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Research Article

Comparative Efficacy of Synthetic Pesticides with Botanical Extracts Under Field Condition on Cabbage White Butterfly (*Pieris brassicae* Linnaeus) (Lepidoptera: Pieridae)

Aneela Kanwal[1], Mehboob Ahmad[2], Isma Khurshid[1], Shatab Khan[2], Imran Ullah[2], Farkhanda Khan[2], Shoaib Ullah Bashir[2], Muhammad Shahid[3], MahRukh[4]

[1]*Hazara Agricultural Research Station, Abbottabad, Pakistan.*
[2]*Agricultural Research Institute, D.I.Khan, Pakistan.*
[3]*Agricultural research Station,Chitral, Pakistan.*
[4]*Baacha Khan University,Charsadda, Pakistan.*
**Correspondent author: mehboobalhazarwi@gmail.com*

ABSTRACT

Cabbage white butterfly, Pieris brassicae (L., 1758) (Lepidoptera: Pieridae), is one of the important insect pest of cabbage crop which causes remarkable quantitative or qualitative crop losses. The effect of different new chemical insecticides and one botanical oil, neem seed oil (Azadirachta indica A. Juss.) on the population density of P. brassicae was studied at Hazara Agricultural research station, Abbottabad (Pakistan). The study showed that neem oil had a significant effect on population of P. brassicae in comparison to control treatment. So, neem oil alone or in combination with insecticides could be used for control of P. brassicae in vegetable crops for a safer food supply.

Keywords: Botanical extracts, white fly, efficacy

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1. INTRODUCTION

Cabbage is one of the most nutritious leafy vegetable and is an excellent source of vitamin C and vitamin K. A 100 g edible portion of cabbage contains 1.8 g protein, 0.1g fat, 4.6 g carbohydrate, 0.6 g mineral, 29 mg Ca, 0.8 mg Fe and 14.1 mg sodium (Ojetayo et al.2011). In Khyber Pakhtunkhwa production of cabbage was 4210 tons in year 2017-18.

The cabbage white butterfly (*Pieris brassicae* (*Linnaeus) (Lepidoptera: Pieridae*), is a serious pest of cauliflower and cabbage in our region (Shankar et al., 2016) as well as world (Hasan, 2008). A single larva can consume about 74 to 80 cm2 leaf area (Younas et al., 2004). In cruciferous vegetables, this pest alone causes 40 percent yield loss annually (Hasan and Ansari, 2010). As a result of feeding, the plants either fail to form compact cabbage heads or produce deformed heads (Uddin et al., 2007).

The problems caused by synthetic pesticides and their residues have increased the need for effective biodegradable pesticides with greater selectivity.

Alternative strategies have included the search for new types of pesticides which are often effective against a limited number of specific target species, are biodegradable into nontoxic products and are suitable for use in integrated pest management programs. The natural plant products derived from plants effectively meet this criterion and have enormous potential to influence modern agrochemical research. When extracted from plants, these chemicals are referred to as botanicals. The use of botanical pesticides is now emerging as one of the prime means to protect crops and their products and the environment from pesticide pollution. Botanicals degrade more rapidly than most chemical pesticides, and are, therefore, considered relatively environment friendly and less likely to kill beneficial pests than synthetic pesticides with longer environmental retention. Most of the botanical pesticides generally degrade within few days and sometimes within a few hours, (Guleria and Tiku, 2009).

Plants such as neem, *Azadirachta indica* A. Juss, chinaberry, *Melia azedarach* L., and *Warburgia* spp., have been known for insect repellent and anti-feedant properties in addition to other plants possessing insecticidal and growth regulating properties. Saxena, R. (1987). Botanical insecticides affect only target insects, do not destroy beneficial natural enemies and provide residue-free food and safe environment. Therefore present research has been proposed on use of botanical insecticides as an integrated insect management program which can greatly reduce the use of synthetic pesticide.

2. MATERIALS AND METHODS

The experiment was conducted at Hazara Agriculture Research Station Abbottabad during March-July 2019 and cabbage seed variety green light was sown in January and nursery was transplanted on 20th March in the field in randomized complete block design with 3 replications. Each treatment was replicated three times in a subplot size of 3x2 m. Row to row distance was kept 75 cm, while plant to plant distance was 45 cm. There were 4 rows in each plot and each row had 10 plants.

