Int.J.Curr.Microbiol.App.Sci (2018) *7*(3): 3558-3564

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 03 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.703.409

Reaction of Cowpea Genotypes for Stemfly *Ophiomyia phaseoli* (Tryon) Diptera: Agromyzidae Infestation

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Keywords

Cowpea genotype, stemfly, *Ophiomyia phaseoli*

Article Info

Accepted:
28 February 2018
Available Online:
10 March 2018

A B S T R A C T

An experiment was conducted on screening of germ plasm against stemfly of cow pea (*Vigna unguiculata* L.) under randomized block design at student farm, university of Agricultural sciences, Bengaluru during rabi, 2016-17. The objective of this study was to investigate the most effective germ plasm type against the stem fly that is *Ophiomyia phaseoli* population. The highest number of eggs recorded in PGCP – 13. The lowest number of feeding punctures was seen in C – 152 and the genotype PGCP – 13, where the highest number of punctures was observed. Lowest number of maggots were seen in KM 5 and KBC – 2 except PGCP – 5 and PGCP – 13. The highest number of pupae recorded in PGCP – 5. The lowest tunnel length was observed in KBC – 8 and highest tunnel length was noticed in PGCP – 13. The yield of ten plant per entries also differed significantly, it was highest in KBC – 2 and lowest yield was noticed in PGCP – 3.

Introduction

Among the various grain legumes, cowpea [*Vigna unguiculata* (L.) Walp.] is one of the most important pulse crop in Karnataka, where it is cultivated over an area of 0.87 lakh hectares with a production of 0.35 lakh tonnes and the productivity of 406 kg/ ha (anon 2012-2013). The cowpea grain contains an average of 23-25 percent proteins, 50-67 percent carbohydrates, fat 1.3 percent and fibre 1.6 percent and 8-9percent of water (Pai, 1990). It is luxuriously growing crop which attracts insect pests and poses serious threat to its production. Cowpea is infested by 21 insect pests (Karungi *et al.*, 2000) of which agromyzid stem fly, *Ophiomyia phaseoli*, is a serious pest in cowpea growing states of India, due to its destructive feeding habits on cortical region of the stem, right from the unfoliage part of the stem.

Materials and Methods

Incidence of stem fly on cowpea

To study the incidence of stem fly the feeding punctures by the adults, oviposition punctures were recorded on 20 randomly selected plant samples at weekly intervals 7 days after

germination (DAG) from four subplots. The number of maggots, pupae, total length of plant from base to growing tip of the stem and tunnelled length by the stem fly was recorded.

Screening of selected genotypes against major insect pests

Ten genotypes *viz.,* KM-5, KBC-2, KBC-8, KBC-9, C-152, PGCP-3, PGCP-5, PGCP-6, PGCP-13 and IT-38956-1 were screened for the reaction to different pests of cowpea. Each genotype was sown in two rows spacing of three meter length. Each genotype was sown in three replications and randomized. The genotypes were sown during the 17th August, 2016. Recommended cultural practices were followed for raising the crop except for the plant protection measures.

Screening of cowpea genotypes for resistance to stem fly

For stem fly screening the genotypes were screened during third week after sowing. Fifteen plants were selected randomly (five plants destructive sampling was made to record the observations:

Incidence of stemfly

The stem fly infestation started right from the seedling stage of the crop (Table1).

Ovipositional punctures

After the first week of sowing i.e. August 3rd week (34th MW) the numbers of ovipositional punctures were i.e. (2.15eggs/five leaves). It started upto third week (35th MW) were maximum number of ovipositional punctures were recorded (2.25eggs/five leaves). Then the number of ovipositional punctures decreased, after the 4th week of sowing (37th MW), there were no ovipositional punctures observed one month after the crop sowing.

Feeding punctures

The number of feeding punctures was seen throughout the crop growth stage but the maximum number of feeding punctures was recorded in the seedling stage of the crop i.e. (155.65/five leaves) at 37th standard meteorological week.

Number of maggots

Maggot's population was seen during the second week of sowing i.e. August 4th week (35th MW) 2.10 maggots/plant and increased upto 3.45 maggots per plant during the third week after sowing (36th MW).

The maggots population was recorded throughout the reproductive stage of crop but numbers were very negligible.

Number of Pupae

The pupal count per plant was also recorded where the pupae were observed at the third week after sowing i.e. September 1st week (36th MW) i.e., 0.15 pupae per plant.

