Short Communication

Inheritance pattern of growth habit in fenugreek (*Trigonella foenum-graecum* L.)

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Fenugreek is an important legume grown primarily as one of the seed spices. However, the basic genetic information is lacking for most morphological traits. This is primarily due to the absence of easily identifiable variants for such traits. The problem is complicated further by the difficulties encountered in artificial hybridization. The small size of flowers in this herbaceous crop poses much problem in artificial crossing. The success of crossing is further limited by slower growth of the ensuing pods and poor seed set.

The genetic resources in fenugreek abound in indeterminate growth habit. The addition of a determinate genotype, UM 305 [1], just a few years back has made it possible to perform genetic dissection for growth habit. The present investigation was thus undertaken to establish the inheritance pattern of indeterminate vs. determinate growth habit taking advantage of honey bees as natural crossing agents.

In the first year of the experiment, two genotypes, namely Rmt1 and UM 305 with indeterminate and determinate growth habits, respectively were grown in alternate rows in about 20 m^2 area. At maturity, these two genotypes were harvested (excluding border rows), threshed and kept separately and carefully to avoid mechanical contamination. The next year (1998-99), a random sample of 200 seeds of each genotype was sown and reared separately. Fifteen days after the first flowering, each plot was observed carefully for deviants (natural hybrids) which could have been possible during 1997-98 because of frequent visits of honey bees from one plant to the other in the quest of nectar. Four plants with indeterminate growth habit were found growing in the plot with determinate type. About 100 crosses were made by taking pollens separately from each of four such indeterminate plants with several plants of UM 305. Further, these four indeterminate

plants were allowed to self-pollinate. (The fenugreek is a natural inbreeder). Out of a total 100 crosses, only four crosses became successful. These four crosses were derived from the first two pollen parents in equal proportion. At maturity, the four *suspected heterozygous* indeterminate plants and the two groups of supposed test crosses were harvested separately and grown again during 1999-2000 (*rabi* season). For test of significance of the proposed hypothesis, chi-square test with one degree of freedom was used [2].

The absence of deviants in the plot of indeterminate plants during 1998-99 indicated either possible absence of natural crosses or dominant nature of this growth habit. However, the presence of indeterminate plants in the plot of determinate plants might be indicative of dominant nature of indeterminate growth habit in the natural heterozygotes for the trait. The test of heterozygosity of these indeterminate plants could further be performed by evaluating the test cross progeny. Further, if indeterminate plants were heterozygotes, they must segregate in the F$_2$ generation.

A perusal to the Table 1A and 1B indicates that the indeterminate plants in the plot of determinate type during 1988-99 were indeed heterozygotes and that

Table 1A. Calculation of chi-squares estimates in F2 populations of four natural hybrids for growth habit in fenugreek

Hybrids	Total plants	Indeterminate	Determinate	χ^2
1	58	44	14	0.001
2	50	38	12	0.001
3	52	41	11	0.230
4	27	21	6	0.120

*Chi-squares are non-significant at P = 0.05 based on monogenic 3:1 expected ratio

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Table 1B. Calculation of chi-squares in testcross progenies of two natural hybrids for growth habit in fenugreek

Test cross with	Total plants	Observed frequency		χ^2
		Indeterminate	Determinate	
Hyb. 1	31	17	14	0.13
Hyb. 2	38	22	16	0.65

*Chi-square is non-significant at P = 0.05 based on monagenic 1:1 ratio

there is complete dominance of indeterminate growth habit over the size arresting inflorescence characteristic. It is so because the supposed heterozygotes segregated in the F_2 generation in a ratio that is consistent with monogenic ratio of 3:1. Similarly, the test cross progenies from two such heterozygotes were also indicating a single factor ratio of 1:1. It is evident that chi-squares were non- significant for F_2 (Table 1A) as well as test cross (Table 1B) populations. It indicated that the proposed null hypothesis was accepted. One important information is obvious from the Table 1, the observed number of determinate plants is lower than the expected

value in both F_2 and test cross populations. This possibly reflects the fact that determinate type is poor competitor in mixture.

Thus it was concluded that the determinate growth habit is a *recessive monogenic* trait. The finding is in complete agreement with the inheritance pattern of growth habit of beans [3] and of tomatoes [4]. The symbol *spsp* (sp represents a single gene) as used to describe determinate tomatoes could similarly be used to represent the gene for determinate fenugreek.

References

1.   **Twentieth Annual Report**, AICRP (Unpubl.) on Seed Spices, 1995-96. Department of Plant Breeding and Genetics, SKN College of Agriculture, Jobner 303 329.

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

3.   **R. W. Allard**. 1960. Principles of Plant Breeding. John Wiley & Sons Inc., New York, USA, 62.

4.   **C. M. Rick**. 1978. "The Tomato". Scientific American, (August).