



ISSN: 0976-3376

Available Online at <http://www.journalajst.com>

ASIAN JOURNAL OF
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 10, Issue, 12, pp.10522-10525, December, 2019

RESEARCH ARTICLE

OCCURRENCE OF STEM FLY, *Ophiomyia Phaseoli* in MAJOR PEST STATUS IN BLACK GRAM IN SOUTHER ZONE OF ANDHRA PRADESH, INDIA

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ARTICLE INFO

Article History:

Received 25th September, 2019
Received in revised form
09th October, 2019
Accepted 17th November, 2019
Published online 30th December, 2019

Key words:

Black gram, Stem fly,
Ophiomyia phaseoli,
Infestation,
Dates of sowing, Varieties.

ABSTRACT

The infestation of Stem fly, (Tryon) *Ophiomyia phaseoli* is being observed regularly in Black gram during *rabi* in Southern zone of Andhra Pradesh, India. Two black gram varieties, i.e. TBG104 and PU31 were tested with four dates of sowing during *rabi* 2018 -19 to record the incidence of stem fly, *Ophiomyia phaseoli*. Four sowings include first fortnight of November to Second fortnight of December. Data on the infestation levels of stem fly was recorded at 15 days interval during the crop period (upto 85 DAS). As initial symptoms, the wilting and drying of first and second tender leaves was noticed. Later, after thickening of the stem, in majority of the infested plants, the damage was observed at basal portion of the stem just above to the ground level. The stems appeared thickened and in that portion, consisted longitudinal spits. The tunneling was observed downwards. With the puparia seen in affected stems, the stem fly infestation was confirmed. The infestation of stem fly was very high during February and March i.e in December sown plots. In D1, D2, D3 and D4 plots, the average per cent stem fly incidence recorded was 12.88, 21.47, 25.42 and 48.00 respectively. No such variations were observed between the 2 varieties with respect to stem fly infestation. In TBG104 and PU31, average infestation levels of 25.46 and 28.43 % were recorded. From the weather data and the data on stem fly infestation levels, it is clear that, most influencing factor is Maximum temperature. Maximum temperature from 36 to 38°C is very congenial for stem fly that was existed during II FN Feb – II FN March. During this period, the per cent infestation was high even maximum 100% also. The relative humidity Morning and Evening recorded during the period of high incidence were 68 to 76% and 22 to 32%.

Citation: Manjula, K., Prasanthi, L. and John sudheer, M. 2019. "Occurrence of Stem fly, *Ophiomyia phaseoli* in Major pest status in Black gram in Southern Zone of Andhra Pradesh, India.", *Asian Journal of Science and Technology*, 10, (12), 10522-10525.

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INTRODUCTION

Black gram (*Vigna mungo* L.; Family: Fabaceae), known as Urad Dal or Black lentil, was originated in India, where it has been in cultivation from ancient times and is one of the most important pulses of India and Pakistan. Blackgram has also been introduced to other tropical areas mainly by Indian immigrants. Black gram plays an important role in Indian diet, as it contains vegetable protein and supplement to cereal based diet. It contains about 26% protein, which is almost three times that of cereals and other minerals and vitamins. Besides, it is also used as nutritive fodder, specially for milch animals. During *kharif*, it is cultivated throughout the country. It is best suited to rice fallows during *rabi* in southern and south-eastern parts of India. In India, Black gram contributes 10% to the national pulse production from an area of 13% (Gailce Leo Justin, 2015). Madhya Pradesh, Uttar Pradesh and Andhra Pradesh are the major Blackgram growing states area-wise.

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The crop is resistant to adverse climatic conditions and improve the soil fertility by fixing atmospheric nitrogen in the soil. The National yield average of Black gram is 585 kg/ha. Andhra Pradesh, is the third major pulse crop grown after Red gram and Gram. Currently, black gram is grown in 34 lakh hectares in Andhra Pradesh. The coastal Andhra region is famous for blackgram after paddy. In other districts, It is mainly grown in *rabi* season. The Guntur district ranks first in Andhra Pradesh for the production of blackgram. Prodhani et al., (2008) reported that, stem fly, *Ophiomyia phaseoli*; Flea beetle, *Phyllotreta striolata*; Thrips, *Thrips tabaci* and pod borer, *Maruca testulalis* are the major pests of blackgram in Bangladesh causing serious damage to the crop. In India, the annual yield losses of black gram due to insect pests has been estimated at about 30 per cent (Gailce Leo Justin, 2015). White fly, *Bemisia tabaci*; Leaf hopper, *Empoasca kerri*; Tobacco caterpillar, *Spodoptera litura*; Semilooper, *Trichoplusia ni*; Bihar hairy caterpillar, *Spilosoma obliqua*; thrips, *Thrips tabaci*; Aphids, *Aphis craccivora*; pod borers, *Maruca spp*, *lampides boeticus* and *Helicoverpa armigera* are the major insect pests that attack Blackgram in India.

