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Evaluation of Certain Insecticides Against Sesame Leaf Webber and Capsule Borer (*Antigastra catalaunalis* Duponchel)

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ABSTRACT

A field experiment trial was conducted during (summer) 2019 and 2020 to evaluate the efficacy of certain insecticides against *Antigastra catalaunalis* on sesame. A total of seven selected insecticide molecules viz., acephate 75% SP, spinosad 45% SC, profenophos 50% EC, imidacloprid 17.8% SL, ethofenprox 10% EC, chlorantraniliprole 18.5% SC and azadirachtin 1500 ppm were tested for their efficacy. Among selected insecticides, chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} (90.28%) was found to be the most effective in reduction of *A. catalaunalis* larval population followed by spinosad 45% SC @ 0.3 ml l^{-1} with 80.23 % larval reduction over control. The next best treatments were profenophos 50% EC @ 2.0 ml l^{-1}, acephate 75% SP @ 1.0 g l^{-1}, ethofenprox 10% EC @ 2.0 ml l^{-1} and imidacloprid 17.8% SL @ 0.4 ml l^{-1} recorded 73.48%, 62.91%, 58.77% and 53.45% mean reduction of *A. catalaunalis* larval population, respectively. The azadirachtin 1500 ppm @ 5.0 ml l^{-1} (29.88%) recorded lowest reduction of *A. catalaunalis* larval population compared to untreated control. The highest seed yield of 801 kg ha^{-1} was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} treatment followed by spinosad 45% SC @ 0.3 ml l^{-1} (783 kg ha^{-1})) and the least seed yield was obtained in azadirachtin 1500 ppm @ 5.0 ml l^{-1} treatment (550 kg ha^{-1}). The highest incremental cost benefit ratio was recorded in profenophos treatment (1:3.22) followed by chlorantraniliprole treatment (1:3.12) and spinosad (1:2.96) treatment.

KEYWORDS: *Antigastra catalaunalis*, insecticides, efficacy, reduction, sesame, yield, cost-benefit ratio, larval population

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1. INTRODUCTION

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 (Alegbejo et al., 2003). It is an annual crop belonging to the order Tubiflorae, family Pedaliaceae commonly known as "Til". Sesame plays an important role in human nutrition and Indian culture. Sesame is the oldest indigenous oil plant with longest history of its cultivation in India. In India, it is grown in all the crop growing seasons viz., kharif, rabi and summer. Due to the presence of potential antioxidants, sesame seeds are known as "the seed of immortality". Seeds of sesame contain 38-54% oil, 18-25% protein, phosphorous, calcium and oxalic acid (Prasad et al., 2002). Sesame seed oil has long shelf life due to the presence of lignans, which have a remarkable antioxidant function (Chakraborthy et al., 2008). It is grown in India in an area of 1.62 m ha with 657 MT production and 405 kg ha^{-1} productivity. In Telangana state sesame occupies an area of 21,000 ha with production and productivity of 13.36 MT and 636 kg ha^{-1} respectively (Anonymous, 2020). 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 crop, leaf webber and capsule borer considered as key pest (Ahirwar et al., 2009; Choudhary et al., 1986). The leaf webber and capsule borer (*Antigastra catalaunalis)* belongs to the family Pyraustidae, order Lepidoptera and is considered to be the most destructive pest, throughout India. It is an important pest because it attacks the crop at all the growth stages starting from two weeks after emergence (Suliman et al., 2004). This pest is active from germination to till the harvest of the crop, so called this pest as Key pest of sesame (Thakur and Ghorpade, 2006). It feeds on tender foliage by webbing the top leaves, feeds on flowers and bores into the pods (Narayanan and Nadarajan, 2005). This insect pest causes 10-70% infestation on leaves, 34-62% on flowers and 10-44% infestation on pods resulting about 72% loss in yield (Ahirwar et al.,2010; Ahuja and Kalyan, 2002).The chemical control has been suggested by many workers to combat with the insect pests of sesame crop (Goel and Kumar, 1991; Kumar et al., 1994; Selvanarayanan and Baskaran, 1996; Tripathi et al., 2007; Kumar and Ali, 2010; Suliman et al., 2013). Insecticides are the primary weapons to control any insect pest. Present-day need emphasizes not only the use of different groups of chemicals that are eco-friendly but also the ones which give satisfactory control of insect pest population by their novel mode of action. Now a days a large number of newer insecticides with novel mode of action are available in market. These insecticides are required only in small quantities as compared to older class of compounds. Efficacy of these chemicals needs to be studied for the effective and economical control of this pest. Keeping in view of the above, in the present study an attempt has been made to evaluate the efficacy of insecticides for the management of sesame leaf webber and capsule borer.

