeri wala tobacco
T3= Desi tobacco
T4= Pattay wala tobacco + Detergent
T5= Beeri wala tobacco + Detergent
T6= Desi tobacco + Detergent
T7= Control

PREPARATION OF EXTRACT

One half kilogram each of three different varieties of tobacco were purchased from Hyderabad market and processed for getting their extracts. The leaves (50 gm) of each plant species were taken separately ground in local grinder and boiled with 1.5 litter water for 45-50 minutes, after cooling the mixture was filtered through muslin cloth. The mixture of each variety will then be kept separately in different containers. The mixture of each variety was applied and pure form as well as Surf detergent (5 gm) mixed with them. Detergent was added in each extract as an adhesive on the leaves of cabbage. Mixture of each treatment was applied on cabbage crop with knapsack hand sprayer. The pre-treatment count of aphid population was made one day before spray. The data was recorded by examining 4 randomly selected plants from each replication and tagged. The post treatment count was made 1, 2, 4 and 7 days' intervals. To observe the effectiveness of each tobacco variety, the reduction percentage of pest population was calculated by using formula of Flemings and Ratnakaran [18] formula. Data thus collected were subjected to statistical analysis using analysis of variance to know the significance of differences among treatments, and LSD (Least Significance Difference) test was also employed to compare different treatments for their efficacy against cabbage aphid.

RESULTS

In order to compared the efficacy of leaf extracts of tobacco varieties against cabbage aphid, the experiment was conducted at Akk Machi near Tandojam during winter 2014-15. The results of the experiment are presented below:

First spray

Population of cabbage aphid and reduction %

The data in Table-1 showed pre-treatment counts of aphids / leaf on cabbage were recorded as (150.66), (146.42), (154.00), (139.00), (139.33), (146.26) and (149.34) in the plots of T1, T2, T3, T4, T5, T6, and T7. The post-treatment reduction in population was worked out as (43.53%), (53.06%), (65.60%), and (79.23%) on day 1, 2, 3 and 1 week intervals in the plots treated with the leaf extract of tobacco variety Pattay wala. Similarly, reduction in the population of aphid was calculated as 62.46%, 67.66, %, 70.36%, and 72.18% at the same intervals in the plots treated with the leaf extracts of tobacco variety Beery wala. The reduction in the population of aphid was recorded as (47.47%), (53.58%), (62.05%), and (68.05%) in the plots treated with Desi tobacco during the same post-treatment interval. The leaf extracts of all tobacco varieties became more effective when detergent was mixed with each of them. The treatment Pattay wala tobacco + Detergent reduced the aphid population as 72.79%, 78.05%, 91.16%, and 94.69% after 1,2,3 and 7 days' post-treatment intervals, respectively. Result further revealed that the treatment Pattay wala tobacco + Detergent reduced more population of the aphid as compared to Beeri wala tobacco + Detergent. This treatment reduced population aphid to 80.84%, 85.56%, 88.31%, and 89.62%, respectively during the same post-treatment intervals. Reduction in the population of aphid during post- treatment intervals due to Desi tobacco + Detergent was recorded was recorded as 73.25%, 76.53%, 79.11%, and 82.24%, respectively. It showed that detergent enhanced the effectiveness of leaf extracts of all tobacco varieties tested. Detergent mixed with the leaf extract of Pattay wala variety brought maximum reduction in aphid population (94.69%) followed by Beeri wala (89.62%) and Desi tobacco (82.24%). Analysis of variance showed significant difference effectiveness of all treatments ($P<0.05$) level of probability.

Table 1. Efficacy of various tobacco leaf extracts against cabbage aphid (first spray).

Treatments	Pre-treat	Post-treatment				Maximum Efficacy (%)
		24 hrs	48 hrs	96 hrs	One week	
T1	150.66	91.33 (43.53%)	79.66 (53.06%)	73.66 (65.60%)	75.33 (79.23%)	(79.23%)
T2	146.42	59 (62.46%)	53.33 (67.66%)	50.66 (70.36%)	46 (72.18%)	(72.18%)
T3	154.00	87.00 (47.47%)	80.66 (53.58%)	68.33 (62.05%)	55.66 (68.05%)	(68.05%)
T4	139.00	40.33 (72.79%)	33.66 (78.5%)	14.33 (91.16%)	8.33 (94.69%)	(94.69%)
T5	139.33	28.66 (80.84%)	22.66 (85.56%)	19.00 (88.31%)	16.33 (89.62%)	(89.62%)
T6	146.26	42.00 (73.25%)	38.66 (76.53%)	35.66 (79.11%)	29.33 (82.24%)	(82.24%)
T7	149.34	160.34	168.22	174.33	168.66	