In recent seasons, stem fly, *Ophiomyia phaseoli* is being regularly observed to infest the *rabi* red gram in southern zone of Andhra Pradesh, India. Black gram stem fly (*Ophiomyia phaseoli*) inserts eggs on the underside of young leaves. Ovipositing sites present as pale pinprick spots when infested leaves are held up to the light. The larvae are whitish, torpedo-shaped maggots that reach little more than 2mm. Larva pupate after 8-11 days. Before pupation, which takes place inside the stem, the larva makes an exit hole for the emergence of the adult. Pupae are smooth, light brown to pale brown, cylindrical in shape with rounded ends. Pupal stage lasts 6–12 days. Adult flies are shiny black and about 2mm long with a pair of clear wings of wingspan 4-5 mm. Infected stems are often red inside (sometimes pale) and a distinct zig-zag tunnel may be observed with maggots or pupae inside. Apart from the exit holes, the plants will initially appear healthy on the outside. Large infestations (3 or more maggots per plant) may cause wilting and may even cause plant death, especially in younger plants particularly if damage occurs in the plant's hypocotyl (basal stem) region (NIPHM, 2014). The studies pertaining to seasonal incidence of black gram stem fly is useful for formulating management strategies. In this line, Two black gram varieties ,i.e, TBG104 and PU31 were sown with four dates of sowing during *rabi* 2018 -19 to study the incidence of stem fly, *Ophiomyia phaseoli*.

MATERIALS AND METHODS

The trial was sown in four dates from first fortnight of November to second fortnight of December. Data on incidence of stem fly was recorded at 15 days interval from sowing to harvesting of the crop). For each date of sowing and each variety, the plot size of 6.0 X 4.5m was maintained. In each plot, 4 square meter areas were earmarked for recording the data. The data on total number plants in square meter, no. of plants infested with stem fly was recorded at fortnight intervals. The symptom of withered and dried first and second leaves was considered in early stage of the crop. Later, the plants with thickened basal portion of stems with splits were considered as infested ones. Data was recorded upto 85 days of crop period. At the end of crop, some of the infested plants were uprooted, brought to the laboratory. Dissected the stems and observed for maggots and puparia of the stem fly. The data was converted to per cent infestation of plants, made into averages for Dates of sowing and Varieties and then subjected to statistical analysis (SPSS).

RESULTS AND DISCUSSION

Before to the thickening of the stem, the wilting and drying of first and second tender leaves was noticed in few plants. Later, after hardening of the stem, In majority of the infested plants, the infestation was seen as thickened (bulged like) at basal portion of the stem just above to the ground level (hypocotyl portion). The thickened portions possessed longitudinal splits. When the infested stems were cut open, hollowness was seen indicating the tunneling by the maggot downwards into below ground stem portion and root. From the dissected stems, puparia were collected and confirmed the stem fly infestation. The infestation of stem fly was very high during February and March i.e in December sown plots. The pest status started to increase in January, reached to maximum of 100 % in February – March. The data with respect to dates of sowing and interaction was highly significant. In D1 (Sown in November first Fortnight), D2 ((Sown in November second

Fortnight), D3(Sown in December first Fortnight) and D4 (Sown in December second Fortnight), the average per cent stem fly incidence recorded was 12.88, 21.47, 25.42 and 48.00 respectively. No much variations were observed between the 2 varieties with respect to stem fly infestation. In TBG104 and PU31, average infestation levels of 25.46 and 28.43 % were

Weather factors and influence on Stem fly infestation: The weather factors prevailed during the period of data record i.e December 2019 to March 2019 is furnished here. The Maximum and Minimum temperatures recorded were lower December and January months than February and March. The Maximum temperatures raised gradually from 28.9 to 37.9°C. The minimum temperatures were fluctuated from 15.1 to 23.70C during the period of data record. Relative Humidity I and II were decreased gradually from 88.6 to 67.8% and 64.7 to 21.5. Sunshine hours increased from 4.8 to 8.9.

