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Research Article

IMPACT OF INSECTICIDES ON YIELD AND ECONOMICS OF SUNFLOWER SEED PRODUCTION IN NEW ALLUVIAL ZONE OF WEST BENGAL.

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Abstract- The current investigation was piloted to evaluate yield and economics in sunflower seed production of different insecticidal treatment schedules in New Alluvial Zone of West Bengal. The experiment was conducted for two consecutive seasons of 2012-13 and 2013-14 at the Instructional farm at Jaguli, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Nadia, West Bengal, India.The results revealed that yield and Benefit: Cost ratio of sunflower seed production was recorded highest in T4 followed by T3, T2, T1, T5, T6 and T7 respectively. It was observed that highest cost of production for seed yield (Rs. 17119.6 and Rs. 17460.6 respectively) were observed in the treatment T4, T1 and T2. Maximum gross income (Rs. 35875 and Rs. 32875 respectively) were recorded in the treatment T4 and T3. However, maximum net returns for sunflower seed production (Rs. 18755 and Rs. 15644 respectively) and benefit: cost ratio (2.10:1 and 1.91:1 respectively) were found in treatment T4 and T3. Thus, it can be advised that T4 (seed treatment imidacloprid @ 5 g/kg of seed followed by lambda cyhalothrin 10 EC @ 1 ml/lit on 30 DAS followed by chlorpyriphos 20 EC @ 2.5 ml/lit 60 DAS) was found most lucrative and economically feasible in New alluvial Zone of West Bengal.

Keywords- Economics, B:C ratio, Insecticides, Sunflower, Yield, Seed production and Alluvial Zone

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Introduction

Sunflower (*Helianthus annuus* L.) is core edible oilseed crop cultivated globally in different parts were in the area of about 22.33 million hectares with the total production of about 27.748 million tones [1]. Sunflower competes with the other three major oilseeds (soybean, groundnut and rapeseed-mustard) in the oilseed scenario at the global level. A sunflower, a member of the family Asteraceae (Compositae) is native to North America and includes 50 species in the genus *Helianthus*. India rank first in oilseed production and oilseed zone covers a vital place in the agrarian budget of the nation. Oilseeds are the key crops that are cultivated in the India, as an alternative of cereals. In relations of area, yield and market value, oilseeds ranks second after food grains. India has a yearly earnings of approximately Rs 80,000 core. Oilseeds in India conquers 12-15 percent area and 7-8 percent production. Whereas, vegetable oil covers 6-7 percent production and 9-12 percent import in the world [2]. The total seed production of sunflower in India is almost 1.44 million tons, from a 2.34 million hectare, with 615 kilograms per hectare average productivity [3]. Karnataka, Andhra Pradesh, Maharashtra and Tamil Nadu are the main sunflower cultivating states in the nation. These four states contribute about 90 percent of total acreage and 78 percent of total seed yield. Among these, Karnataka occupies first position accounting 53 percent of the total area and 35 percent of total production of India [4]. In the recent years, the crop is also becoming popular in non-traditional states *viz.,* Punjab, Haryana, West Bengal and Uttar Pradesh. West Bengal accounts 16 thousand hectare areas under sunflower, producing 19.7 thousand tonnes of sunflower seeds [5]. The crop losses due to different insect pests diverge from area to area as well as different phonological stages of crops, resulting 30 percent failure in crop stand [6]. About 18.5 to 46.3 percent crop loss, due to single pest, leafhopper was reported from Maharashtra [7]. Key pest, *H. armigera* feed voraciously on developing grains, flower buds, and ovaries, causing around 50% yield reduction [8]. If bud formation and blooming stage coincide with the pick activity of the pest, it takes heavy toll causing yield loss. In Karnataka [9] informed 120 kg/ha seed reduction due to capitulum borer damage. However, defoliaters *viz*., capitulum borer, tobacco caterpillar, Bihar hairy caterpillar causes reduction in sunflower seed production around 268 kg/ha in a rainfed *kharif* at Bangalore [10].Keeping in view these facts, the present investigation was undertaken to study the Impact of Pesticides on Yield and Economics of Sunflower seed production in New Alluvial Zone of West Bengal.

