Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(1): 299-303

Received: 07-11-2018
Accepted: 09-12-2018

Syed Shahzad Ali
Department of Entomology, Sindh Agriculture University, Tandojam, Pakistan

Syed Suhail Ahmed
Department of Entomology, Sindh Agriculture University, Tandojam, Pakistan

Huma Rizwana
Department of Livestock Management, Sindh Agriculture University, Tandojam, Pakistan

Izhar Ali Jatoi
Department of Entomology, Sindh Agriculture University, Tandojam, Pakistan

Syed Shaharyar Ali
Department of Entomology, Sindh Agriculture University, Tandojam, Pakistan

Correspondence
Syed Shahzad Ali
Department of Entomology, Sindh Agriculture University, Tandojam, Pakistan

Effect of plant extract and synthetic insecticides against insect pests of cabbage crop

Syed Shahzad Ali, Syed Suhail Ahmed, Huma Rizwana, Izhar Ali Jatoi and Syed Shaharyar Ali

Abstract
A field study was carried out during 2015 at Mohammad Bukhsh Dahar Farm, Bakrani District Larkana, to examine the effect of plant extract and synthetic insecticides against insect pests of cabbage crop. Four treatments with three replications were applied. The treatments were: T1=Chemical control Confidor20% SL (Imidacloprid), T2= Neem, T3= Tobacco, T4= Untreated (Control). Two insect pests were found infesting cabbage including white flies and thrips. Pretreatment- and post-treatment observations were recorded.

The results revealed that against thrips, the first spray of chemical control (Confidor) showed highest reduction percent (84.62%) followed by Neem (76.62%), Tobacco (74.76%), and lowest for untreated control (6.14%); while in the second spray, chemical control (Confidor) showed highest effect against thrips (87.33%); followed by Neem (79.96%), Tobacco (78.32%) and least by untreated plot (2.61%). Against Whitefly, similar pattern found in chemical control (Confidor) which showed highest effect (78.68%), followed by Neem (62.01%), Tobacco (55.35%) and untreated control (8.27%). After second spray, chemical control (Confidor) showed highest reduction percent (85.19%) followed by Neem (71.12%), Tobacco (63.96%) and the lowest was resulted by untreated control (4.46%). Chemical control (Confidor) showed its superiority in effect to combat sucking insect pests studied in cabbage, followed by Neem, Tobacco and untreated control remained the least.

Keywords: Plant extract, synthetic insecticides, cabbage, thrips, whitefly

Introduction

Cabbage, *Brassica oleracea* L. hybrid variety (shehzadi) is a cole crop belongs to the *Cruciferae* family. Cabbage is the most important vegetable crops in the world. It contains most of the minerals and vitamins necessary for human diet. In Pakistan cabbage is cultivated on an area of about 11.350 thousand hectares with annual production of 206.385 thousand tones, however in the province of Sindh in grown 1.65 thousand hectares with the production of 11.385 thousand tones [1]. To control these insect pests, most of the growers relied only on the use of insecticides and they apply on the schedules or calendar spraying without any considerations whether the pests are present in the field or damage occurs or not. Such practices can create the following problems: (1) selection of resistance in population, (2) destruction of beneficial species, (3) resurgence of treated populations, (4) outbreak of secondary pests, (5) residues in foods and environment and (6) hazard to human and environment. Sole reliance on insecticides has created problems for controlling insect and maintaining environment. Thus intensified search for alternative strategies of pest control is necessary. Among the strategies available, botanical insecticide is one of the promising tactic to control the vegetable pests. Cabbage is the attacked by as many as 24 insect pest species which cause serious economic loss to the crop [2]. Among the different insect pests, sucking insect pests are the devastators, aphid, *aphis gossypii*, jassid, *amrasca deveatan*, whitefly, *bemisia tabacai* and thrip, *thrips tabaci*, diamond back moth and cut worms are the serious pests including of cabbage in the local condition. These insect pests damaged the crop resulting poor growth of plant and loss of yield (Luckmann and Metcalf, 1994). Due to hazards of pesticides recently neem bio pesticides is use for pest control in crops [3]. Neem tree (*Azadirachtan indica A. Juss*) has been a subject of great interest for scientists, all over the world and a large number of research articles had been published that prove the antifeedent, repellent, IRG, toxic effects of neem formation, isolated functions, crude extracts and kernel powder. The most important active ingredient of most neem based bio-pesticides is

