Metroglyph Analysis in Pear Germplasm

G Sharma and OC Sharma
Department of Fruit Breeding and Genetic Resources, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan-173 230 (Himachal Pradesh)

Metroglyph and index score analysis was carried out for different characters like trunk girth, yield, tree height, spread, fruit weight, length, breadth, TSS, acidity, sugar, time of flowering, time of maturity, sugar acid ratio and taste in pear germplasm. A total of 29 pear accessions were used and in scatter diagram 4 groups were formed. Lowest score was recorded against *Pyrus ussuriensis*. There was great deal of variability among groups, as well as within the groups, index score value varied between 1-12 and 2-8.

Key Words: Index Score, Metroglyph, *Pyrus*, Tree and Fruit Characters, Variability

Pear (*Pyrus* spp.) is a delectable fruit, next only to apple in importance. The genus *Pyrus* belongs to family Rosaceae and probably originated in the mountainous regions of western China from where it moved both in east and west directions. Later, evolution took place in different regions under isolation, ecological tolerance, introgression and interspecific hybridization (Bell and Hough, 1986; Layne and Quamme, 1975). The pear available in market belongs either to *Pyrus communis* or *Pyrus pyrifolia* or to the hybrid group of the two species. The importance of pear lies in good amount of carbohydrates, protein, organic acid, vitamins, minerals, pectic substances, aroma constituents, tannin and enzymes. The world production of pear is 13069 thousand MT while India contributes only 130 thousand MT (FAO, 1997). Because of its tolerance to a wide range of soil and climatic conditions, it is grown both in temperate and subtropical conditions. The genus *Pyrus* has many species which are important for improvement of different traits.

Materials and Methods

The present investigations were carried out at pear germplasm collection block of Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan which is situated at an altitude of 1275 m above mean sea level, latitude 30°50N and longitude 77°8 E. The material was introduced from different parts of the world, grown here and evaluated for different traits. The data was collected in 1998 for trunk girth, yield, tree height, fruit weight, fruit length, fruit breadth, TSS, acidity, sugar, time of flowering, time of maturity and for taste. The metroglyph and index score analysis was carried out according to the method suggested by Anderson (1957). The germplasm which was evaluated is given as below:

1. Autumn of Yokolove, 2. Babugosha, 3. Bartlett, 4. Buttira Giffor, 5. Beloved of Michurin, 6. Beurre Hardy, 7. Beurre Bose, 8. Beurre Diel, 9. Beurre-de-Amanlis, 10. China pear, 11. Chojuro, 12. Conference, 13. Durandeau, 14. Godara sand pear, 15. Jargonelle, 16. Kashmiri, 17. Kieffer, 18. Laxton's Superb, 19. Le Conte, 20. Monarch, 21. Napolean, 22. Noveau Pointeau, 23. *Pyrus ussuriensis*, 24. Sentya Brpskaya, 25. Shinsui, 26. Smajkanska pozdniaza, 27. Starking Delicious, 28. W.B. Chorte and 29. Winter Nellis.

The class intervals and index score values for different traits is given in Table 1 and 2. The metroglyph analysis for different traits was carried out in two steps by taking 10 characters in one and rest in the other. The trunk girth and yield were taken common in both the analyses.

Results and Discussion

The results of metroglyph analysis are presented in Fig. 1 and Fig. 2. Each germplasm is represented by a semi-circle, the X coordinates of each circle being trunk girth and Y coordinates the yield. The other characters have been represented by rays at different positions on the glyph. Both the scattered diagrams show four complexes.

Complex I

This complex consists of medium trunk girth and high yield (Fig. 1). It contains three germplasm (16, 18, 24). The main characteristics of the complex were medium tree height, tree spread, fruit weight, fruit length, fruit breadth, TSS and high acidity and sugar (Fig. 1). While Fig. 2 indicates medium tree spread (NS), mid to late flowering, mid to early maturity, low to high sugar acid ratio and sub-acidic to sweet in taste.

