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Screening for leafhopper (*Empoasca flavescens*) resistance in germplasm accessions of castor (*Ricinus communis* L.)

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ABSTRACT

A field experiment was conducted at Regional Agricultural Research Station, Palem during Kharif, 2019 to screen the castor germplasm accessions (100 no.) against leafhopper along with susceptible (DPC-9) and resistant checks (M-574). Out of which, 20 entries did not exhibit hopper burn (hopper burn grade 0 on 0-4 scale) and were found highly resistant to leafhopper. Leafhopper population among the accessions ranged from 8.8 to 27.2 leafhoppers/3 leaves/plant, whereas the susceptible check, DPC-9 recorded 67.8 leafhoppers/3 leaves/plant with hopper burn grade of 4 on 0-4 scale. Fourteen entries recorded a low leafhopper population (17.6 to 38.8 leafhoppers/3 leaves/plant) with hopper burn grade 1 (upto 10% hopper burn). The Leafhopper population was highest in RG-111 (70.6 leafhoppers/3 leaves/plant) with a hopper burn grade of 4 (76 to 100% hopper burn). The germplasm accessions that were found resistant to leaf-hopper can be utilized in breeding programs to develop resistant cultivars.

Keywords: *: Castor, Germplasm, Leafhopper, Screening, Sources of resistance. Checks.*

INTRODUCTION

Castor (*Ricinus communis* L.) is an important nonedible oilseed crop of dry land area with huge industrial importance [14]. It is widely distributed and adapted throughout the tropics, subtropics, and temperate areas due to its low demand on soil fertility, the requirement of moderate rainfall, less competition with other food crops and food-grade oils. Castor is grown for its seeds, which is extracted for the non-edible oil mainly used in the manufacturing of paints, lubricants, soaps, hydraulic brake fluids, polymers and per- fumery products, among others; several derivatives of castor oil are used in a variety of industries. [1]. India is the major producer in the world, castor seed with a production of 17.95 lakh tonnes (lt) during 2021-22 season, against 17.89 lt in 2020-21. (Anon, 2022). Among states, Gujarat is leading with 6.52 lakh ha (13.45 lakh tonnes) under castor followed by Rajasthan 1.77lakh ha (2.76 lakh tonnes), Andhra Pradesh 0.16 lakh ha (0.064 lakh tonnes), and Telangana 0.022 lakh ha (0.037 lakh tonnes). According to the government's 2nd advance estimates, all India castor production in 2022-23 is at area 8.917 lakh ha,with production 18.82 lakh tonnes. [Source: Directorate of Economics and Statistics (DES). * 2nd Advance estimates.

Castor is attacked by insect pests right from sowing to harvesting. More than 60 species of insects and mites have been reported to cause damage to the castor crop and their related yield loss has been estimated to be about 40-89% [9, 13 & 8]. The seed yield losses in castor due to insect pests varied with the season, the severity of the pest and the hybrid variety of the plant [6]. The sucking pests such as leafhoppers (*Empoasca flavescens*), whiteflies and thrips have been known to be the most important pests attacking castor resulting in excessive loss of grain yield [11]. 14- 15% of yield loss caused by sucking pests was recorded in Gujarat in India [7]. Nymphs and adults of leafhoppers suck the sap from the under surface of the leaves causing leaf margins to become yellow, curling and under severe infestation, hopper burn symptoms were also noticed [6]. The use of tolerant/resistant cultivars in integrated pest management programs is the most economical approach that will minimizes the number of insecticidal application and conserves natural enemies besides preserving environmental safety. Hence, the present study was conducted to identify resistant genotypes against leafhoppers.

MATERIALS AND METHODS

The field experiment was conducted at the Regional Agricultural Research Station, Palem. A total of 100 castor germplasm accessions were screened against leafhopper which were collected from ICAR-IIOR, Rajendranagar, Hyderabad. Each accession was sown in a single row of 6 m length with the spacing of 90 cm x 60 cm in augmented block design. The crop was raised as per the package of practices [3] except the plant protection measures.

Susceptible check DPC-9 was used as an infester row and sown after every five rows of germplasm accessions. Leafhopper counts (nymph) were recorded on three leaves in each plant selecting one leaf from top (excluding 2 topmost leaves), middle (medium maturity) and bottom (leaving one or two bottom most leaves) on the main shoot. Population recorded as number of leafhoppers/3 leaves per plant and percent leaf area burnt

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per plant (average of 5 plants). Hopper burn injury was recorded as per the scale suggested [2].

Hopper burn grade:
0 - No injury
1 - Hopper burn upto 10%
2 - Hopper burn 11 to 25%
3 - Hopper burn 26 to 50%
4 - Hopper burn above 50%

RESULTS AND DISCUSSION

Out of 100 castor germplasm accessions screened 20 entries *viz.,* RG-18, RG-311, RG-1607, RG-1624, RG-1922, RG-2746, RG-2781, RG-116, RG-2816, RG-2822, RG-1621, RG-3080, RG-2094, RG-3445, RG-3741, RG-3795, RG-63, RG-1389-1, RG-2296 and RG-2210 did not exhibit any hopper burn (hopper burn grade 0 on 0-4 scale) and found highly resistant to leafhopper. The leafhopper population in the entries ranged from 8.8 to 27.2 leafhoppers/3 leaves/plant; whereas the susceptible check DPC-9 recorded 67.8 leafhoppers/3 leaves/plant with hopper burn grade of 4 on 0-4 scale. [4].Thirteen entries *viz.,* RG-19, RG-45, RG-155, RG-1647, RG-2758, RG-2800, RG-3425, RG-211, RG-2139, RG-3477, RG-29, RG-1594, RG-1663 have recorded hopper burn grade of 1 (10% hopper burn) with low leafhopper population ranging from 17.6 to 38.8 leafhoppers/3 leaves/plant as compared to the susceptible check, DCS-9 which has recorded a hopper burn grade of 3 (51 to 75% hopper burn) with the population of 58.6 /3 leaves/plant. [10 & 15].The incidence of leafhopper population was high in sixteen entries *viz.,* RG-392, RG-47, RG-386, RG-2241, RG-2430, RG-104, RG-109, RG-111, RG-3548, RG-72, RG-1437, RG-2149, RG-66, RG-380, RG-3233 and RG-1298) with leafhopper population ranging from 40.2 to 70.6 leafhoppers/3leaves/plant with hopper burn grade of 4 (76 to 100% hopper burn).

