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METROGLYPH ANALYSIS IN *TRICHOSANTHES DIOICA* (ROXB.)

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Abstract

Morphological variation in eighteen lines of pointed gourd (*Trichosanthes dioica* Roxb.) was determined by Metroglyph method showing their genetic relationship. Assessment of variability of pointed gourd may help for successful utilization of its different attributes in developing suitable genotypes for yield and stability. A total of twelve quantitative characters were used for analyzing genetic variation. Arbitarily the clusters were found in the diagram but not in consolidated form. Cluster I was represented only by two lines. Almost similarly cluster II was found to be comprised of only three lines. On the contrary, cluster III contains thirteen lines of pointed gourd, although they were found to be located scattered showing their great morphological variations.

Key words: Metroglyph analysis, *Trichosanthes dioica*, variability

Introduction

Pointed gourd commonly called as *potal* in Bangladesh is a dioecious perennial herbaceous vegetable. This crop is of Indo- Malayan origin and distribution, and is extensively grown in eastern India (Chakravarthy 1982) and to a lesser extent in other parts of South Asia (Mythili and Thomas 1999). *Trichosanthes dioica* Roxb. commonly known as "Sespadula" in English and "Parwal" in Hindi, is widely grown throughout India (Shah and Seth 2010). Assam-Bengal region is believed to be the primary centre of origin of pointed gourd (Choudhury 1979). Fruits of this plant are used as vegetable in Indian sub-continental food system. Besides fruits, other parts of the plant, such as the leaves and tender shoots are also used in the traditional system of medicine since ancient times. It is a member of Cucurbitaceae (Chakraborty et al. 1991) and the plant is creeper and grows as vine remains dormant during winter (Nath et al. 1987). Roots are tuberous with long taproot system. Vines are pencil thick in size with dark green cordate simple leaves. Flowers are tubular white with 16 -19 days initiation to anthesis time for pistillate flowers and 10 -14 days for staminate flowers. Stigma remains viable for approximately 14 hours and 40 - 70% of flowers set fruit (Singh 1989).

Traditionally *T. dioica* is multiplied through stem cuttings and root cuttings. Propagation through seeds is not desirable due to poor germination and imbalanced male-female ratio. Seed based populations have a tendency to give more male than female plants and in some cases the ratio goes up to 85:15, limiting their use as their utility ends with pollination (Som et al. 1993).

The assessment of variability present in the crop helps for successful utilization of plant characters in developing suitable varieties for yield and stability. Krishnaprasad and Singh (1991) evaluated twelve genotypes of pointed gourd at the Central Horticulture Experiment Station, Ranchi, India during 1985-86 and 1987-88 growing seasons and found them to exhibit significant difference in all traits. Prasad and Singh

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(1989) found low genotypic and phenotypic variance for node order of first female flower opening (2.68 to 7.42) in ribbed gourd. Arora et al. (1983) found moderate heritability and high genetic advance (69.98 and 48.39) for first female flower opening in sponge gourd.

Anderson (1957) proposed metroglyph and index score method to study the pattern of morphological variation in crop species. This technique has been used by several workers (Ramanujam and Kumar 1964, Mukherjee et al. 1971, Venkatarao et al. 1973, Singh and Chowdhury 1974, Kabir et al. 1993) in various crops. This effort has not yet been carried out in *Trichosanthes dioica*, which may also be of help in predicting their relationship. Thus, a metroglyph analysis was made in different lines of *Trichosanthes dioica* to draw a conclusion for the aforesaid problems.

Eighteen lines of *Trichosanthes dioica* (Roxb.) were used as experimental material in the present study. The vines of the lines were grown under uniform conditions with three replications of each. The seventeen lines were collected from BARI (Ishwardi) and only one from Rajshahi. Observations were made on 5 plants randomly selected for twelve morphological characters of stem, leaf, flower and fruit.