The infestation of stem fly was low in December and January months. During February and March, high infestation levels were recorded . From the weather data and the data on infestation levels, it is clear that, most influencing factor is Maximum temperature. Maximum temperature from 36 to 38°C is very congenial for stem fly that was recorded during II FN Feb – II FN March. During this period, the per cent infestation was high even reached to maximum of 100% also. The relative humidity Morning and Evening recorded during the period of high incidence were 68 to 76% and 22 to 32%. The following is the some of relevant literature to the present results. Singh and Kumar (2008) reported stem fly as one of the important insect pests of black gram from Tamil Nadu. Stem fly infestation in blackgram causes wilting of plants and leads to death. Damage occurs in the plants hypocotyl (Basal stem) region. Infested stems show zig zag tunneling with maggots and pupae inside (NIPHM, 2014). Proadhan *et al.* (2008) conducted an experiment on the Incidence of major insect pests of blackgram at different dates of sowing at Regional Agricultural Research Station, Bangladesh Agricultural Research Institute, Ishurdi, Pabna with six sowing dates initiating from August 07 to September 11, 2007 at an interval of seven days. Hundred percent of the sampled plant was found to be infested by stemfly and intensity of infestation varied significantly. The lowest stem tunneling per plant by stemfly infestation was observed in Aug 7 sowing followed by Aug 14 and 21. The study indicates that early planting (up to 21 August), in general, gave lower infestation by the insects than late plantings. Significantly the highest yield was obtained from Aug 7 followed by Aug 14 and Aug 21, while Sept 11 and Sept 04 had the lowest yield.

Savde *et al.* (2018), carried out biology of stem fly, (*Ophiomyia phaseoli*) at College of Agriculture, Parbhani, India and reported that , stem fly is the most dangerous agromyzid fly in the world and its damage varies from crop to crop and season to season, being especially severe to seedlings. It Deposits eggs in punctures of the leaf tissue, the first pair of leaves of bean seedlings being favourite sites for oviposition and cause extensive tunneling to young plants. The stem fly incidence was observed on black gram and soybean from July to November and on cowpea from July to October. Overall plant growth is stunted and it may die; yield losses in some east-Asian countries can come to 30-50% and even to 100%. Zahid *et al.* (2009) reported that the larvae of stem fly, *Ophiomyia phaseoli* made tunnel by feeding inside the stem of mungbean plant.



Stem fly infested blackgram plants (Thickened stems with Splits)



Puparia of the Black gram stem fly

Period of Data record	D1		D2		D3		D4	
	LBG104	PU31	LBG104	PU31	LBG104	PU31	LBG104	PU31
I FN Dec 2018	0	0	0	0				
II FN Dec 2018	0	0	0	0				
I FN Jan 2019	9.19	4.35	0.72	0	0	0	0	0
II FN Jan 2019	18.52	10.87	8.96	11.48	5.48	1.29	0	0
I FN Feb 2019	9.26	34.78	19.4	16.39	0	0	2.94	4.82
II FN Feb 2019			83.33	79.31	44.83	75.86	100.00	96.61
I FN March 2019					50	96.49	100.00	100.00
II FN March 2019							100.00	100.00

	Dates Of Sowing	Varieties	Dates X varieties
P value	0.000	0.009	0.000
f value	1.769	0.799	503.67
	4 subsets	2 subsets	

Date 1	Date2	Date3	Date4	Variety 1	Variety 2
12.88	21.47	25.42	48.00	25.46	28.43

Average Per cent infestation of stem fly

	Temperatures (°C)		Relative Humidity (%)		Rainfall (mm)	Sunshine hours
	Max.	Min.	RH morn.	RH eve.		
I FN Dec 2018	28.9	20.2	88.6	64.7	27.4	4.8
II FN Dec 2018	29.8	19.5	81.9	51.34	0.00	6.9
I FN Jan 2019	29.1	15.1	83.9	43.6	0.00	8.5
II FN Jan 2019	29.9	17.7	86.3	47.5	0.03	7.2
I FN Feb 2019	31.7	19.9	83.3	46.0	0.00	7.9
II FN Feb 2019	36.2	21.0	75.8	32.2	0.08	8.5
I FN March 2019	37.4	23.7	67.8	31.1	15.0	8.5
II FN March 2019	37.9	22.9	71.9	21.5	0.00	8.9

Per centage of stem tunneling was found to be major factor for yield reduction by stem fly. Stem fly, (*Ophiomyia phaseoli*) maggots mine the leaves or bore into the leaf petiole or tender stem resulting in withering, drooping and death of plant. The characteristic symptoms of damage include drooping of the first two leaves and yellowing of plants. It attacks plant soon after germination which is most vulnerable to insect pest attack. If these pests are not controlled, at times the whole crop can be destroyed or severely damaged requiring re-sowing of the crop. It can cause 5 – 20 % and 3 – 62% damage in mungbean and urdbean, respectively. The egg is oval, milky white, opaque or translucent. The newly hatched larvae are pale and yellowish white in color. The adult fly is metallic black color. Eggs are laid in leaves, especially the unifoliate leaves. Incubation period is 2 to 4 days. Pupation is observed in the midrib of the leaflet and pupal period is 8 days. Adult longevity varies 7.13 ± 2.39 and 15.42 ± 3.78 days, respectively (UASR Agropedia, 2019). The present studies may be the first report on stem fly attained major pest status in Black gram from Andhra Pradesh, India.

Acknowledgement

The Authors are highly grateful to Acharya N G Ranga Agricultural University for providing the facilities for carrying out the present field and laboratory research on Black gram stemfly.

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