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EFFICACY OF NEEM BASED BIOPESTICIDES AND CHEMICAL INSECTICIDE AGAINST *SPODOPTERA LITURA* ON CAULIFLOWER UNDER FIELD CONDITION IN GURUGRAM DISTRICT OF HARYANA

Bharat Singh*, Neetu Singh[1] and Satyandra Singh[2]

[*]Amity Institute of Organic Farming, Amity University, Sec-125, Noida, 201303 (U.P) 201303.
[1]Amity Centre for Biocontrol and Plant Disease Management Sec-125, Noida, 201303 (U.P) 201303.
[2]National Centre for Integrated Pest Management, IARI, Pusa, New Delhi, 110012.

Abstract

The field experiment during 2017-18 in *rabi* season was conducted to study the efficacy of neem biopesticides/ products *viz.* neem oil, Neem seed kernel extract, Neem leaf extract and one synthetic pesticide Quinalphos 25% EC @2ml/L, for management of larval population of *S.litura* (Fab.) at Khanpur village of Pataudi Block in district Gurugram which is second major pest of Cauliflower after diamond back moth. The results showed that chemical pesticide Quinalphos 25% EC showed maximum efficacy in terms of larval population reduction (62.37% and 63.90%) against *S. litura.* followed by neem oil (58.26% and 57.89%), neem seed kernel extract (54.83% and 55.24%), neem leaf extract (50.70% and 51.42%) and lowest for untreated (14.60% and 12.50%) in first and second spray respectively. Among the neem biopesticides, neem oil showed maximum reduction in larval population of *S. litura* under field condition. Neem seed kernel and leaf extract showed results at par. As cauliflower is commonly used as fresh vegetable, it is advisable in case of chemical pesticide Quinalphos 25% EC at least one month early before picking the cauliflower for avoiding the residual toxicity. Out of neem based biopesticides, neem oil is recommended as an alternative to chemical pesticides particularly for low population of *S.litura* under field condition.

Key words: *Spodoptera litura,* Quinalphos 25% EC, neem oil, neem seed kernel

Introduction

Cauliflower (*Brassica oleracea* var. *Botrytias* L.) being a crucifer member contains most of the minerals and vitamins essential for human diet. It has been reported to have 70mg of vitamin A and 75mg vitamin C per 100g of sample and is peculiar in stability of vitamin C after cooking (Singh, 1997). Cauliflower contains proteins and minerals such as potassium, sodium, iron, phosphorous, calcium and magnesium (Chaudhary, 1996). Cauliflower is low in fat, high in dietary fiber and water content. It also has anticancer value (Zhang *et al.,* 1992). Cauliflower contains glucosinolates which detoxify carcinogenic compounds. High intake of cauliflower has been found to reduce risk of cancer in human.

Besides the nutritional value, Cauliflower are subject to attacked by number of insect pests, the tobacco caterpillar (*Spodoptera litura* Fab.), diamond back moth (*Plutella xylostella* L.), cabbage butter fly (*Pieris brassicae* L.), cabbage leaf webber (*Crocidolomia binotalis* Zell.), cabbage semi lopper (*Trichoplusia ni* Hubner), painted bug (*Bagrada hallaris* burmeister and *Bagrada cruciferarum* Kirk.), mustard saw fly (*Athalia lugens proxima* Klug.), flea beetle (*Phyllotreta cruciferae Goeze*), aphids (*Lipaphis erysimi* Kalt. and *Brevicoryne brassicae* L.) (Ayyar, 1963; Lal, 1964; Chaudhary *et al*., 2001, Rao and Lal, 2005). Among all these, *Spodoptera litura* (F.) (Lepidoptera: Noctuidae) have been encountered in cauliflower crop in block Pataudi of Gurugram district and area was heavily infested during early and late winter season during 2017-2018. The pest cause damage to an extent of 80-100 % percent in the nurseries under favorable conditions (Chari *et al.,* 1994) and 10-25 percent in field crops (Rao and Sitaramaiah, 2001). Out of ignorance, the farmers are using banned chemical pesticides/without level claim *viz.* Phorate, Diamethoate, Cypermethrin and Monocrotophos

***Author for correspondence :** E-mail : singhbharat1967@gmail.com

which are not recommended for combating insect pests of vegetables.

The indiscriminate use of pesticides has destroyed the natural ecosystem and the natural balance ratio of pests and its natural enemies is found to be disturbed. The pesticides do not kill the pests alone but also the beneficial ones of different categories, the predators, parasites, animals, birds and finally disturb agro-ecosystem. Another major issue is development of resistance among them against chemical pesticides. Continuous use of chemical inputs resulted in damaged to the environment thus cause human ill health. It impacted on agricultural production and reduced sustainability.

As the matter of great concern, there is need to find viable alternatives against chemical pesticides so as to minimize the pesticide residues. According to renowned agricultural scientist M.S Swaminathan. in 1999, agriculture production system in the 21st century need to be based on the appropriate use of bio-technology, eco technology, information technology, integrated pest management etc. for monitoring and effective control method of insect pests. The main aim of using these bio-pesticides that many phytophagous pests may controlled by their insecticidal *azardirachtin* property (Singh, 1997). *Azadirachtin* has best effects, in inhibition of insect growth regulator, feeding deterrence and reproduction. Equally neem seed kernel extract has minimal toxicity to non-target organisms, pollinators and degrades rapidly in the environment (Kraus *et al*., 1981; Broughton *et al*., 1986; Saxena, 1990) Marbuea *et al.,* 1993; Anjaneyulu and Misha, 1998). Field experiments have successfully demonstrated the potential of neem extract as a pest-control agent (Martinez, 2002; Kreutzweiser *et al.*, 2004) and it is used in agricultural as well as aquaculture systems to control various predators, parasites and pathogenic bacteria (Dunkel and Ricilards, 1998; Das *et al.*, 2002).

