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ECONOMIC INJURY LEVEL OF SESAME LEAF WEBBER AND CAPSULE BORER *ANTIGASTRA CATALAUNALIS* (DUPONCHEL)

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ABSTRACT

A field trial was conducted at the experimental farm of Project Coordinating Unit Sesame and Niger (ICAR), College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh) during pre-rabi season, 2018 on TKG-22 variety. Economic injury level was worked out by calculating seed yield obtained from incidence/ population levels of *Antigastra* (0, 1, 2, 3, 4, 5, 6, 2.38 and 0.45 larvae/ plant) maintained from 20 DAS to till maturity of the crop. The total cost involved in the insecticide protected treatment was calculated taking into account the cost of three foliar sprayings of profenophos 50 EC (2 ml/ l). The correlation coefficient between larval population and seed yield was found highly significant (r= -0.92) and relationship was found negative. The regression equation showed that the yield of sesame seeds was reduced by 1.16 q/ ha for every increase of one larvae/ plant during pre-rabi 2018. The economic injury level was found 0.74 larvae/ plant for sesame during pre-rabi 2018.

Key words: *Antigastra catalaunalis*, sesamum, incidence, population levels, larvae/ plant, profenophos, correlation coefficients, seed yield, regression, economics

Sesame (*Sesamum indicum* L.) is an important oilseed crop with India ranking first in area and production with average productivity of 463 kg/ ha. (Anonymous, 2018). Bayissa (2010) mentioned that *A. catalaunalis* is the most destructive pest and attack sesame crop in all stages of its development. At vegetative stage, it feeds on the tender foliage by webbing the top leaves and later bores into the flowers and capsules and cause up to 90% yield loss (Ahuja and Kalyan, 2002). Egonyu et al. (2005) and Singh (1987) mentioned that Economic Threshold Level (ETL) and Economic Injury Levels (EIL) for *Antigastra catalaunalis* on sesame might get initiated when 10% infestation is reached and delay in spraying beyond this level results in economic loss in seed yield. Before reaching that level, it is desirable to initiate control. Stone and Pedigo (1972) concluded that EIL mainly depends on the market price of the produce and cost of plant protection. Hence, assessment of crop loss due to insect pest becomes essential for any IPM measure. The present study estimates the economic injury level for leaf webber and capsule borer *A. catalaunalis* on sesame under field condition.

MATERIALS AND METHODS

The present investigation was conducted in the experimental farm of Project Coordinating Unit Sesame and Niger (ICAR), College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur during pre-rabi season, 2018. To maintain the stock culture, larvae of *A. catalaunalis* were collected from the sesame field and brought to the laboratory for rearing. The larvae were kept in the petri dishes for pupation and fresh food viz., tender leaves and flowers were provided as their diet, maintaining strict hygiene, with fresh diet given as per need. After pupation in silken cocoon, these were collected and placed in rearing cages for the emergence of the adults. Sesame seedlings planted in disposable plastic glasses were placed inside the cage for oviposition and resting of moths. A swab of cotton dipped in 10% honey solution was kept in rearing cage as a food for adults. The eggs laid on seedling were collected carefully by moistened camel hair brush and placed in the petri dishes for hatching. The larvae thus obtained were used for artificial release. The sesame seed was sown in field condition and care was taken to avoid infestation by sucking insects and foliar diseases. Two healthy plants for each treatment were selected and carefully examined for the eggs, larvae, pupae and adults and were removed from the plants. The selected plants were covered with mosquito nets (screen cage) supported with specially designed iron rods.

In treatments, T_1 to T_7 plants were protected from damage by insect pests with mosquito nets and known number of 2nd instar larvae were released in each cage according to the treatments and maintained till maturity, with releasing of fresh 2nd instar larvae and removing the old larvae after pupation. According to treatment, the numbers of larvae were transferred by means of soft camel hair brush. The plants were artificially infested at 20 days after germination. After introducing the larvae, the bottom of the cages was sealed with mud to prevent the entry of other insects. Plants were periodically observed for pre and post infestation of other insect pests. Treatment T_8 and T_9 plants were grown in open condition. In treatment T_8 insects were allowed to feed on the plants while in treatment T_9, foliar spray of profenophos 50%EC @ 2ml/ l was given- three sprays, first at 30 DAS and subsequent ones at intervals of 15 days.

Observations were made at vegetative (30 DAS), flowering (45 DAS) and capsule stages (70 DAS) by counting the damaged/ healthy leaves, flowers and capsules/ plant. After maturity the screen nets were removed and plants were harvested separately to record the yield/ plant and converted to q/ ha (@ 2,50,000 plants/ ha). The economic injury level for *A. catalaunalis* was computed with the regression equation Y = a + bx, between the larval density and reduction in yield; reduction in yield in respective treatment = yield in completely protected treatment - yield in respective treatment. The EIL was computed based on the procedure given by Stone and Pedigo (1972) and modified by Ongulana and Pedigo (1974).