2. MATERIALS AND METHODS

The experiment was laid out in Randomized Block Design (RBD) with eight treatments including untreated control and replicated thrice at Regional Agricultural Research Station, polasa, Jagtial (18°15'15.8" N, 78°58'51.6" E), PJTSAU, Telangana state, India on sesame variety Swetha til which is a popular variety in Telangana state during (summer)2019 and 2020. Required numbers of plots having a plot size of 12 m^2 (3m × 4 m) were prepared to accommodate all the eight treatments. Spacing of 30 x 15 cm was adopted for raising the sesame crop. Each plot was separated by a gap of 0.75 m, so that drifting of insecticides during spraying was minimized. Selected insecticide molecules that are known to have novel mode of action viz., acephate 75% SP, spinosad 45% SC, profenophos 50% EC, imidacloprid 17.8% SL, ethofenprox 10% EC, chlorantraniliprole 18.5% SC and azadirachtin 1500 ppm were tested at their respective recommended field concentrations against leaf webber and capsule borer of sesame. A total of two insecticidal applications were given during the crop growth period. First insecticidal application was given when the pest reached economic threshold level (25 Days after sowing (DAS)). The second insecticidal application was given 20 days after first spray (45 DAS). Data on mean number of larvae was recorded from 10 randomly selected plants. % reduction of test treatments expressed as population reduction in individual treatments with reference to control. The % reduction of larval population was calculated by using modified Abbott's formula given by Fleming and Retnakaran (1985).

% Population reduction= 1-[(Post treatment population in treatment)/(Pre treatment population in treatment)×(Pre treatment population in control)/(Post treatment population in control)]×100

Data on % leaf, flower and capsule damage due to *A. Catalaunalis* was recorded from 10 randomly selected plants.

% leaf/flower/capsule damage=(No. Of damaged leaves/flowers/capsules/Total no. Of leaves/flowers/capsules)×100

The yield data was recorded from each plot separately. Seed yield from each plot was converted into kilogram per hectare. Cost benefit ratio was also calculated for each treatment.

3. RESULTS AND DISCUSSION

The pooled mean % reduction of *A. Catalaunalis* larval population at five days after first spray during *summer*

2019 and 2020 indicated that all the insecticides were superior over control. The pooled data (Table 1) revealed that, highest mean % reduction of *A. Catalaunalis* larval population was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} (68.71) followed by spinosad 45% SC @ 0.3 ml l^{-1} (58.92) and these two treatments were significantly different from each other. Ethofenprox 10% EC @ 2.0 ml l^{-1} was the next best treatment and this treatment was on par with profenophos 50% EC @ 2.0 ml l^{-1} and acephate 75% SP @ 1.0 g l^{-1} with 48.79%, 46.49% and 46.27% reduction of *A. Catalaunalis* larval population over control, respectively. Regarding % leaf damage at five days after spray revealed that, the significantly lowest mean % leaf damage was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} (3.13) treatment. The treatments spinosad 45% SC @ 0.3 ml l^{-1} and profenophos 50% EC @ 2.0 ml l^{-1} recorded with 4.16 and 4.60 % leaf damage and these two treatments were on par with each other. Ten days after first insecticidal spray, the significantly highest mean % reduction of *A. Catalaunalis* larval population was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} (80.77) treatment followed by spinosad 45% SC @ 0.3 ml l^{-1} with 71.97 % reduction. Profenophos 50% EC @ 2.0 ml l^{-1} and acephate 75% SP @ 1.0 g l^{-1} with 63.84% and 60.95% reduction of *A. Catalaunalis* larval population, respectively and these two treatments were on par with each other. The % leaf damage at 10 DAS revealed that, significantly lowest %leaf damage was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} (2.01) treatment. The treatment spinosad 45% SC @ 0.3 ml l^{-1} and profenophos 50% EC @ 2.0 ml l^{-1} recorded with 3.00% and 3.24 % leaf damage, respectively and these two treatments were on par with each other.