azadirachtin (AZA), a liminoid mix with excellent insecticidal activity against many pytophagous pests. *Azadirachtin* has numerous effects on insect pests, including IRG, feeding deterrence and reproduction inhibition. Equally neem seed extract has minimal toxicity to non-target organisms such as parasitoids, predators and pollinators and degrades rapidly in the environment [4].

The pesticides have also become a threat to the environment, the human health and the ecosystem. The indiscrimination use of chemical poisons (pesticides) has destroyed the natural ecosystem and the natural balance ratio of pests and its natural enemies has been disturbed. The pesticides do not kill the pests alone but also destroy the predator; parasites, animals, birds, and some time human being get seriously affected while using the spray material. The pesticides are the only readily available source for destroying pest population in many developing countries like Pakistan [5].

In the present study, neem and tobacco will be tested against cabbage pests which will not destroy natural enemies and is safe to environment. The products will be compared with Confidor 20% SL (Imidacloprid) pesticide for comparison. The proposed IPM strategy will be useful information for the management of cabbage pests.

Materials and Methods

Effect of tobacco, neem and synthetic pesticide examined against Cabbage insect pests under field conditions during the year 2015 at Mohammad Bukhsh Dahar Farm, Bakrani, District Larkana. There were three replicated Randomized Complete Block Design (RCBD) in a sub-plot size of 3m x 3 ($9m^2$). The seed of Cabbage, *Brassica oleracea* L hybrid variety (Shahzadi) was used throughout the experiment. The recommended distance from row to row and plant to plant is 60 cm and 15 cm was maintained.

The extracts of the following (Bio-pesticide) botanicals plants were used to examine their effect against cabbage insect pests. The treatments were as under:

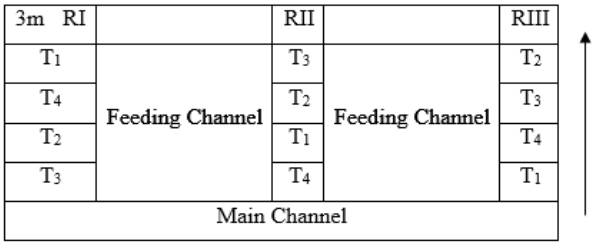
T1 Chemical control (Confidor20% SL (Imidacloprid))
T2 Tobacco
T3 Neem
T4 Control (untreated)

For preparation of plant extract, 05 kgs leaves, each of Neem and Tobacco were collected and processed for getting the extract. The leaves of each plant species were taken separately and boiled with 10 liters water and filtered through muslin cloth. After preparing the extracts, the cabbage crop was sprayed with a knapsack hand sprayer. Pre-treatment was observed from 20 plants randomly selected from each treatment before spray. Post-treatment observations were recorded after 3 and 5 days after spray. Treatment was repeated after interval of 15 days. The pest population was also recorded from pesticide Confidor20% SL (Imidacloprid) treated crop. The reduction percentage by all treatments was calculated.

The collected data was subjected to analysis by using analysis of variance for knowing the significance of difference in the population of different insect pests and infestation at different intervals after treatment, and LSD (Least Significance Difference) test was applied to evaluate different treatments for their efficacies against insect pests. At the end, the data will be analyzed through statistical package (Statistix 8.1).

Layout Plan of the Experiment

Layout: Randomized Complete Block Design
Replications: Three
Plot Size: 3m x 3m ($9m^2$).
Treatments 04
T1=Chemical control Confidor20% SL (Imidacloprid)
T2= Neem
T3= Tobacco
T4=Control (untreated)



Results

The experiments were conducted during 2015 at the experimental area of Mohammad Bukhsh Dahar Farm, Bakrani, District Larkana.to examine the effect of tobacco, neem and synthetic pesticide against cabbage insect pests under field conditions. Four treatments were formed including a control such as: T1=Chemical control Confidor20% SL (Imidacloprid), T2= Tobacco, T3=Neem and T4=Control (untreated). We monitor three insect pests in cabbage that is whitefly, thrips, and diamond back moth. The data were observed on these insect pests after treatment and pre-treatment insect count were also recorded.

