Study of Efficacy of Various Bio-Pesticides in Reducing the Pest Populations on Okra in Winter Season at Rewa (M.P.) India

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Abstract

Okra or lady's finger *[Abelmoschus esculentus (L.) Moench* commonly known as bhindi is cultivated in almost all the states of India. It is very popular in India because of its easy cultivation, dependable yield and adaptability to varying moisture conditions. It is an important vegetable crop due to its nutritional, industrial and medicinal value. About 20 insect pests are reported to attack okra, of these the Jassid (*A. biguttulla biguttulla*), Aphid (*A. gossypii*) and the Shoot and fruit borer (*E. vittella*) are the important pests and cause heavy losses to okra crop. Wide spread and indiscriminate use of synthetic insecticides has resulted in undesirable ecological changes. Farmers apply chemical insecticides at frequent intervals to combat the pests. This makes the problem more complicated in the case of vegetables like okra where frequent harvests and consumption are common. The present study is under taken for the management of major pests of okra with botanicals based bio-pesticides. The experiment was conducted using five bio-pesticides among which Achook showed the highest yield i.e., 33.90,followed by Neem gold 28.73, Neem azal 28.01, Biotos 26.45 and Biofer 26.38 q/ha.

KEYWORDS: Bio-pesticides, Insect pests, Aphids, Jassids, Shoot & fruit borers, Leaf hoppers, White-fly.

Introduction

Okra or lady's finger [*Abelmoschus esculentus* (L.) Moench] commonly known as bhindi is cultivated in almost all the states of India. It is known by many local names in different parts of the world. It is called lady's finger in England, Gumbo in the United States of America, guino-gumbo in Spain, guibeiro in Portugal and bhindi in India. Even with in India different names have been given to it in different regional languages. It is quite popular in India because of easy cultivation, dependable yield and adaptability to varying moisture conditions. It is an important vegetable crop due to its nutritional, industrial and medicinal value. The fruits are harvested when immature and eaten as a vegetable. The root and stem of okra are used for cleaning the cane juice from which gur or brown sugar is prepared (Chauhan, 1972). Its ripe seeds are roasted, ground and used as a substitute of coffee in some countries. Mature fruits and stem containing crude fiber are used in the paper industry. Extracts from the seeds of the okra is viewed as alternative source for edible oil. The greenish yellow edible oil has a pleasant taste and odor, and is high in unsaturated fats such as oleic acid and linoleic acid. The oil content of the seed is quite high, i.e. about 40%. It is said to be very useful against genito-urinary disorders, spermatorrhoea, and chronic dysentery (Nadkarni, 1927). Its medicinal value has also been reported in curing ulcers and relief from hemorrhoids (Adams, 1975).

India ranks first in the world with 3.5 million tons (70% of the total world production) of okra produced from over 0.35 million ha. land (FAOSTAT 2008).

About 20 insect pests are reported to attack okra (Butani and Verma, 1976), of these the jassid (*A. biguttulla biguttulla*). Aphid (*A. gossypii*) and the shoot and fruit borer (*E. Vittella*) are the important pests and cause heavy losses to okra crop.

Wide spread and indiscriminate use of synthetic insecticides has resulted in undesirable ecological changes such as development of resistance in the insects, resurgence of sucking pests, destruction of their natural enemies, changes in species dynamics, deposition of residues in and on soil and plants producing risks to human and animal health besides environmental pollution (Mahapatro and Gupta, 1998). Now A.P.S. University Rewa M.P. days farmers apply chemical insecticides at frequent intervals to combat the pests which deposit more residues in and on plants. This makes the problem more complicated in the case of vegetables like okra where frequent harvests and consumption are common. In view of the above situations botanicals seem to be the best solution to all the problems, without affecting the natural enemies and environment. Hence, the present study is under taken for the management of major pests of okra with botanicals based bio-pesticides.

Materials and Methods

The experiment was laid out for the study of the effect of certain bio-pesticides on the insect pests of okra (*Abelmoschus esculentus*) in winter at the village Ajgarha of District Rewa (M.P.). Parbhani Kranti was used as the test variety. The winter crop was sown on 16th October 2014 and harvested on 23th February 2015.

