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VARIABILITY IN FLORAL ATTRIBUTES OF HORSEGRAM (*MACROTYLOMA UNIFLORUM* (LAM.) VERDC.)

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ABSTRACT

The variability in floral attributes was studied in 30 strains of horsegram. The flowers were bisexual, complete, zygomorphic and papilionaceous. The calyx was gamosepalous, having five sepals united at the base, forming an involucre. The corolla was polypetalous having five petals in vexillary aestivation. The androecium consisted of ten stamens which were in diadelphous condition. The gynoecium was simple and monocarpellary. There was a wide range of variation in the area of standard petal, length of filament, carpel length and number of ovules per flower.

Key words: Floral attributes, horsegram, variability.

The hybridization method of breeding has produced spectacular results in various crops. For sustained rise in the genetic potential of a crop, recourse must be taken to recombination breeding. However, as far as horsegram is concerned, use of hybridization is very limited and this is mainly because of the small flowers of horsegram. The logical way to tackle the difficult hybridization is to gather information on floral attributes of this crop in order to enable the plant breeder to develop suitable crossing techniques. In view of this, the present investigation has been undertaken to obtain a clear picture of the floral attributes and the variability for these attributes in horsegram.

MATERIALS AND METHODS

The experimental material consisted of 30 strains of horsegram (*Macrotyloma uniflorum* (Lam.) Verdc.) collected from different regions. The experiment was conducted under field conditions. The seeds sown were placed at 20 cm between rows and 10 cm between plants. The recommended cultural practices were followed. The observations were recorded on six quantitative characters and the data were analysed according to Panse and Sukhatme [1].

RESULTS AND DISCUSSION

The detailed investigation of the floral structure revealed that the horsegram flower is bisexual, complete, zygomorphic and papilionaceous (Fig 1:1). The flowers were dissected and detailed investigations were carried out on the different parts of the flower, i.e. calyx, corolla, androecium and gynoecium.

The calyx is gamosepalous with five sepals. The sepals are fused at the base into a long-toothed involucre (Fig. 1:2). The sepals are thin and tapering towards apex. The calyx is shorter in length. The calyx length at different stages is shown in Table 1. It is evident that initially the calyx is shorter, covering the small bud completely. It elongates with increasing size of bud and reaches its maximum at dehiscence stage. However, after this stage, it laggs much behind the corolla in growth. At the time of flower opening, it starts decreasing in size and becomes yellowish green in colour and starts drying up, resulting in smaller length. However, calyx is persistent. Thus, the calyx poses no problem in crossing work.

Table 1. Length of calyx at different stages in horsegram

Stage	Particulars	Calyx length (mm)
I	Primordial	7.2
II	Middle (emasculation)	8.4
III	Dehiscence	8.7
IV	Opening of flower	8.4
V	Opened flower	8.1

The corolla is polypetalous, having five petals in vexillary aestivation. As in other papilionaceous flowers, the horsegram flower also has the outer standard or vexillum, the two lateral wings or alae, and the two inner petals fused into the keel or carina (Fig. 1:3). The wings and keel are smaller in size. However, the standard petal is large and broad enough and covers the other flower parts. The area of the standard ranges from 83.5 mm^2 (cv. Bihar Local) to 108.2 mm^2 (cv. Local Red), the average size of the standard being 94.2 mm^2, indicating appreciable amount of variation for this character amongst the strains studied (Table 2). The standard is relatively larger in some of the strains studied and 15 strains have standard larger than the general mean. The colour of the standard is initially yellowish green and it turns into pale yellow subsequently. Therefore, flower colour is not attractive for entomophily. The standard of horsegram flower also cannot serve as an "advertisement flag" to attract insects. Moreover, the flowers remain hidden behind the leaves.

The androecium consists of ten stamens in diadelphous condition: nine forming a staminal tube around the style of the gynoecium (Fig. 1:4). The anthers almost completely surround the stigma, thus ensuring self-pollination. The filaments are very short with small anthers. The length of the filament ranges from 9.0 mm to 11.5 mm, the average being 10.3 mm (Table 3). Thus, the androecium could apparently pose difficulty in emasculation.

Table 2. Variation in area of standard, filament and carpel length, and number of ovules per flower and per plant in horsegram

