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Screening of Castor Genotypes for Resistance Against Green Leafhopper, *Empoasca flavescens* Fabricius.

B. Mounica*, N. C. Venkateswarlu, T. Murali Krishna, P. Sudhakar and K. V. Hari Prasad

Department of Entomology, S. V. Agricultural College, ANGRAU, Tirupati-517502, (A.P.)

*Corresponding Author E-mail: bmounica2035@gmail.com

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ABSTRACT

A screening trial with 28 castor genotypes was conducted to assess their relative reaction to leafhoppers (Empoasca flavescens). Among the twenty eight genotypes screened, leafhopper population ranged from 20.48 to 54.28. Highest leafhopper population was recorded in DPC-9 (54.28) followed by DCH-177 (42.93). Least leafhopper population was recorded in GCH-7 (20.48), VP-1 (20.63). The genotypes DPC-9, PCH-111 and DCH-177 recorded highest hopper burn scores of 2.4, 2.4 and 2.0. Lowest hopper burn scores were found in genotypes GCH-7 (0.00), PCH-254 (0.00), SKI-336 (0.00). The castor genotypes with triple bloom were found to be resistant to leafhopper and genotypes with zero and single bloom were found to be susceptible to leafhopper.

Key words: *Castor, Leafhopper, Hopper Burn, Bloom*

INTRODUCTION

Castor (*Ricinus communis* L.) is an important non-edible oilseed crop belonging to family Euphorbiaceae and genus *Ricinus.* It is grown especially in arid and semi arid regions for its beans, which contains up to 48% oil, mainly used in manufacturing of paints, lubricants, soaps, hydraulic brake fluids, polymers and perfumery products. The major insect pest problems in castor are the defoliators *viz.*, semilooper, *Achaea janata* L., tobacco caterpillar *Spodoptera litura* Fab., capsule borer *Conogethes punctiferalis* Guen. and the sucking pests such as leafhopper, *Empoasca flavescens* Fab. thrips, *Retithrips syriacus* Mayet and whitefly, *Trialeurodes ricini* Misra[5]. Green leafhopper, *Empoasca flavescens* Fab. is one of the serious sucking pest at vegetative stage. By the introduction of high yielding varieties and hybrids, leafhopper became a serious problem[13].Morphological characters of host plant serve as a non-preference mechanism for feeding and oviposition by insects[8]. Bloom character of castor crop played a major role in determining the resistance or susceptibility to sucking pests. Identification and use of resistant genotypes in breeding programme for the development of resistant varieties against the insect pests and their use in IPM programmes is the most economical approach and would be inexpensive in long run because it minimizes the number of insecticides application, lessens the expenses involved in plant protection and conserves the natural enemies besides preserving the environmental safety.

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Hence the present study was carried out to identify the resistant genotypes of castor against leafhopper.

MATERIALS AND METHODS

The experiment was conducted during *kharif*, 2016 at Dryland farm, Sri Venkateswara Agricultural College, Tirupati to screen selected castor genotypes for resistance against leafhopper, *Empoasca flavescens.* The experiment was laid out in Randomised Block Design with two replications and spacing of 90cm between the rows and 60cm for plant to plant within row. The seed material was procured from Indian Institute of Oil Seeds Research, Hyderabad and Regional Agricultural Research Station, Palem, Mahabubnagar, Telangana.

Data on leafhopper population

The nymph and adult populations were recorded from 3 leaves per plant for each entry in five randomly selected plants from one month after germination till the maturity at weekly intervals. The leaves were selected as one from top (excluding two top most leaves), middle (medium matured leaves) and bottom (leaving two bottom most leaves) on the main shoot. The data collected on leafhopper population was statistically analysed.

Hopper burn symptoms

Hopper burn injury on leaves was recorded at 30, 60, 90, 120, 150 DAS and per cent damage was scored as per standard grades followed by All India Coordinated Research Project (AICRP) on Castor. The observations that are recorded were finally analysed using DMRT.

Grade (score)	Hopper burn on leaves (%injury)
0	no injury
1	hopper burn 0-10%
2	hopper burn 11-25%
3	hopper burn 26-50%
4	hopper burn above 50%

The data on both leafhopper population and hopper burn symptoms were subjected to statistical analysis.

