

# Occurrence and preliminary characterization of gynoecious ridge gourd [*Luffa acutangula* (L.) Roxb.] in a natural population

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A gynoecious plant of ridge gourd (*Luffa acutangula*) with absolute expression of gynoecism collected from Hoogly district of West Bengal, India, was identified and characterised at Indian Agricultural Research Institute, New Delhi. This is the first report of naturally occurring gynoecism in *Luffa acutangula*. Efforts were made to maintain the line by crossing with the sister line. With its preliminary form, few crosses were also attempted with released cultivars of ridge gourd 'Pusa Nasdar' and 'Pusa Nutan' to examine the possible involvement of genetic/ environmental factors in the expression of gynoecious flowering habit.

Ridge, angled gourd, or angled loofah (*Luffa acutangula* (L.) Roxb.) is a cucurbitaceous vegetable originated in sub-tropical region of Asia. India is considered as a primary centre of origin (Chakravarty, 1990). This crop is cultivated in India, Southeast Asia, China, Japan, Egypt and other parts of Africa. Ridge gourd is generally monoecious in nature with pistillate (female) flowers borne in axil of flowers and staminate (male) flowers in raceme (Fig. 1). Moreover, it has an ancestral form "Satputia" found in Bihar (one of the eastern states of India) which is hermaphrodite (Fig. 1; both male and female organs in same flower) in nature and was given a separate taxonomy status as *Luffa hermaphrodita* (Singh and Bhandari, 1963). Monoecious ridge gourd is late in maturity and produces large size fruit with less number of fruits. Whereas, hermaphrodite form is early in maturity and produces large number of small size fruits in clusters.

The occurrence of gynoecism in *Luffa acutangula* is very rare. A gynoecious plant (only female flower in a plant) of *Luffa acutangula* with absolute expression of gynoecism, which was collected from Hoogly district of West Bengal (another eastern state of India) was identified and characterised at Indian Agricultural Research Institute, New Delhi. This is the first report of naturally occurring gynoecism in *Luffa acutangula*, though male sterility in ridge gourd was reported earlier by Pradipkumar *et al.* (2007). In this paper attempt has been made to present the preliminary observations of plant and fruit characters of the gynoecious plants.

The potential use of gynoecy in increasing cucumber yield was studied by several workers. The gynoecious sex form in bitter melon (*Momordica charantia* L.) has been reported in recent past from India (Behera *et al.*, 2006) which is under the control of a single recessive gene (Behera *et al.*, 2009). It was found that the number of female flowers was positively correlated with yield in some population-season combinations. Moderate to highly significant positive correlations ( $r$ ) between per cent pistillate nodes and yield were also identified in cucumber suggesting sex expression has potential for increasing yield through indirect selection (Cramer and Wehner, 2000). A positive correlation ( $r = 0.24$  to  $0.40$ ) was observed with the number of females nodes on lateral branches and total fruit per plant (Fan *et al.*, 2006). Like that of cucumber and bitter melon, the gynoecism in *Luffa* reported in this study will be helpful for significant increase in yield through easy and economic way of hybrid development and hybrid seed production in this crop.

## Salient features of gynoecious *Luffa acutangula*

1. Plant type: Trailing or climbing vines with angular stem and tendrils with vines of 1.5 -2.0 m in length.
2. Leaf characters: Leaves dark green, 3-5 lobed, shallow lobbing, nearly glabrous, smooth with long petioles. Internode length 7.0-7.5 cm.
3. Flower characters: Gynoecious, petals yellow and showy, female flower solitary (Fig. 1) in long pedicel (5.0-6.5 cm), occasionally in clusters, ovary long (3.5-5.0 cm), slightly ribbed stigma, trifid, anthesis time 5.30 pm - 6.30 pm.
4. Fruit characters: Fruits long (15-20 cm), straight, light green, smooth with very shallow ridges. Average fruit weight 55-65 g, tender flesh.
5. Disease reaction: Field tolerance to *Luffa yellow mosaic virus*.
6. Maturity: Ready for first harvesting 55-60 days.

Since the gynoecious plant was identified at latter stage, i.e. at flowering stage, therefore spraying of growth

regulators like GA<sub>3</sub> and silver thiosulphate did not have any effect for induction of male flowers for its maintenance. Efforts were made to maintain the line by sibbing with one of the sister line and simultaneously crossing was also attempted with released cultivars of ridge gourd 'Pusa Nasdar' and 'Pusa Nutan' to examine the possible involvement of genetic/ environmental factors in the expression of gynoecious flowering habit. Vine cutting and tissue culture are also being attempted to maintain the line for its further exploitation.

