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Effect of Dates of Sowing on Incidence of Leaf Hoppers, *Empoasca flavescens* Fab. on Castor Genotypes

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A B S T R A C T

Effect of dates of sowing on incidence leafhopper, *Empoasca flavescens* on castor genotypes during *Kharif* season 2013 revealed that incidence of leaf hoppers in general comparatively high in late sown crop than early sown crop. When castor was sown early, high hopper population was recorded on GCH-4 (98.67 hoppers) and low population on M-574 (9.00 hoppers). In the case of early sown crop, hopper burn score of 2 with 11 to 25 percent injury was observed on DPC-9, DCS-9, PCH-111, PCH-106 and Kranthi and where as in late sown crop, maximum hopper burn score of 4 with more than 50 percent hopper injury was observed on DPC-9, DCS-9, PCH-288, PCH-111, RG-2835, PCH-106, PCH-222 and RG-2928.

Introduction

Castor (*Ricinus communis* Lin.) in an important non edible oilseed crop which is grown in arid and semi-arid regions. In India, Castor is sown during July or August and harvested around December or January. More than 20 species of insect pests were found associated with castor, but many of them were highly irregular in occurrence over years, distributed in patches with low population causing no remarkable damage to the crop. Only 10 species belonging to Lepidoptera, Hemiptera, Orthoptera and Thysanoptera showed variable economic importance and of them, five species were found regular with high degree of severity as major pests. Most of the insect pests were either defoliators or sucking pests (Sarma *et al.,* 2005). The magnitude of insect pest problem is quite high in Southern India where castor is grown mainly as rainfed crop, resulting in lower seed yield.

The major pest problems in castor include the defoliators, semilooper, *Achaea janata* L., tobacco caterpillar, *Spodoptera litura* Fab. capsule borer, *Conogethes punctiferalis* Guen. and the sucking pests, leafhopper, *Empoasca flavescens* Fab. thrips, *Retithripssyniacus* Mayet and whitefly, *Trialeurodes ricini* Misra (DOR, 2005; Lakshminarayana and Raoof, 2005). Studies on relationship between different dates of sowing aid to find out the

incidence of insect pests which helps to forewarn the cultivators to resort to preventive measures against such pests in time. Usually, pest occurrence and its population fluctuations depend on the changing environmental situation.

Materials and Methods

The field was ploughed thoroughly thrice to obtain fine tilth and propely levelled after removing stubbles, weeds and trash. Two sowings were taken up on 30.07.2013 and 30.08.2013 by dibling the seed with a spacing of 90x60 cms at the rate of two seeds per hill. Gap filling was done a week after germination.

The seedlings were thinned out within 15 days after sowing allowing one healthy seedling to grow for hill. The recommended dose of fertilizer i.e., 80 kg N, 60 kg P and 40 kg K/ha was applied, of which half dose of nitrogen and the entire dose of potash and phosphorus were applied as basal and rest of nitrogen at 30, 60 and 90 days after germination in equal doses.

The experimental plots were irrigated as and when required. Pre-emergence herbicide Pendimethalin 30 EC was applied a day after sowing to arrest the growth of weeds. Hand weeding was done twice so as to keep the crop free of weeds. Leaf hoppers counts including both nymph and adults were recorded on three leaves in each plant selecting one leaf from top (excluding two top most leaves), middle (medium maturity) and bottom (leaving 1 or 2 bottom most leaves) on the main shoot. Population was recorded as no of leaf hoppers/3 leaves/plant and percent leaf area burnt per plant (average of three plants). Observations were taken in the early morning (6.00-8.00am) hours and leaf hoppers count will be recorded and percent of leaf burnt (hopper burn) at peak infestation was reported. Hopper burn injury was recorded by following the score index given by Directorate of Oilseeds Research, Rajendranagar, Hyderabad.

