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Short Communication

METROGLYPH ANALYSIS IN *CUPHEA*

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Cuphea species provide diverse type of medium chain fatty acids obtained from its seed oil. The oils have a wide range of industrial applications in the manufacture of soap, detergents, cosmetics, pharmaceuticals, surface coating and lubricant. At present these fatty acids are commercially obtained from coconut and palm kernel. Among the 200 species of the genus *Cuphea* some species are rich in lauric, capric and caprylic acids. Also capric acid is a renewable source which is presently available only from petrochemicals (Hirsinger, 1980; Graham *et al.*, 1981). Therefore, a need was felt to screen/identify the germplasm and to evaluate the suitable types of fatty acids by the metroglyph analysis. The metroglyph technique has proved to be very useful for picking up high yielding superior type of genotypes from germplasm collection. (Pandey *et al.*, 1990; Chauhan *et al.*, 1990). The seeds of 15 accessions/introduction of *Cuphea* procured through U.S.D.A, from Iowa State University, Iowa, U.S.A. were sown in nursery beds and the seedlings thus obtained were first raised in a glass house and latter transplanted in a field (twenty plants per row) in randomised block design with three replications. The data were recorded on 15 plants from each replicate on plant height, number of days to flowering, number of seed/flower, seed yield/plant, 1000 seed weight, major fatty acids (number of carbon atoms), days to flowering and seed yield (Kak *et al.*, 1995). The fatty acid content of seeds were analysed by GLC as suggested by Thies (1981). Metroglyph and Index score analysis were carried out according to the method suggested by Anderson (1957). The class intervals for various characters are presented in Table 1. The variation in each character is represented by a corresponding range in the length of rays. Different characters are represented by a different position of the rays on the glyph. The index value for each character has been divided into three classes viz. no. rays, short rays and long rays. The total index score was recorded by summing up the index scores.

Table 1. Class interval and index values for 6 characters of *Cuphea*

Characters	Index values					
	1	Sign	2	Sign	3	Sign
Plant height (cm)	49.0	0	49.1-69.0	♂	≥ 69.1	♂
Number of days to flowering	32.0	0	32.1-52.0	♂	≥ 52.1	♂
Number of seeds /flower	10.9		11-20.0		≥ 20.1	
Seed yield/plant (g)	5.0		5.1-8.3		≥ 8.4	
1000 seed weight (g)	1.3	0	1.31-2.9	♂	≥ 2.91	♂
Major fatty acid (Number of C-atoms)	10	0	10.1-12.0	♀	≥ 12.1	♀

Fifteen accessions/introductions analysed are as below :

1. *C. glossostoma*	2. *C. laminuligera*	3. *C. lutea*
4. *C. tolucana*	5. *C. wrightii*	6. *C. paucipetala*
7. *C. leptopoda*	8. *C. inflata*	9. *C. lanceolata*
10. *C. procumbens*	11. *C. racemosa*	12. *C. aperta*
13. *C. painteri*	14. *C. cyanea*	15. *C. viscosissima*

The plant height, number of seeds/flower, seed yield/plant and 1000 seed weight ranges from 29.0-88.0 cm, 3.0-30.0 g, 0.2-15.0 g and 0.18-4.0 g with a mean value of 56.6 cm, 121.13 g, 5.1 g and 1.94 g, respectively).

It takes between 47-92 days for flowering. The number of carbon atoms in fatty acids varies from 8.0 to 18.2. The content of fatty acid namely, capric acid, caprylic acid, lauric acid and linoleic acid varies from 0.15-69.5%, 10.0-87.3%, 2.0-70.0% and 1.6-60.0% respectively.

The results of metroglyph analysis are presented in Fig. 1. Each introduced accession is represented by a semi-circle, the X Co-ordinates of each circle being the number of seeds/flower and Y Co-ordinate being the seed yield/plant. The other characters have been represented by rays at different position on the glyph. The scatter diagram shows four complexes.