RESULTS AND DISCUSSION

Data on leafhopper population was recorded from 30 Days After Sowing (DAS) to 163 DAS. No consistent rankings were observed in the leafhopper population on different castor varieties from 30 DAS to 86 DAS (Table 1). The leafhopper population on different genotypes were ranged from 0.00 to 26.70 leafhoppers upto 86 DAS. At 93 DAS, the population of leafhoppers increased gradually. The highest population was recorded in the entry DCH-177 (30.90) and significantly different from other genotypes followed by DPC-9 (27.78), PCH-111 (26.80). The lowest population was recorded in SKI-333 (9.25) followed by VP-1 (9.71), M-574 (10.00) and PCH-282 (10.43) and significantly different from the rest of the entries. At 100 DAS, highest population of leafhopper was recorded in DPC-9 (50.56) followed by DCH-177 (40.90) and statistically significant from rest of entries (Table 1). Lowest hopper population was observed in VP-1 (9.14) which is statistically significant from rest of entries followed by SKI-84 (10.67). From 121 DAS till 163 DAS, DPC-9 recorded consistently highest leafhopper population ranged from 72.00 to 153.67 followed by DCH-177 ranging from 63.70 to 106.80. However there was no consistent trend in the castor genotypes recording lowest population except PCS-124 ranged from 33.20 to 61.70. Hence mean of leafhopper population from 30 DAS to 163 DAS were taken into consideration in ranking castor genotypes as most preferred / least preferred genotypes. Cumulative data on leafhopper population revealed that the incidence was more on the genotypes DPC-9 (54.28) which is statistically significant from other entries followed by DCH-177 (42.93). The genotypes that showed next higher incidence were DCS-107 (33.56), SKI-341

(33.17) and statistically significant from other entries. Least leafhopper population was recorded in GCH-7 (20.48), VP-1 (20.63), Haritha (20.78) and statistically not significant from other entries. The leafhopper population of other genotypes were in between these two groups (Table 1).The data from the Table 2 revealed that the hopper burn scoring at 30 DAS and 60 DAS was very low which coincided with leafhopper population (Table 1). As the leafhopper population gradually increased and reached its maximum at 163 DAS consequently hopper burn scores also reached its maximum at 150 DAS. From the mean data it could be noted that genotypes DPC-9, PCH-111 and DCH-177 had recorded highest scores of 2.4, 2.4 and 2.0 which are statistically not significant from other entries. Lowest hopper burn scores was found in genotypes GCH-7 (0.00), PCH-254 (0.00), SKI-336 (0.00) statistically significant from other entries, JP-96 (0.10), GCH-4 (0.10) statistically significant from others, TMV-5 (0.20), SKI-84 (0.20), M-574 (0.20). The reaction of other entries were in between these two groups.Based on data on leafhopper population and hopper burn scoring, genotypes GCH-7, PCH-254 and SKI-336 could be ranked as least preferred genotypes with lowest leafhopper population and hopper burn scores and entry DPC-9 could be ranked as the most preferred variety with highest leafhopper population and high hopper burn scores. The reactions of other genotypes were in between these two groups. The genotypes GCH-7, Haritha, M-574, VP-1, DCH-519, SKI-336 and GCH-4 have recorded lowest leafhopper population. These genotypes are triple bloom varieties where the stems, petiole and leaf lamina is covered with wax bloom. Presence of wax bloom on surface of plant parts could act as barriers for feeding by phytophagous insects. The present investigation is in accordance with Seshadri and Seshu[10] who reported that castor varieties with wax bloom were comparatively more resistant to leafhopper. The authors were of opinion that the degree of resistance increases with the intensity of the bloom. The present findings is also in agreement with Lakshminarayana[4], Rao *et al.*[9], Silpakala and Murali Krishna[11], Vijaya *et al.*[14]. Findings of present investigation also revealed that leafhopper population and hopper burn scorings were higher in the genotypes DPC-9, PCH-111, DCH-177 which were either zero or single bloom genotypes, where the wax bloom is absent on the leaf lamina, and hence there were more leafhopper population on zero/ single bloom genotypes as there was no barriers/ deterrence for the insects feeding on leaves.The results of present investigation are also in accordance with Lakshminarayana[3], Dorairaj *et al*.[2], Suganthy[12] who reported that triple bloom varieties as more resistant to leafhopper compared to zero or single bloom genotypes.The results are also in accordance with Anjani *et al*.[1] reported that the bloom character of castor was found to have influence on the reaction to sucking pests. Most of the resistant entries to jassids and thrips were of double and triple bloom, while entries resistant to whitefly were no bloom or single bloom.