Types of Survey:

During the investigation both qualitative and quantitative surveys were done.

Qualitative Survey:

In this type of survey, the insect pests and their natural enemies found in the field were preserved for identification. After identification the actual pests were sorted.

Quantitative Survey:

The population of insect pests and the infested parts were recorded.

Major Insect Pests of Okra found in the area:

(1) Shoot & fruit borer (*E. vittella*)

(2) Jassid (*Amrasca biguttula biguttula*)

(3) Aphid (*Aphis gossypii*)

(4) Whitefly (*Bemisia tabaci*)

(5) Red cotton bug (*Dysdercus koenigii*)

(6) Thrip (*Thrips tabaci*)

Location, Climate and Weather Conditions of the experimental site:

Rewa is situated in the north-eastern part of Madhya Pradesh. The climate of this region is semi-arid and subtropical. Rewa is situated at the 24·31^0 north latitude and 81·19^0 east longitude. It lies along NH-7 in between Jabalpur and Varanasi. Rewa enjoys

the sub tropical climate, hot and dry summers and cold winters are the main characteristic features of the region. The annual rainfall varies from 900 mm to 1000 mm. which is received mainly from July to September but sometimes winter rains are also received.

Soil Characteristics:

The soil of experimental field was silty clay loam in texture, with pH 7.25, medium in organic carbon (56%) and low in available nitrogen and phosphorus and high in available K (315 kg/ha).

Details of Bio-pesticide treatments

T_1- Neem azal 3ml/L

T_2- Neem gold 5ml/L

T_3- Biofer 1.5ml/L

T_4- Biotos 1.5ml/L

T_5- Achook 5ml/L

T_6- Control (Untreated)

Details of the Experiment

Experimental design: Randomized block design (RBD)

(i) Replication: One set of three replications

(ii) Treatments: 5

(iii) Distance between:

(a) Plant to plant - 15 cm.

(b) Row to row - 30 cm.

(c) Two replications - 1 m.

(d) Plot to plot - 1m.

(iv) Plot size: 3X4 m.

(v) Total area: 319 sq. m.

(vi) Net area: 216 sq. m.

Variety: Parbhani Kranti

Date of Sowing: Winter 16th October 2014

Date of Harvest: 23th Feb 2015

Statistical methods used in the experiment:

Data recorded was compiled and tabulated and the statistical analysis was done. Anova has been calculated for comparing the variance of various treatments. The data were analyzed by the methods of analysis of variance as derived by R.A. Fisher (1958).

Results and Discussion

The study of pest populations on okra plant at various growth stages was done in the year 2014-15 and the mean of pest populations were calculated (Table No. 1).

(i) Incidence of shoot & fruit Borer -

The incidence of shoot & fruit borer was recorded earliest in 30 DAS (1.94) and it remained latest up to 120 DAS. The severity of its incidence was recorded highest on 120 DAS (4.33) and lowest on 30 DAS as 1.94/15 fruits.

(ii) Incidence of Jassids -

The incidence of Jassids was observed earliest in 15 DAS (2.96) and it remained latest up to 120 DAS (6.74). The severity of its incidence was found highest on 120 DAS (6.74) and lowest population was recorded on 15 DAS (2.96).

(iii) Incidence of Aphids -

Mean population of Aphids on okra plants at various growth stages during the season is depicted in Table No. 1. It showed its incidence on the plant on 15 DAS i.e. 3.34. Its number was highest on 120 DAS (7.90) and lowest in 15 DAS (3.34).

(iv) Incidence of white fly -

The data of Table No. 1 shows the occurrence of white flies on okra. The pest appeared on 15 DAS (2.86). Its population increased till 105 DAS (3.97) and declined gradually till 120 DAS (3.93).

(v) Incidence of Red Cotton Bug -

The activity of Red Cotton bug was recorded earliest in 15 DAS (2.96). The severity of its incidence was recorded highest on 120 DAS (4.33) and lowest on 15 DAS (2.96).