Two insecticidal formulations including control were tested (Table-1). Standard agronomic practices were carried out as per recommendations. Observations on population dynamics of insect pests started as soon as their infestation was noticed. Population density was determined on randomly selected plants at weekly interval.

Observations on the *P. brassicae* population from the selected plants were recorded before spray and after 1, 3 7 days after spray. The population density of the insect was recorded on three randomly selected plants on the basis of number of larvae per plant. All open leaves and heads of the selected plants were observed thoroughly and the number of larvae found were recorded. Data obtained were analyzed statistically and the efficacy of the insecticides and botanical oils were worked out.

3. RESULTS AND DISCUSSION

3.1 Seasonal Incidence of *P. brassicae* larvae on cabbage.

It was observed that the larvae first appeared on cabbage in the 3rd week of April, and the population peaked during the 3rd week of May, 2019 and remained active up to June. In the present investigation, the number of larvae per plant ranged from 0.66-7.53. (Table # 2). It was found that 3rd and 4th week after transplantation is sensitive to attack of cabbage butterfly so suitable control measures should be done onstage.

3.2 Population dynamics of cabbage butterfly on green light variety under different treatments

Population dynamics of the cabbage butterfly on green light variety under different treatments were recorded. Efficacy

of insecticides revealed that all the treatments at 1, 3, 7 days after spray were superior to control (Table-2). There was no significant difference between the treatments one day before spray.

The observations recorded on 1st day after spray revealed that all the treatments proved significantly superior over control. Neem seed oil T2 was found to be most effective by (1.5 larvae/ plant), followed by nova star i.e bifenthrin (2.83 larvae /plant) whereas T3 was found to be least effective (Table-2).

The relative efficacy of insecticides against the cabbage white butterfly *(P. brassicae)* showed that Neem oil had higher efficacy against *P. brassicae* in reducing pest population. Mean population of *P. brassicae* after two sprays revealed that Neem oil was effective and superior. The bifenthrin was found to be ineffective.

3.3 YIELD

The highest yield (42 kg /plot) was noted in T2 and lowest yield was noted in T4 (19.5kg/plot) as presented in table 3.

Table: 1. Details of products used in the experiment

Treatment	Trade name	Active ingredient	Recommended dose
T1(synthetic pesticide)	Nova Star	Bifinthrin and abamectine	2.5ml/liter of water
T3(synthetic pesticide)	Range star	Lambda cahaloyhrine	2.5ml/liter of water
T2(botanical oil)	Neem oil Purchased from local market		2ml/liter of water

Table.2: Mean number of larvae per plant under different treatments

Treatments	Pre spray data	1day after spray	3nd day after spray	7th day after spray	Means
T1(Bifinthrine+abamectine) (novastar)	3.5	2.83de	3.167d	2e	2.66B
T2 Neem oil	3.6	1.5e	2.50de	0.667f	1.55A
T3 (lambda cyhalothrine) (range star)	3.5	3.1667d	3.667d	1.667e	2.7B
T4(control)	3.7	4.1667c	5.83b	7.500a	5.833C
Lsd value	N.S	3.700A	2.958B	2.916B	

After 3 days of application all the treatments proved significantly superior over control. Neem oil (2.50 larvae/ plant) was found to be most effective treatment while T3 was found to be least effective having 3.667 larvae per plant.

7th day after spray revealed that all the treatments proved significantly superior over control. While neem oil (0.6 larvae/ plant) was found to be most effective treatment in reducing the larval population followed by range star and nova star showing 2 and 1.07 larvae per plant.

Our results matched with the findings of Singh et al. (1987) who observed the repellent effect of neem (*Azadirachta indica*) against 2nd and 3rd instar larvae of *Pieri sbrassicae* on cabbage. All concentrations of seed kernel suspension and oil emulsion and 2% leaf water extract had a significant anti-feedant effect, reducing the mean leaf area consumed by 40-50%.