Influence of weather parameters on incidence of leafhopper *Empoasca flavescens*

Statistical analysis revealed a significant negative correlation between leafhopper population and maximum temperature (r = -0.864), minimum temperature (r = -0.738), evaporation (r = -0.627) on the susceptible variety DPC-9. The other abiotic parameters did not show any significant correlation with leafhopper population (Table 3). Multiple linear regression analysis of leafhopper population and weather parameters revealed no significant relationship (Table 4).

Multiple linear regression model fitted was, $Y=817.079-18.047\ X_1+3.758\ X_2-2.303\ X_3+3.754\ X_4-48.126\ X_5-37.059\ X_6+10.928\ X_7$ with R^2 value of 0.742.

Significant negative correlation between leafhopper population and maximum temperature observed in the present investigation contradicts the finding of Men *et al*.[6] who reported positive correlation between leafhopper population and maximum temperature. This could be due to the effect of local weather parameters prevalent during the period of experimentation.Significant positive correlation between leafhopper population and sunshine hours was observed in the present investigation which was in accordance with the Yadav and Singh[15] who reported positive correlation between leafhopper population and sunshine hours while significant negative correlation between leafhopper population and evaporation observed in the present investigation is in contradiction with Yadav and Singh[15] reporting positive significant correlation between leafhopper population and evaporation in mungbean.

