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Short communication

Inheritance of resistance to mycoplasma like organism in fenugreek (*Trigonella foenum-graecum* L.)

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Fenugreek (*Trigonella foenum-graecum* L.) is an important legume grown primarily as one of the seed spices. Besides, it is also used as a leafy vegetable. However, the basic genetic information is meagre owing to the lack of easily identifiable variants [1]. Empirical evidences suggest that the crop is affected by a number of pathogens. Like other legumes, it is also affected by mycoplasma/ mycoplasma like organism (MLO). Although, it has been noticed continually at All India Coordinated Research Projects on Seed Spices, Jobner, no work has been done towards its identification and establish the genetics of resistance to such an organism. Although the available germplasm at this place show resistance to this organism, affected plants do appear sporadically in the populations of fenugreek, presumably as a result of mutation at any one locus which governs disease reaction caused by the MLO. The present investigation aimed at tracing the inheritance pattern of resistance to the MLO in fenugreek.

A variant that appeared in a population of a determinate genotype, UM305, was selected during 1998-99. It was suspected to be heterozygote. It was inferior to normal plants in several attributes. However, it bore pods along with normal seeds. The progeny of this plant was raised in the following season (1999-2000). In this generation, nearly fifty per cent of the total plants showed resemblance to the parent plant. Two such plants were randomly selected and advanced again to the next generation (2000-2001) to test their breeding behaviour. The entire experiment was executed at S.K.N. College of Agriculture, Jobner.

The breeding test for selected variant (1998-99) indicated that the plant was heterozygous. It segregated into three discrete categories: normal, intermediate and diseased (Table 1). The progeny of two such intermediate plants again followed the same trend (Table 2). The application of chi-square test [2] indicated that the observed data in both the years fitted in a 1:2:1 phenotypic ratio for normal, intermediate and diseased types. This indicated that a single gene was segregating to account for the observed phenotypic ratio. Dominance for most traits appeared to be either partial or non-existent.

Diseased plants appeared to be poor competitors in mixture. A few diseased plants died before flowering. The plants that survived had peculiar characteristics (Table 1). They had fertile pollens and ovules were looking normal too. The blooming period was usually long. However, floral abscission following anthesis eventually led to no pod formation. These plants maintained their vigour until end-of-the-season. At the

Table 1. Salient features of different classes of plants obtained from the suspected heterozygote (intermediate plant) affected by putative MLO*.

Characters	Description		
	Normal plants	Intermediate plants	Diseased plants
Plant height (cm)	30.00	25.00	15.00
Primary branches	6.00	3.00	15.00 (lean & thin stem)
Leaf shape	Oval	Oval, abnormal leaf margins	Narrow
Leaf colour	Deep green	Green	Light green
Flower size and shape	Normal	Normal	Normal
Pollen	Functional	Functional	Functional
Ovule	Normal	Normal	Normal
Colour of plants at maturity	Straw colour	Slight green	Light green
No. pods/plant	34.00	18.00	Zero (adult stage) to a few
Pod colour at maturity	straw colour	Slight green	Light green
Size of pod	6.80	5.00 cm	3.00 cm
Seed/pod	10.00	5.00	2.0
Seed germinability	Normal	Normal	Normal

*The observation is based on mean values of five plants averaged over two years (1999-2000 & 2000-2001).

Table 2. Classes of plants in segregating generations.

Year	Intermediate plant (heterozygous)	Progeny of intermediate plant			The value of χ^2 (1:2:1)#
		Normal	Interme-diate	disea-sed	
1999-2000	01	15	27	13	0.1554
2000-2001	02A*	15	30	12	0.4735
	B*	16	28	11	0.9190

*Individual plant progeny.
#Chi-square values are non-significant at P = 0.05.

end of growing season, each such plant bore a few small-sized pods with a few normal seeds. This could have happened because the MLO-mediated process that probably affects fertilization and pod development somehow became weak. Seeds from each such plant had normal germination. All such completely diseased plants were breeding true to the type like progeny of resistant normal ones.

Similar findings were also noticed in another set of experiment, which included two other genotypes namely, RMt1 and RMt 141. These two genotypes have indeterminate growth habit; the effect of MLO appeared to be similar, albeit not the same as observed in the case of heterozygous variant selected from UM 305 (a determinate type). Hence, to avoid ambiguity, the characteristics of resistant, intermediate and diseased types segregated from heterozygous variants of indeterminate genotypes have not been included in the present paper.

The resistance reaction to MLO appeared to have shown dosage effect. Two doses of favourable (resistance) alleles (MM) in plants gave them complete resistance to MLO. In the heterozygous condition (Mm), intermediate reaction was observed, as the heterozygotes were neither completely resistant nor completely diseased. The plants carrying unfavourable allele in double dose (mm) gave completely susceptible reaction to the MLO. It was thus concluded that the MLO would cause seeming sterility and other abnormalities in plants lacking in resistance gene pair and resistance to this organism appeared to be monogenic with no dominance.

References

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2. **Strickberger M. W.** 1996. Genetics (The Second Indian Reprint). Prentice-hall of India Pvt. Ltd., New Delhi: 131-132.