Score index (0-4 score):

0- No injury
1- Hopper burnt upto 10%
2- Hopper burnt 11-25%
3- Hopper burnt 26-50%
4- Hopper burnt above 50%

Results and Discussion

Effect of early sowing on incidence of leafhoppers, *Empoasca flavescens* on castor genotypes

Study on effect of dates of sowing on incidence of leafhoppers, *Empoasca flavescens* on castor genotypes revealed that when genotypes were sown early during the month of July, the genotype GCH-4 has recorded maximum hopper population of 98.67 where genotype, PCH-254 has recorded minimum of 9.00 hoppers per plant and average of 2 score hopper burn with 11 to 25 percent hopper burn injury. However, when the castor crop is sown early, only hopper burn to an extent 25 percent with maximum of 2 score was reported in majority of the genotypes i.e. DPC-9 with 80.33 hoppers, DCS-9 with 88.33 hoppers, PCH-111 with 87.67 hoppers and Kranthi with 89.67 hoppers. Similarly the genotypes, PCH-288 with 80.33 hoppers, RG-2835 with 83.00 hoppers, RG-1180 with 52.33 hoppers and RG-776 with 77.00 hoppers.

When the genotypes was sown early, the genotypes 48-1, Haritha. PCH-254, M-574, PCH-248, PCH-294, PCH-262 and PCH-282 though few hopper population ranging from 10.00 to 22.00 was recorded with no hopper burn symptom (Table 1).

Table.1 Incidence of leafhoppers, *Empoasca flavescens* on early sown crop

Genotypes	Hoppers/3 leaves/plant	Hopper burn/plant	Hoppers/3 leaves/plant	Hopper burn/plant	Hoppers/3 leaves/plant	Hopper burn/plant	Mean hoppers/ 3 leaves/3plants	Mean hopper burn/plant
DPC-9	91	2	83	2	67	2	80.33(4.39)	2
DCS-9	87	2	69	1	71	2	75.67(4.33)	2
48-1	10	0	5	0	15	0	10.00(2.32)	0
Haritha	27	0	15	0	18	0	20.00(3.02)	0
PCH-288	93	2	71	1	77	1	80.33(4.39)	1
PCH-111	77	2	99	2	87	2	87.67(4.48)	2
PCH-254	10	0	15	0	10	0	11.67(2.52)	0
M-574	10	0	8	0	9	0	9.00(2.30)	0
Kiran	99	3	79	1	87	2	88.33(4.49)	2
PCH-248	24	0	25	0	17	0	22.00(3.12)	0
PCH-294	45	0	39	0	57	0	47.00(3.86)	0
PCH-262	15	0	25	0	19	0	19.67(3.01)	0
GCH-4	100	2	99	2	97	2	98.67(4.60)	2
PCH-282	20	0	31	0	19	0	23.33(3.17)	0
RG-2835	63	1	75	1	89	2	75.67(4.33)	1
PCH-106	88	2	91	3	65	1	81.33(4.40)	2
PCH-222	77	1	93	2	79	1	83.00(4.43)	1
RG-2928	91	2	77	1	81	1	83.00(4.43)	1
RG-1180	53	0	41	0	63	2	52.33(3.96)	1
RG-776	77	1	67	1	87	1	77.00(4.35)	1
Kranthi	93	2	89	2	87	2	89.67(4.51)	2
SEm							0.16	
CD (P=0.05)							0.33	