Complex II

Complex II contains 6 germplasm (2, 9, 19, 20, 21, 29). In this group tree height (medium), E.W. (East-West) tree spread (medium) fruit weight medium, fruit length

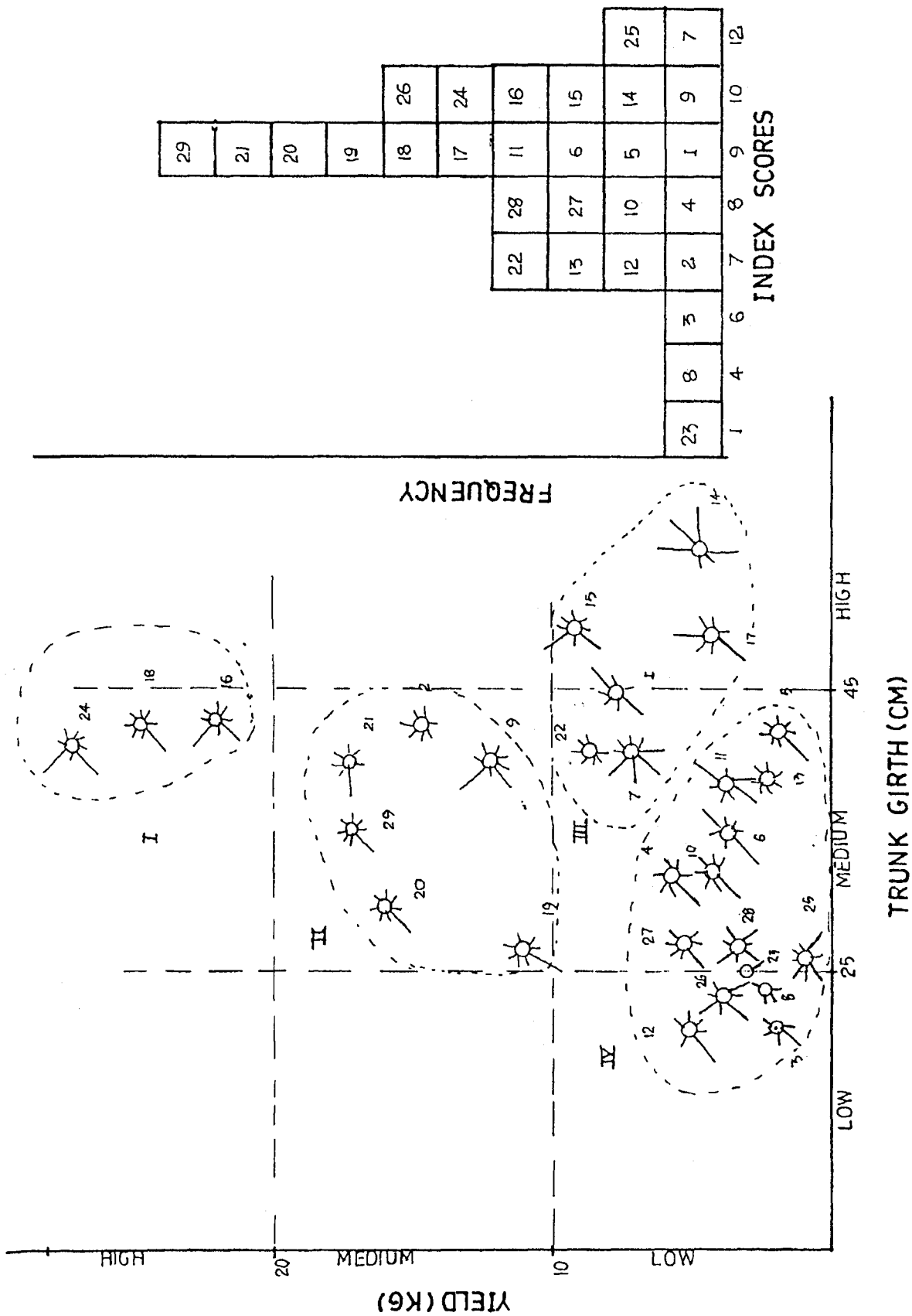

Fig. 1. Scatter diagram of metroglyph for tree and fruit characters

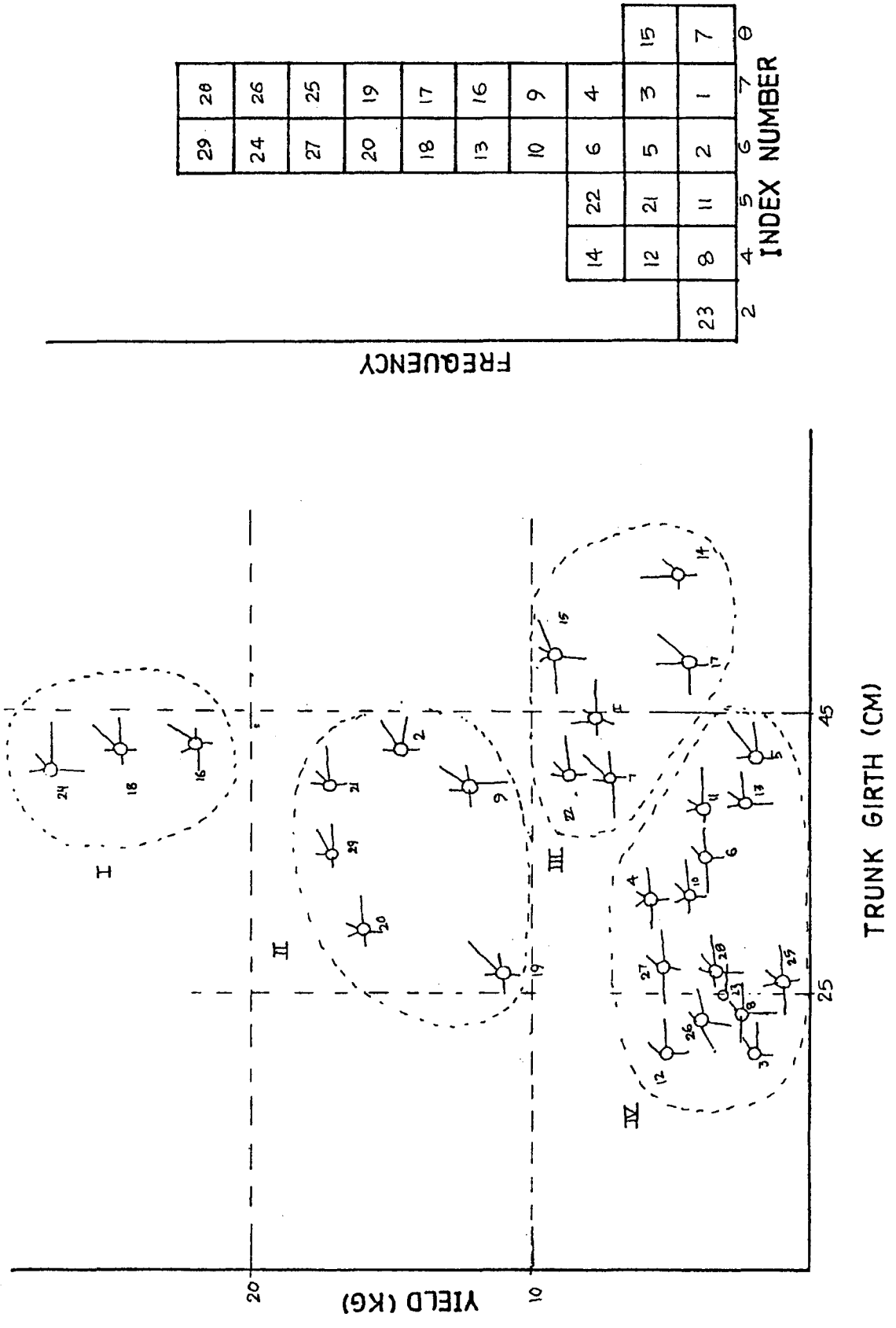

Fig. 2. Scatter diagram of metroglyph for tree, floral and fruit characters

(medium to high) fruit breadth medium, TSS (low to medium), acidity (low to high) and sugar, medium to high (Fig. 1). Fig. 2 of the complex 2 indicates that this group has minimum of 5 rays and maximum of 7 rays for the traits like tree spread NS, time of flowering, time of maturity, sugar acid ratio and taste.

