Indian J. Pl. Genet. Resources 9(2): 229-235, 1996

METROGLYPH AND INDEX SCORE ANALYSIS OF SOME QUANTITATIVE TRAITS IN *BERBERIS LYCIUM* ROYLE.

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Seeds were collected from seventeen different seed sources within the state of Himachal Pradesh ranging from 900 to 2,600 m above msl. Dharampur (1), Rajgarh (3), Solan (16) and Gohar (14) were among the four top ranking seed sources for eight characters. There were six different morphological complexes recognized on the basis of dry shoot weight per seedling and seedling height. Morphological variation within group was of low magnitude. Majority of the high scoring seed stands were in groups V and VI characterized by higher seedling height and dry shoot weight

Key words : Metroglyph, variability, index score, divergence, seed stands

INTRODUCTION

Berberis is a genus mainly of shrubs under family Berberidaceae The genus consists of 280 species distributed throughout the world (Anon 1974). *Berberis lycium* locally known as "Kashmal" is one of the promising source of berberene, a medicinal valued alkaloid. The species has multipurpose utility like fuelwood, fruits, biofence, medicinal and a palatable leaf fodder for sheep and goats during the lean period of summer and winter months. It's roots are used as a good febrifuge, carminative and gentle aperient (Anon, 1976). Roots also act as a good intestinal astringent, cure for cough, chest, throat troubles, eye sores, eye itch, piles and chronic diarrhoea. The genetic resources of this species are depleting fast in Himachal Pradesh because of unscientific exploitation of its roots. With the present pace of exploitation the species is expected to become endangered within a few years. Therefore, an attempt was made to collect the seeds from different altitudes within the state to scan the complex morphological variations for the quantitative traits, further analyze them by reducing into scores and subsequently compare the scores. Metroglyph analysis is one of the tools to analyze such complex variations and assess the

variability. The analysis has been successfully utilized in several agricultural and horticultural crops, but no such information is available on forest tree and/or shrub species. Therefore, an exercise was made to analyze the type of variation existing in this important multipurpose shrub vis-a-vis to conserve *ex-situ* for further utilization in breeding and improvement programmes.

MATERIALS AND METHODS

The material was collected from 17 seed stands namely Dharampur, Jaunaji, Rajgarh, Kandaghat, Subathu, Sarahan, Palampur, Mandi, Kullu, Chail, Fagu, Shimla, Dharamsala, Gohar, Dalhousie, Solan and Darlaghat areas of Himachal Pradesh within an altitudinal range from 900 to 2,600 m above msl (Fig. 1). Fresh matured berries were collected, depulped and seeds extracted. These fresh seeds were sown in the nursery in three replications without giving any presowing treatment and complete germination was obtained within two months. The data on morphological traits were recorded by selecting 10 random seedlings in each replication for seedling height and other characteristics after one year growth in the nursery (Table 1). The metroglyph and index score analysis was carried out according to the method suggested by Anderson (1957). The class interval for different characters was also calculated (Table 2). The index scores were obtained by assessing numerical values on the basis of range of variability assuming an index score of 1 as lowest, 2 as medium and 3 as highest. The sum total of index score for six characters in each stand was considered as an indication of its total worth and the histograms of the index scores constructed (Fig. 2).

RESULTS AND DISCUSSION

Mean performance of the seedlings from different seed stands (Table 1), showed that the highest seedling shoot dry weight was depicted by Dharampur (3.12 g), followed by Rajgarh (2.169 g), Solan (1.739 g), Palampur (1.66 g) and Mandi (1.64 g). The lowest shoot dry weight was observed for Darlaghat (0.63 g) followed by Dalhousie (0.68 g), Chail (0.87 g) and Sarahan (0.91 g). Seed stands of Dharampur, Rajgarh, Solan and Gohar were among the top ranking genotypes for most of the characters (Table 1).

The results of the metroglyph analysis drawn on the shoot dry weight and seedling height are represented in Fig. 2. These characters are most important from breeding point of view, therefore, they were used in plotting the glyph. The remaining six characters were represented by symbols at different positions in the glyph (Table 2).

The perusal of the scatter diagram (Fig. 2) depicted that six groups were distinguished on the basis of morphological variations. The first group consisted of four seed stands obtained from Kandaghat, Sarahan, Dalhousie and Darlaghat.