Thrips

First spray

The (Table-1) showed that statistically, differences in thrips population on cabbage plantation were non-significant for pre-treatment ($F=0.02$; $DF=14$; $P>0.05$) and 3 days after first spray ($F=2.02$; $DF=14$; $P>0.05$); while thrips population decreased significantly after 5 days of first spray ($F=2.92$; $DF=14$; $P<0.05$). The effect of bio-pesticides (Table-1) showed that in cabbage plantation sprayed with chemical (Confidor20% SL (Imidacloprid)), the thrips population was reduced from 14.11/leaf to 1.23/leaf after 5 days of spray indicating the highest efficacy of 84.62%; while the crop sprayed with neem was ranked 2nd, where pre-treatment thrips population was 13.73/leaf decreased to 2.22/leaf after 5 days of spray showing efficacy of 76.62 percent. The crop sprayed with synthetic pesticide (Tobacco) was ranked 3rd, where pre-treatment thrips population was 13.87/leaf decreased to 2.49/leaf 5 days of spray showing efficacy of 74.76 percent. Similarly, the untreated (Control) was ranked 4th, where pre-treatment thrips population was14.48/leaf decreased to 12.98/leaf after 5days of spray with lowest efficacy of 6.14 percent. According to the efficacy the treatments ranking were chemical control, neem, tobacco and untreated.

2nd spray

The figures (Table-2) examined that the thrips inhabitants after second spray of chemical control was reduced from 11.69/leaf to 0.85/leaf after 5 days of spray showing the highest efficacy of 87.33 percent; and the crop sprayed with neem was ranked 2nd, where the thrips population decreased

from 12.93/leaf to 1.97/leaf after 5 days of spray showing efficacy of 79.96%. The synthetic pesticide (Tobacco) was ranked 3rd, where the thrips population decreased from 13.01/leaf to 2.23/leaf after 5 days of spray, showing efficacy of 78.32%. Similarly, untreated (Control) was ranked 4th, where thrips population decreased from 13.39/leaf to 12.89/leaf after 5 days of spray showing lowest efficacy of 2.61%. According to the efficacy, the treatments were ranked as: chemical control, neem, tobacco and untreated (control).

Population of thrips on cabbage after second spray of bio-pesticides showed non-significant variation for pre-treatment ($F=0.44$; DF=14; $P>0.05$) while the thrips population declined significantly when monitored 3 days after the spray ($F=9.69$; DF=14; $P<0.05$) and 5 days after spray ($F=12.81$; DF=14; $P<0.05$).

Whitefly

First spray

Whiteflies population on cabbage in response to application of bio-pesticides showed non-significant variation for pre-treatment insect count ($F=0.35$; DF=14; $P>0.05$); while the whiteflies population declined significantly when observed after 3 days spray ($F=59.32$; DF=14; $P<0.05$), 5 days after spray ($F=60.30$; DF=14; $P<0.05$);

The data (Table-3) revealed that on the basis of effectiveness against the target insect, the chemical control was ranked 1st reducing whiteflies population from 4.41/leaf to 0.57/leaf after 5th days of spray showing the highest efficacy of 78.68%; and the crop sprayed with neem was ranked 2nd, where the whiteflies population decreased from 4.37/leaf to 1.09/leaf after 5 days of spray showing efficacy of 62.01%. Similarly, synthetic pesticide (Tobacco) was ranked 3rd by effectiveness against whiteflies decreasing its population from 4.39/leaf to 1.23/leaf showing efficacy of 55.35 percent. Untreated was ranked 4th, decreasing whiteflies population from 4.47/leaf to 4.00/leaf after 5 day of spray showing lowest efficacy of 8.27 percent. According to the effectiveness the treatments ranked as chemical control, neem, tobacco and untreated.