(vi) Incidence of Thrips -

The mean population of thrips at various growth stages during the winter (2014-15) is given in Table No. 1. It is evident from the data that the presence of thrips was seen first time at the early stage of 15 DAS (1.58) which successively increased till 120 DAS (3.71). The severity of its incidence was highest on 120 DAS (3.71) and lowest on 15 DAS (1.58).

Table No. 1

Population of different insect pests of Okra in winter season 2014-15

Name of Insect Pest	**15 DAS**	**30 DAS**	**45 DAS**	**60 DAS**	**75 DAS**	**90 DAS**	**105 DAS**	**120 DAS**
Shoots & Fruit borer (*Earias vittella*)	0.0 (0.70)	3.3 (1.94)	5.6 (2.46)	11.3 (3.43)	12.7 (3.63)	15.3 (3.97)	17.3 (4.21)	18.3 (4.33)
Jassid	8.3	11.6	17.0	28.0	27.0	31.6	33.3	45.0

(*Amarsca biguttula biguttula*)	(2.96)	(3.47)	(4.18)	(5.33)	(5.24)	(5.66)	(5.81)	(6.74)
Aphid (*Aphis gossypii*)	10.7 (3.34)	15.3 (3.97)	22.0 (4.74)	36.3 (6.06)	38.3 (6.22)	40.6 (6.41)	45.0 (6.74)	62.0 (7.90)
White Fly (*Bemisia tabaci*)	7.7 (2.86)	8.3 (2.96)	10.7 (3.34)	13.7 (3.76)	14.7 (3.89)	14.3 (3.84)	15.3 (3.97)	15.0 (3.93)
Red Cotton Bug (*Dysdereus koenigii*)	8.3 (2.96)	9.0 (3.08)	11.3 (3.43)	18.0 (4.30)	16.3 (4.09)	17.7 (4.26)	18.0 (4.30)	18.3 (4.33)
Thrips (*Thrips tabaci*	2.0 (1.58)	3.3 (1.94)	6.0 (2.54)	11.3 (3.43)	10.7 (3.34)	12.7 (3.63)	13.0 (3.67)	13.3 (3.71)
SEM ±	0.092	0.098	0.123	0.056	0.048	0.069	0.050	0.057
CD at 5%	0.597	0.310	0.387	0.177	0.152	0.219	0.157	0.179

After the fourth spray Achook (5ml/L) was observed to be the best treatment among all the bio-pesticides followed by Neem gold, Neem azal, Biofer and Biotos as the lowest percentage of insect pests were recorded by its application (Table No. 2)

Table No. 2

Effects of various bio-pesticides after the fourth spray on the populations of Okra pests in winter season of 2014-15.

S. No.	Treatments	Doses %	Foot & Shoot Borers	Leaf hoppers	Aphids	White-fly	Red Cotton Bug	Thrips
1.	T1 Neem azal	3ml/l	4.5 (2.24)	15.3 (3.97)	18.0 (4.30)	6.0 (2.54)	9.0 (3.07)	6.6 (2.67)
2.	T2 Neem gold	5ml/l	4.4 (2.21)	14.3 (3.85)	16.3 (4.10)	5.0 (2.33)	8.5 (2.99)	6.3 (2.61)
3.	T3 Biofer	1.5ml/l	4.9 (2.32)	16.0 (4.06)	19.6 (4.49)	6.2 (2.58)	9.3 (3.13)	7.0 (2.73)
4.	T4 Biotos	1.5ml/l	4.7 (2.29)	16.3 (4.10)	18.3 (4.33)	6.3 (2.61)	9.2 (3.11)	6.8 (2.70)
5.	T5 Achook	5ml/l	3.9 (2.10)	10.6 (3.34)	12.6 (3.62)	3.3 (1.95)	7.3 (2.79)	5.2 (2.38)
6.	T6 Control		11.4 (3.44)	29.6 (5.49)	33.3 (5.81)	11.6 (3.48)	19.0 (4.41)	11.3 (3.43)
SEM±			0.060	0.052	0.045	0.084	0.064	0.060

