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BJ Chopade
Department of Agricultural Entomology, P.G. Institute Akola, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

PK Rathod
Department of Agricultural Entomology, P.G. Institute Akola, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

GM Golvankar
Department of Agricultural Entomology, P.G. Institute Akola, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

PT Patil
Department of Agricultural Entomology, P.G. Institute Akola, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Correspondence
BJ Chopade
Department of Agricultural Entomology, P.G. Institute Akola, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Economics of newer insecticides against major insect pests of sesamum

BJ Chopade, PK Rathod, GM Golvankar and PT Patil

Abstract
The present field trial carried out on the economics of newer insecticides on against major insect pests of sesamum at the field of Department of Entomology, Dr. PDKV, Akola, during *kharif* 2014. Results revealed as regards to the sesamum yield, chlorantraniliprole 18.5% w/w SC, fenvalerate 20% EC and novaluron 5.25% + indoxacarb 4.5% SC, were found to be most effective treatments recording yield of 649, 644 and 583 kg/ha respectively.

As far as economics of the treatments is concerned, fenvalerate 20% EC, triazophos 40 EC and novaluron 5.25% + indoxacarb 4.5% SC were emerged as most economic treatments recorded an ICBR of 1:18.53, 1:4.12 and 1:3.79 respectively. From the farmers point of view, the above treatments were most effective in terms of net monitory returns.

Out of the six insecticides the fenvalerate 20 EC was found to be effective and recording minimum percent infestation of gall fly and capsule borer as well as the highest 1:18.53 ICBR was recorded.

Keywords: ICBR, sesamum, gall fly, capsule borer, newer insecticides, B:C ratio etc.

Introduction

Sesame *(Sesamum indicum* L.) is perhaps the oldest oilseed crop known and used by man. It is called as the "Queen of Oilseeds" because of its excellent qualities of the seed, oil and meal. Sesame seed is a vital nourishing food and used as a flavouring agent. Sesame oil has desirable fatty acid composition and excellent stability against oxidative rancidity. (Taware *et al*.2006) [10].

Sesamum is growing in 24 percent area with about 1.8 million ha in the world with annual production of 4.76 million metric tonnes (FAI, 2014) [5]. Sesamum grown in 2012-13 in India in the area of 1.7 lakh ha with productivity of 402 kg/ha and production of 7.15 lakh tones (Anon., 2014a) [2]. In Maharashtra in 2012- 13 sesamum grown with area of 0.40 lakh ha with productivity of 300 kg/ha and production of 0.12 lakh tones (Anon., 2014b) [3].

This crop is attacked by 29 species of insect pests in different stages of its plant growth out of that shoot webber and capsule borer, *Antigastra catalaunalis* Dup. is an important pest causing 10-60% yield loss (Ahirwar *et al*. 2010) [1]. Another serious pest of sesamum is gall fly the infestation by *Asphondylia sesami* Felt. was recorded about 99.23 percent of the plants in the population from the plains of West Bengal and estimated loss in the yield due to the gall formation was calculated as 31.28 percent (4.47 to 85.71%) (Sengupta *et al.* 2002) [7].

Sesamum is an important oilseed crop and is reported to be attacked by a number of pests among which sesamum gall fly and capsule borer are major pests. Gall fly and capsule borer are internal feeders and needs to be managed in time to avoid heavy losses. Pest management continues to be an important effort to deal with pests with the different insecticides and new approaches need to be made for fulfilling the existing research gaps. However, the published information about these pests to manage with different insecticides which are economically feasible to farmers is very limited. Looking towards the economics of the sesamum plant protection measure, no much work has been reported by the workers and therefore it is necessitated to undertake the present investigation to study the economics performance of different insecticides against major pests of sesamum.

Material and Methods

Economics was carried out on the basis of yield of sesamum obtained and expenditure involved in various treatments, the B:C ratio was worked out. The details of the costs of individual item taken into consideration while working out the economics are given below.

Particulars	:	Cost (₹)
1. Flubendiamide 20% WG	:	6000/kg
2. Flubendiamide 39.35%m/m SC	:	13000/kg
3. Novaluron 5.25% + Indoxacarb 4.5% SC	:	2100/lit
4. Fenvalerate 20% EC	:	300/lit
5. Chlorantaniliprole 18.5% w/w SC	:	12666/lit
6. Triazophos 40 EC	:	450/lit
7. Labour charges	:	180/day
8. Spray pump charge	:	40/day
9. Market value of sesamum	:	6000/qt

Results and Discussion

Effect of various treatments on yield of sesamum

The yield recorded from the various treatments is given in Table 1 and data indicated significant differences among the various treatments in respect to yield of sesamum. The highest yield (649 kg/ha) was obtained in the treatment due to chlorantraniliprole 18.5% SC @ 0.006%, fenvalerate 20% EC @ 0.012%, novaluron 5.25% + indoxacarb 4.5% SC @ 0.014% and flubendiamide 39.35% SC @ 0.01% recording (644 kg/ha), (630 kg/ha) and (583 kg/ha), respectively. These treatments were found at par with each other and significantly superior over the rest of the treatments.