Second spray

The results indicated that whiteflies population on cabbage in response to application of second spray of bio-pesticides showed non-significant variation for pre-treatment insect count ($F=1.40$; DF=14; $P>0.05$); while the whiteflies population declined significantly when observed after 3 days after spray ($F=28.47$; DF=14; $P<0.05$), and 5 days after spray ($F=35.14$; DF=14; $P<0.05$).

The results (Table-4) further examined that on the basis of effect against whiteflies after second spray, the chemical control was ranked 1st reducing whitefly population from 3.04/leaf to 0.31/leaf after 5th days of spray showing the highest efficacy of 85.19 percent and the crop sprayed with neem was ranked 2nd, decreasing whiteflies population from 3.29/leaf to 0.79/leaf after 5 days of spray showing efficacy of 71.12 percent. Similarly, synthetic pesticide (Tobacco) was ranked 3rd by effectiveness against whiteflies decreasing its population from 3.33/leaf to 0.91/leaf showing efficacy of 63.96%; while the untreated was ranked 4th, decreasing whiteflies population from 3.81/leaf to 3.60/leaf after 5th days of spray showing efficacy of 4.46 percent. According to the efficacy of bio-pesticides against whiteflies after second spray, the treatments ranked as: chemical control, neem, tobacco and untreated.

Discussion

Many of the remarkable researches have pave the way to understand that safe and long lasting solution of the insect pests problem is associated with the use of natural substances for their control, because the nature has a balanced ecosystem that keeps the population of all the biological organisms within the specific limits being useful or harmful for other organisms on earth.. This study entitles the result of tobacco, neem and synthetic insecticide against insect pests of cabbage under field conditions. The products will be compared with (Confidor20% SL (Imidacloprid)) pesticide for comparison. The proposed IPM strategy will be useful information for the management of cabbage insect pests.

Our research revealed that the 1st spray of chemical control exhibited maximum effectiveness (84.62%), against thrips followed by neem (76.62%), tobacco (74.76%) and lowest for untreated (6.14%). While second spray of, chemical control showed highest efficacy against thrips (87.33%); followed by neem (79.96%), tobacco (78.32%), and least by untreated (2.61%). Against whiteflies, chemical control indicated maximum efficacy (78.68%) as observed after 1st spray, followed by neem (62.01%), tobacco (55.35%) and least efficacy for untreated (8.27%); while after second spray also, chemical control showed high efficacy (85.19%), followed by neem (71.12%), tobacco (63.96%) and the lowest efficacy was resulted by untreated (4.46%). According to the overall efficacy of bio-pesticides against thrips and whiteflies the chemical control, neem, tobacco and the least was found in untreated plot. Our results are validating [6] who reported that botanical pesticide neem has efficacy of 50% mortality of aphid's population. Furthermore our study is consistent with [7] who determined the efficacy of the botanical insecticide botanical pesticides provided the highest control of the sucking pests and bollworms [8]. Found that neem based bio-pesticides control the sucking complex population in cotton; while [9] examined that neem seed extract have good effect on minimizing population of Jassid, whitefly, aphid and thrips on cotton. Moreover [10], used neem, Dhatura, Sufaida and cow urine for the control of cotton insect pests; and [11] sprayed bio-pesticides and found good control of sucking complex by neem based pesticides [12]. Revealed that treatment of neem formulation with azadirachtin at fifteen days interval for controlling the population of jassid. Similarly [13], reported that extracts of *Azadirachta indica* (Neem), and *Allium sativum* (garlic) at the concentration of 0.015% were effective to control insect pests. Similarly [14], examined Chemical control, Neem, Garlic and Tobacco extract and good control was observed in extract of tobacco is (98.60%) mortality of mealy bug and also good control on others insect pests [15]. stated that safflower aphid, *Uroleucon compositae* (Theobald) is a major pest which causes 30 to 80 per cent yield loss based upon the weather conditions and for its effective control integrated management practices have been suggested including use of bio-pesticides [16]. Reported that plant extracts significantly reduced pest population ($P< 0.05$) in both experiments. Dimethoate reduced aphid by 96% while amitraz reduced red spider mite by 72% [17]. Suggested implementation of integrated pest and disease management programme in irrigated cauliflower crop led to reduction in number of conventional pesticide sprays by 50-60% [18]. Advised the use and efficacy of *A. indica* based pesticides against different pests of both crop fields as well as stored grains of India [19]. Found that the bio-pesticides showed better insect pest control than the synthetic pesticides on safflower.

