Developing Bitter Gourd (*Momordica charantia* L.) Populations with a Very High Proportion of Pistillate Flowers

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The occurrence of gynoecism in bitter gourd (*Momordica charantia* L.) is very rare, although a population with high proportion of pistillate flowers has been developed and utilized for hybrid development (1). We identified gynoecious plants of bitter gourd with absolute expression of gynoecism and recently presented the first report on its preliminary characterization (2). This report describes the development of five populations with very high proportions of pistillate flowers from these gynoecious plants.

During the summer season (February sown) of 2000, three gynoecious plants, *viz*., Gy23 Gy63 and Gy263B were obtained in three germplasm populations. In the July 2000, planting, segregation in the F_1 generation for gynoecious and monoecious plants was observed due to the existence of heterozygous gene(s) for gynoecism in the utilized male plants. It was concluded that the gynoecism trait in identified plants was heritable and under the control of certain major recessive gene(s) (2). In a F_1 cross, developed using Gy63 (gynoecious plant obtained in VRBT-63 population) and VRBT-63 (monoecious plant), one monoecious plant (with 87.7% pistillate flowers) was obtained and selfed. The pollen of this monoecious plant was utilized for sib mating to one gynoecious plant (100% pistillate flowers) obtained in the same cross. During the rainy season of 2001, selfed F_2 and full sib (F_2 sib) progenies were raised. Four F_2 and one F_2 sib plants were selected for further advancement. Observations on the number of staminate and pistillate flowers were recorded throughout the F_2 crop (Table 1). Among the four F_2 plants, three plants were gynoecious (100% pistillate flowers) and one plant was monoecious (94.4% pistillate flower) and from the full sib F_2 family one selected plant was gynoecious (Table 1). The pollen from the monoecious plant was used to pollinate the four gynoecious plants creating full sib F3 seeds. The monoecious plant was also selfed creating selfed F3 seed. During summer season of 2002, all the families (one F_3 and four F_3 sibs) were raised and observations with respect to proportion of staminate and pistillate flowers were recorded on five randomly selected plants from each population (Table 1).

Results pertaining to the proportion of pistillate flowers in F_2 and F_3 generations revealed that like five F_2 plants, plants of all the five F_3 populations had very high proportion (> 90%) of pistillate flowers, which ranged from 91.0% in line 333/2 to 99.3% in line 323/4 (Table 1). All F_3 populations were also characterized by the recovery of at least one absolute gynoecious plant (100% pistillate flowers). During the same season, PIBG-1 an improved variety and Pusa Hybrid-1 a promising hybrid, had 11.3% and 13.4% pistillate flowers, respectively. Further, unlike most of the bitter gourd populations, all plants of these five populations were characterized by the emergence of pistillate flowers at lower nodes. The maximum of 70% pistillate flowers has been reported in a bitter gourd line, which was utilized to develop hybrids (1). Hence five F_3 populations developed during this study are not only promising for yielding increased number of fruits, but also for their utilization in the hybrid seed production after further advancement of 2-3 generations through selection of gynoecious plants and sib-pollinating with plants having a very high proportion of pistillate flowers.

Table 1. Proportion of pistillate flowers in five F_2 plants of the cross Gy63 x VRBT-63 and five F_3 populations derived from the respective F_2.

Generation (# of plants)	Lines	Proportion of pistillate flowers (%)				
		333/1	333/2	333/3	333/4	323/4
F_2/F_2 sibs (1)		94.4	100	100	100	100
F_3/F_3 sibs (5)		94.27	91.01	93.0	91.72	99.3
		(86.13-100)	(98.5-100)	(82.03-100)	(95-100)	(98.86-100)

Although we have been able to maintain the absolute gynoecious plants through sib-pollination, the detailed genetic study of gynoecism is in progress in order to determine the most appropriate and predictive method(s) of its maintenance through crossing. Thus, it would be imperative to identify suitable molecular markers associated with the sex habit, so that gynoecious plants can be identified at a very early stage and more efficiently utilized in hybrid seed production. Nevertheless, considering the paramount importance of gynoecious lines in cost effective hybrid seed production, it would also be imperative to develop micro-propagation protocol(s) for its large-scale multiplication and examine its feasibility in hybrid seed production of bitter gourd.

Literature Cited

1. W.B., Zhou, S.B. Luo, J.N. Luo, et al. 1998. An early maturing and high yielding bitter gourd F_1 hybrid Culii No -1. Plant Breeding Abstracts 68: 1002.
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