Table 1: Leafhopper population of different genotypes in *kharif*, 2016

Genotype	30 DAS	37DAS	44DAS	51DAS	58DAS	65DAS	72DAS	79DAS	86DAS	93DAS
Jwala	0.60^{ab}	1.10^{abcd}	1.20^{ab}	1.80^{ab}	4.60^{abc}	4.40^{ab}	7.60^{ab}	6.80^{ab}	8.30^{abcd}	16.70^{abcde}
DCH-177	1.40^{bc}	2.90^{cde}	5.20^{c}	3.40^{abc}	2.90^{a}	16.50^{d}	4.90^{a}	10.70^{abc}	26.70^{f}	30.90^{g}
DCH-519	0.00^{a}	1.10^{abcd}	0.90^{ab}	1.50^{ab}	4.20^{ab}	2.50^{a}	7.50^{ab}	5.10^{a}	8.50^{abcd}	14.00^{abcde}
DCS-107	2.30^{c}	3.50^{de}	4.00^{bc}	2.10^{abc}	14.60^{d}	6.80^{ab}	5.40^{a}	12.90^{abc}	14.5^{de}	20.00^{bcdef}
DCS-78	0.80^{ab}	1.30^{abcde}	3.10^{abc}	4.70^{bc}	11.80^{cd}	11.00^{bcd}	5.80^{ab}	10.90^{abc}	9.70^{abcd}	11.70^{ab}
Jyothi	0.11^{a}	0.67^{abc}	0.44^{ab}	0.22^{a}	6.00^{abc}	4.33^{ab}	11.33^{abc}	6.67^{ab}	11.44^{bcde}	15.67^{abcde}
DPC-9	0.11^{a}	0.44^{abc}	0.78^{ab}	1.33^{a}	6.44^{abc}	4.11^{ab}	9.33^{abc}	10.00^{abc}	15.00^{de}	27.78^{fg}
GCH-4	0.30^{ab}	1.80^{abcde}	1.20^{ab}	2.70^{abc}	6.50^{abc}	3.70^{ab}	7.20^{ab}	13.10^{bc}	13.70^{cde}	21.80^{def}
GCH-7	0.00^{a}	0.20^{ab}	0.40^{ab}	0.60^{a}	6.90^{abc}	2.70^{a}	6.40^{ab}	12.70^{abc}	11.60^{bcde}	11.50^{ab}
JC-12	0.29^{ab}	2.57^{bcde}	2.29^{abc}	2.57^{abc}	4.43^{abc}	4.71^{ab}	10.71^{abc}	10.86^{abc}	10.29^{abcde}	12.43^{abc}
JP-96	0.30^{ab}	0.90^{abc}	2.30^{abc}	1.60^{ab}	6.20^{abc}	3.80^{ab}	13.60^{abc}	8.10^{abc}	11.50^{bcde}	14.70^{abcde}
M-574	0.00^{a}	2.56^{bcde}	2.67^{abc}	3.00^{abc}	8.22^{abcd}	5.44^{ab}	8.22^{abc}	8.00^{abc}	7.11^{abcd}	10.00^{a}
PCH-111	1.40^{bc}	3.70^{e}	1.80^{abc}	1.00^{a}	2.90^{a}	4.30^{ab}	8.00^{ab}	8.00^{abc}	18.10^{e}	26.80^{fg}