RESULTS AND DISCUSSION

The results revealed that at vegetative stage, the larvae of *A. catalaunalis*, thrived on the new shoots, and in the reproductive stage on the flowers and young pods. A significant impact on the per cent damaged leaves, flowers and capsules/ plant in treatments were th varied incidence. In general the damaged leaves, flowers and capsules increased as the larval numbers increased, and ranged from 0.00 to 72.97%, 0.00 to 83.33% and 0.00 to 80.67%, respectively. These observations corroborate with those of Shrivastava et al. (2002) that damage to flowers and capsules ranged from 2 to 75% and from 1.4 to 31.2%, respectively. Treatment T_9 (completely protected by foliar spray) was observed with the least leaf (4.87%), flower (5.42%) and capsule damage (5.55%). The treatment (T_8) where crop was left naturally without taking any protection measures recorded 30.44% damaged leaf, 35.32% flower and 21.56% capsule/plant. However, maximum (72.97% leaves; 83.33% flowers and 80.67% capsules/ plant) damage was in T_6 where 6 larvae/ plant was maintained; there was no damage T_7 control (0 larvae/ plant).

A significant impact on the seed yield was thus observed with *A. catalaunalis* incidence. Significantly maximum yield (7.00 g/ plant) was observed in the treatment without larvae in caged condition. This is on par with treatments of spraying profenophos (6.64 g/ plant) and 1 larva/ plant (4.16 g/ plant). Plants grown in natural condition (no cage) without spray (2.22 g/ plant) was at par with T_2 (2 larvae/ plant- 2.40 g/ plant). Minimum seed yield (0.12 g/ plant) was in the treatment T_6 in which 6 larvae/ plant followed by T_5 (0.34 g), being on par with each other and also with treatment T_4 (0.76 g/ plant).

The larval incidence showed significant positive correlation with % leaf (r=0.99**), flower (r=0.99**) and capsule (r=0.99**) damage, as well as % losses in seed yield (r=0.92**) while it showed significant negative correlation with seed yield (r=-0.92**). Leaf, flower and capsule damage showed significant positive relationship with loss in seed yield; leaf (r= - 0.93**) flower (-0.90**) and capsule damage (r=-0.85**) showed significant negative correlation with seed yield; and leaf damage showed significant positive correlation with % flower (r= 0.99**) and % capsule damage (r=0.98**).

Economic injury level was worked out using seed yield data and total cost involved in the three sprays of profenophos (Rs 5142/ ha). Income from the treatments was computed taking Rs 6000/ q as the price of sesame seed. The relationship between the number of larvae (0, 1, 2, 3, 4, 5, 6, 0.45 and 2.38 larvae/ plant) and yield in q/ ha (plants were infested from 20 days after germination and larval population were maintained till maturity of the crop) in TKG-22 variety determined with correlation coefficients/ regression equation is depicted in Fig. 1. These reveal that the correlation coefficient was highly significant (r= -0.92) and relationship is negative between incidence and yield. The yield was reduced by 1.16 q/ ha for every increase of one larvae/ plant.

Present observations derive supported from those of Wazire and Patel (2016). Manisegaran et al. (2002) reported that for increase in 1 larvae/ m^2 the yield loss was 18 to 200 kg/ ha during vegetative and reproductive stage. Wazire and Patel (2016) reported that yield was reduced by 0.57 and 0.43 q/ ha for every increase of one larvae/ plant. The present finding of the economic injury level as 0.74 larvae/ plant (variety TKG 22) derive support from the findings of Wazire and Patel (2016) and Bhadoria (1997).

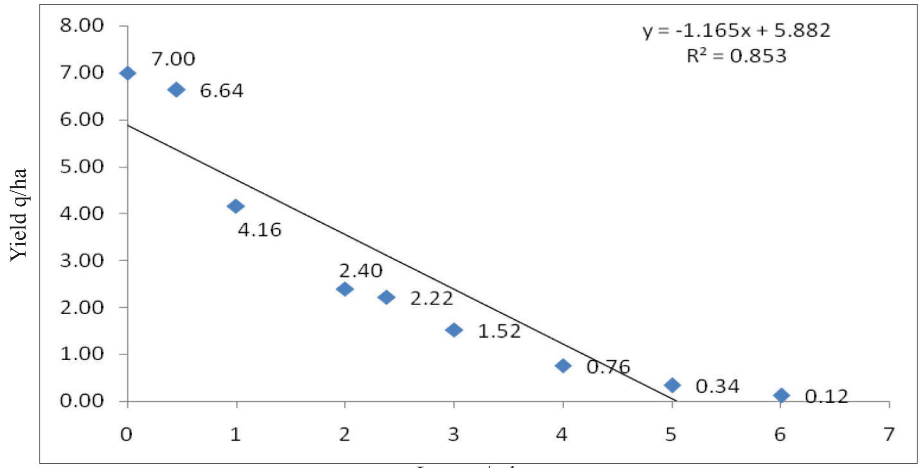

Fig. 1. Incidence of *A. catalaunalis* vs. seed yield in sesame

Table 1. Relationship between larval population vs. damages and seed yield in sesame