The highest number of pupae per plant recorded during the fifth week after sowing (35th MW) i.e., 2.95 pupae per plant. The pupal count per plant was also recorded through the crop growth stage.

Percent tunneling

The total plant length of the genotypes did not differ significantly among the genotypes but tunnel length varied significantly among the genotypes.

It varied from 5.88 to 9.29 cm. The lowest tunnel length was observed in KBC-8 (5.88) which is on par with KBC-9, C152 and PGCP 6. The highest tunnel length was noticed in PGCP-13.

Results and Discussion

The number of eggs laid was significantly different among the entries. The number of eggs laid per five leaves varied from 0.00 to 1.50 eggs. No eggs were recorded in PGCP -6 which was on par with KBC – 9, KBC – 8, KBC – 2 and C – 152. The highest number of eggs recorded in PGCP – 13 (1.50). The number of feeding punctures per 5 leaves also varied significantly among the entries ranging from 128.17 to 269.50 (Table 1). The lowest number of feeding punctures seen in C – 152 (128.17), which was on par with all entries except the genotype PGCP – 13, where the highest number of punctures (269.50) were observed. The number of maggots per plant also varied significantly among all the entries. Lowest number of maggots was seen in KM 5 (0.13) and KBC – 2 (0.13) which were on par with all other genotypes, except PGCP – 5 and PGCP – 13. Where in the number of maggots were 1.67 and 1.61 respectively. The number of pupae per plant also varied significantly among all the entries. Lowest number of pupae was seen in 0.33 to 3.15. The lowest number of pupae seen in KM – 5 (0.33), KBC – 9 (0.33) and C – 152 which is on par with KBC – 2, KBC – 8, PGCP – 6 and IT- 38956, whereas highest number of pupae recorded in PGCP – 5. The total plant length of the genotypes did not differ significantly among the genotypes but tunnel length varied significantly among the genotypes. It varied from 5.88 to 9.29 cm. The lowest tunnel length was observed in KBC - 8 (5.88) which is on par with KBC – 9, C – 152, PGCP – 6. The highest tunnel length was noticed in PGCP – 13. The yield of ten plant per entries also differed significantly, it was highest in KBC – 2 (19.61gms), PGCP – 6 (19.62 gms), KBC – 8 (19.53gms), KM – 5 (19.26 gms). The lowest yield was noticed in PGCP - 3 (15.86gms).

Table.1 Incidence of stem fly during, *Kharif 2016*

Met wk.	Weeks	Ovipositional Punctures/ 5leaves	Feeding Punctures/ 5leaves	No. of maggots /plant	No. of pupae /plant	Percent tunneling
34	24-08-2016	2.15	45.55	0.00	0.00	**81.52**
35	31-08-2016	2.22	64.30	2.10	0.00	**76.53**
36	07-09-2016	1.10	60.75	3.40	0.15	**64.33**
37	14-09-2016	0.20	155.65	1.30	1.45	**54.41**
38	21-09-2016	0.00	119.55	0.35	2.95	**55.58**
39	28-09-2016	0.00	106.10	0.25	1.25	**58.01**
40	05-10-2016	0.00	90.15	0.00	0.35	**48.43**
41	12-10-2016	0.00	57.35	0.00	0.20	**43.25**
42	19-10-2016	0.00	55.10	0.00	0.20	**43.39**
43	26-10-2016	0.00	57.90	0.15	0.20	**45.44**
44	02-11-2016	0.00	48.15	0.05	0.35	**44.89**
45	09-11-2016	0.00	56.65	0.00	0.10	**44.82**
46	**16-11-2016**	**0.00**	**50.48**	**0.00**	**0.30**	**43.84**