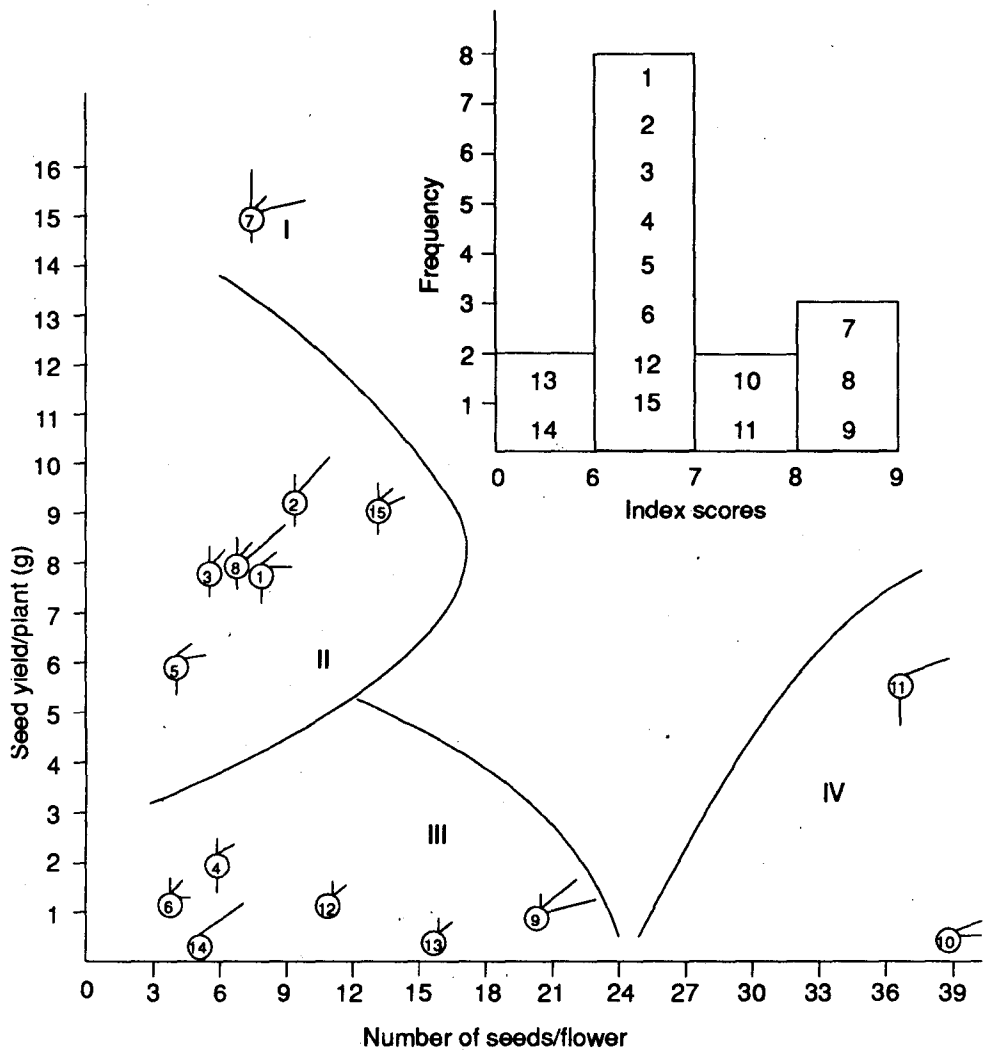

Fig. 1. Scatter diagram in metroglyph analysis

Complex I consists of a single accession (7) and is represented by three rays. The main characteristics of the complex were maximum height, moderate number of days to flowering and maximum 1000 seed weight. **Complex II** contains 6 accession (1, 2, 3, 5, 8, 15) and has minimum of three rays. The main features of this complex are average plant height, moderate number of carbon atoms with an average 1000 seed weight. **Complex III** contains 6 accessions (4, 6, 9, 12, 13, 14) and is represented by minimum of two rays except accession 14 which is represented by a single ray. The main characteristics of this group are average plant height, average to maximum number of days

to flowering and minimum to moderate number of carbon atoms. **Complex** IV comprised two accesion 10 and 11. The accession 10 has maximum days to flowering and accession 11 has maximum number of carbon atoms.

There were both similarities and dissimilarities among the complexes. Complex I contains a single accession (*C. leptopoda*) and has maximum amount of capric acid (83.8%) while all other fatty acids were less. This accession could be a good renewable source of capric acid which is presently obtained from petrochemicals. In Complex II, accession 8 and 15 (*C. inflata* and *C. viscosissima*) are also good source of capric acid, while accessions 1, 2 and 5 (*C. glossostoma* and *C. laminuligera, C. wrightii*) have more than 60% lauric acid which represent an ideal source for the manufacture of detergents. In Compelx III, accession 4 and 12 (*C. tolucana* and *C. aperta*) are also good source of lauric acid while the accession 13 and 14 (*C. painteri* and *C. cyanea*) contain more than 60% of caprylic acid. Complex IV contains only two accessions, 10 and 11 (*C. procumbens* and *C. racemosa*). *C. racemosa* does not contain any major acid except linoleic acid (60%) while *C. procumbens* contains major amount of capric acid (78%).

On the basis of frequency diagram the accessions 7, 8 and 9 (*C. leptopoda, C. inflata* and *C. lanceolata*) fall under index score of 8-9 which are very good source for capric acid, while accessions 13 and 14 (*C. painteri, C. cyanea*) fall under index score of 0-6 which are good source for caprylic acid. The accessions 10 and 11 (*C. procumbens, C. racemosa*) come under index score of 7-8, and are good source for capric acid and linoleic acid. The other accessions that fall between index score of 6-7 have mixture of other fatty acids. The above accessions could be selected for further breeding programme for their specific traits. Out of 15 accessions under study only *C. racemosa* contain 60% of linoleic acid while the other accessions do not contain more than 7% of linoleic acid. Similarly *C. procumbens* and *C. leptopoda* contain 78% and 83.8% of capric acid while other fatty acid are in negligible percentage. The present study shows the genus *Cuphea* forms tentatively four germplasm complexes into which various accessions sort out among themselves.

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