

**FLORAL BIOLOGY AND VARIATION IN TWO CULTIVARS OF EGGPLANT,
SOLANUM MELONGENA L.**

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Abstract

Variation in the vegetative, floral and fruit characters at different stages of growth was studied in two local cultivars of eggplant. In most of the characters nonsignificant differences were observed between the two varieties at early stages of growth, however, significant differences were observed in various variables at later stages of growth. 'Long purple' was found to be an impure variety having some proportion of round and oval fruit bearing plants. Thus for further studies crossing was made in all possible combinations using 'Long purple' having long, oval and round fruits and 'Round purple' plants. 'Long purple' having oval fruits was superior to other types in vigour and yield. Studies on floral biology and pollen germination were made as well.

Introduction

The main aim of breeding studies is to estimate the magnitude of genetic variance, so that an effective method of selection for the improvement of crop may be developed. The knowledge of floral biology including the time of anthesis and receptivity of stigma is a prerequisite for such a programme. Since phenotypic data are used to infer conclusions about the genotype, an understanding of phenotypic variance is necessary for appropriate interpretation of data.

The present study was conducted to study the variation in two local cultivars of eggplant at different stages of growth. A study on the anthesis, receptivity of stigma and pollen culture *in vitro* was made as well.

Materials and Methods

Seeds of 'Long purple' and 'Round purple' obtained from a local seed seller were sown in earthen pots having sandy loam soil and manure in 1:1 ratio. Thirtysix day old seedlings were transplanted in the field in six replications. Plants were raised through usual cultural practices. Data on the length and breadth of leaves; length of petioles; number of spines on leaves and petioles; number of branches, floral buds, flowers and fruits per plant; number of sepals, petals and stamens per flower; length of anthers and styles; colour, weight, length and perimeter of fruits were recorded at various intervals. These variables were studied through analysis of variance, coefficients of regression and correlation (Sneecor, 1966).

Emasculation was done one day before pollination. Pollen fertility was studied through staining and germination of pollen grain *in vitro*. Pollen germination technique was same as described earlier (Vahidy & Nafees, 1973).

Results and Discussion

Germination one week after sowing was 50 and 25 percent in 'Round purple' and 'Long purple' respectively. The low rate of germination in both varieties showed

that most of the seeds were not viable. Significant differences were observed for breadth of first true leaves. However, 10 days after germination length and breadth of leaves, length of petioles and number of spines on leaves and petioles were statistically non-significant between varieties. These characters were found to be significant at 50 days after germination (Table 1). The length of leaves varied significantly, but this significance was of not much value for selection because similar differences were present between plots of same variety as well. However, selection of plants having desirable shape of fruit can be made on the basis of leaf breadth, length of petiole, number of spines on leaves and petiole, as marked differences were present between varieties. Characters on leaves, sepals, petals, flower initiation and flowering period have been used to distinguish between exotic and local varieties of eggplant (Nsowah, 1969). In another study he found significant intervarietal differences in two seasons for floral initiation, floral opening and yield characters in 16 varieties of eggplant (Nsowah, 1970). In the present study flowering started at the same time in both varieties and none could be classified as early or late variety. Greater number of flowers bloomed in 'Long purple', in which greater number of flowers were produced by plants having oval fruits. 'Round purple' had very short period of flowering and produced lesser number of flowers. Similar varietal differences were reported by Quagliotti (1967a).

Length of anthers and styles varied significantly between varieties (Table 1). Number of sepals, petals, stamens and the size of corolla have been used as reliable characteristics for distinguishing eggplant cultivars (Quagliotti, 1967b). However, in the present investigation the two varieties could not be distinguished on the basis of number of sepals, petals and stamens (Table 2). Flower colour ranged from dark purple to light purple. Sepals had large black or brown spines, or were hairy. Petals were somewhat flat or curved. Flowers were divided into four types according to the length of style, viz., long, medium, short and very short styled. Similar observations have been made earlier (Tatebe, 1938; Prasad & Prakash, 1968). Anthesis took place at 11 a.m. Pollen were shed in the form of yellowish powder through the two apical pores present at the tip of anthers. At the time of receptivity stigmatic surface became sticky and juicy. Stigma remained receptive for 3 to 4 days after pollination. Artificial crossing was done in all possible combinations. The percentage of fruit set showed that both varieties were cross compatible.

Viability of pollen grains was found to be highest soon after anthesis and then declined markedly. Similar results were obtained by Frydrych (1964) and Mikaeljan (1964). In acetocarmine test viability was higher in 'Round purple'. Since this is not a sure test of viability, pollen were germinated in an artificial medium as well. High humidity and 10 percent sucrose were necessary for pollen germination in eggplant. Higher and lower concentrations of sucrose resulted in twisting and bursting of pollen tubes. Significant differences were observed for pollen germination percentage between varieties (Table 3). *In vitro* germination of pollen grains was much higher than reported by Prasad & Prakash (1968). Apart from genetical differences this might be due to change in culture medium. Significant differences between varieties were obtained for diameter of germinating pollen grains and pollen tube length (Table 3). Under similar conditions all four types had different rate of pollen tube growth. Duncan's multiple range test showed that the pollen tube length of 'Long purple' having long, oval and round fruits were significantly different from that of 'Round purple'.

