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ASSESSMENT OF YIELD LOSSES DUE TO MAJOR INSECT PESTS IN SESAME

S Omprakash*, C Narendra Reddy[1], P Swarnasree[1], T Kiranbabu[2] and M Sreedhar[3]

Regional Agricultural Research Station, Jagtial 505327,
Professor Jayshankar Telangana State Agricultural University, Telangana, India
[1]Department of Entomology, College of Agriculture, Rajendranagar, Hyderabad 500030, Telanagana, India
[2]Department of Plant Pathology, Rice Research Institute, Rajendranagar, Hyderabad 500030, Telanagana, India
[3]Deaprtment of Genetics and Plant Breeding, Quality Control Lab,
Rajendranagar, Hyderabad 500030, Telanagana, India
*Email: omprakashagrico@gmail.com (corresponding author): ORCID ID 0000-0002-3817-3068

ABSTRACT

Yield losses due to major insect pests viz., leaf webber and capsule borer *Antigastra catalaunalis* (Duponchel) and gall fly *Asphondylia sesami* (Felt) in promising sesame varieties was carried out at the Regional Agricultural Research Station, Jagtial, during summer, 2019 and 2020 under protected and unprotected conditions. The highest % avoidable yield losses was recorded in Hima variety (35.45) followed by Swetha, Sharada, GT 10, Madhavi, Gouri, VRI 1 and Rajeswari with 34.27, 33.17, 32.48, 31.05, 30.53, 30.01 and 29.75, respectively. Regarding cost benefit ratio, highest was recorded in Hima variety (1:2.23) followed by Swetha (1:2.05) and Sharada (1:1.75).

Key words: Sesame, varieties, yield loss, leaf webber and capsule borer, gall fly, unprotected, protected, incidence, infestation, cost benefits

Sesame, *Sesamum indicum* L. is the oldest oilseed crop of the world cultivated throughout India and considered as 'Queen of oilseeds' because of its superior oil quality. In India, it is grown in all the crop growing seasons viz., kharif, rabi and summer. India ranks third in the world with 19.47 lakh ha with a productivity of 470 kg/ ha. Among the several cardinal factors responsible for low yield of sesame, damage by insect pests is considered as one of the vital factors causing substantial yield loss under field conditions. Out of 67 insect pests damaging the sesame, leaf webber and capsule borer *Antigastra catalaunalis* (Duponchel) and gall fly *Asphondylia sesami* (Felt) were considered as major insect pests (Choudhary et al., 1986). The information on crop yield losses is prerequisite to determine the relative importance of pests and to provide a sound base for an integrated management schedule. However, losses in yield are much variable depending upon the pest reaction on different varieties (Ahirwar et al., 2008; Dhandhalya and Shiyani, 2009). Hence, information on the yield losses due to major insect pests as a whole in sesame varieties is limited. Hence, present investigation on "avoidable yield loss estimation studies in promising sesame varieties against major insect pests" was undertaken.

MATERIALS AND METHODS

The study on avoidable yield losses due to major insect pests in promising varieties was carried out at Regional Agricultural Research Station, Jagtial during summer 2019 and 2020. The experiment was laid out in factorial randomized block design with eight selected varieties viz., T_1: Swetha, T_2: Gouri, T_3: Rajeshwari, T_4: Madhavi, T_5: VRI-1, T_6: Sharada, T_7: Hima, T_8: GT10 and replicated thrice under protected and unprotected conditions. Required plot size of each treatment is 12 m^2 and adopted 30 x 15 cm spacing for raising the sesame crop. Irrigation channels of one meter width were prepared between each replication for effective irrigation to the crop. Each plot was separated by a buffer zone of 0.75 m, so that drifting of insecticides during spraying was minimized in protected condition. In protected condition, crop was protected by treating the seed with imidacloprid 600 FS @ 5 ml/ kg seed and carbendazim @ 3g/ kg seed followed by foliar spray of profenophos 50 EC @ 2ml/ l and mancozeb @ 2.5g/ l at 25 days after sowing. Acephate 1g/ l and myclobutanil 1g/ l was sprayed at flowering and pod initiation stage. Insecticides were not sprayed under unprotected conditions. Data on larval incidence, leaf, flower and capsule damage by *A. catalaunalis* and flower infestation by *A. sesami* was recorded. The data on population incidence was transformed to square root transformation while values in percentages to arc sine value transformation (Gomez and Gomez, 1984) using OPSTAT software. Data on yield in each treatment plot was collected and avoidable yield loss and cost benefit ratio were computed using standard methodology.

