



## Outcrossing behaviour in fenugreek (*Trigonella foenum-graecum* L.)

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Fenugreek (*Trigonella foenum-graecum* L.) is one of the important seed spices. It has typical papilionaceous flowers: five sepals, five petals, ten stamens and one ovary. The last two petals fuse at the base to form keel, which covers the stamens even after fertilization. Thus the crop is cleistogamous and little is known about outcrossing in this crop. The present investigation, therefore, aimed at generating information on the extent of natural crossing and its possible implications in breeding fenugreek.

Though fenugreek is generally of indeterminate growth habit, a new genotype, UM-305, with determinate growth habit, has been found. In the present investigation, UM-305 was taken as a marker genotype and three others namely, RMt-1, RMt-141 and RMt-143 of indeterminate growth habit were taken as the source of pollen. In the winter season of 1997-98, UM-305 was interplanted with a random sample of composite seeds of the three indeterminate genotypes in alternate rows. Plants were grown at normal spacing (30 × 10 cm<sup>2</sup>). Optimum agronomic package of practices except pesticides use were followed. At maturity, seeds were harvested from UM-305. A random sample of 200 plants was grown from this seed in the following winter season of 1998-99. Four indeterminate plants were identified among 200 plants. These four plants were harvested individually and individual plant progenies were grown during the winter season of 1999-2000 to test their breeding behaviour. Further, the entire experiment was repeated twice in the same sequence commencing from 1998-99 and 1999-2000 with the same sample size and experimental layout (Table 1). The observed proportion of outcrosses was multiplied by 2 to obtain an estimate of the actual outcrossing rate ( $t$ ), which could be shown according to Allard [1] to be the

maximum likelihood estimate  $t = h/p$ , in which  $h$  is the frequency of recognizable outcrosses in the progeny of recessives and  $p$  is the frequency of dominant alleles in the pollen pool.

Four, two and seven indeterminate plants were observed during 98-99, 99-2000, and 2000-2001, respectively. These were putative heterozygotes or natural crosses. All the putative crosses segregated into indeterminate vs. determinate types in an approximate 3:1 ratio, confirming that these putative crosses were indeed natural crosses. It also confirmed that determinate growth habit is a monogenic recessive trait [2&3]. It is obvious from the Table that the actual extent of natural crossing varied from 2.1 to 7.0 per cent across the years. This was probably due to the insects' degree of preference for fenugreek compared to other crops. Empirical evidence suggests that honeybees prefer fennel (*Foeniculum vulgare* Mill.) compared to fenugreek. The lowest number of natural hybrids was found in 1999-2000 since fennel was found growing at a distance of only about 3m from experimental field in the preceding year (1998-99). Contrary to this, the maximum number of natural crosses (7) was found in the year 2000-2001 and fennel was not grown in the vicinity of the experimental plot during the previous year (1999-2000). The average extent of natural crossing was found to be 4.37 per cent. The study indicated the presence of natural crossing through honeybees despite the presence of cleistogamous flowers. The mechanism of outcrossing as observed was tripping. Therefore, proper isolation distance must be kept and maintained especially when breeder/foundation seed production is carried out.

**Table 1.** Outcrossing percentage in between three indeterminate types (IDT) with one determinate type (DT) of fenugreek (UM-305)

Year	Population size	No. of IDT plants	No. of idt.seg. 3:1	Observed outcrossing %	Actual outcrossing %
1998-99	200	4	All (4)	2.00	4.00
1999-00	190	2	All (2)	1.05	2.10
2000-01	200	7	All (7)	3.50	7.00

### References

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