At five days after second spray (Table 1) revealed that highest mean % reduction of *A. Catalaunalis* larval population was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} (63.92) treatment which was significantly superior over other treatments and next effective treatments followed were spinosad 45% SC @ 0.3 ml l^{-1} and profenophos 50% EC @ 2.0 ml l^{-1} with 54.80 and 51.25 %reduction of *A. Catalaunalis* larval population, respectively and these treatments were on par with each other. The significantly lowest mean % flower damage was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} treatment with 2.47%. The treatments viz., spinosad 45% SC @ 0.3 ml l^{-1}, profenophos 50% EC @ 2.0 ml l^{-1} and acephate 75% SP @ 1.0 g l^{-1} recorded with 3.74%, 4.09% and

Table 1: Efficacy of certain insecticides against *A. Catalaunalis* on sesame after insecticidal spray

Treatments	First spray				Second spray				% Capsule damage
	Mean % reduction of *A. Catalaunalis* larval population		% leaf damage		Mean % reduction of *A. Catalaunalis* larval population		% flower damage		
	5 DAS	10 DAS	5 DAS	10 DAS	5 DAS	10 DAS	5 DAS	10 DAS	
Acephate 75% SP	46.27[cde] (42.86)	60.95[cd] (51.33)	5.20[cde] (13.18)	4.09[de] (11.67)	48.23[cd] (43.99)	62.91[d] (52.48)	4.35[cd] (12.03)	2.83[cd] (9.69)	3.15[cd] (10.23)
Spinosad 45% SC	58.92[b] (50.14)	71.97[b] (58.04)	4.16[b] (11.77)	3.00[b] (9.98)	54.80[b] (47.75)	80.23[b] (63.60)	3.74[b] (11.15)	1.91[b] (7.95)	2.02[b] (8.17)
Profenophos 50% EC	46.49[cd] (42.99)	63.84[c] (53.04)	4.60[bc] (12.38)	3.24[bc] (10.37)	51.25[bc] (45.71)	73.48[c] (59.01)	4.09[c] (11.66)	2.53[c] (9.15)	2.79[c] (9.62)
Imidacloprid 17.8% SL	39.07[f] (38.69)	49.08[ef] (44.47)	5.96[f] (14.13)	4.71[def] (12.54)	35.62[f] (36.64)	53.45[ef] (46.98)	5.46[ef] (13.52)	4.20[f] (11.82)	4.48[ef] (12.22)
Ethofenprox 10 % EC	48.79[c] (44.31)	55.36[de] (48.08)	5.04[cd] (12.97)	3.95[cd] (11.46)	41.92[de] (40.35)	58.77[de] (50.05)	5.08[e] (13.03)	3.47[e] (10.73)	4.28[e] (11.94)
Chlorantraniliprole 18.5% SC	68.71[a] (55.99)	80.77[a] (63.99)	3.13[a] (10.20)	2.01[a] (8.16)	63.92[a] (53.08)	90.28[a] (71.83)	2.47[a] (9.04)	1.03[a] (5.83)	1.16[a] (6.17)
Azadirachtin 1500 ppm	27.63[g] (31.71)	31.07[g] (33.88)	6.31[g] (14.55)	5.96[g] (14.13)	23.24[g] (28.82)	29.88[g] (33.13)	6.68[g] (14.98)	5.29[g] (13.30)	5.51[g] (13.57)
Untreated control	0.00 (0.00)	0.00 (0.00)	8.77[h] (17.23)	10.62[h] (19.02)	0.00 (0.00)	0.00 (0.00)	8.41[h] (16.86)	8.82[h] (17.28)	9.95[h] (18.38)
SEm±	1.12	1.43	0.41	0.38	1.22	1.47	0.38	0.33	0.30
CD (p=0.05)	3.45	4.39	1.27	1.17	3.75	4.51	1.18	1.03	0.91