RESULTS AND DISCUSSION

The data from Table 1 reveals that the *A. catalaunalis* larval incidence ranged from 0.12 to 0.22 in selected varieties at 30 days after sowing. The results revealed that, under protected conditions no significant difference was observed in selected varieties. While under unprotected conditions at 30 days after sowing, the *A. catalaunalis* larval incidence varies within the treatments from 0.22 to 0.47 larvae per plant. The lowest incidence was recorded in the varieties GT-10, Sharada, Hima, Gouri and Madhavi with 0.22, 0.22, 0.25, 0.28 and 0.28 larvae per plant and these five varieties were on par with each other. The highest larval incidence was recorded in VRI-1 (0.45 larvae/ plant) and swetha variety (0.47 larvae/ plant) and these varieties were on par with each other and the lowest leaf damage was recorded in GT-10 (4.01%) followed by Sharada (4.02%) and Gouri (4.34%) and these three varieties were on par with each other. At 50 and 70 days after sowing same trend was recorded in protected and unprotected conditions. Flower infestation by *A. sesami* in protected and unprotected conditions revealed that, under protected conditions, nil infestation was recorded in Gouri variety. The next best varieties were Hima (1.01%) and Sharada (1.28%). Whereas, under unprotected conditions, significantly lowest was recorded in the variety gouri (0.70%). The varieties Madhavi (2.58%) and Sharada (2.99%) were on par with each other. The highest increased seed yield in protected condition (Table 1) was recorded in Hima (255 kg/ha) variety followed by GT-10 (252 kg/ ha). The avoidable yield losses in selected sesame varieties revealed that varieties viz., Swetha, Gouri, Rajeshwari, Madhavi, VRI 1, Sharada, Hima and GT-10 were recorded 34.27, 30.53, 29.75, 31.05, 30.01, 33.17, 35.45 and 32.48% avoidable yield losses, respectively. These results were in agreement with Singh et al. (1985) who reported that, *A. catalaunalis* cause yield loss up to 10 -70% in sesame. Rohilla et al. (2003) reported that 15.62 to 66.83% yield losses can be avoided due to *A. catalaunalis* by application of insecticides. Manisegaran et al. (2001) opined *A. catalaunalis* causes the damage to the crop from 5 to 40%.

The highest cost benefit ratio recorded in Hima (1:2.23) followed by Swetha, Sharada, Rajeshwari, Gouri and GT-10 with 1:2.05, 1:1.75, 1:1.41, 1:1.39 and 1:1.36, respectively. The lowest was recorded VRI 1 and Madhavi with 1: 1.28 and 1: 1.19, respectively. The highest cost benefit ratio was observed in white seeded sesame viz, Hima, Swetha and Rajeshwari due to high price in the market compare to brown and black seed. Literature pertains to cost benefit ratio in sesame varieties were scanty. These results were in accordance with Nayak et al. (2015) who reported that net profits of rupees 2997.5 in JT-307, rupees 2556.3 in JT-308, rupees 2463.8 in JTS-8 and rupees 2408.7 in JT-306 were earned due to protection of crop. The sesame variety TKG -308 registered highest seed yield (630 kg ha^{-1}) and recorded BC ratio of 1.90 due to protected conditions (Anonymous, 2019).

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AUTHOR CONTRIBUTION STATEMENT

Omprakash conducted the original experiment and wrote original manuscript and done the data analysis. Narendra Reddy helps in planning of experiment. Swarnasree, Kiranbabu and Sreedhar contributed the conceptualizing, visualization, editing and supervision during research work.

CONFLICT OF INTEREST

No conflict of interest.

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Table 1. Incidence, damage and cost benefits- *A. catalaunalis* and *A. sesami* (Summer 2019, 2020)