Further the next best treatments flubendiamide 20% WG @ 0.006% (461 kg/ha) and triazophos 40 EC @ 0.06% (451 kg/ha) were found statistically at par with each other and significantly superior over untreated control.

The finding of the present investigation was in close conformity with Singh *et al.* (2002) [9] also reported highest yield of linseed (9.87 q/ha) in plots treated with fenvalerate 0.04 kg a.i. / ha and it was most economical treatment with cost benefit ratio of 1:19.09.

Sengar (2003) [8] evaluated different insecticides for the control of *A. catalaunalis*. Among them spark was found most effective insecticide and recorded highest yield (61.32 kg/ha). The insecticide profenofos @ 0.05% and triazophos @ 0.04% also found effective and recorded seed yield (312.76 and 257.30 kg/ha), respectively.

Thakare *et al*. (2005) [11] also recorded maximum yield of sesamum (647 kg/ha) with highest ICBR (1:10.60) in the treatment fenvalerate 0.01 percent.

Thakor (2006) [12] studied the economics of different treatments used for the management of *A. catalaunalis.* The treatment triazophos 40 EC @ 0.04% recorded seed yield of 416.66 kg/ha. Deshmukh (2009) [4] reported that fenvalerate 20 EC was found to be best effective treatments against gall fly and capsule borer recording yield of 613 kg/ha

Jadhav (2010) [6] evaluated different insecticides for the control of sesamum leaf webber and capsule borer, *A. catalaunalis.* The highest seed yield was obtained in the treatment profenofos 50 EC (8.45 q/ha) followed by endosulfan 35 EC (7.02 q/ha), triazophos 40 EC (6.59 q/ha) and lambda cyhalothrin 5 EC (6.31 q/ha). The lowest yield was recorded in the control as (3.55 q/ha) which was significantly poor. Finding of above research worker are parallel with the finding of present investigation.

Incremental cost benefit ratio of different treatments

Considering the cost of inputs for different treatments and corresponding yield from the treatments, the incremental cost benefit ratio (ICBR) of all treatments were worked out at prevailing market rates and the data is presented in Table 2.

The data revealed that the treatments with fenvalerate 20 EC @ 0.012% emerged as the most economic one recording highest ICBR of 1: 21.78. It was followed by triazophos 40 EC @ 0.06% and novaluron 5.25% + indoxacarb 4.5% SC @ 0.014% recording ICBR of 1:4.97 and 1:4.59 respectively. Next economic treatments were chlorantraniliprole 18.5% SC @ 0.006% and flubendiamide 39.35% SC @ 0.01% recorded ICBR 1:3.62 and 1:3.40, respectively.

However, treatment with flubendiamide 20% WG @ 0.006% found comparatively less economic (1:2.66) as compared to the above treatments. Morever, treatment with fenvalerate 20% EC @ 0.012% recorded maximum increment benefit of Rs. 21350/ha this was followed by chlorantraniliprole 18.5% SC @ 0.006% (Rs. 17776/ha), novaluron 5.25% + indoxacarb 4.5% SC @ 0.014% (Rs. 17536/ha), flubendiamide 39.35% SC @ 0.01% (Rs. 13958/ha), triazophos 40 EC @ 0.06% (Rs. 7345/ha) and flubendiamide 20% WG @ 0.006% (Rs. 6920/ha).

The above data indicated economics of different treatments in terms of incremental cost benefit ratio (ICBR). Farmers are mostly interested in obtaining more benefit in terms of enhanced grain yield with very little expenses in plant protection. The data revealed that among the various treatments studied fenvalerate 20% EC @ 0.012% was found to be most economic treatment recording highest ICBR of 1:21.78. It is followed by triazophos 40 EC @ 0.06% and novaluron 5.25% + indoxacarb 4.5% SC @ 0.014% recording ICBR of 1:4.97 and 1:4.59 respectively. Economically least effective treatment was flubendiamide 20% WG @ 0.006% with ICBR of 1:2.66 owing to its cost and moderate efficacy.