index score value in both the figures. This is due to the fact that it is a separate species having most of the traits of inferior quality. But it is an important source of improvement as far as germplasm point of view is concerned. The great deal of variability in the germplasm indicates better chances for future improvement. It

Table 1. Class intervals and index values for different characters in pear germplasm

Characters	Index value 0	Symbol	Index value 1	Symbol	Index value 2	Symbol
Trunk girth (cm)	Low (<25)	-	Medium (25-45)	-	High (>45)	-
Yield (kg)	Low (<10)	-	Medium (10-20)	-	High (>20)	-
Tree height (m)	Low (<3)	Ó	Medium (3-6)	Ó	High (>6)	Ó
Tree spread EW (m)	Low (<2)	O-	Medium (2-5)	O-	High (>5)	O—
Fruit weight (g)	Low (<75)	Ọ	Medium (75-150)	Ọ	High (> 150)	Ọ
Fruit length (cm)	Low (<5)	-O	Medium (5-8)	-O	High (>8)	—O
Fruit breadth (cm)	Low (<5)	Ơ	Medium (5-7)	Ơ	High (>7)	Ơ
TSS (°Brix)	Low (<12)	Ọ	Medium (12-13)	Ọ	High (<13)	Ọ
Acidity (%)	High (>80)	Ọ	Medium (60-80)	Ọ	Low (<60)	Ọ
Sugars (%)	Low (<8)	Ọ	Medium (8-9)	Ọ	High (>9)	Ọ

Table 2. Class intervals and index values for different characters in pear germplasm

Characters	Index value 0	Symbol	Index value 1	Symbol	Index value 2	Symbol
Trunk girth (cm)	Low (<25)	-	Medium (25-45)	-	High (>45)	-
Yield (kg)	Low (<10)	-	Medium (10-20)	-	High (>20)	-
Tree spread NS (m)	Low (<2)	O	Medium (2-4)	Ó	High (>4)	Ó
Time of flowering	Early (before 10th March)	O	Medium (10th to 20th March)	O-	Late (after 20th March)	O—
Time of maturity	Late (after 31st July)	O	Medium (25th to 31st July)	Ọ	Early (before 25th July)	Ọ
Sugar-acid ratio	Low (<15)	O	Medium (15-20)	-O	High (>20)	—O
Taste	Acidic	O	Sub-acidic	Ơ	Sweet	Ơ

Complex III

This complex contains 6 germplasms (1, 7, 14, 15, 17, 22) having low yield and medium to high trunk girth. Most of the characters in these complexes are of high value. Their index score values lie between 7 to 12 and 4-8 (Fig. 1 and 2).

Complex IV

This complex consists of maximum number of germplasm as high as 14 (3, 4, 5, 6, 8, 10, 11, 12, 13, 23, 25, 26, 27, 28). This group has low yield and low to medium trunk girth. There is a lot of variability in this complex. Its index score value varied between 1 to 12 (Fig. 1) while in another scatter diagram it ranged between 2 to 7 (Fig. 2). The minimum score in both the figures is recorded against the germplasm No. 23 (*Pyrus ussuriensis*).

There were both similarities and dissimilarities among the complexes. *Pyrus ussuriensis* had clear cut distinction from all other germplasms as it has lowest

appears from these studies that metroglyph and index score analysis of 29 pear accessions can be divided into different complexes on account of trunk girth and yield. Similar studies have also been carried out in almond (Sharma *et al.*, 1989) and in seedling walnut (Sharma and Sharma, 1997).

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