TABLE I. Results of analyses of variance for length and breadth of leaves, length of petioles, anthers and styles and number of spines on leaves and petioles.

Sources of Variation	D.F.	Mean Square			D.F.	Mean Square		
		Lengths of				Number of spines on		
		Leaf	Petioles ^a	Anthers ^b	Styles ^c	Leaves ^d	Petioles ^b	
		Length ^a	Breadth ^d	Petioles ^e	Styles ^f	Leaves ^g	Petioles ^h	
Varieties	1	2851**	597**	285**	2.63**	1	327**	143**
Plots of same varieties	10	159**	20 ^{n.s.}	10 ^{n.s.}	0.26 ^{n.s.}	10	37**	4 ^{n.s.}
Plants of same plots	60	26 ^{n.s.}	16 ^{n.s.}	20 ^{n.s.}	0.37 ^{n.s.}	60	9**	3 ^{n.s.}
Leaves/Flowers of same plants	288	18	9	13	0.03	226	4	1

^aObservations 50 days after germination.^bObservations 80 days after germination.^{n.s.} Nonsignificant.

*Significant at .05 level of probability.

**Significant at .01 level of probability.

TABLE 2. Results of analyses of variance for number of floral buds; flowers; sepals, petals and stamens; and branches.

Sources of Variation	D.F.	Mean Square								
		Number of floral buds			Number of flowers					
		Days after germination	Number of flowers	Number of sepals, petals & stamens	Number of flowers	Number of sepals, petals & stamens	Number of branches			
		53	67	90	188	130	150			
Varieties	1	184**	5565**	29808**	1891*	5000**	486**	1.34 ^{n.s.}	16200**	
Plots of same varieties	10	36 ^{n.s.}	553*	2627*	106**	93 ^{n.s.}	16 ^{n.s.}	2.79 ^{n.s.}	2166*	
Plants of same plots	60	24	128	364	51	46	11	0.34	192	

^{n.s.}, *, **Same as Table 1.

After fruit formation it was noticed that 'Long purple' was not a pure variety. It had plants with long, oval and round fruits. Plants of these three types and of 'Round purple' were morphologically different from each other. Plants of 'Long purple' having oval fruits may be hybrids between long and round varieties. These plants showed certain characteristics which were intermediate between long and round varieties. In general these were strong, sturdy and with greater number of branches. The flowering period was long and greater number of flowers were produced perhaps because of hybrid vigour. Intervarietal hybrids superior to their parents in stature, yield and length of growing period have been reported (Eldin *et al.*, 1967; Thakur *et al.*, 1968). Tiwari (1966) observed better vitality and vegetative vigour and bigger fruit branches in hybrids than in their parents. Similarly, Hussain *et al.* (1972) observed that hybrids were superior in length of plants and in length and thickness of fruits.

TABLE 3. Results of analyses of variance for diameter of ungerminating and germinating pollen grains, percentage of pollen germination and pollen tube length.

Sources of variation	D.F.	Mean Square			
		Diameter		Germination percentage	Pollen tube length
		Ungerminating	Germinating		
Replication	3	3.51	3.16	42.6	65.2
Types of plants ^a	3	2.80 ^{n.s.}	6.66*	324.9**	569.6**
Error	9	2.10	1.63	23.6	92.5

^a'Long purple' having long, oval and round fruits and 'Round purple'.

^{n.s.}, *, **Same as in Table 1.

Significant differences were present between varieties for fruit weight and perimeter (Table 4). These variables also varied significantly within varieties. This may be due to the presence of long, oval and round fruits in 'Long purple' within the same plots. The colour of fruit in 'Long purple' ranged in shades from light purple, medium purple, dark purple to very dark purple. 'Round purple' had fruits of medium purple colour. Sambandam (1967) succeeded in making a guide chart for colour combination in hybrid eggplant. He reported that fruit colour was determined by two genetically controlled characters, namely the skin colour and the flesh colour. It

was noted by Andronicescu *et al* (1961) that the light colour and dull surface of some early varieties were genetically transmitted in the progeny and thus reduces the fruit quality.

Coefficient of regression analysis showed that number of fruit depends upon number of branches (b = 5.23). Thus selection could be done for plants having greater number of branches to produce a high yielding variety. Correlation studies were made between leaf index and fruit index in 'Long purple' having long fruits. It was observed that with the increase in leaf index there was an increase in fruit index as well (r = 0.71).

TABLE 4. Results of analyses of variance for weight and perimeter of fruits.

Sources of variation	D.F.	Mean Square	
		Weight	Perimeter
Varieties	1	25457*	1110*
Plots of same varieties	10	5467 ^{n.s.}	317**
Plants of same plots	60	12225*	84**
Fruits of same plants	226	2721	5

^{n.s.}, *, **Same as in Table 1.

The present investigation has given an indication that 'Round purple' and 'Long purple' varieties can be distinguished from each other by various vegetative traits. Although 'Long purple' was not a pure variety it was superior to 'Round purple' in various respects. Selection is required to purify the 'Long purple' variety.

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