The results of the present investigations are in conformity with the findings of Thakare *et al*. (2005) [11] registering maximum yield of sesamum (647 kg/ha) with highest ICBR of 1:10.60 with fenvalerate 20 EC (0.01%). Morever, the earlier worker Deshmukh (2009) [4] reported that spinosad 45 SC and fenvalerate 20 EC were found to be most effective treatments recording yield of 681 and 613 kg/ha, respectively. The highest ICBR 1:10.65 was recorded in spinosad 45 SC followed by fenvalerate 20 EC (1:9.60).

Singh *et al*. (2002) [9] also reported highest yield of linseed (9.87 q/ha) in plots treated with fenvalerate 0.04 kg a.i. / ha and it was most economical treatment with cost benefit ratio of 1:19.09.

Thakor (2006) [12] studied the economics of different treatments used for the management of *A. catalaunalis.* The treatment triazophos 40 EC @ 0.04% and neem oil 1% recorded seed yield 416.66 and 340.45 kg/ha seed yield with 1:14.87 and 1:3.55 incremental cost benefit ratio, respectively.

These results are in agreement with results reported in the present investigations

Table 1: Effect of various treatments on yield of Sesamum

Treatments	Yield (Kg/ha)
T_1: Flubendiamide 20% WG @ 0.006%	461
T_2: Flubendiamide 39.35% SC @ 0.01%	583
T_3: Novaluron 5.25% + Indoxacarb 4.5% SC @ 0.014%	630
T_4: Fenvalerate 20% EC @ 0.012%	644
T_5: Chlorantaniliprole 18.5% SC @ 0.006%	649
T_6: Triazophos 40 EC @ 0.06%	451
T_7: Untreated control	325
'F' test	Sig.
SE(m)±	21.59
C.D.(0.05)	66.54

Table 2: Yield and incremental cost benefit ratio for different treatment

Treatments	Quantity of insecticide required for 2 spray	Cost of treatments (₹/ha)		Total cost (₹) (A)	Yield (Kg/ha)	Increased yield over control (Kg/ha)	Value of increased yield (₹/ha) (B)	Increment benefit (C) = (B-A)	ICBR (B:C)
		Cost of insecticides	Labour + sprayer charges						
T_1: Flubendiamide 20% WG @ 0.006%	0.300 kg.	1800	800	2600	461	136	9520	6920	1:2.66
T_2: Flubendiamide 39.35% SC @ 0.01%	0.254 kg.	3302	800	4102	583	258	18060	13958	1:3.40
T_3: Novaluron 5.25% + Indoxacarb 4.5% SC @ 0.014%	1.435 lit.	3014	800	3814	630	305	21350	17536	1:4.59
T_4: Fenvalerate 20% EC @ 0.012%	0.600 lit.	180	800	980	644	319	22330	21350	1:21.78
T_5:Chlorantaniliprole 18.5% SC @ 0.006%	0.324 lit.	4104	800	4904	649	324	22680	17776	1:3.62
T_6: Triazophos 40 EC @ 0.06%	1.500 lit.	675	800	1475	451	126	8820	7345	1:4.97
T_7: Untreated control	---	----	----	-----	325	-----	-----	-----	-----

Cost details

1. Flubendiamide 20% WG – ₹ 6000/kg	2. Flubendiamide 39.35%m/m SC – ₹13000/kg	3. Novaluron 5.25% + Indoxacarb 4.5% SC – ₹ 2100/lit
4. Fenvalerate 20% EC– ₹300/lit	5. Chlorantaniliprole 18.5% w/w SC– ₹ 12666/lit	6. Triazophos 40 EC – ₹ 450/lit
7. Labour charges– ₹ 180/day	8. Spray pump charge – ₹ 40/day	9. Market value of sesamum – ₹ 6000/qt

Conclusion

Results revealed As regards to the sesamum yield, chlorantraniliprole 18.5% w/w SC, fenvalerate 20% EC and novaluron 5.25% + indoxacarb 4.5% SC, were found to be most effective treatments recording yield of 649, 644 and 583 kg/ha respectively. However, though the fenvalerate 20 EC was found effective in terms of recording minimum percent infestation of gall fly and capsule borer and recorded highest ICBR of 1:18.53.

As far as economics of the treatments is concerned, fenvalerate 20% EC, triazophos 40 EC and novaluron 5.25% + indoxacarb 4.5% SC were emerged as most economic treatments recorded an ICBR of 1:18.53, 1:4.12 and 1:3.79 respectively. From the farmers point of view, the above treatments were most effective in terms of net monitory returns.

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