Population of cabbage aphid against leaf extract of tobacco after second spray

Data in Table-2 showed that pre-treatment count of 51.66, 42.033, 58.24, 50.66, 56.24, and 63.00 aphids / leaf of cabbage were determined for T1, T2, T3, T4, T5, T6, and T7. After second spray; leaf extract of Pattay wala tobacco variety reduced aphid population by (62.33%), (73.72%), (74.17%) and (86.51%) at 24, 48, 96 hours and 1 week post-treatment intervals, respectively. The leaf extract of Beeri wala tobacco variety was found lesser effective than the leaf extract of Pattay wala variety. Due leaf extract of Beeri wala variety, the population of aphid on cabbage leaf was reduced by (40.07%), (46.76%), (67.61%) and (79.59%) during the same post-treatment intervals, respectively. The leaf extract of Desi tobacco variety could not have performed well; however, performed well at 24-hour interval and reduced aphid population by (51.22%) as compared to leaf extracts of Pattay wala and Beeri wala tobacco varieties. After 24 hour, the leaf extract of Beeri wala could not reduce aphid population effectively. It further reduced the aphid population up to 16.36% until 1 week interval. Similarly, to the 1st spray, the performance of the exracts of all tobacco varieties enhanced with detergent and their effectiveness was recorded up to 1 week interval. The treatment of leaf extract of Pattay wala + detergent brought 97.25% reduction in aphid population followed by the treatments beeri wala leaf extract + detergent (88.26%) and desi tobacco leaf extract + detergent (77.64%). Analysis of variance showed significant difference in the effectiveness of treatments. However, LSD showed non- significant difference in the performance of T1 and T2; T5 and T6.

Table 2. Efficacy of various tobacco extracts against cabbage aphid (second spray)

Treatments	Pre-treat	Post-treatment				Maximum Efficacy (%)
		24 hrs	48 hrs	96 hrs	One week	
T1	51.66	26.11 (62.33%)	16.66 (73.72%)	12.66 (74.17%)	08.33 (86.51%)	(86.51%)
T2	42.33	30.33 (40.07%)	27.66 (46.76%)	17.33 (67.61%)	10.33 (79.59%)	(79.59%)
T3	54.24	32.66 (44.21%)	29.66 (55.45%)	26.33 (61.12%)	19.66 69.68%)	(69.68%)
T4	50.66	7.66 (58.55%)	5.00 (74.26%)	3.33 (77.86%)	1.66 (97.25%)	(97.25%)
T5	52.24	15.33 (72.81%)	13.33 (79.21%)	11.66 (82.12%)	7.33 (88.26%)	(88.26%)
T6	41.66	19.66 (56.27%)	18.33 (64.79%)	14 (72.38%)	11.33 (77.64%)	(77.64%)
T7	63.00	68.00	77.33	78.66	75.33	

Crop yield

Based on present findings, average crop yield per acre was calculated and presented in (Figure-1), which indicated that average crop yield (320 kg) was noted for cabbage crop sprayed with T4 followed by T5 (300 kg), T6 (291 kg), T1 (270 kg), T2 (254 kg), T3 (249 kg) and T7 (224 kg), respectively. The highest yield was recorded of the plots treated with leaf extract of Pattay wala tobacco plus detergent and the lowest from untreated plots.

CONCLUSIONS

Based on the results it is concluded that all treatments effectively reduced the aphid population on cabbage plants. Leaf extract of highest yield was achieved in the plots treated with Pattay wala tobacco + detergent followed by Beeri wala tobacco + detergent.

Pattay wala tobacco+detergent brought maximum reduction in aphid population followed Beeri wala tobacco + detergent, Desi tobacco + detergent, Pattay wala tobacco alone during both sprays.

SUGGESTIONS

Based on present findings, it is recommended that leaf extract of tobacco variety Pattay wala tobacco + detergent and Beeri wala tobacco + detergent should be sprayed against cabbage aphid for better yield .

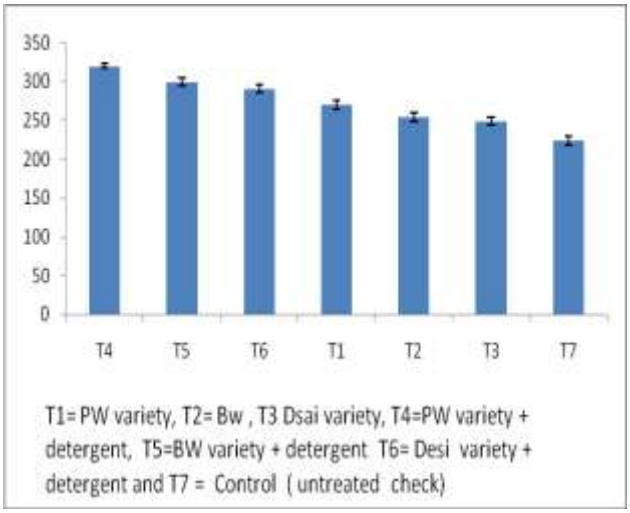

Figure 1. Average yield of cabbage crop per plot.

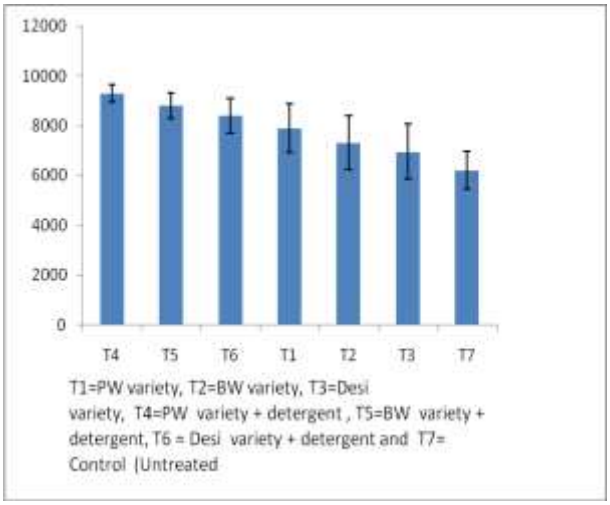

Figure 2. Average yield of cabbage crop per acre

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