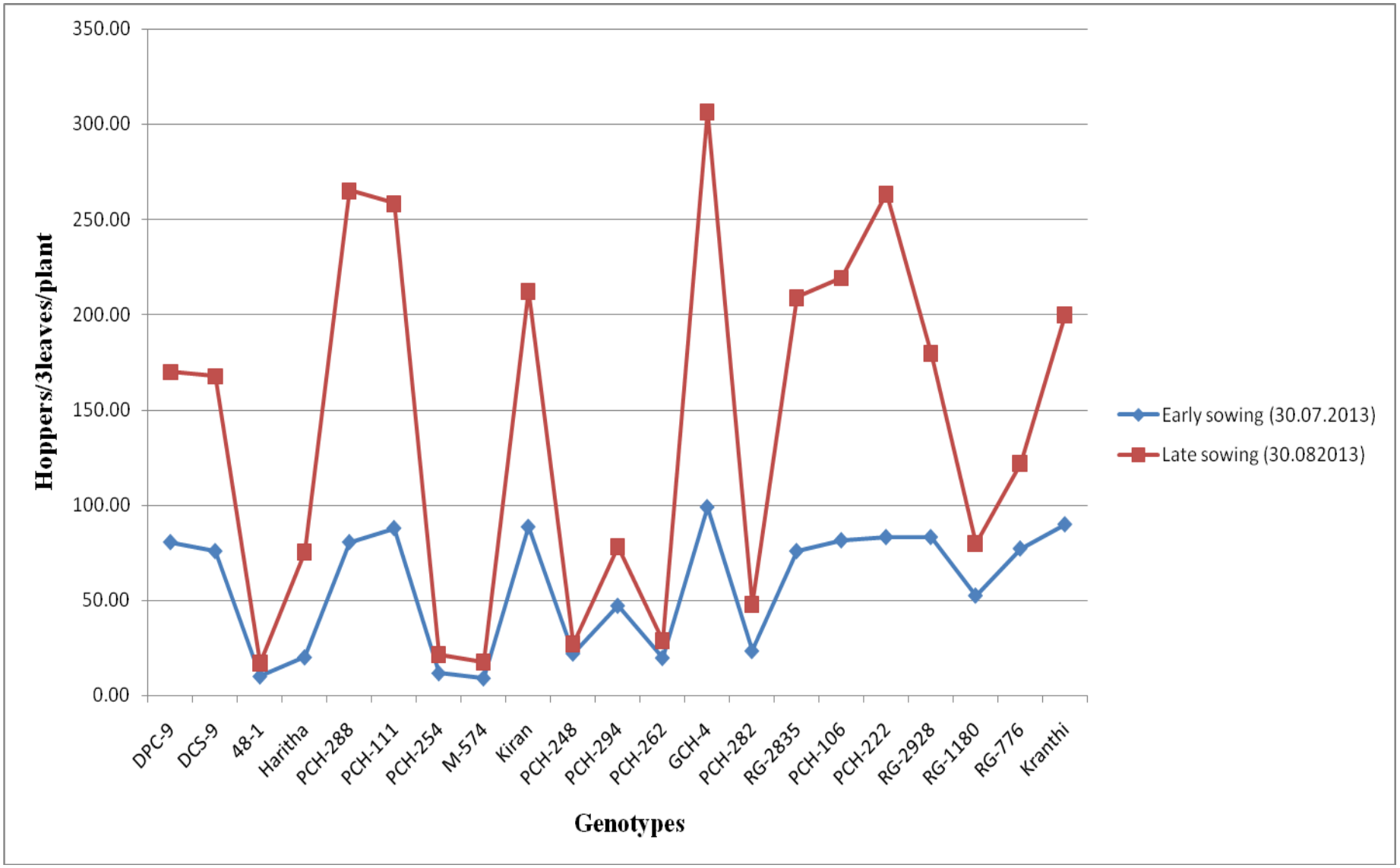
Figures in parenthesis are logarithmic transformed values.
SED =Standard error of difference
CD (P=0.05) = Critical Difference at 5% level of significance

Table.2 Incidence of leafhoppers, *Empoasca flavescens* on late sown crop

Genotypes	Hoppers/3 leaves/plant	Hopper burn/plant	Hoppers/3 leaves/plant	Hopper burn/plant	Hoppers/3 leaves/plant	Hopper burn/plant	Mean hoppers/ 3 leaves/3plant	Mean hopper burn/plant
DPC-9	198	4	185	4	127	4	170.00(5.12)	4
DCS-9	175	4	172	4	156	3	167.67(5.13)	3
48-1	25	0	13	0	13	0	17.00(2.85)	0
Haritha	67	2	81	2	78	2	75.33(4.33)	2
PCH-288	251	4	189	4	355	4	265.00(5.55)	4
PCH-111	220	4	310	4	245	4	258.33(5.55)	4
PCH-254	20	0	24	0	21	0	21.67(3.12)	0
M-574	17	0	22	0	14	0	17.67(2.91)	0
Kiran	212	3	225	3	200	3	212.33(5.36)	3
PCH-248	24	1	23	1	35	1	27.33(3.33)	1
PCH-294	87	2	73	2	75	2	78.33(4.371)	2
PCH-262	25	0	40	0	22	0	29.00(3.37)	0
GCH-4	315	3	300	3	305	3	306.67(5.73)	3
PCH-282	44	1	51	2	49	0	48.00(3.89)	1
RG-2835	233	4	230	4	164	4	209.00(5.34)	4
PCH-106	240	4	194	4	224	4	219.33(5.39)	4
PCH-222	266	4	263	4	261	4	263.33(5.58)	4
RG-2928	218	4	119	4	202	4	179.67(5.16)	4
RG-1180	78	2	74	2	88	2	80.00(4.39)	2
RG-776	112	3	134	3	120	3	122.00(4.81)	3
Kranthi	260	3	190	3	150	3	200.00(5.28)	3
SEm							0.16	
CD(P=0.05)							0.322	

