

FLORAL BIOLOGY OF ANNUAL DRUMSTICK

Drumstick (*Moringa oleifera*) is an important perennial multipurpose vegetable crop grown widely in India. The immature or half-mature fruits of this plant is the main edible part. It is a rich source of vitamin A, nicotinic acid, calcium and iron. Drumstick is generally propagated by limb cutting, whereas a variant form popularly known as 'annual drumstick' is propagated by seed, getting increasingly popular in South India. In Kerak this form of drumstick is of recent introduction. It has been showing marked difference with respect to flowering habit in comparison with the perennial forms of drumsticks. Generally annual drumstick has early flowering habit commencing from August-September with a peak period of blossoming during December-January. Even though the crop comes to flower during early season, fruit set occurs only in December-January blooms. Practically no attempt has been made to study the floral biology and mode of pollination of annual drumstick grown in Kerala so as to unravel the reasons for the non-fruiting during the early flowering periods.

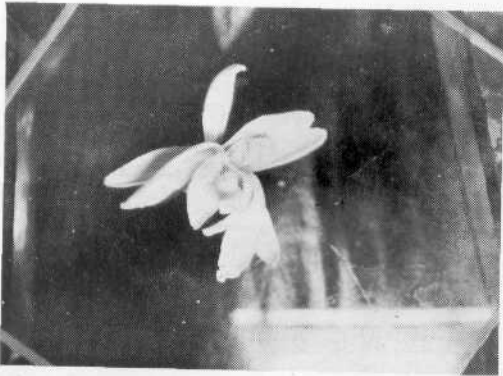


Plate 1. Opened flower with closed anthers and introvert stigma

With this back ground, a study was conducted on the annual drumstick plants maintained in the Department of Olericulture, College of Horticulture, Vellanikkara. The observational plants comprised of a two year old annual

drumstick genotype AD-4 and its five progenies of one year old viz. AD-4-1, AD-4-3, AD-4-5, AD-4-7 and AD-4-8. Observations were made on the floral morphology and floral biology of the plants under observation from 1995 August to 1996 January as per (Shukla and Mishra, 1979). The pollen morphology and fertility studies were made by resorting to the staining procedure postulated by Alexander (1980).

The observation plants showed uniform pattern of flowering. They came to bloom during two seasons of the year viz., August-September and December-January. The emergence of the inflorescence in the first phase commenced from later August to early September. These blooms produced practically no fruits. The second phase of flowering commenced from early December to late January, which resulted in fruit set.

The inflorescence was a monochasial cyme, flowers were fragrant, nectarous, hermaphrodite, oblique stalked and irregular. Calyx was deeply five partite, coupler-cyathiform, oblique and green. Corolla was comprised of five petals, white with brownish base. Stamens were five, alternating with five staminodes, the hind-most stamen being the longest. Ovary stalked, monocarpellary, bearing double row of

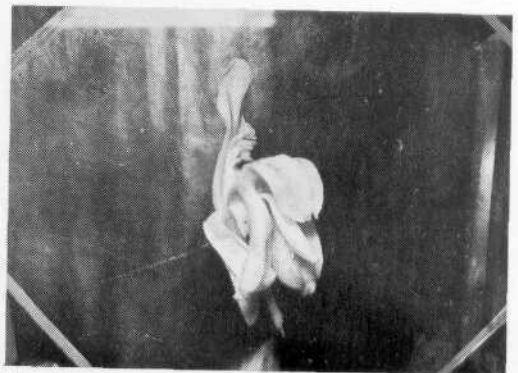


Plate 2. Opened flower with anthers dehiscent but stigma introvert

Table 1. Characteristic features of pollen grains and the result of pollination study at different stages of anthesis in annual drumstick

Stage of anther and stigma in the fully opened flower	Nature of pollen grains	Pollen stainability per cent	Pollen size, μm		Pollination studies		
			Fertile	Sterile	No. of crosses made	No. of fruit set	Per cent of set
Closed anther but stigma introvert	Clumpy and very sticky	89.5	33.3	22.1	25	-	-
Anthers dehiscid but stigma introvert	Less sticky	92.5	32.5	22.4	24	-	-
Anthers shrivelled but stigma extrovert	Mostly shrivelled	13.6	25.7	22.2	10	25	83.3

ovules, style thin, curved white, shortly pubescent and hollowed at the apex. This observation on flower morphology was conforming to the descriptions on the perennial type of drumstick made by Ramachandran *et al.* (1980).