Keeping these points, the present investigation was aimed to study the efficacy of neem based products *i.e* neem oil, neem kernel extract, neem leaves and synthetic chemical pesticide, Quinalphos 25EC for management of *S.litura* under field condition.

Materials and Methods

The field experiment was conducted to study the bio efficacy of neem products *viz.* Neem oil @5ml/L, Neem seed kernel extract (NSKE 5%) @5ml/L, Neem leaf extract (NLE) @5ml/L and synthetic pesticide Quinalphos 25% EC @2ml/L applied separately against *S.litura* (Fab.) at Khanpur village (Pataudi Block) heavily infested with *S.litura* population in district Gurugram during 2017-18.

The field trials were conducted in randomized block design (RBD) with five treatments and each treatment was replicated thrice. The cauliflower Cv. Pusa Samradhi was sown in well prepared nursery bed using in lines then light sprinkler irrigation was applied for easy germination of seeds. Before sowing seed in nursery seed treated with systemic fungicide Carbandezim 50 W.P. @ 2.5g per kg seed to check the fungal attack. The nursery beds was covered with rice hey to maintain the moisture and after germination of seeds at initial stage, the rice hey was removed and nursery bed covered with insect proof net to protect the seedlings from the insect pests attack. In nursery bed the irrigation was given as and when required.

Healthy seedlings of cauliflower were uprooted carefully and transplanted in well prepared plots of size 4m×3.5m with row to row and plant to plant spacing were

First spray

Table 1: Effect of different treatments in reduction of larval population of *Spodoptera litura* (F.) after first spray

Treatment /Doses	Count of pest population (Mean/10 plants)	Pest population reduction after sprays		Pest population reduction after sprays (Mean/10 plants)	Efficacy(%)
		3 days	7 days		
T1	5.82	3.80	3.46	3.63	62.37
T2	4.60	2.62	2.74	2.68	58.26
T3	5.38	2.84	3.06	2.95	54.83
T4	4.24	2.09	2.21	2.15	50.70
T5	4.86	0.68	0.74	0.71	14.60
L.S.D	0.757	0.361	0.703	0.371	-
SE(m)	0.229	0.109	0.212	0.105	-
SE(d)	0.323	0.154	0.30	0.173	-
C.D (P=0.05)	1.21	1.07	1.04	1.19	-

T1 Quinalphos 25 EC @2ml/L.; T2 Neem oil @5ml/L.; T3 Neem seed kernel extract(5%) @5ml/L.; T4 Neem leaf extract @5ml/L; T5 Control (untreated)

Second spray

Table 2: Effect of different treatments against reduction of larval population of *Spodoptera litura* (F.) after second spray

Treatment /Doses	Count of pest population (Mean/10 plants)	Pest population reduction after sprays		Pest population reduction after sprays (Mean/10 plants)	Efficacy(%)
		3 days	7 days		
T1	4.85	3.86	2.34	3.10	63.91
T2	5.32	2.84	3.32	3.08	57.89
T3	4.96	2.56	2.92	2.74	55.24
T4	4.92	2.42	2.64	2.53	51.42
T5	5.44	0.69	0.67	0.68	12.50
L.S.D	0.571	0.214	0.091	0.033	-
SE(m)	0.165	0.065	0.027	0.041	-
SE(d)	0.233	0.091	0.039	0.027	-
C.D (P=0.05)	0.97	1.27	1.09	0.04	-

T1 Quinalphos 25 EC @2ml/L.; T2 Neem oil @5ml/L.;T3 Neem seed kernel extract(5%) @5ml/L.; T4 Neem leaf extract @5ml/L; T5 Control (untreated)

50×45 cm, respectively.

The knapsack sprayer was used for spraying the neem products or natural bio pesticides and insecticide separately. The intensive care was taken to check the drift of pesticides. The first spray was done during the last week of December of the year 2017-18 and subsequent second spray was applied at 10 days interval. The observations were recorded in terms of larval population count before and after sprays. The data were statistically analyzed.

Results and Discussion

The Quinalphos 25EC which was attributed to release of organophosphorus a. i. which has penetrated in to larval body surface quickly along with the water. The activity of neem oil was comparatively high among the neem bio pesticides (Hole *et al.*, 2009). Similarly result were obtained and reported (Singh *et al.*, 2018). The extract of neem oil being rich in azadirachtin content from neem seed, where as in case of neem leaf extract did not show much activity against the larvae of *S.litura.*

The present investigation revealed that spray of Quinalphos 25 EC showed maximum efficacy (62.37%) against *S.litura*. followed by neem oil (58.26%) neem seed kernel extract (54.83%), neem leaf extract (50.70%) and lowest for untreated (14.60%).

While second spray of Quinalphos 25 EC against the pest population showed highest efficacy (63.91%) followed by neem oil (57.89%), neem seed kernel extract (55.24%), neem leaf extract (51.42%) and least by untreated (12.50%).

Conclusion

As cauliflower is used as fresh vegetable, it is advisable to use insecticides at least one month early before picking the cauliflower to avoid to residual toxicity. Out of natural biopesticides, Neem oil is safe and cost effective for management of larval population of *S.litura* at field level.

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