PCH-254	0.67^{ab}	1.00^{abcd}	0.33^{ab}	0.67^{a}	4.33^{ab}	3.33^{ab}	15.67^{bc}	7.00^{ab}	9.00^{abcd}	14.67^{abcde}
PCH-282	0.43^{ab}	1.29^{abcde}	0.29^{ab}	0.43^{a}	6.29^{abc}	3.29^{ab}	10.14^{abc}	9.00^{abc}	11.57^{bcde}	10.43^{a}
Haritha	0.40^{ab}	1.90^{abcde}	0.50^{ab}	1.10^{a}	4.00^{ab}	4.50^{ab}	7.00^{ab}	6.80^{ab}	5.60^{abc}	14.20^{abcde}
Kiran	0.20^{ab}	1.00^{abcd}	0.40^{ab}	0.30^{a}	3.80^{ab}	3.30^{ab}	9.80^{abc}	8.00^{abc}	7.60^{abcd}	12.40^{abc}
Pragathi	0.60^{ab}	1.10^{abcd}	1.00^{ab}	1.00^{a}	5.20^{abc}	3.00^{ab}	6.30^{ab}	7.40^{ab}	11.60^{bcde}	22.90^{efg}
Kranthi	1.20^{abc}	1.80^{abcde}	3.20^{abc}	5.30^{c}	5.90^{abc}	16.20^{cd}	7.40^{ab}	5.10^{a}	5.70^{abc}	21.00^{cdef}
SKI-215	0.33^{ab}	1.00^{abcd}	3.33^{abc}	5.17^{c}	6.67^{abc}	4.50^{ab}	11.67^{abc}	7.00^{ab}	11.67^{bcde}	18.33^{abcde}
SKI-333	0.25^{ab}	0.00^{a}	0.00^{a}	0.25^{a}	4.75^{abc}	1.50^{a}	6.50^{ab}	9.50^{abc}	6.25^{abc}	9.25^{a}
SKI-335	0.30^{ab}	1.90^{abcde}	1.60^{ab}	0.40^{a}	3.70^{ab}	9.10^{abc}	7.30^{ab}	8.40^{abc}	8.5^{abcd}	16.50^{abcde}
SKI-336	0.25^{ab}	1.50^{abcde}	0.75^{ab}	0.75^{a}	4.50^{abc}	9.00^{abc}	9.25^{abc}	8.75^{abc}	3.25^{a}	14.75^{abcde}
SKI-341	0.00^{a}	2.60^{bcde}	0.40^{ab}	2.00^{abc}	10.60^{bcd}	2.80^{a}	17.80^{c}	15.80^{c}	8.00^{abcd}	15.40^{abcde}
SKI-84	0.33^{ab}	0.00^{a}	0.00^{a}	0.33^{a}	8.00^{abcd}	4.00^{ab}	8.33^{abc}	10.67^{abc}	8.00^{abcd}	14.33^{abcde}
TMV-5	0.38^{ab}	1.13^{abcd}	0.50^{ab}	1.25^{a}	5.50^{abc}	1.75^{a}	9.13^{abc}	11.25^{abc}	8.13^{abcd}	13.38^{abcd}
VP-1	0.00^{a}	0.14^{ab}	0.14^{a}	1.14^{a}	6.57^{abc}	7.71^{ab}	8.57^{abc}	8.29^{abc}	4.29^{ab}	9.71^{a}
YRCH-1	0.25^{ab}	1.25^{abcde}	1.63^{ab}	4.75^{bc}	7.13^{abc}	9.00^{abc}	12.38^{abc}	6.88^{ab}	7.00^{abcd}	13.00^{abcd}