Following metroglyph method, a mean table from the recorded data was prepared where each value was the mean over replications (Anderson 1957, Mehra and Anderson 1969, Singh and Chowdhury 1979). A particular line was represented by a glyph, the X-axis being the stem length and the Y-axis being the leaf area. Ten other characters were represented by rays on glyph, the ray for same character having the same position in each glyph. The range of variation in each character was represented by varying length of rays, i.e., a line having low value with no ray, medium value with short ray and high value with long ray. The index values were decided on the basis of range of variability and were divided into three classes, i.e., 1-no ray, 2-short ray and 3-long ray (Table 1). The total index values were recorded by summing up the index scores of all the 12 characters studied.

The results of morphological analysis (Fig. 1a,b) were considered to study the pattern of morphological variation. The minimum and maximum scores were $n \times 1$ and $n \times 3$, respectively where 'n' was the total number of characters included in the study. The performance of a genotype is denoted by the index score of that genotype and depending upon the score the length of ray varies. Two most variable characters are used for determining the X and Y axis to plot the graph and thus, for construction of metroglyph pattern (Singh and Chaudhury 1979). Stem length and leaf area were the two variable characters in the present study. A keen examination of placement of glyphs on the graph indicated that these two characters were not related to each other. Four characters *viz*. fruit length, circumference of fruit, weight of fruit and no. of seeds per fruit were recorded from female plants logically. This might have reason for marked differentiation of all the lines studied in this experiment.

In this study the cluster III definitely had high values for those characters which directly contribute to the length of inter-node, no. of inter-node, fresh weight of leaf, days to flowering, length of flower, fresh weight of flower, length of fruit and weight of fruit. It has been observed that the maximum no. of lines i.e. thirteen belongs to the cluster III out of eighteen. There were most similarities, observed between PG19 and PG28 by showing the ray patterns. PG19 showed the maximum Y-value including other variable characters. This

variety also expressed all variable characters by showing short ray on the graph. Cluster II, consisted of three lines. BARI2 and PG06 were found to be correlated only according to X and Y-values.

Table 1. Class intervals, index values and distribution of scores of *Trichosanthes dioica* under different intensities.

Characters	Range of means	Index values					
		1		2		3	
		Range	Sign	Range	Sign	Range	Sign
Length of stem (cm) **(X-axis)**	68.38-122.81	89.36 (9)		89.37-110.34 (7)		110.35 (2)	
Length of inter-node (cm)	4.47-6.81	5.52 (9)		5.53-6.57 (8)		6.58 (1)	
Number of inter-node	12.27-21.11	15.22 (11)		15.23-18.17 (6)		18.18 (1)	
Leaf area (cm^2) **(Y-axis)**	27.13-95.05	59.30 (8)		59.31-91.47 (9)		91.48 (1)	
Fresh weight of leaf (gm)	0.897-3.396	2.06 (9)		2.07-3.22 (8)		3.23 (1)	
Days to flowering (first time)	105.06-133.91	118.83 (9)		118.84-132.60 (7)		132.61 (2)	
Length of flower (cm)	6.45-8.85	7.30 (10)		7.31-8.15 (6)		8.16 (2)	
Fresh weight of flower (gm)	0.695-1.043	0.856 (10)		0.857-1.00 (6)		1.01 (2)	
Length of fruit (cm)	6.01-11.50	8.73 (10)		8.74-11.45 (6)		11.46 (1)	
Circumference of fruit (cm)	7.09-13.48	10.79 (8)		10.80-14.49 (9)		14.50 (0)	
Weight of fruit (gm)	10.55-62.48	37.18 (9)		37.19-63.81 (8)		63.82 (0)	
No. of seeds per fruit	16.79-33.29	23.25 (9)		23.26-29.71 (7)		29.72 (1)	

● Number of scores shown in parenthesis

Cluster I was represented by only two lines namely PG08 and PG23. All the minimum variable values were shown by PG23. This line did not show any ray of variable characters. This is further said since PG08 and PG23 are obtained by Cluster I, but there is far difference among other characters between the two lines. Comparatively medium values of characters i.e. length of inter-node, fresh weight of leaf, length, circumference and weight of fruit and highest value of the No. of inter-nodes of BARI1 indicated that it had probably undergone recombination in the part with other lines of the same cluster. This variety showed the highest value of stem length.