Materials and Methods

The investigation was piloted at the Instructional farm of Jaguli, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Nadia, West Bengal, India. In two consecutive crop seasons of 2012-13 and 2013-14, the efficacy of different insecticidal treatment schedules was evaluated against important insect pests of sunflower. The sunflower cv. Aditya (Indo-American Pvt. Ltd.) was sown in the middle of December in the plots measuring 4×3 sq.m. area with 60cm x 45cm spacing between row to row and plant to plant, respectively was maintained. All the standard agronomic practices, recommended for this region, except application of insecticides were followed for raising the crop. The crop was harvested at 115 days after sowing (second week of April). Seven different insecticidal treatment schedules including control were assessed against the pests in randomized block design and each schedule was replicated three times. The schedules were consisting of both chemical and non-chemical insecticides as mentioned in [Table-1]. During the crop season, population

of sucking pest (aphid and whitefly) was recorded one day before and 1, 3, 7 and 14 days after application of different treatments while, population of capitulum borer and tobacco caterpillar was recorded one day before and 3, 7 and 14 days after application of different treatments and find out percent suppression due to the treatments over untreated check. The population of whitefly and aphid was recorded from two upper, two middle and one lower leaves of randomly selected 5 plants per treatment per replication. The population of capitulum borer and tobacco caterpillar was counted from randomly selected 5 plants per treatment per replication. Finally, the extent of infestation in sunflower by different pests was recorded by seed weight in each plot after the harvesting. For the present study simple tabular analysis was adopted to compile the costs, returns and profits. The data were analyzed after converting them into necessary statistical transformation.

Table-1 *Insecticidal treatment schedules for the control of insect pests of sunflower*

Treatments		Insecticides and Time of application	
T1	Seed treatment (imidacloprid @ 5 g/kg of seed)	NSKE@5%(30 DAS)	HaNPV@250 LE/ha (60 DAS)
T2	Seed treatment (imidacloprid @ 5 g/kg of seed)	NSKE@5%(30 DAS)	SlNPV@250 LE/ha (60 DAS)
T3	Seed treatment (imidacloprid @ 5 g/kg of seed)	NSKE@5%(30 DAS)	Lamdacyhalothrin (10 EC 1 ml/lit) (60 DAS)
T4	Seed treatment (imidacloprid @ 5 g/kg of seed)	Lamdacyhalothrin (10 EC 1 ml/lit) (30 DAS)	Chlorpyriphos (20 EC 2.5 ml/lit) (60 DAS)
T5	Seed treatment (imidacloprid @ 5 g/kg of seed)	Chlorpyriphos (20 EC 2.5 ml/lit) (45 DAS)	-
T6	Seed treatment (imidacloprid @ 5 g/kg of seed)	-	-
T7	Control	-	-

Results and Discussion

Yield and Economics of sunflower seed under different treatment schedules:

The data related to the economics of production of sunflower seed for different treatments have been presented in [Table-2]. Perusal of data in [Table-2] reveals that during the first year of the experiment (2012-13) all the treatment schedules were significantly superior to untreated control and seed yield of sunflower per plot was found maximum in T4 (1177.8 kg/ha) followed by T3 (1047.2 kg/ha), T1 (1022.2 kg/ha), T2 (1000 kg/ha), T5 (897 kg/ha), T6 (833.3 kg/ha) and T7 (583.3 kg/ha) respectively. An observation of data revealed that highest cost of seed production (Rs 17460.6) was recorded in treatments T1 and T2 respectively. Whereas, lowest (Rs. 16160) was observed in T6. On the other hand maximum gross income (Rs 35333) was observed in the treatment T4 followed by T3 (Rs. 31417) while minimum gross income (Rs 25000) was observed in T6. As a result, the highest net returns and benefit: cost ratio, among the different treatment schedules, was obtained in T4 (2.06) followed by T3 (1.82), T1 (1.76), T2 (1.72), T5 (1.62) and T6 (1.55).

Table-2 *Economics of different treatment schedules during 2012-13 for sunflower seed production*

Treatments	Yield kg/ha	Total cost of treatment/ha	Gross return/ha	Net return/ha	B:C ratio
T1	1022.2	17460.6	30667	13206	1.76
T2	1000.0	17460.6	30000	12539	1.72
T3	1047.2	17231	31417	14186	1.82
T4	1177.8	17119.6	35333	18214	2.06
T5	897.2	16629.6	26917	10287	1.62
T6	833.3	16160	25000	8840	1.55
T7	583.3	-	-	-	-

*Sale price of sunflower seed Rs.30/Kg, **total cost includes cost cultivation, cost of pesticides and labour (2 man days/spraying/ha)

During the second year experiment (2013-14) of present investigation all the treatment schedules were significantly superior over control. It was evident from the [Table-3] that the highest seed yield of sunflower per plot was recorded from T4 (1213.9 kg/ha) followed by T3 (1144.4 kg/ha), T2 (1058.3 kg/ha), T1 (980.6 kg/ha), T5 (944.4 kg/ha), T6 (891.7 kg/ha) and T7 (688.9 kg/ha) respectively. Treatment T1 and T2 resulted in maximum cost (Rs. 17460.6) while minimum cost (16160) were observed in T6. Similarly, maximum gross return (Rs. 36417) was observed in T4, followed by T3. The net profit (Rs./ha) varied from 10,590 in T6 to 19,297 in T4 as a result the highest monetary return obtained from T4 (2.13) followed by T3 (1.99), T2 (1.82), T1 (1.68), T5 (1.70) and T6 (1.66) respectively.