## Literature Cited

- Behera, T.K., S.S. Dey and P.S. Sirohi. 2006. 'DBGy-201' and 'DBGy-202': two gynoecious lines in bitter gourd (*Momordica charantia* L.) isolated from indigenous source. *Indian Journal of Genet* 66: 61-62.
- Behera, T.K., S.S. Dey, A.D. Munshi, A.B. Gaikwad, Anand Pal, and Iqbal Singh. 2009. Sex inheritance and development of gynoecious hybrids in bitter gourd (*Momordica charantia* L.). *Scientia Horticulturae* 120: 130-133.
- Chakravarty, H.H. 1990. Cucurbits in India and their role in development of vegetable crops. pp 325-348. In: Bates, D. M., Robinson, R. W. and Jeffrey, C. (eds.), *Biology and Utilization of the Cucurbitaceae*. Cornell University Press, Ithaca, New York.
- Cramer, C.S. and T.C. Wehner. 2000. Path analysis of the correlation between fruit number and plant traits of cucumber populations. *HortScience* 35: 708-711
- Fan, Z., M.D. Robbins and J.E. Staub. 2006. Population development by phenotypic selection with subsequent marker-assisted selection for line extraction in cucumber (*Cucumis sativus* L.). *Theoretical and Applied Genetics* 112: 843-855.
- Pradeepkumar, T., R. Sujatha, B.T. Krishnaprasad and I. Johnkutty. 2007. New source of male sterility in ridge gourd (*Luffa acutangula* (L.) Roxb.) and its maintenance through in vitro culture. *Cucurbit Genetics Cooperative Report* 30: 60-63.
- Singh, D. and M.M. Bhandari. 1963. The identity of an imperfectly known hermaphrodite *Luffa*, with a note on related species. *Baileya* 11: 132-141.

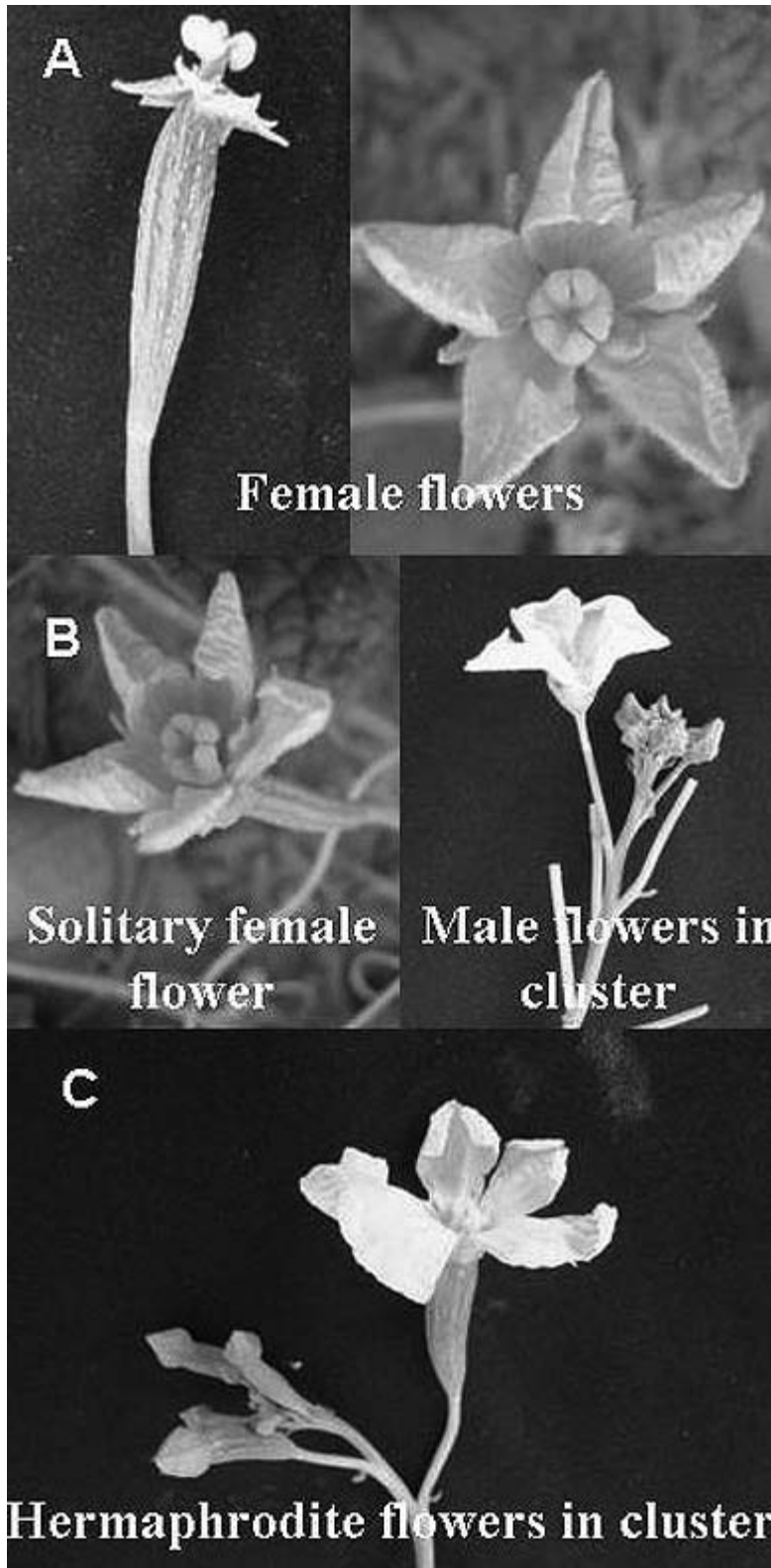


Figure. 1 A. Female flower of gynodioecious *Luffa acutangula*; B. Female flower and male flowers of monoecious *L. acutangula*; C. Hermaphrodite flowers of *L. hermaphrodita*