Genotype	100DAS	121DAS	128DAS	135DAS	142DAS	149DAS	156DAS	163DAS	Mean
Jwala	17.70^{bcdef}	46.3^{bcde}	85.6^{ghi}	68.70^{hi}	65.70^{defgh}	58.70^{abcd}	79.60^{e}	65.00^{cde}	30.02^{cd}
DCH-177	40.90^{h}	63.70^{f}	90.20^{hi}	95.20^{j}	76.90^{h}	100.30^{gh}	93.30^{f}	106.80^{h}	42.93^{e}
DCH-519	17.10^{abcdef}	40.30^{abcd}	44.70^{a}	41.80^{abcd}	54.00^{abcdefg}	59.50^{abcd}	47.10^{abc}	43.10^{ab}	21.83^{a}
DCS-107	21.10^{def}	48.00^{cde}	62.70^{cd}	55.40^{cdefgh}	95.40^{i}	81.60^{ef}	72.90^{de}	80.90^{efg}	33.56^{d}
DCS-78	18.60^{bcdef}	50.50^{de}	77.10^{efgh}	74.90^{i}	70.30^{gh}	71.30^{cdef}	68.80^{de}	71.40^{def}	31.87^{cd}
Jyothi	15.11^{abcdef}	48.44^{cde}	74.80^{defg}	54.67^{cdefgh}	75.33^{h}	60.22^{abcd}	77.33^{e}	62.22^{cd}	29.17^{cd}
DPC-9	50.56^{i}	72.00^{f}	106.89^{j}	128.00^{k}	151.44^{j}	113.00^{h}	126.22^{g}	153.67^{i}	54.28^{f}
GCH-4	19.70^{cdef}	34.30^{a}	42.70^{a}	41.90^{abcd}	46.30^{ab}	54.10^{abcd}	51.20^{abc}	38.40^{a}	22.26^{a}
GCH-7	12.30^{abc}	39.40^{abc}	44.30^{a}	42.40^{abcd}	49.30^{abcd}	39.20^{a}	43.80^{ab}	44.90^{ab}	20.48^{a}
JC-12	14.00^{abcde}	40.86^{abcd}	66.14^{cde}	67.71^{ghi}	63.43^{bcdefgh}	56.57^{abcd}	70.14^{de}	58.57^{bcd}	27.70^{bc}
JP-96	13.30^{abcd}	33.40^{a}	46.00^{a}	44.90^{abcd}	51.10^{abcde}	40.10^{a}	42.40^{ab}	62.40^{cd}	22.03^{a}
M-574	11.78^{abc}	38.78^{abc}	46.78^{ab}	46.11^{abcd}	51.11^{abcde}	46.67^{ab}	46.44^{ab}	41.22^{ab}	21.34^{a}
PCH-111	28.50^{g}	45.60^{bcde}	61.30^{bcd}	63.00^{efghi}	67.00^{efgh}	55.70^{abcd}	72.00^{de}	62.80^{cd}	29.55^{cd}
PCH-254	17.67^{bcdef}	42.67^{abcd}	47.33^{ab}	45.33^{abcd}	53.67^{abcdef}	53.00^{abcd}	55.00^{bc}	50.00^{abc}	23.41^{a}
PCH-282	11.14^{ab}	38.86^{abc}	47.14^{ab}	56.57^{defgh}	52.57^{abcde}	45.71^{ab}	40.57^{ab}	44.86^{ab}	21.70^{a}
Haritha	13.40^{abcde}	33.20^{a}	45.60^{a}	38.50^{ab}	43.50^{a}	50.30^{abc}	61.70^{cd}	41.90^{ab}	20.78^{a}
Kiran	12.60^{abc}	38.90^{abc}	52.50^{abc}	54.90^{cdefgh}	48.90^{abcd}	49.50^{ab}	47.00^{abc}	43.00^{ab}	21.89^{a}
Pragathi	18.70^{bcdef}	37.90^{abc}	47.10^{ab}	47.30^{abcd}	49.60^{abcd}	52.30^{abcd}	49.20^{abc}	49.60^{abc}	22.88^{a}
Kranthi	14.00^{abcde}	37.80^{abc}	57.20^{abc}	53.90^{bcdefgh}	47.90^{abc}	47.80^{ab}	52.70^{abc}	64.90^{cde}	24.94^{ab}
SKI-215	21.50^{ef}	47.00^{bcde}	71.50^{def}	64.67^{fghi}	75.00^{h}	73.17^{def}	74.17^{de}	71.00^{def}	31.54^{cd}
SKI-333	17.25^{abcdef}	48.25^{cde}	91.50^{i}	54.50^{cdefgh}	67.00^{efgh}	88.25^{fg}	79.50^{e}	91.25^{g}	31.99^{cd}
SKI-335	22.50^{fg}	45.90^{bcde}	77.30^{efgh}	66.70^{fghi}	64.90^{cdefgh}	62.50^{bcde}	69.80^{de}	71.10^{def}	29.91^{cd}
SKI-336	17.75^{bcdef}	43.00^{abcd}	47.50^{ab}	40.25^{abc}	49.75^{abcd}	47.75^{ab}	44.00^{ab}	51.75^{abc}	21.92^{a}
SKI-341	14.60^{abcdef}	53.80^{e}	83.40^{fghi}	67.40^{ghi}	69.40^{fgh}	72.60^{def}	77.60^{e}	82.80^{fg}	33.17^{d}
SKI-84	10.67^{ab}	48.00^{cde}	52.00^{abc}	33.67^{a}	56.00^{abcdefg}	59.00^{abcd}	44.00^{ab}	51.00^{abc}	22.69^{a}
TMV-5	14.25^{abcde}	36.50^{ab}	45.38^{a}	47.88^{abcde}	47.13^{ab}	47.00^{ab}	37.13^{a}	43.75^{ab}	20.63^{a}
VP-1	9.14^{a}	33.86^{a}	52.00^{abc}	51.57^{bcdef}	48.86^{abcd}	50.29^{abc}	43.00^{ab}	48.86^{abc}	21.34^{a}
YRCH-1	11.5^{abc}	43.25^{abcd}	54.88^{abc}	52.75^{bcdefg}	51.88^{abcde}	48.75^{ab}	48.38^{abc}	43.63^{ab}	23.24^{a}