Screening of castor germplasm accessions against sucking pests (2019-20)

S. No.	Genotype	Stem colour and bloom	Leafhopper	
			Palem	
			No./3 leaves /plant	*Hopper burn (0-4 grade)
1.	RG-18	G3	8.8	0
2.	RG-19	R2	36.8	1
3.	RG-29	R2	33.8	1
4.	RG-45	R2	33.8	1
5.	RG-47	R2	33.8	1
6.	RG-57	G2	50.0	3
7.	RG-63	R2	20.8	0
8.	RG-66	G2	48.4	4
9.	RG-72	R2	62.8	4
10.	RG-82	R2	53.4	3
11.	RG-89	R2	47.6	3
12.	RG-104	R2	60.4	4
13.	RG-109	G2	64.8	4
14.	RG-111	R2	70.6	4
15.	RG-116	R2	12.2	0
16.	RG -155	R2	22.6	1
17.	RG-211	G3	26.4	1
18.	RG-226	R2	50.8	3
19.	RG-248	R2	39.6	3
20.	RG-289	R2	43.2	3
21.	RG -297	G3	34.6	2
22.	RG-298	G2	47.4	3
23.	RG - 311	R2	9.4	0
24.	RG-329	R2	37.6	3
25.	RG-330	G2	34.2	2
26.	RG-357	G2	41.2	3
27.	RG-358	R2	39.4	2
28.	RG-380	R2	63.0	4
29.	RG -386	G2	60.4	4
30.	RG -392	R2	46.4	4
31.	RG-408	R2	48.2	3
32.	RG-602	G2	43.4	3
33.	RG-631	R3	36.4	3
34.	RG-817	R2	36.8	2
35.	RG-931	NG	NG	NG
36.	RG-941	G2	19.4	1
37.	RG-1298	R2	55.4	4
38.	RG 1389-1	R3	25.0	0
39.	RG- 1437	G2	70.4	4
40.	RG-1494	G2	32.4	2
41.	RG-1525	NG	NG	NG
42.	RG-1594	R2	27.6	1
43.	RG -1607	R2	11.6	0
44.	RG -1608	G3	25.8	2
45.	RG-1618	R2	62.4	3
46.	RG-1621	G2	13.4	0
47.	RG 1624	G3	20.4	0
48.	RG -1647	G2	17.6	1
49.	RG-1661	R2	44.2	2
50.	RG-1663	G2	28.2	1
51.	RG-1695	NG	NG	NG
52.	RG-1741	R2	29.6	2
53.	RG -1922	G2	8.6	0
54.	RG-1941	R2	49.2	3
55.	RG-1963	NG	NG	NG
56.	RG-1969	NG	NG	NG
57.	RG-2035	G2	52.0	3
58.	RG-2048	R2	52.2	3
59.	RG-2067	R2	39.6	2
60.	RG-2068	NG	NG	NG
61.	RG-2094	R3	13.0	0
62.	RG-2139	R3	26.2	1
63.	RG-2149	R2	63.6	4
64.	RG-2210	G3	17.8	0
65.	RG- 2241	G2	40.2	4
66.	RG-2296	R2	18.8	0
67.	RG-2350	NG	NG	NG
68.	RG -2430	R2	63.8	4
69.	RG-2439	G2	39.4	2
70.	RG-2451	R2	44.2	3
71.	RG-2481	R3	48.8	3
72.	RG-2719	R2	26.8	2
73.	RG-2722	R2	38.6	3
74.	RG -2746	G2	16.4	0
75.	RG -2758	R2	38.8	1
76.	RG-2764	G3	43.6	3
77.	RG -2776	NG	NG	NG
78.	RG -2781	R2	27.2	0
79.	RG-2797	R3	59.2	3
80.	RG- 2800	R0	30.4	1
81.	RG-2816	G2	10.8	0
82.	RG -2818C	R2	32.2	2
83.	RG -2819	G3	36.6	2
84.	RG-2822	R2	21.4	0
85.	RG-3013	NG	NG	NG
86.	RG-3037	R2	41.2	3
87.	RG-3060	G3	43.4	3
88.	RG 3067	G3	35.2	2

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89.	RG-3080	G2	17.6	0
90.	RG-3132	NG	NG	NG
91.	RG-3233	R2	48.0	4
92.	RG-3425	R2	28.2	1
93.	RG-3445	G3	18.6	0
94.	RG-3477	R2	26.4	1
95.	RG-3548	G2	70.2	4
96.	RG-3667	R2	34.8	2
97.	RG-3728	R2	48.6	2
98.	RG-3741	R2	12.2	0
99.	RG-3761	R2	54.8	3
100.	RG-3795	G2	19.4	0
101.	DCS-107©	G2	72.2	4
102.	DCH-177©	R1	42.4	3
103.	DCH-519©	G3	20.1	0
104.	M-574©	G3	18.4	0
105.	DCS-9©	R2	58.6	3
106.	DPC-9©	G0	67.8	4

© -Check; NG–Not Germinated; NT-Not Tested;

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