DAS: Days after Spraying; Figures in parenthesis are angular transformed values

4.35% flower damage and these treatments were on par with each other. Ten days after second spray revealed that highest mean % reduction of *A. Catalaunalis* larval population was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} (90.28) treatment and this treatment was significantly superior over other treatments. The next effective treatments followed were spinosad 45% SC @ 0.3 ml l^{-1} and profenophos 50% EC @ 2.0 ml l^{-1} with 80.23% and 73.48% reduction of *A. Catalaunalis* larval population, respectively. Acephate 75% SP @ 1.0 g l^{-1} (62.91%) was next best treatment and this treatment was on par with ethofenprox 10% EC @ 2.0 ml l^{-1} (58.77%). Imidacloprid 17.8% SL @ 0.4 ml l^{-1} and azadirachtin 1500 ppm @ 5.0 ml l^{-1} were found to be the least effective with 53.45% and 29.88% reduction of *A. Catalaunalis* larval population, respectively. Significantly lowest flower damage was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} treatment with 1.03% followed by spinosad 45% SC @ 0.3 ml l^{-1} with 1.91 % flower damage. The treatments profenophos 50% EC @ 2.0 ml l^{-1} and acephate 75% SP @ 1.0 g l^{-1} recorded 2.53% and 2.83% flower damage and these treatments were on par with each other. All insecticidal treatments were significantly superior over untreated control (8.82%). Regarding the capsule damage, lowest damage was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} treatment with 1.16% followed by spinosad 45% SC @ 0.3 ml l^{-1} with 2.02%. Profenophos 50% EC @ 2.0 ml l^{-1} and acephate 75% SP @ 1.0 g l^{-1} with 2.79% and 3.15% capsule damage and these two treatments were on par with each other. The highest mean % capsule damage was recorded in azadirachtin 1500 ppm @ 5.0 ml l^{-1} with 5.51% capsule damage. All insecticidal treatments were significantly superior over untreated control (9.95%). The present findings were in agreement with Premdas et al. (2018) and Ramoliya Amit (2014) who reported that, chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} has given a successful reduction in larval population of *A. Catalaunalis*. Chlorantraniliprole and spinosad were considered as the best insecticides by recording minimum larval population of *Antigastra* on sesame, highest % reduction over control, least damage of capsules and highest grain yield (Naveen et al., 2019). The present findings were in agreement with Rakesh Yalawar et al. (2020) and Jyothi et al. (2019) who reported that, spinosad 45 SC @ 0.15 ml l^{-1} was found to be most effective against leaf webber and capsule borer. These results were in accordance with Wazire and Patel (2015) who reported based on number of larvae per plant, % flower and capsule infestation recorded after two sprays, spinosad 0.001% was found significantly most effective. Another insecticide azadadirachtin @ 1500 ppm was least effective in controlling *A. Catalaunalis* larval population. This result was in agreement with Kaushal Kishore et al. (2020) who reported neemarin was least effective treatment against insect pests of sesame.

The pooled seed yield during *summer* 2019 and 2020 results revealed that, all the insecticidal treatments recorded significantly higher seed yield over untreated control (Table 2). The highest seed yield of 801 kg ha^{-1} was recorded in chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1} followed by spinosad 45% SC @ 0.3 ml l^{-1} (783 kg ha^{-1}) and these were on par with each other. The next effective treatments followed were profenophos 50% EC @ 2.0 ml $l^{-1}$and acephate 75% SP @ 1.0 g l^{-1} recorded the seed yield of 702 and 661 kg ha^{-1}, respectively and these treatments were on par with each other. The other treatments ethofenprox 10%

Table 2: Yield and cost benefit ratio of treatments

	Seed yield (kg ha^{-1})	Incremental yield over control (kg ha^{-1})	Value of incremental yield over control (₹ ha^{-1}) (₹)	Cost of treatments (Chemical cost + labour cost) ((₹ Ha^{-1}) (₹)	Net profit (₹ ha^{-1}) (₹)	Incremental Cost: Benefit ratio
Acephate 75% SP	661	196	14667	3800	10867	1: 2.86
Spinosad 45% SC	783	317	23778	6000	17778	1: 2.96
Profenophos 50% EC	702	236	17722	4200	13522	1: 3.22
Imidacloprid 17.8% SL	605	139	10417	3900	6531	1: 1.67
Ethofenprox 10 % EC	645	179	13440	4400	9040	1: 2.05
Chlorantraniliprole 18.5% SC	801	335	25111	6100	19011	1: 3.12
Azadirachtin 1500 ppm	550	84	6306	4000	2036	1: 1.15
Untreated control	466	-	-		-	-
SEm±	19.51					
CD (p=0.05)	59.75					

1US$= 76.575 INR

EC @ 2.0 ml l^{-1} and imidacloprid 17.8% SL @ 0.4 ml l^{-1} were recorded the yield of 645 and 605 kg ha^{-1} respectively and on par with each other in terms of yield obtained in sesame. The least effective treatment was azadirachtin 1500 ppm @ 5.0 ml l^{-1} with seed yield of 550 kg ha^{-1}. All treatments were significantly superior over untreated control (466 kg ha^{-1}). The pooled efficacy of different insecticidal treatments on seed yield was found to be in the following order.

