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Field Screening of Castor (*Ricinus communis* L.) Germplasm Against *Fusarium* Wilt

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ABSTRACT

Field trial was conducted to evaluate 100 germplasm accessions in wilt sick plot with krathi as susceptible check and haritha as resistant check. Germplasm accessions were sown in single row with 5m length with 17 initial plants at 45X30cm spacing. Resistant and susceptible checks were sown after every 5 test entries. Initial inoculum load of the wilt pathogen was found to be $1.64X10^3$ cfu/g of soil before the start of the experiment and it was increased to $1.83X10^3$ cfu/g of soil at the end of the experiment. Out of 100 accessions screened, thirteen germplasm accessions viz., RG-2241, 2272, 2275, 2299, 2301, 2432, 2457, 2863, 2885, 2890, 2891, 2894, 2896 were found to be resistant under wilt sick conditions up to 150 days after sowing.

Key words : Castor, *Fusarium* wilt, Germplasm Screening.

Castor is the third important oilseed crop of Andhra Pradesh in terms of acreage and economy after groundnut and Sunflower. The crop is mostly restricted to Southern Telangana agro-climatic zone of the state, in which Mahaboobnagar and Nalgonda districts account to 80% of total castor area of A.P. It is the livelihood crop of resource poor farmers in these two districts, which are characterized by low and erratic rainfall and shallow sandy soils in Telangana region of the state. Castor is the most preferred crop in these areas as it is having excellent rejuvenating capacity and genetic potential to give some yields even under adverse conditions. In addition to growing of the crop completely under rainfed conditions, poor management and Fusarium wilt, a devastating disease yields are further depressing up to 50-60% and worsening the already precarious condition of the farmers.

Castor is an industrial oilseed crop. Because of its almost unlimited industrial applications, castor enjoys tremendous demand in international market. India is the world's top producer and exporter of castor. Castor wilt caused by *Fusarium oxysporum* f. sp. *ricini* is one of the principal yield limiting factor in the production of castor in the major castor growing regions in India (Anonymous., 1998). The disease can be managed to a certain extent by fungicide seed treatment as well as with use of biocontrol agents. The role of monoculture in increasing the disease incidence after each subsequent crop with reduction in yield is well documented (Merwe, 1979). Identifying resistant cultivars to these fungi in germplasm collection would be the most practical way to control this disease. The present study was undertaken to identify source of resistance in castor germplasm for *Fusarium* wilt.

MATERIAL AND METHODS

Field screening was conducted during 2005-06 in wilt sick plot of Regional Agricultural Research Station, Southern Telangana Zone (STZ) of Andhra Pradesh, Palem, Mahaboobnagar district. Diversified types of castor germplasm accessions over obtained from Directorate of Oilseeds Research (DOR), Rajendranagar, Hyderabad. A total of 250 germplasm accessions were evaluated in wilt sick plot with krathi as susceptible check and Haritha as resistant check. Germplasm accessions were sown in single row with 5m length with 17 initial plants at 45X30cm spacing. Resistant and susceptible checks were sown after every 5 test entries. The inoculum load of the wilt pathogen was estimated before sowing and after harvest of the crop as per Sharma and Singh (1973) and expressed as colony forming units per gram of soil (cfu/g). Inoculum load of sick plot was maintained

Table 1. Screening of castor germplasm accessions for resistance to *Fusarium* wilt.

S.No.	Entry No.	Plant Stand	Wilt incidence (%)				
			30 DAS	60 DAS	90 DAS	120 DAS	150 DAS
1	RG-2241	15	00.0	00.0	00.0	5.9	17.7
2	RG-2272	16	5.9	11.8	11.8	17.7	17.7
3	RG-2275	10	00.0	00.0	00.0	5.9	17.7
4	RG-2299	17	00.0	00.0	00.0	11.8	17.7
5	RG-2301	15	00.0	00.0	5.9	5.9	17.7
6	RG-2432	15	00.0	00.0	00.0	11.8	17.7
7	RG-2457	17	00.0	00.0	5.9	11.8	17.7
8	RG-2863	17	00.0	5.9	5.9	11.8	17.7
9	RG-2885	6	00.0	00.0	00.0	11.8	17.7
10	RG-2890	15	00.0	00.0	00.0	5.9	17.7
11	RG-2891	12	00.0	00.0	11.8	11.8	17.7
12	RG-2894	17	5.9	11.8	11.8	17.7	17.7
13	RG-2896	16	00.0	00.0	00.0	00.0	17.7
R. check	Haritha	12	33.3	41.6	50.0	75.0	83.3
S. check	Kranti	16	0.0	6.25	6.25	12.5	12.5

by adding Fusarium culture mass multiplied on sorghum seeds at regular intervals and maintained through out the season. Disease incidence (number of infected plants) was monitored periodically at 30 days intervals up to 150 days. Wilt incidence was calculated using the formula.

$$\text{Wilt incidence} = \frac{\text{No. of plants showing wilt incidence}}{\text{No. of plants germinated}} \times 100$$

Germplasm accessions showing <20% wilt incidence were categorized as resistant and others as susceptible to this disease.

RESULTS AND DISCUSSION

Initial inoculum load of the wilt pathogen was found to be $1.64X10^3$ cfu/g of soil before the start of the experiment and it was increased to $1.83X10^3$ cfu/g of soil at the end of the experiment. No significant difference in the colony count was recorded at different locations of the plot. Out of 250 accessions screened, twenty seven germplasm accessions viz., RG-2241, 2272, 2275, 2299, 2301, 2432, 2457, 2863, 2885, 2890, 2891, 2894, 2896 (Table-1) were found to be resistant under highly wilt sick plot conditions up to 150 days after sowing. Wilt incidence in these accessions ranged from 0 to 20%, where as in the susceptible check Kranti it was 33.3 to 83.3% and 0.0 to 12.5% in the resistant check Haritha and all remaining accessions showed more than 20% wilt incidence and categorized as susceptible to this disease.

Fusarium wilt is the one of the major disease in castor characterized by discoloration of hypocotyles, loss of turgidity of top leaves and marginal necrosis at the seedling stage. On adult plants gradual yellowing and sickly appearance of leaves followed by necrosis, browning of xylem tissues and irreversible wilting with bending of apical leaves and branches. It was first reported in India in1974 (Nanda and Prasad, 1974). Fusarium wilt incidence as high as 85-90% was reported in wilt endemic areas of various castor growing states. Even the leading wilt resistant castor hybrid GCH-4 turned out to be susceptible to Fusarium wilt with 90% wilt incidence in endemic areas (Patel *et al*., 1991). Hence there is a need for identification and incorporation of new source of wilt resistance in breeding material for development of resistant cultivars.

From the above results it can be concluded that these resistant germplasm accessions can be used as donor parents in the breeding programmes for the development of Fusarium wilt resistant varieties in castor and need to further evaluate for their stable resistant reaction and yield parameters.

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