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Short Communication

Inheritance of rust resistance in cowpea [*Vigna unguiculata* (L.) Walp.]

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Yield levels of cowpea [*Vigna unguiculata* (L.) Walp.] are generally low because of its relative susceptibility to diseases and pests. Cowpea is attacked by over 35 major diseases caused by viruses, bacteria, fungi and nematodes [1-3]. The occurrence, severity and yield loss due to each disease and mixed infections vary from place to place but some diseases occur and cause significant damage across the cowpea growing regions of the world. Cowpea rust (*Uromyces vignae* Barcl.) an important disease in India especially in Karnataka causes considerable yield loss. The pustules are small, roundish open, powdery and brown coloured. They appear in groups when infection is severe and leaves may wither resulting in considerable damage to the crop. Breeding resistant varieties assumes importance in view of the problems associated with the chemical control measures. For this, knowledge of the inheritance pattern is a prerequisite to chalk out breeding strategies.

The material for the study consisted of F_2 and F_2M_2 populations of three crosses viz., C-152 × C-11, C-152 × KM-1 and C-152 × C-70 and M_2 population of C-152. Among the parents involved in the crosses, C-152 was highly susceptible and C-11, C-70 and KM-1 were highly resistant to rust. The crop was raised in unreplicated blocks. All around the experimental plot susceptible variety C-152 was grown to provide sufficient inoculum to spread the infection. The crop was raised during kharif season of 2000 at Botanical garden, UAS, Dharwad. The usual cultural practices except plant protection measures recommended for cowpea were followed to raise the crop. In each of the six segregating populations (F_2's and F_2M_2's) and C-152 (M_2) population, five leaves per plant were taken randomly to score for the number of rust pustules found on leaves under natural epiphytotic conditions. Scoring was done by following the method of Mayee and Datar [4] considering 0 to 3 as resistant types and those from 5 to 9 as susceptible ones and chi-square test was used to assess the goodness of fit for a particular ratio.

In all the F_1's, susceptibility was dominant (Table 1). The F_2 plants of crosses C-152 × C-11, C-152 × KM-1 and C-152 × C-70 showed 3:1 ratio indicating a single dominant gene controlling the susceptibility (Table 2). This is supported by the findings of Bray [5] on F_2 plants of fodder legume. However, the earlier reports on inheritance of rust indicate that resistance was dominant [6]. The present report is a deviation from the opinion held by the earlier workers in respect of inheritance pattern for rust resistance in cowpea.

Table 1. Reaction of parents and F_1s to cowpea rust (*Uromyces vignae*)

	Number of plants	
Population	Resistant	Susceptible
Parents		
C-152	0	52
C-11	41	0
KM-1	68	0
C-70	45	0
F_1s		
C-152 × C-11	0	41
C-152 × KM-1	0	45
C-152 × C-70	0	42

The frequency of resistant mutants/segregants in M_2 of C-152 and F_2M_2 populations of all the three crosses were also scored for the reaction to rust. The results indicated (Table 3) that the frequency of resistant types was quite high compared to susceptible types in all the F_2M_2 populations where the number of resistant segregants was nearly three times more than the susceptible segregants. In M_2 population (Table 3), however the proportion of susceptible plants was high. But the proportion of resistant mutants was also relatively high as compared to the proportion of resistant segregants in F_2 populations (Table 2). This can be explained on the basis of the fact that the proportion of mutants with homozygous recessive condition for a particular allele is more in M_2 than in F_2 since in the former, the forces of mutation changing the allele from

Table 2. Segregation pattern for rust resistance in F_2 populations of cowpea

Cross	Number of F_2 plants		χ^2	
	Susceptible	Resistant	3:1	P
C-152 × C-11	95	25	1.10	0.20-0.30
C-152 × KM-1	122	34	0.85	0.30-0.50
C-152 × C-70	102	29	0.56	0.30-0.50
Total	-	-	2.51	0.30-0.50
Pooled χ^2	319	88	2.46	0.10-0.20
Heterogeneity χ^2			0.05	> 0.95

Table 3. Frequency of resistance and susceptible segregants in M_2 and F_2M_2 populations of cowpea

Population	Resistant	Susceptible
C-152 M_2	113	247
C-152 × C-11	272	94
C-152 × KM-1	209	152
C-152 × C-70	336	101

dominant to recessive condition as well as subsequent recombination involving dominant and recessive allele would increase the relative proportion of homozygous recessive types. In F_2, however, the force of recombination of dominant and recessive allele only would lead to the formation of recessive homozygotes. On the basis of same reasoning, the higher frequency of resistant segregants in F_2M_2 than in M_2 can be explained.

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