Chlorantraniliprole 18.5% SC > Spinosad 45% SC > Profenophos 50% EC>Acephate 75% SP>Ethofenprox 10 % EC>Imidacloprid 17.8% SL>Azadirachtin 1500 ppm > Untreated control

These results were also in conformity with Naveen et al. (2019) who reported that chlorantraniliprole 20% SC @ 0.20 ml l^{-1} and spinosad 45 SC @ 0.12 ml l^{-1} was considered as the best insecticides by recording highest grain yield. Panday et al. (2017) reported seed treatment with imidacloprid + foliar spray profenophos 50 EC outperformed over others in terms of % increase in yield (95.00 %) over control. Mamtadevi et al. (2017) also reported that, highest seed yield of 8.22, 8.16, 7.85 and 7.59 q ha^{-1} was recorded in the plots treated with spinosad, indoxacarb, acephate and carbaryl, respectively.

Maximum benefit from a single rupee was realized with the treatment profenophos 50% EC @ 2.0 ml $l^{-1}$and the incremental cost-benefit ratio due to this treatment was 1:3.22 and was followed by chlorantraniliprole 18.5% SC @ 0.3 ml l^{-1}, spinosad 45% SC @ 0.3 ml l^{-1} acephate 75% SP@ 1.0 g l^{-1} and ethofenprox 10% EC @ 2.0 ml l^{-1} with the incremental cost-benefit ratios were 1: 3.12, 1: 2.96, 1: 2.86 and 1: 2.05, respectively. The lowest incremental cost-benefit ratio was recorded imidacloprid 17.8% SL @ 0.4 ml l^{-1} and azadirachtin 1500 ppm @ 5.0 ml l^{-1} with 1:1.67 and 1: 1.15, respectively (Table 2).

4. CONCLUSION

Among the different selected tested insecticides, chlorantraniliprole @ 0.3 ml l^{-1} and spinosad @ 0.3 ml l^{-1} were identified as effective insecticides in reduction *A. Catalaunalis* larval population and its damage in sesame crop followed by profenophos @ 2.0 ml l^{-1} and acephate @ 1.0 g l^{-1}. The other treatments viz., ethofenprox 10% EC @ 2.0 ml l^{-1} and imidacloprid 17.8% SL @ 0.4 ml l^{-1}were the next best treatments.

5. FUTURE RESEARCH

In the present investigation only few insecticides were tested for efficacy studies. There is a tremendous scope to test different new insecticides and botanicals either alone or in combination to find out their efficacy against *Antigastra catalaunalis* of sesame.

6. ACKNOWLEDGEMENT

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7. REFERENCES

Ahirwar, R.M., Banerjee, S., Gupta, M.P., 2009. Seasonal incidence of insect pests of sesame in relation to abiotic factors. Annals of Plant Protection Sciences 17(2), 351–356.

Ahirwar, R.M., Gupta, M.P., Smita, B., 2010. Bio ecology of leaf roller/ capsule borer, *Antigastra catalaunalis* (Dupochel). Advances of Bioresearch1(2), 90–104.

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.

Alegbejo, M.D., Iwo, G.A., Abo, M.E, Idowu, A.A., 2003. Sesame: A potential industrial and export oilseed crops in Nigeria. Journal of Sustainable Agriculture 23, 59–76.

Anonymous 2020. INIDIASTAT Crop Statistics 2020. India´s comprehensive statistical analysis. http://www.indiastat.com/. Accessed on 19th December, 2021.

Chakraborthy, G.S., Sharma, G., Kaushik, K.N., 2008. *Sesamum indicum* - A review. Journal of Herbal Medicine and Toxicology 2(2), 15–19.

Choudhary, R., Singh, K.M., Singh, R.N., 1986. Pest complex and succession of insect-pests in *Sesamum indicum* Linn. Indian Journal of Entomology. 48, 428–438.

Fleming, R., Retnakaran, A., 1985. Evaluating single treatment data using Abbott's formula with reference to insecticides. Journal of Economic Entomology 78, 1179–1181.

Goel, S.C., Kumar, S., 1991. Ovicidal action of synthetic pyrethroids on the eggs of Bihar hairy caterpillar, *Spilosoma obliqua* (Walker) and sesamum sphinx, *Acherontiastyx* (Westwood). Entomon 16(3), 237–239.