Respectively [20]. Reported that the mixture of neem and wild garlic was most usefull in reducing population densities of whitefly and aphid than either plant extract applied alone. In conclusion, results of this study suggested a synergistic effect of fermented plant extracts of neem and wild garlic as a bio-pesticide [19]. Suggested combination of bio-pesticides and synthetic pesticides application against whiteflies, thrips, jassids and other common insect pests of cabbage.

Table 1: Effect of various bio-pesticides against thrips infestation on cabbage as compared to chemical control (Confidor20% SL (Imidacloprid) at different intervals after first spray

Plant extracts	Pre-treat.	Pest population/plant after:		Pest Reduction /plant	Efficacy%
		3 days	5days		
Chemical control	14.11	3.11	1.23	11.94	84.62
Neem	13.73	4.20	2.22	10.52	76.62
Tobacco	13.87	4.51	2.49	10.37	74.76
Untreated	14.48	14.21	12.98	0.89	6.14
S.E.±	0.2148	0.1842	0.1902		
LSD 0.05	0.4423	0.4013	0.4144		

Table 2: Effect of various bio-pesticides against thrips infestation on cabbage as compared chemical control (Confidor20% SL (Imidacloprid) at different intervals after second spray.

Plant extracts	Pre-treat.	Pest population/plant after:		Pest Reduction /plant	Efficacy%
		3 days	5days		
Chemical control	11.69	2.11	0.85	10.21	87.33
Neem	12.93	3.21	1.97	10.34	79.96
Tobacco	13.01	3.41	2.23	10.19	78.32
Untreated	13.39	13.19	12.89	0.35	2.61
S.E.±	1.0981	0.5812	0.5438		
LSD 0.05	2.3825	1.2663	1.1848		
LSD 0.01	3.3541	1.7753	1.6610		

Table 3: Effect of various bio-pesticides against whiteflies infestation on cabbage as compared to Chemical control (Confidor20% SL (Imidacloprid)) at different intervals after first spray.

Plant extracts	Pre-treat.	Pest population/plant after:		Pest Reduction /plant	Efficacy%
		3 days	5days		
Chemical control	4.41	1.31	0.57	3.47	78.68
Neem	4.37	2.23	1.09	2.71	62.01
Tobacco	4.39	2.69	1.23	2.43	55.35
Untreated	4.47	4.21	4.00	0.37	8.27
S.E.±	0.3989	0.1842	0.1902		
LSD 0.05	0.8691	0.4013	0.4144		
LSD 0.01	1.2185	0.5626	0.5810		

Table 4: Effect of various bio-pesticides against whiteflies infestation on cabbage as compared to chemical control (Confidor20% SL (Imidacloprid)) at different intervals after second spray

Plant extracts	Pre-treat.	Pest population/plant after:		Pest Reduction /plant	Efficacy%
		3 days	5days		
Chemical control	3.04	0.58	0.31	2.59	85.19
Neem	3.29	1.10	0.79	2.34	71.12
Tobacco	3.33	1.49	0.91	2.13	63.96
Untreated	3.81	3.68	3.60	0.17	04.46
S.E.±	0.3297	0.1648	0.1550		
LSD 0.05	0.7183	0.3591	0.3377		
LSD 0.01	1.0071	0.5035	0.4735		

Conclusion

1. The bio-pesticides were highly effective to control thrips and whiteflies on cabbage.
2. Neem and tobacco showed significantly higher effect against the target insect pests when compared with control.
3. By overall efficacy of bio-pesticides against thrips and whiteflies after first and second spray, the treatments ranked as: chemical control, neem, tobacco and untreated.