Strains	Area of standard (mm^2)	Length of filament (mm)	Length of carpel (mm)	Number of ovules	
				per flower	per plant
PLKU 128	91.8	9.3	10.0	4.25	524.1
PLKU 160	101.2	11.5	11.0	4.15	781.6
IC 26128	87.2	9.0	10.0	3.95	803.1
IC 26137	100.5	99.0	9.6	3.71	1221.5
IC 32767	79.3	11.0	11.5	4.00	1133.3
Local Red	108.2	11.0	11.5	3.78	923.6
Hebbl 2	97.0	11.0	11.5	4.26	881.8
KBR 1	98.7	10.5	11.0	4.38	990.7
Wadala x K 33	88.2	10.0	10.5	4.01	831.4
PLKU 62	97.8	9.5	10.0	3.98	926.3
S 67 x 34	95.5	10.8	11.2	4.14	961.0
K 42	93.8	10.0	10.5	3.85	918.9
PDM 1	97.8	10.0	10.5	4.32	1353.6
K 33	94.2	10.0	10.0	4.12	999.8
HG 93	99.0	9.0	9.5	4.36	1059.5
Rahuri Local	86.8	11.0	10.6	2.96	721.3
Katrain 12	100.5	11.0	11.5	3.53	870.7
BR 67	86.8	10.0	10.3	4.12	1061.2
D 40-1	97.3	11.5	11.0	3.59	769.9
V. No. 818-1	88.7	11.0	11.0	4.50	1270.5
PLKU 96	96.7	10.5	11.0	4.27	1133.0
HPK 4	89.2	11.0	11.5	4.70	1026.1
33 A/7	100.5	9.4	16.8	4.09	1017.1
JND 1	91.3	10.0	10.0	4.43	1447.1
HSB 4	91.8	10.9	10.7	3.73	1178.7
HPK 5	103.0	10.5	11.0	4.21	487.0
V. No. 12/4	90.5	11.0	11.5	3.88	1038.6
PLKU 38	92.7	11.0	11.5	3.87	833.3
No. 7-1-1	94.8	10.0	9.0	3.81	1111.3
Bihar Local	83.5	10.0	10.5	3.35	339.5
Mean	94.2	10.3	10.9	4.01	953.2
SE	1.0	0.13	0.23	0.07	44.5
Range	83.5–108.2	9.0–11.5	9.0–16.8	2.96–4.70	339.5–1447.1
SD	5.3	0.73	1.28	0.43	243.7
CV	5.6	7.09	0.12	0.72	25.5

The gynoecium is simple and monocarpellary (Fig. 1: 5,6). The carpel length ranged from 9.0 mm to 16.8 mm (Table 2). It is evident that, as compared to the filaments length, the carpel length had relatively wider range of variation. The average carpel length among the strains studied was 10.9 mm, which was more or less equal to the average length of the filaments. However, 15 strains have carpels longer than the general mean, which indicates that it would be worthwhile to select strain like 33 A/7, where the carpel is longer (16.8 mm) as compared to the filaments (9.4 mm), which may facilitate emasculation. The number of ovules per flower ranges from 2.96 to 4.70, indicating the presence of appreciable amount of variation for this character among the strains studied. The ovule number is important because it is the ovule which ultimately turns into seed after fertilization. Hence, it would be worthwhile to select the strains with more ovules so that a single flower can produce more seeds on crossing. Considerable variation is also observed for number of ovules per plant, ranging from 339.5 to 1447.1. The higher number of ovules per plant would also be advantageous in getting more seeds from the F_1 plants. In all, 16 strains exceeded the general mean in ovule number, indicating the possibility of successful selections for higher ovule number per plant.

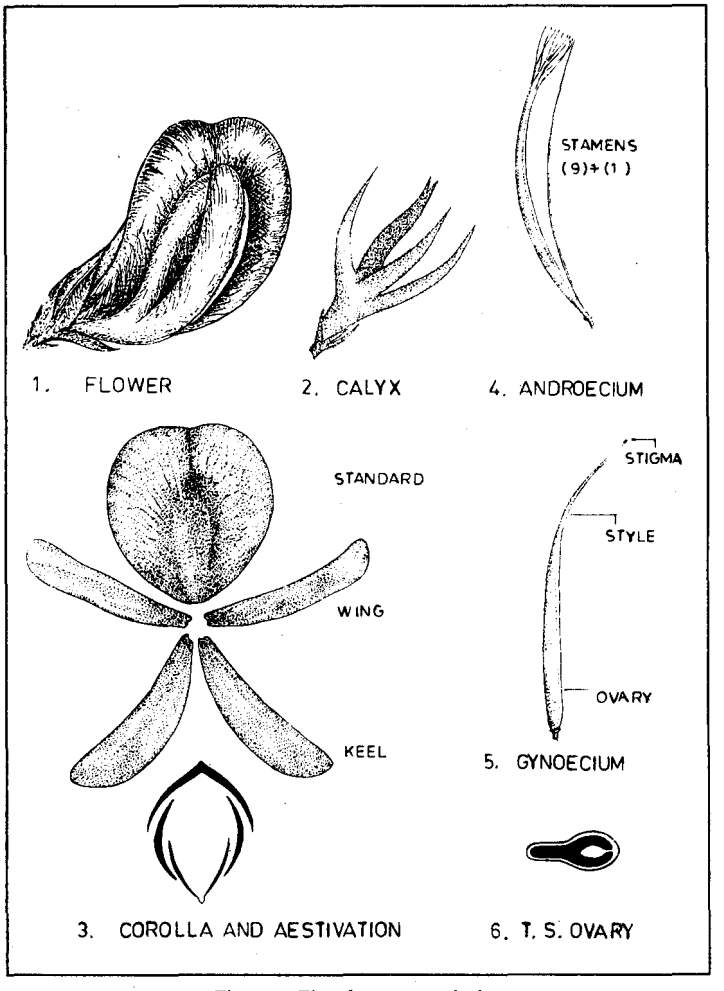

Fig. 1. Floral structure in horsegram.

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