Treatments	Larval incidence No./ plant	Damage at			Seed yield / plant (g)	Seed yield (q/ha)	Loss in seed yield (q/ha.)	Avoidable yield loss (%)
		30 DAS Leaf damage (%)	45 DAS Flower damage (%)	70 DAS Capsule damage (%)				
T_1	1	12.18 (20.42)*	10.83 (19.19)	7.89 (16.32)	4.16	10.40	7.10	40.57
T_2	2	26.81 (31.18)	22.31 (28.18)	16.45 (23.92)	2.40	6.00	11.50	65.71
T_3	3	37.20 (37.59)	37.08 (37.51)	30.16 (33.31)	1.52	3.80	13.70	78.29
T_4	4	47.65 (43.65)	52.08 (46.20)	44.17 (41.65)	0.76	1.90	15.60	89.14
T_5	5	59.72 (50.60)	68.75 (56.04)	60.45 (51.03)	0.34	0.85	16.65	95.14
T_6	6	72.97 (58.68)	83.33 (65.99)	80.67 (63.92)	0.12	0.30	17.20	98.29
T_7	Control (0/plant)	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)	7.00	17.50	-	0.00
T_8	No cage (2.38/ plant)	30.44 (33.48)	35.32 (36.45)	21.56 (27.65)	2.22	5.55	11.95	68.29
T_9	Foliar spray-profenophos 50 EC (0.45/ plant)	4.87 (12.72)	5.42 (13.44)	5.55 (13.62)	6.64	16.60	0.90	5.14
SEm ±		17.72	20.17	19.81	0.72	1.22		
C. D. (p = 0.05)		53.14	60.48	59.39	2.15	3.65		
CV (%)		10.50	11.38	12.64	8.19	9.44		

*Figures in parentheses angular transformed values

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REFERENCES

Ahuja D B, Kalyan R K. 2002. Losses in seed yield due to insect pests in different varieties of sesame, *Sesamum indicum* L. Annals of Plant Soil Research 4(1): 99-103.

Anonymous. 2018. 4th Advance estimates, Agriculture Statistics Division, Directorate of Economics and Statistics, New Delhi.

Bayissa G W. 2010. Adoption of improved sesame varieties in Meisso District, West Hararghe Zone, Ethiopia. M. Sc. Thesis, Haramaya University, Haramaya, Ethiopia.

Bhadoria R K. 1997. Integrated approaches for the management of *Antigastra catalaunalis* (Duponchel) along with population dynamics and varietal susceptibility of *Asphondylia sesami* Felt on sesamum. M.Sc. (Ag.) Thesis. Gujarat Agricultural University, Junagadh.

Egonyu J P, Kyamanywa S, Anyanga W, Ssekabembe C K. 2005. Review of pests and diseases of sesame in Uganda. African Crop Science Conference Proceedings, Vol. 7. pp. 1411-1416, Kampala, Uganda.

Manisegaran S, Manimegalai N, Pushpa, J., Mohammed S E N. 2001. Non-preference mechanism of resistance in sesame to shoot webber and capsule borer *Antigastra catalaunalis*. Annals of Plant Protection Sciences 9 (1): 123-124.

Ogulana M O, Pedigo L P. 1974. Economic injury levels of the potato leaf hopper on soyabean in Iowa. Journal of Economic Entomology 67: 29-32.

Shrivastava N, Duhoon S S, Raghuwanshi K M S, Fernandez M J. 2002. Testing of different germplasm lines of sesame against leaf roller and capsule borer, *Antigastra catalaunalis*. Sesame and Safflower Newsletter 17: 69-70.

Singh K M. 1987. Economic injury level of the sesame leaf webber *Antigastra catalaunalis* dup in Delhi India. Indian Journal of Plant Protection 15 (2): 136-141.

Stone J D, Pedigo L P. 1972. Development of economic injury level of green clover worm on soybean in Iowa. Journal of Economic Entomology 65: 197-201.

Wazire N S, Patel J I. 2016. Determination of economic injury level (EIL) for leaf webber and capsule borer, *A. catalaunalis* (Duponchel) in sesamum. International Journal of Life Sciences, Special Issue A6.

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