Jyothi, J., Vijay Kumar, L., Shruthi, R., Anusha, S.B., 2019. Management of leaf webber and capsule borer *Antigasta catalunalis* (Lepidoptera: Pyralidae) in sesame. International Journal of Chemical Studies 7(3), 5135–5140.

Kaushal Kishore, Kabir, Neelam Yadav,Vikrant, 2020. Efficacy of insecticides against the seasonal incidence of major insect pests of sesamum (*Sesamum indicum* L.). Journal of Entomology and Zoology Studies 8(1), 1635–1638.

Kumar, S., Goel, S.C. 1994. Studies on the life history of a Pyralid, *Antigastra catalaunalis* Duponchel) in Western Uttar Pradesh. Bulletin of Entomology

35(1-2), 123–128.
Mamtadevi, C., Kumawat, K.C., Samota, R.G., Tejpal Bajaya, 2017. Efficacy of different insecticides against leaf and capsule borer, *Antigastra catalaunalis* (Dup.) infesting sesame, *Sesamum indicum* (L.). Journal of Pharmacognosy and Phytochemistry 6(4), 1228–1232.
Narayanan, U.S., Nadarajan, L., 2005. Evidence for a male- produced sex pheromone in sesame leaf webber, *Antigastra catalaunalis* (Duponchel) (Pyraustidae: Lepidoptera). Journal of Current Science 88(4), 631–634.
Naveen, B., Sushila Nadagouda, Ashoka, J., Sreenivasa, A.G., 2019. Bio efficacy of novel insecticides against capsule borer *Antigastra catalunalis* (Duponchel) in sesame. International Journal Current Microbiology and Applied Science 9, 279–284.
Panday, A.K, Rajani Bisen, Roshni Sahu, Ranganatha, A.R.G., 2017. Comparative efficacy of seed treatment and their combinations with foliar spray of insecticides for the management of *Antigastra catalaunalis* in sesame. Journal of Entomology and Zoology Studies 5(5), 1216–1220.
Prasad, S.S., Yadav, U.S., Srivastava, R.K., 2002. Integrated management studies against *Olitorius* jute pests. Annals of Plant Protection Sciences 10, 248–251.
Premdas, M.I.C., Hariprasad, K.V., Manjula, K., Mohan Reddy, D., Sumathi, P., 2018. Management of lepidopteran pests of sesamum with certain insecticides. Andhra Pradesh Journal of Agricultural Sciences 4(1), 7–13.
Rakesh Yalawar, V.S., Acharya, Hiremath, R., 2020. Bio efficacy of different insecticides against leaf webber and capsule borer, *Antigastra catalaunalis* (Dup.) on sesame. Journal of Pharmacognosy and Phytochemistry 9(5), 90–93.
Ramoliya Amit, G., 2014. Seasonal incidence, varietal screening and chemical control of pest complex of sesamum in *summer* season. M.Sc. (Ag.) Thesis submitted to Junagadh Agricultural University, Gujarat.
Selvanarayanan, V., Baskaran, P., 2000. Biology and spinning behaviour of sesame shoot webber and capsule borer, *Antigastra catalaunalis* Duponchel (Lepidoptera: Pyraustidae). Sesame and Safflower Newsletter 15, 75–77.
Suliman, E.H., Nabil, B.H.H., Alawia, O.A., 2004. Evaluation of some insecticides for the control of sesame webworm, *Antigastra catalaunalis* (Dup.) Proceedings of the 2nd National Pest Management Conference, Sudan.
Suliman, E.N.H., Bashir, N.H.H., Suliman, E.N.H., Asad, Y.O.H., 2013. Biology and webbing behaviour of sesame webworm *Antigastra catalaunalis* Duponchle (Lepidoptera: Pyraustidae). Global Journal of Medicinal Plant Research 1(2), 210–213.
Thakur, S.G., Ghorpade, S.A. 2006. Sesame leaf webber and capsule borer, *Antigastra catalaunalis* Dup. A review. Journal of Maharashtra Agricultural University 31(3), 300–307.
Tripathi, J.K., Srivastava, J.P., Tripathi, A., Agrawal Neerja. 2007. Efficacy of different insecticides against *Antigastra catalunalis* infesting sesamum. Journal of Plant Protection and Environment 4(2), 81–84.
Wazire, N.S., Patel, J.I., 2015. Efficacy of insecticides against sesamum leaf webber and capsule borer, *Antigastra catalaunalis* (Duponchel). Indian Journal of Entomology 77(1), 12–15.