The values followed by the same letters are not significant as per DMRT.

Table 2: Hopper burn scores of different genotypes during *kharif*, 2016

Treatments	30DAS	60DAS	90DAS	120 DAS	150DAS	Mean
Jwala	0.00^{a}	0.50^{ab}	1.00^{abc}	1.50^{cd}	1.50^{bcd}	0.90^{efg}
DCH-177	1.00^{c}	1.50^{c}	2.00^{cd}	2.50^{e}	4.00^{g}	2.20^{i}
DCH-519	0.00^{a}	0.00^{a}	0.00^{a}	0.50^{ab}	1.00^{abc}	0.30^{abcd}
DCS-107	1.00^{c}	1.50^{c}	2.00^{cd}	2.50^{e}	3.00^{efg}	2.00^{i}
DCS-78	0.00^{a}	0.50^{ab}	0.50^{ab}	1.00^{bc}	1.00^{abc}	0.60^{cdef}
Jyothi	0.00^{a}	0.50^{ab}	0.50^{ab}	1.00^{bc}	1.50^{bcd}	0.70^{defg}
DPC-9	0.50^{b}	1.00^{bc}	2.50^{d}	4.00^{f}	4.00^{g}	2.40^{i}
GCH-4	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.50^{ab}	0.10^{ab}
GCH-7	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
JC-12	0.00^{a}	0.00^{a}	0.50^{ab}	0.50^{ab}	1.00	0.40^{abcd}
JP-96	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.50^{ab}	0.10^{ab}
M-574	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	1.00^{abc}	0.20^{abc}
PCH-111	0.50^{b}	1.50^{c}	2.50^{d}	3.50^{f}	4.00^{g}	2.40^{i}
PCH-254	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
PCH-282	0.00^{a}	0.00^{a}	0.00^{a}	1.00^{bc}	1.00^{abc}	0.40^{abcd}
Haritha	0.00^{a}	0.00^{a}	0.50^{ab}	1.00^{bc}	1.00^{abc}	0.50^{bcde}
Kiran	0.00^{a}	0.50^{ab}	1.00^{abc}	1.50^{cd}	2.00^{cde}	1.00^{fg}
Pragathi	0.00^{a}	0.00^{a}	1.00^{abc}	2.00^{de}	2.50^{def}	1.10^{g}
Kranti	0.00^{a}	0.00^{a}	0.00^{a}	1.00^{bc}	1.00^{abc}	0.40^{abcd}
SKI-215	0.00^{a}	0.00^{a}	0.50^{ab}	1.00^{bc}	1.50^{bcd}	0.60^{cdef}
SKI-333	0.00^{a}	0.00^{a}	0.50^{ab}	2.00^{de}	2.50^{def}	1.00^{fg}
SKI-335	0.00^{a}	0.50^{ab}	0.50^{ab}	1.00^{bc}	1.50^{bcd}	0.70^{defg}
SKI-336	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
SKI-341	0.00^{a}	1.00^{bc}	1.50^{bcd}	2.00^{de}	3.50^{fg}	1.60^{h}
SKI-84	0.00^{a}	0.00^{a}	0.00^{a}	0.50^{ab}	0.50^{ab}	0.20^{abc}
TMV-5	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	1.00^{abc}	0.20^{abc}
VP-1	0.00^{a}	0.00^{a}	0.50^{ab}	1.00^{bc}	1.50^{bcd}	0.60^{cdef}
YRCH-1	0.00^{a}	0.00^{a}	0.50^{ab}	1.00^{bc}	1.50^{bcd}	0.60^{cdef}

The values followed by same letter do not differ significantly as per DMRT.

Table 3: Simple correlations between weather parameters and leafhopper population on DPC-9 variety of castor during *kharif* , 2016

Weather parameter	Correlation coefficients (r)
Maximum temperature	-0.864**
Minimum temperature	-0.738**
Relative humidity	0.243 NS
Rainfall	-0.203 NS
No. of rainy days	-0.339NS NS
Evaporation	-0.627**
Sunshine hours	0.507*

** Correlation is significant at the 0.01 level

* Correlation is significant at the 0.05 level

NS-Not significant

Table 4: Multiple linear regression between weather parameters and number of leafhopper population on DPC-9 of castor during *kharif*, 2016

Variable	Regression	Standard error	t-value
X_1 – Maximum temperature	-18.047 NS	5.511	-3.275
X_2 – Minimum temperature	3.758 NS	5.272	0.713
X_3 – Relative humidity	-2.303 NS	0.704	-3.273
X_4 – Rainfall	3.754 NS	1.454	2.583
X_5 – No. of rainy days	-48.126 NS	16.467	-2.923
X_6 – Evaporation	-37.059 NS	16.534	-2.241
X_7 – Sunshine hours	10.928 NS	7.789	1.403

R^2 Value = 0.742, 'F' Value = 3.232, NS = Non significant

CONCLUSION

Among 28 castor genotypes screened against leafhopper GCH-7, PCH-254 and SKI-336 could be ranked as the least preferred genotypes with lowest leafhopper population and hopper burn scores while the genotypes DPC-9, DCH-177 could be ranked as most preferred genotypes with highest leafhopper population and hopper burn scores. This could be supported by the fact that GCH-7, PCH-254 and SKI-336 were triple bloom genotypes imparting resistance to the leafhopper by antixenotic mechanism while DPC-9, DCH-177 and PCH-111 were zero and single bloom genotypes respectively with no wax bloom on their leaf lamina.The correlation studies on leaf hopper population with abiotic factors showed that maximum temperature, minimum temperature, rainfall, number of rainy days and evaporation were negatively correlated whereas relative humidity and sunshine hours were positively correlated with leafhopper population.

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