Figures in parenthesis are logarithmic transformed values.
SED =Standard error of difference
CD (P=0.05) = Critical Difference at 5% level of significance

Fig.1 Incidence of leafhoppers, *Empoasca flavescens* on castor genotypes in early (30.07.2013) and late (30.08.2013) sowings



Effect of late sowing on incidence of leafhoppers, *Empoasca flavescens* on castor genotypes

Data presented in the table 2 revealed that when genotypes were sown late by 30 days during August, in general highest hopper burn score of 4 was observed in some genotypes like DPC-9, PCH-288, PCH-111, RG-2835, PCH-106, PCH-222 and RG-2928 showing more than 50 percent hopper burn injury. Similarly, certain genotypes including 48-1, PCH-254, M-574 and PCH-262 have exhibited hopper burn symptom though meagre population ranging from 17.00 to 29.00 was observed. The genotypes, DCS-9, Kiarn, GCH-4, RG-776 and Kranthi have recorded hopper burn score of 3 with 167.67, 212.33, 306.67, 122.00 and 200.00 hoppers per plant. Hopper burn ranging from 11 to 25 percent recording 2 score hopper burn was observed in the genotypes, Haritha (75.33 hoppers), PCH-294 (78.33 hopper) and RG-1180 (80.00 hoppers). Hopper burn score of 1 with 1 to 10 percent was observed in the genotypes PCH-248 and PCH-282 with less than 50.00 hoppers per plant.

Overall comparison of incidence of major sucking pest leafhopper, *E. flavescens* between early and late sowing with an interval of 30 days during July and August, 2013. It was clear that the late sown crop was much preferred, indicated by the enormous increase in population to a maximum of 306.67 hoppers as in the case of GCH-4, 265.00 in case of PCH-288, PCH-222 and 258.33 in the case of PCH-111. Similarly, maximum of 4 score with more than 50.00 percent hopper burn was recorded in the case of genotypes, DPC-9, PCH-288, PCH-111, RG-2835, PCH-106 and RG-2928. The genotypes DCS-9, Kiran, GCH-4, RG-776 and kranthi showing a score of 3 with 26.00 to 50.00 percent hopper burn recorded an average population ranging from 122.00 to 306.67 hoppers per three leaves per plant. A score of 2 showing 11.00 to 25.00 percent hopper burn was observed in the genotypes, Haritha and PCH-262, in the late sown crop which was completely free from infestation when sown early during the month of July. The outstanding contribution from the present study is that the genotypes, 48-1, PCH-254 and M-574 remained totally free from leafhopper infestation even if sown early. But certain genotypes including PCH-294 and PCH-282 which were free of hopper infestation during early sowing became susceptible to hopper infestation recording hopper burn of 1.00 to 10.00 percent with the score of 1 indicating their variation in the degree of infestation which might be based on leaf characters. In contrast, drastically change in hopper burn score from 1 to 4 was observed indicating genotype, susceptibility to hopper as seen in the case of genotypes, PCH-288, RG-2835, PCH-222 and RG-2928 when sown late. This might be due to multiplication of the pest which is enhanced by cold and humid weather i.e. temperature ranging from a maximum of 28.7^0C and minimum of 14.62^0C as well as relative humidity ranging from 50.00% to 86.00% during November might have favoured the hopper incidence. Present results confirm the observations made by Akashe *et al.*, (2015), Jayaraj and Basheer (1964), Jayraj (1966) and APR castor (1986).

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