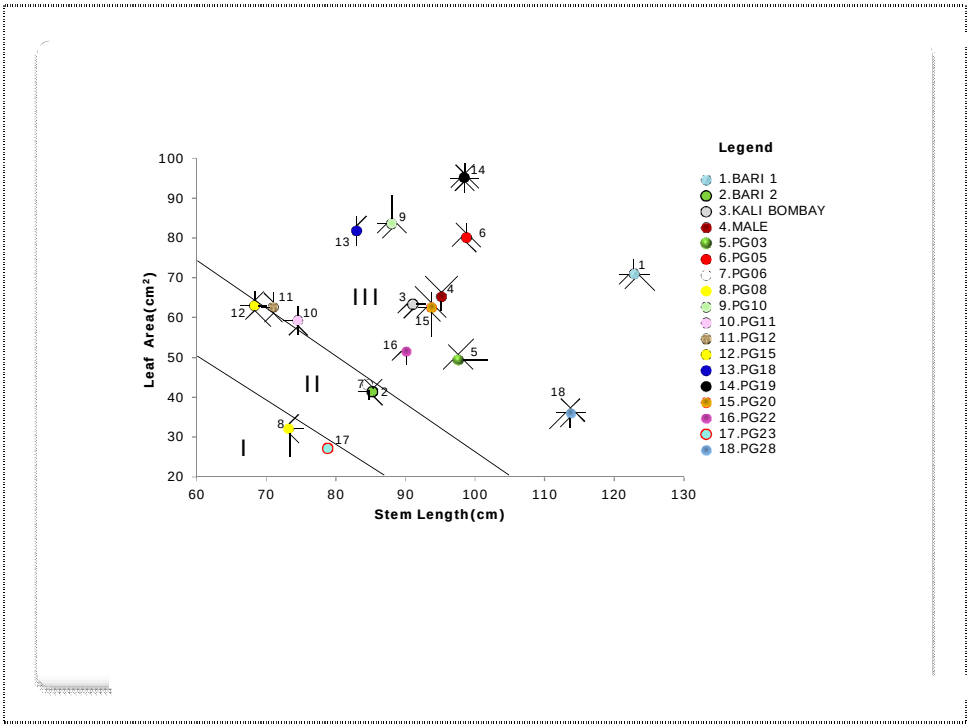

Fig.1a. Metroglyph diagram of various characters in eighteen lines of *Trichosanthes dioica.*

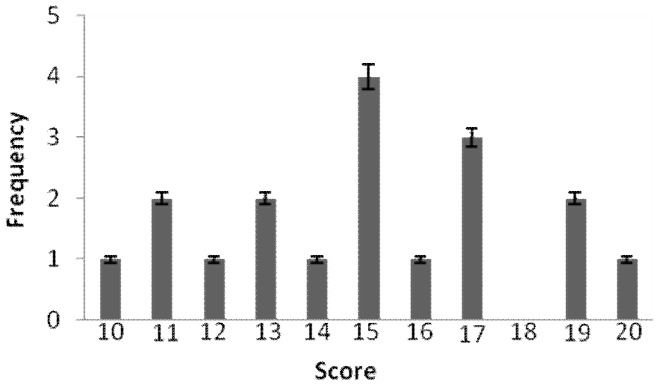

Fig.1b. Index score of eighteen lines of *Trichosanthes dioica.*

Conclusion

From the study it can be concluded that most of the lines of pointed gourd are much differentiated from each other and this is why most of them were found to be scattered on metroglyph graph. It also can be said that most of the characters were obtained having medium values. The present findings also indicated that the genotypes could show less genetic divergence if the number of studied materials could be increased. Moreover, few characters recorded from female plants might have shown distinctive differences morphologically among the lines and that may be reason also for not forming consolidated clusters of the genotypes.

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