Table.2 Screening of cowpea genotypes against stem fly

Sl No.	Genotypes	Egg punctures/ 5 leaves	Feeding punctures/5leaves/plant	No. of maggots/ plant	No. of pupae/plant	Total length of plant	Tunnel length of plant	Yield of 10 labelled plants (in grams)
1	KM-5 (check)	0.33^{a} (0.91)	170.3^{a} (12.80)	0.13^{a} (0.79)	0.33^{a} (0.91)	11.89 (3.52)	7.05^{ab} (2.75)	19.26^{e}
2	KBC-2	0.27^{a} (0.87)	142.87^{a} (11.90)	0.13^{a} (0.79)	0.40^{a} (0.94)	10.65 (3.33)	7.01^{ab} (2.73)	19.61^{e}
3	KBC-8	0.18^{a} (0.82)	167.09^{a} (12.76)	0.22^{a} (0.83)	1.04^{a} (1.21)	10.30 (3.28)	5.88^{a} (2.52)	19.53^{e}
4	KBC-9	0.13^{a} (0.79)	157.20^{a} (12.53)	0.27^{a} (0.86)	0.33^{a} (0.91)	10.62 (3.31)	5.96^{a} (2.53)	19.11^{de}
5	C-152	0.27^{a} (0.87)	128.17^{a} (11.34)	0.40^{a} (0.93)	0.33^{a} (0.91)	9.17 (3.11)	5.99^{a} (2.54)	18.02^{cd}
6	PGCP-3	1.13^{c} (1.25)	159.60^{a} (12.63)	1.33^{b} (1.34)	2.13^{bc} (1.59)	9.77 (3.20)	7.31^{ab} (2.79)	15.86^{a}
7	PGCP-5	1.07^{bc} (1.21)	193.50^{a} (13.85)	1.67^{b} (1.45)	3.15^{c} (1.91)	10.10 (3.26)	8.22^{bc} (2.95)	16.33^{ab}
8	PGCP-6	0.00^{a} (0.71)	134.47^{a} (11.61)	0.40^{a} (0.92)	0.53^{a} (1.00)	9.49 (3.15)	6.16^{a} (2.57)	19.62^{e}
9	PGCP-13	1.50^{c} (1.41)	269.50^{b} (16.42)	1.61^{b} (1.45)	1.20^{ab} (1.28)	11.74 (3.50)	9.29^{c} (3.13)	17.39^{bc}
10	IT-38956-1	0.38^{ab} (0.94)	154.42^{a} (12.35)	0.47^{a} (0.97)	1.20^{a} (1.25)	11.61 (3.47)	6.95^{ab} (2.73)	18.42^{cd}
F test		5.56	4.02	8.12	6.26	1.18	4.15	11.87
SE m±		0.10	0.72	0.10	0.13	-	0.10	0.40
CD (p=0.05)		0.29	2.15	0.28	0.40	-	0.29	1.20
CV (%)		17.24	9.76	15.96	19.60	-	6.19	3.81

Note: Figures in the parentheses are √x+0.5transformed values. In vertical columns, means followed by similar alphabets are not different statistically (0.05) as per DMRT