Thakur and Parmar (2000) conducted field trials in Himachal Pradesh and evaluated 8 different pyrithriod insecticides in which cypermethrin, decamethrin and

Table-3: Yield parameter as per treatment

S. No.	Techniques	Yield (kg/plot)
1	(T1) Novastar.	26.5B
2	(T2) Neem oil	42A
3	(T3) Range star.	27B
4	(T4) control	19.5C

fenvalerate gave complete protection to Brassica crop against *Pieris brassicae*. His study showed same result as our work explained that lambda cahylothrin (synthetic

pyrithriod) shows effectiveness to control cabbage butterfly larvae.

Grisakova et al. (2006) studied the effects of Neem EC (1% azadirachtin) on the cabbage white butterfly which is major pest of cruciferous plants and found that neem extract also induced high mortality by causing lethal failures of larval-larval and larval-pupal ecdysis, which were typical for insecticides possessing morphogenetic activity commonly referred to as IGR activity. His findings matches to finding of our experiment and revealed that Neem EC had toxic and antifeedant/deterrent effects but also acted as a growth regulator for *P.brassicae* larvae.

4. CONCLUSIONS

Useful insecticidal and repellent properties of neem oil extracts have been shown in the study, which indicates it can be used to suppress the cabbage white butterfly caterpillars in food crops. In addition, insecticide-botanical combinations can provide cost effective solutions for crop problems and can be used as an important part of integrated pest management strategies. However, achieving more acute interactions, the synergistic mechanism between insecticides and the botanicals should be the focus in future research.

5. REFRENCES

Grisakova, M., L. Metspalu, K. Jogar, K. Hiiesaar, A. Kuusik, P. Poldma. 2006. Effect of biopesticide neem EC on the Large White butterfly, Pierisbrassicae (L.) (Lepidoptera: Pieridae). Agronomy Research. 4:181-186.

Guleria, S. and A.K Tiku. 2009. Integrated Pest Management: Innovation-Development Process .Botanicals in Pest Management: Current Status and Future Perspectives. pp. 317-329.

Hasan, F. and M.S. Ansari, 2010. Effect of different cole crops on the biological parameters of Pierisbrassicae (L.) (Lepidoptera: Pieridae) under laboratory conditions. J. Crop Sci. Biotech. 13: 195-202.

Hasan, W., A.K. Gupta and C.P. Singh. 2008. Biology of cabbage butterfly, Pierisbrassicae (L.) (Lepidoptera: Pieridae) on cabbage and Indian mustard. J. Oilseeds Res. 25: 104-5.

Ojetayo, A.E., J.O. Olaniyi, W.B. Akanbi and T.I. Olabiyi. 2011. Effect of fertilizer types on nutritional quality of two cabbage varieties before and after storage. J. Appl. Biosci. 48: 3322– 3330.

Saxena, R., 1987. Antifeedants in tropical pest management. International Journal of Tropical Insect Science. 8:731-736.

Shankar, U., D. Kumar. S.K. Singh and S. Gupta, 2016. Pest complex of Cole crops and their management. Technical Bulletin No. 1, SKUAST-Jammu, p.14.

Singh, K., P.L., Sharma and K. Singh 1987. Evaluation of antifeedant and repellent qualities of various neem (Azadirachtaindica) formulations against Pierisbrassicae L. larvae on cabbage and cauliflower. Research and Development Reporter, Regional

Hort. Res. Sta. Udheywalla, Jammu, India. 4:76-78.

Uddin, M.N., M.M. Hoque, S.N. Alam, A.K.M.S.R. Mollik, A.K.M. Khorsheduzzaman, S. Alam, M.M. Rahman, A.N.M.R. Karim, E.G. Rajotte and G.C. Luther. 2007. IPM approach for controlling two lepidopteran pests of cabbage in Bangladesh. Bangladesh J. Entomol., 17: 19-29.

Younas, M., M. Naeem, A. Raqib and S. Masud. 2004. Population dynamics of cabbage butterfly (Pierisbrassicae) and cabbage aphids (Brevicorynebrassicae) on five cultivars of cauliflower at Peshawar. Asian J. Plant Sci. 3: 391-393.