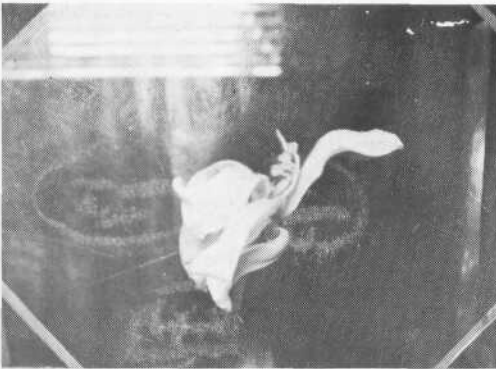


Plate 3. Opened flower with stigma extrovert

The flower opening, anther dehiscence and stigma receptivity occurred in a phased manner expressing a prominent protrandrus conditions. The flower opening commenced from 2.30 p.m. and completed by next day 9 a.m. Anthers at the time of flower opening were of closed anther type (Plate 1) and stigma introvert and non-receptive. Anthers got dehiscid next day between 9 and 9.30 a.m., but the stigma still remained introvert (Plate 2). At this time even though the anthers got burst open, pollen did not properly disperse due to the extreme stickiness and they got clubbed together. Subsequently, the stigma got exerted outside the anther in the next day morning

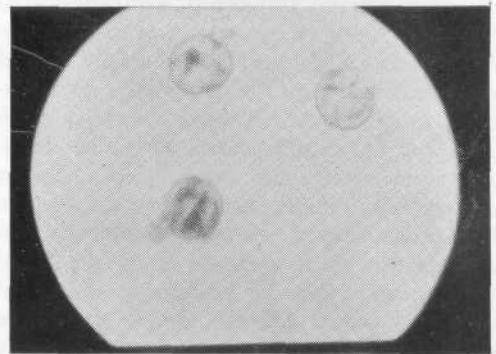


Plate 4. Shrivelled and sterile pollen grains of flowers having extrovert stigma (x 400)

between 8 and 8.30 a.m. (Plate 3) being receptive, but by that time pollen grains of that flower had mostly shrivelled and become considerably non-viable (Plate 4). There was little chance for the viable pollen from nearby flowers to get placed on the stigma by wind disbursement due to the pollen size and the

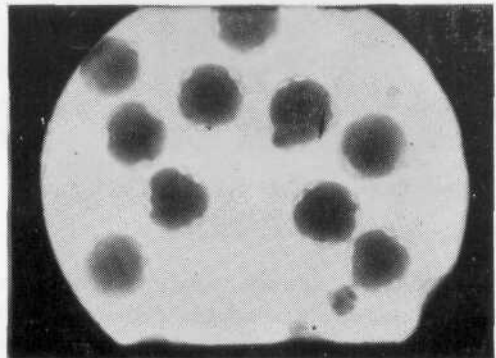


Plate 5. Powdery and fertile pollen grains of flowers having introvert stigma (x 400)

pollen stickiness. This condition prevailed during the entire period of the early season blooms, resulting in the non-setting of fruits. In early December, the second phase of flowering commenced when, probably due to the dry span, the pollen stickiness was found to be diminished and they became more powdery (Plate 5). At the same time the activity of black ants and flea beetle (*Podagrionidae*) were at its peak causing a fair chance for cross pollination. Assisted pollination on the exerted

stigma between 8 and 9.30 a.m. resulted in fruit set (Table 1). Thus, the study shows that for the fruit set of annual drumstick under natural condition a dry span during flowering, profuse flowering for the pollen availability and a lot of insect activity are essential. When these conditions are not prevailing in the early flowering period assisted pollination if resorted can bring about off-season fruiting in these trees.

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