Table-3 *Seed yield of sunflower under different treatment schedules during 2013-14*

Treatments	Yield kg/ha	Total cost of treatment/ha	Gross return/ha	Net return/ha	B:C ratio
T1	980.6	17460.6	29417	11956	1.68
T2	1058.3	17460.6	31750	14289	1.82
T3	1144.4	17231	34333	17102	1.99
T4	1213.9	17119.6	36417	19297	2.13
T5	944.4	16629.6	28333	11704	1.70
T6	891.7	16160	26750	10590	1.66
T7	688.9	-	-	-	-

*Sale price of sunflower seed Rs.30/Kg, **total cost includes cost cultivation, cost of pesticides and labour (2 man days/spraying/ha)

The data of both experiment years (2012-13 and 2013-14), regarding the seed yield of sunflower in different treatment schedules was pooled and presented in [Table-4]. It is revealed that all the treatment schedules were significantly superior to untreated. Out of the seven treatment schedules T4 (seed treatment with imidacloprid 70 WS @ 0.05% + foliar spray with lambda cyhalothrin 10 EC at 30 DAS + chlorpyriphos 20 EC at 60 DAS) and T3 (seed treatment with imidacloprid 70 WS @ 0.05% + foliar spray with NSKE 5% at 30 DAS + lambda cyhalothrin 10 EC at 60 DAS), were found most effective by recording highest seed yield of sunflower (1195 kg/ha and 1095 kg/ha with B:C ratio of 2.10 and 1.91 respectively). It is because of the fact in these treatment schedules seed treatment with imidacloprid followed by chemical spraying *viz*., lambda cyhalothrin and chlorpyriphos in T4 and T3, hence they remained active for a longer period to reduce the damage cause by insect pests. However, treatment schedules T2 (1029 kg/ha) and T1 (1001 kg/ha), are at par with each other with a benefit cost ratio of 1.77 and 1.72 respectively and reduced the insect pests population significantly, but were not as economic as T4 and T3. Hence the decreasing order of benefit cost ratio over control was T4 (2.10) followed by T3 (1.91), T2 (1.77), T1 (1.72), T5 (1.66) and T6 (1.60) respectively.

[11]From Maharashtra recorded the highest yield of chickpea from the plot treated with lambda cyhalothrin followed by quinalphos and HaNPV. However, [12] estimated cost of production, net incomes over moveable cost, net incomes over aggregate cost and B:C ratio for sunflower seed yield were Rs. 41451.23/ ha, Rs. 38054.06/ ha, Rs. 27911.77/ ha and 1.67, respectively. Also, [13] from Maharashtra studied the effect of different herbicides on yield and economics of

sunflower and computed B:C ratio in a range 1.97 to 2.89.

Table-4 *Seed yield of sunflower under different treatment schedules (pooled data 2012-13 and 2013-14)*

Treatments	Yield kg/ha	Total cost of treatment/ha	Gross return/ha	Net return/ha	B:C ratio
T1	1001	17460.6	30042	12581	1.72
T2	1029	17460.6	30875	13414	1.77
T3	1096	17231	32875	15644	1.91
T4	1196	17119.6	35875	18755	2.10
T5	921	16629.6	27625	10995	1.66
T6	863	16160	25875	9715	1.60
T7	636	-	-	-	-

*Sale price of sunflower seed Rs.30/Kg, **total cost includes cost cultivation, cost of pesticides and labour (2 man days/spraying/ha)

Conclusions

Experimental results publicized that T4 (seed treatment imidacloprid @ 5 g/kg of seed followed by lambda cyhalothrin 10 EC @ 1 ml/lit on 30 DAS followed by chlorpyriphos 20 EC @ 2.5 ml/lit 60 DAS) was found most lucrative (1:2.1 BC ratio) as well as most effective in reducing the population of pests. Among the other treatment schedules T3 (seed treatment with imidacloprid @ 5 g/kg of seed followed by NSKE @ 5% on 30 DAS followed by lambda cyhalothrin 10 EC @ 1 ml/lit on 60 DAS) found to be next economic (1:1.91 BC ratio) in seed production followed by T2 (1:1.77 BC ratio), T1 (1:1.72 BC ratio), T5 (1:1.66 BC ratio) and T6 (1:1.60 BC ratio).

Conflict of Interest: None declared

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