Fig.1 Incidence of stem fly, *O. phaseoli*

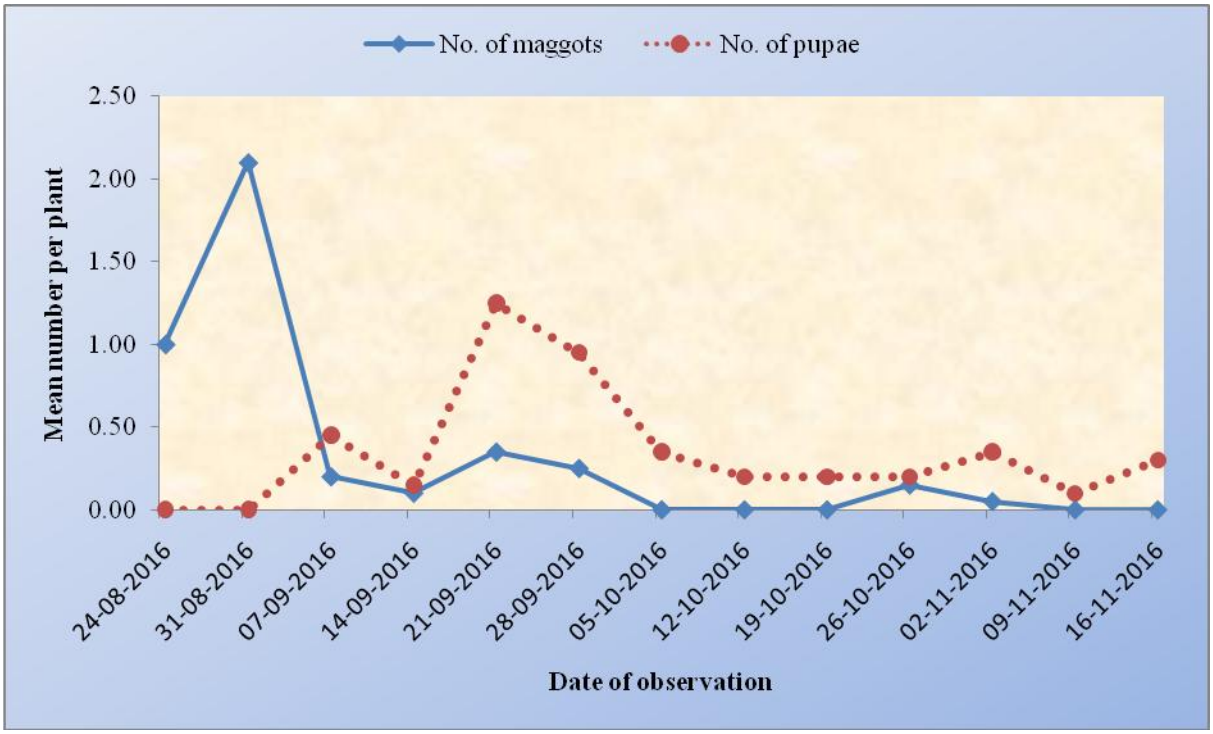


Fig.2 Reaction of cowpea genotypes to stem fly infestation

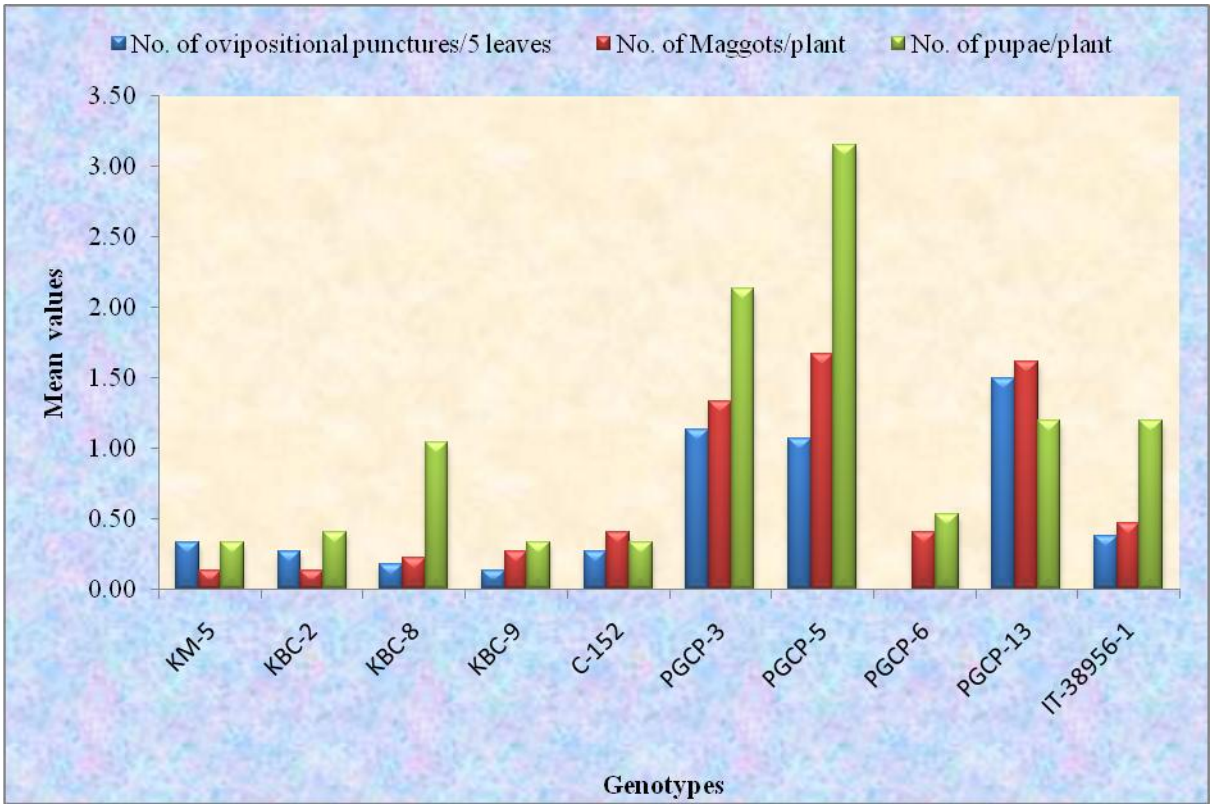
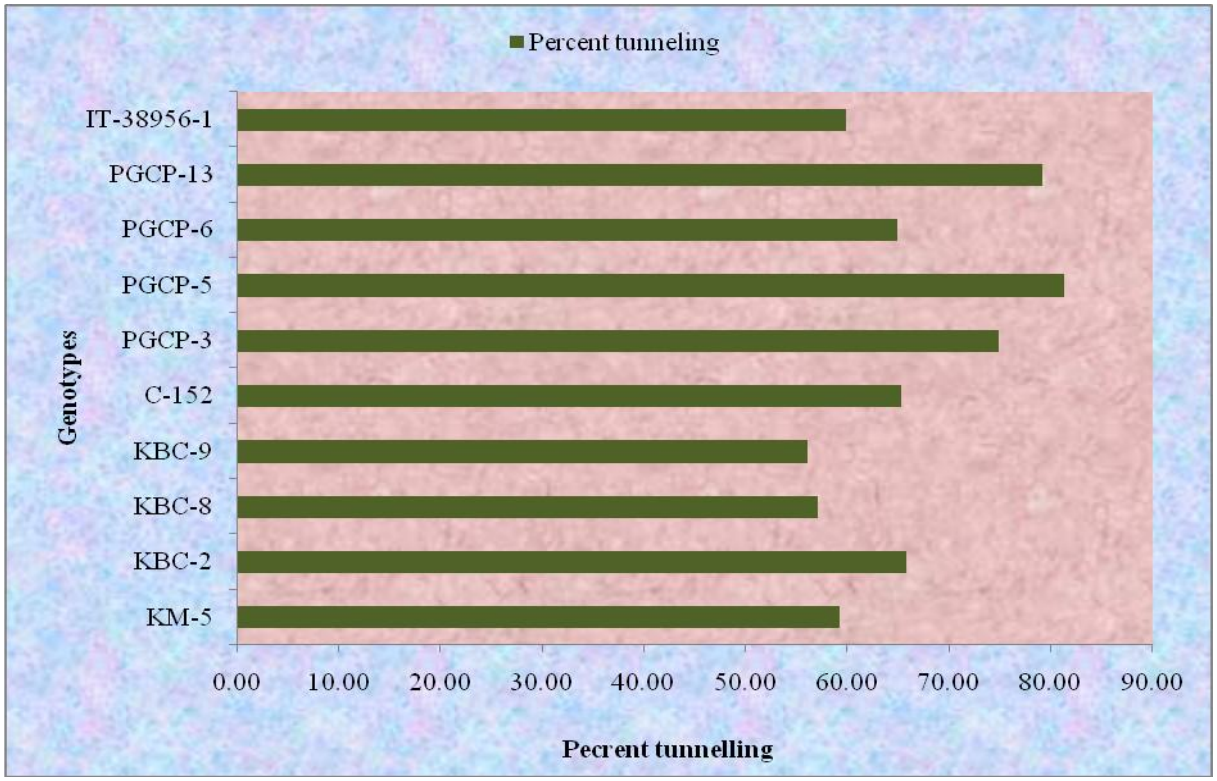