CD at 5%			0.188	0.164	0.142	0.266	0.201	0.190

Figures in the brackets are the transformed values = $\sqrt{\times +0.5}$

Yield of healthy fruits under different bio-pesticidal treatments in winter season of 2014-15:

The yield (q/ha) of Okra fruits under the treatment of different bio-pesticides has been presented in Table No.3 in winter season 2014-15. Achook (5ml/l) showed highest yield (33.90 q/ha) followed by Neem gold 5ml/l (28.73 q/ha) and Neem azal 3ml/l (28.01 q/ha). Biofer 1.5ml/l (26.38 q/ha) & Biotos 1.5 ml/l (26.45 q/ha) were comparatively less effective. However the treated plots gave more significant yield as compared to the control (untreated) c (23.70 q/ha).

Table No. 3

Yield of healthy fruits of under different bio-pesticides treatment in winter season 2014-15

S.N.	Treatment	Dose	Fruit Yield in Winter q/ha
1.	Neem azal	3 ml/l	28.01
2.	Neem gold	5 ml/l	28.73
3.	Biofer	1.5 ml/l	26.38
4.	Biotos	1.5 ml/l	26.45
5.	Achook	5 ml/l	33.90
6.	control (untreated)	-	23.70
S E M ±		**-**	**0.056**
C D at 5%		**-**	**0.176**

Okra is susceptible to a large range of insect pests and diseases (N'Guessan *et al.* 1992, Ghanem 2003). It is infested by a number of insect pests like *Amrasca devastans*, *Earias vittella*, *Bemisia tabaci, Helicoverpa armigera*, *Acrocereops bifasciata*, *Thrips tabaci, Aphis gossypii*, *Podagrica, Anomisflava*, *Sylepta derogata*, *Haritalodes derogeta, Dysdercus koengii* and *Nezara viridula*. *Amrasca devastans, E. vittela, H. armigera* and *B. tabaci* are the notorious and major insect pests of okra (Dubey *et al.* 1999 Basu, 1995; Lohar, 2001). Various growth stages of the crops are susceptible to the different insects

pests and diseases (Ek-amnuay 2007, Fasunwon & Banjo 2010). Insect pests like crickets can be a problem during germination or seedling stage of the crop while the thrips, whitefly and other phloem feeders are common during vegetative stage (Fajinmi & Fajinmi 2010). Jassids transmit viral diseases and seriously stunt plant growth, reduce available leaf area for photosynthesis resulting into serious yield and quality loss (Sastry & Singh 1974, Ali *et al.* 2005).Insect pest infestation not only reduces the growth but also transmit pathogenic diseases (Sheedi, 1980; Dhaliwal *et al.,* 1981). Bio control agents and neem extracts have been reported ecofriendly options for management of insect pests of okra (Al- Eryan *et al.* 2001; Bindu *et al.* 2003; Singh and Brar, 2004; Poulraj and Ignacimuthu, 2005). Neem oil produced non-toxic effects after spray and acted as antifeedant, growth inhibitor and oviposition deterrent against insect pests of Okra and Cotton (Ahmed *et al.* 1995).

Bio-pesticides are target specific, eco-friendly and biodegradable and potential alternatives to chemical pesticides in addressing various pest management issues. Several bio-pesticides were evaluated against the major pests of okra under field conditions and their efficacies were compared by various workers. Ayyangar and Rao (1989) have reported that azadirachtin played a major role in controlling the insect pests by adversely affecting the consumption and utilization of plant parts by the pests.

In the present investigation the yield (q/ha) of healthy fruits under the treatment of different bio-pesticides was calculated (Table No. 3) and Achook showed the highest yield i.e 33.90,followed by Neem gold 28.73, Neem azal 28.01, Biotos 26.45 and Biofer 26.38 q/ha. Thus after taking various observations it can be concluded that regarding the vegetable yield Achook is the most efficient bio-pesticide.

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