Reference

1. Anonymous. Federal bureau of statistics, government of Pakistan Islamabad. 2014, 1-2.
2. Devjan P, Singh TK. Insect pest and natural enemies complex of cauliflower in the agro-ecosystem of Manipur. Indian journal of Entomology. 2002; 64(3):275-278.
3. Isman MB, Koul O, Luczynski A, Kaminski J. Insecticide and antifeedant bioactivities of neem oils and their relationship to azadirochtin content. J. Agri. Food Chem. 1990; 38:106-1411.
4. Mardue AJ, Blackwell. Azadirachin, an update. J. Insect Phys. 1993; 39:903-924.
5. Lohar MK. General Entomology (Ist Edition). Department Entomology Sindh Agriculture Universities Tando Jam, 2001.

6. Lowery DT, Isman MB. Effect of Neem and azadrachtin on aphids and their natural enemies. ACS Symposium Series 557. American Chemical Society, Washington DC, USA. 1994; 7:78-91
7. Bindu P, Bharpoda TM, Patel JJ, PAtel JR. Ovicidal effect of botanical and synthetic insecticides on bollworms. Indian Journal of Entomolgy. 2003; 65(2):112-138.
8. Hassan M, Ahmad F, Ali Aand Ahmad M. Some studies on the effect of synthetic growth regulators and neem plant materials against sucking insect pests of cotton. Pakistan Entomologist. 2006; 11(3):75-79.
9. Khattak MK, Rashid M, Hussain SAS, Islam T. Comparative effect of neem (*Azadirachta indica*) oil, neem seed water extract and Baythroid against whitefly, Jassids and Thrips on cotton. Pak. Entomol. 2006; 28(1):31-37.
10. Dutt U. Mealy Bug Infestation In Punjab: Bt. Cotton Falls Flat. Kheti Virasat Mission. Jaitu, Faridkot district based environmental NGO in Punjab, 2007.
11. Khaskheli MA. Mealy bug: An emerging threat to cotton crop Model Farming, Pakissan.com, 2007, 1-5.
12. Yadav JB, Singh RS, Tripathi RA. Evaluation of Bio-pesticides against pest complex of Okra. Annals of Plant Protection Sciences. 2008; 16(1):492-498.
13. Rukhsana A, Mughal SM, Munir M, Sultana K, Qureshi R, Arshad M *et al*. Mycoflora associated with seeds of different sunflower cultivars and its management. Pak. J. Bot. 2010; 42(1):435-445.
14. Arain MI. Effect of Botanical pesticides against mealy bug on cotton. M.Sc. Thesis submitted to Sindh Agriculture University Tandojam, 2009.
15. Hanumantharaya L, Balikai RA, Mallapur CP, Venkateshalu, Kumar CJ. Integrated Pest Management Strategies against safflower aphid, *Uroleucon compositae* (Theobald). 7th International Safflower Conference, Wagga Wagga, Australia, 2009.
16. Muzemu T, Khanapara AV, Kapadia MN. Efficacy of Bio-pesticides alone and in Combination with Insecticides against *Helicoverpa armigera* on Pigeonpea. Research J. Agricul Sci. 2011; 2(2):340-343.
17. Ahuja DB, Srinivas P, Singh RV, Malik M. Development of Farmer-led Integrated Management of Major Pests of Cauliflower Cultivated in Rainy Season in India. J Agricul. Sci. 2012; 4(2):87-91.
18. Debashri M, Tamal M. A Review on efficacy of *Azadirachta indica* A. Juss based biopesticides: An Indian perspective. Research J. of Recent Sci. 2012; (3):94-99.
19. Gupta T, Tharpoda TM, Patel JR, Patel JJ. Evaluation of various schedules based on botanical and synthetic insecticides in cabbage ecology. Indian J. Entomology. 2013; 65(3):344-346.
20. Nzanza B, Mashela PW. Control of whiteflies and aphids in tomato (*Solanum lycopersicum* L.) by fermented plant extracts of neem leaf and wild garlic. African J. Biotech. 2012; 3(1, 2):45-53.