Fig.3 Per cent tunnelling in cowpea genotypes



The number of ovipositional punctures were significantly lowest in PGCP - 6, KBC – 9, KBC – 8, KBC – 2 where highest number were seen in PGCP – 13 and PGCP – 3. The number of maggots punctures were significantly lowest in KM – 5, KBC - 2, KBC - 8, KBC – 9, whereas PGCP – 13, PGCP – 5 and PGCP - 3 has more number of maggots. The pupal population were significantly lowest in KM – 5, KBC - 9, C - 152 and KBC – 2. In PGCP - 5 and PGCP – 3 highest number of pupae were observed. The tunnel length was significantly lower in KBC - 8, KBC – 9 and C – 152 and significantly higher in PGCP - 13 and PGCP – 5. Further significantly highest seed yield recorded in PGCP – 6, KBC - 2, KBC - 8, KM – 5 and KBC – 9 (Fig. 1–3; Table 2). Present findings are similar with those of talekar and tengkana (1993) where in out of ten entries six or seven entries were moderately resistant to stem fly. There exist significant variations in the different cowpea genotype studied with respect to agronomic and pest damage traits. Selection based on the rank summation index calculated identified two top-ranking lines – PGCP - 13 and KBC - 2 therefore could be recommended for testing on farmer's field since they could be used to overcome the challenges faced by farmer.

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How to cite this article:

Mantesh Soratur, K.S. Jagadesh, D. Devika Rani, T.G. Avinash and Shiva Murthy Naik. 2018. Reaction of Cowpea Genotypes for Stemfly *Ophiomyia phaseoli* (Tryon) Diptera: Agromyzidae Infestation. *Int.J.Curr.Microbiol.App.Sci.* 7(03): 3558-3564.
doi: https://doi.org/10.20546/ijcmas.2018.703.409