Treatments	Factors	Larvae/ plant* 30 DAS	Larvae/ plant* 50 DAS	Larvae/ plant* 70 DAS	% damage** 30 DAS (Leaf)	% damage** 50 DAS (Flower)	% damage** 70 DAS (Capsule)	% flower infestation (45 DAS)**	Seed yield (kg/ ha)	Increased seed yield (kg/ha)	% avoidable seed yield loss	Profit of incremental yield (Rs.)	Net profit (Rsha^{-1})	Incremental cost benefit ratio
T_1- Swetha	Protected	0.22 (0.85)	0.15 (0.81)	0.10 (0.77)	4.93 (12.83)	4.71 (12.53)	2.70 (9.46)	2.05 (8.23)	704	241	34.27	19304	12304	1:2.05
	Unprotected	0.47 (0.98)	0.55 (1.02)	0.45 (0.97)	9.26 (17.72)	8.39 (16.84)	6.35 (14.60)	4.65 (12.45)	463					
T_2- Gouri	Protected	0.13 (0.79)	0.12 (0.79)	0.15 (0.81)	1.82 (7.75)	2.58 (9.24)	1.79 (7.69)	0.00 (0.00)	717	219	30.53	15322	8322	1:1.39
	Unprotected	0.28 (0.88)	0.31 (0.90)	0.28 (0.88)	4.34 (12.02)	5.37 (13.40)	3.52 (10.81)	0.70 (4.80)	498					
T_3 - Rajeshwari	Protected	0.22 (0.85)	0.12 (0.79)	0.08 (0.76)	2.03 (8.19)	3.80 (11.24)	1.59 (7.24)	1.42 (6.84)	649	193	29.75	15437	8437	1:1.41
	Unprotected	0.32 (0.91)	0.36 (0.93)	0.33 (0.91)	4.67 (12.48)	7.41 (15.80)	3.23 (10.35)	3.41 (10.64)	456					
T_4 - Madhavi	Protected	0.15 (0.81)	0.15 (0.82)	0.07 (0.75)	3.83 (11.29)	2.63 (9.33)	1.21 (6.32)	1.39 (6.77)	604	188	31.05	13131	7131	1:1.19
	Unprotected	0.28 (0.88)	0.33 (0.91)	0.37 (0.93)	5.42 (13.46)	6.87 (15.20)	4.73 (12.56)	2.58 (9.24)	416					
T_5 - VRI 1	Protected	0.22 (0.85)	0.18 (0.82)	0.12 (0.79)	4.84 (12.70)	4.30 (11.97)	2.62 (9.32)	2.52 (9.13)	699	210	30.01	14674	7634	1:1.28
	Unprotected	0.45 (0.97)	0.53 (1.01)	0.45 (0.97)	10.24 (18.66)	8.08 (16.59)	5.71 (13.82)	4.60 (12.38)	489					
T_6 - Sharada	Protected	0.13 (0.79)	0.12 (0.79)	0.07 (0.75)	1.82 (7.75)	1.96 (8.05)	1.16 (6.18)	1.28 (6.49)	757	251	33.17	17526	10526	1:1.75
	Unprotected	0.22 (0.85)	0.27 (0.88)	0.22 (0.85)	4.02 (11.57)	3.88 (11.36)	2.43 (8.97)	2.99 (9.96)	506					
T_7 - Hima	Protected	0.15 (0.81)	0.10 (0.77)	0.05 (0.74)	2.43 (8.97)	1.41 (6.82)	1.57 (7.20)	1.01 (5.76)	719	255	35.45	20385	13385	1:2.23
	Unprotected	0.25 (0.87)	0.33 (0.91)	0.27 (0.88)	4.47 (12.18)	5.47 (13.53)	3.43 (10.67)	4.03 (11.58)	464					
T8 - GT 10	Protected	0.12 (0.79)	0.00 (0.00)	0.00 (0.00)	2.24 (8.61)	0.00 (0.00)	0.00 (0.00)	1.49 (7.01)	777	252	32.48	15144	8144	1:1.36
	Unprotected	0.22 (0.85)	0.27 (0.88)	0.18 (0.82)	4.01 (11.55)	2.81 (9.65)	2.39 (8.89)	4.20 (11.83)	525					
SEm (±) (Protected)		-	-	-	0.15	0.18	0.14	0.23						
CD (p=0.05)		NS	NS	NS	0.44	0.52	0.39	0.68						
SEm (±) (Unprotected)		0.01	0.01	0.01	0.30	0.36	0.27	0.47						
CD (p=0.05)		0.03	0.02	0.03	0.87	1.03	0.78	1.35						
SEm (±) (PXUP)		0.01	0.01	0.01	0.42	0.50	0.38	0.66						
CD (p=0.05)		0.03	0.03	0.04	1.23	1.46	1.11	1.91						

DAS – days after sowing, NS –Non significant; *Figures in parentheses square root (($\sqrt{X+0.5}$) transformed values; **Figures in parentheses angular transformed values; Cost of spray (Insecticide+ labour cost) Rs. 6000

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