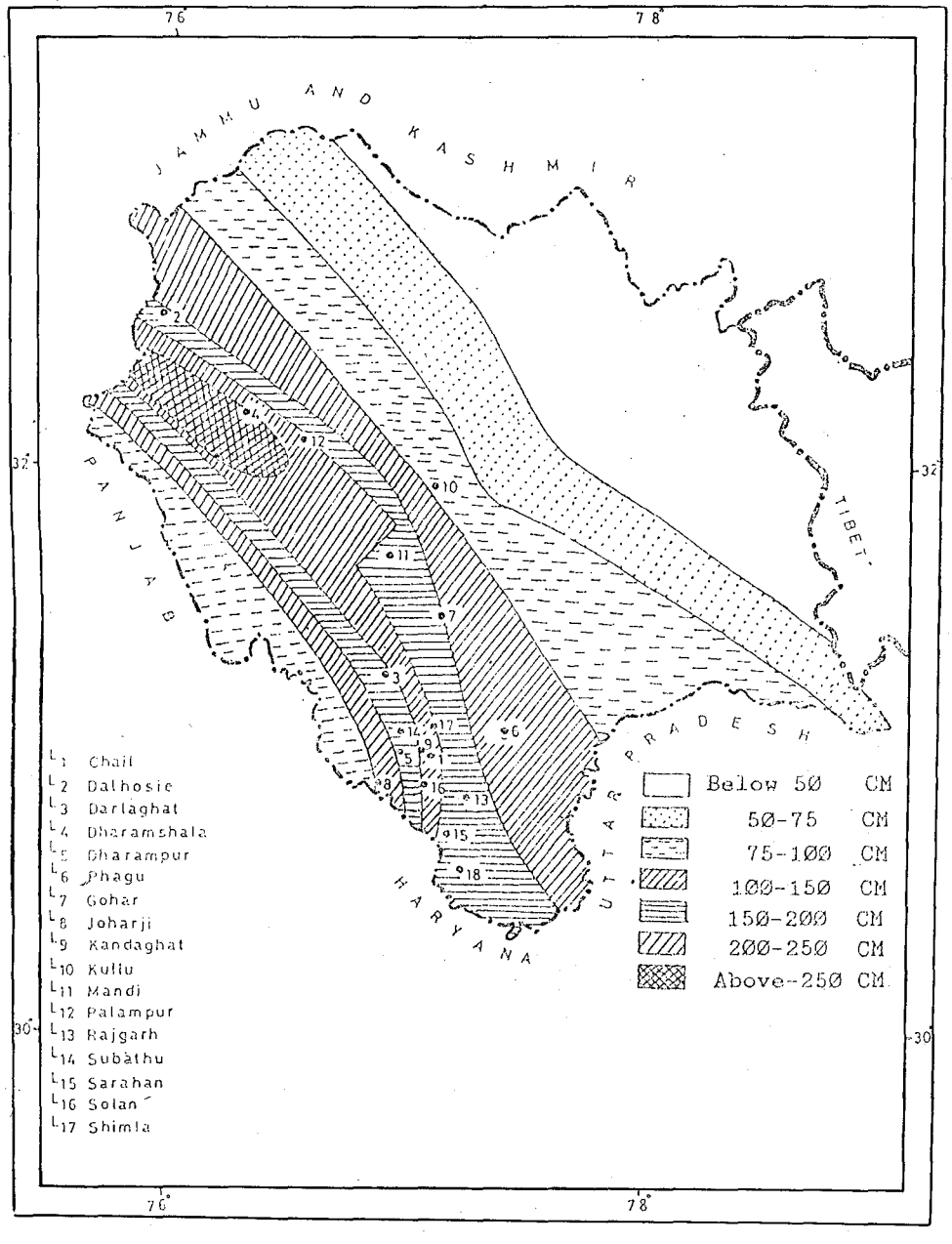

Fig. 1. Map showing location of *Berberis lycium* provenances in Himachal Pradesh along with rainfall zones

The stands of this group were characterized by low shoot and root dry weight, minimum seedling height and the score range (6) was uniform and low.

Table 1. Mean values for eight characters in *Berberis lycium*

Sr. No.	Provenances	Height (cm)	Diameter (cm)	Number of Leaves	Internodal length (cm)	Shoot fresh weight (g)	Shoot dry weight (g)	Root fresh weight (g)	Root dry weight (g)	Total score
1	Dharampur	16.50	0.25(3)	26.15(3)	1.73(3)	6.73(3)	3.12	2.17(3)	0.99(3)	18
2	Jaunaji	10.62	0.18(1)	16.80(1)	0.93(1)	2.73(1)	1.18	1.10(1)	0.59(2)	7
3	Rajgarh	15.28	0.20(2)	20.56(2)	1.64(3)	4.85(2)	2.16	1.64(2)	0.74(2)	13
4	Kandaghat	8.94	0.17(1)	14.28(1)	0.82(1)	2.02(1)	0.97	1.0691)	0.52(1)	6
5	Subathu	12.05	0.20(2)	18.78(2)	1.24(2)	2.96(1)	1.35	1.42(2)	0.64(2)	11
6	Sarahan	7.88	0.15(1)	12.00(1)	0.7291)	1.96(1)	0.91	0.87(1)	0.40(1)	6
7	Palampur	12.25	0.20(2)	18.42(2)	1.35(2)	3.46(2)	1.66	1.3192)	0.59(2)	12
8	Mandi	9.66	0.17(1)	13.92(1)	1.02(1)	3.4192)	1.64	1.06(1)	0.49(1)	7
9	Kullu	10.65	0.18(1)	20.78(2)	0.97(1)	2.10(1)	1.02	0.89(1)	0.42(1)	7
10	Chail	9.97	0.17(1)	18.31(2)	0.88(1)	1.85(1)	0.87	1.18(2)	0.50(1)	8
11	Fagu	11.49	0.19(2)	17.86(2)	1.20(2)	3.02(1)	1.45	1.20(2)	0.56(2)	11
12	Shimla	10.90	0.18(2)	17.51(2)	1.57(3)	2.00(1)	0.97	0.98(1)	0.46(1)	10
13	Dharamsala	10.00	0.15(1)	16.27(1)	0.88(1)	2.08(1)	0.96	0.99(1)	0.46(1)	6
14	Gohar	13.71	0.19(2)	22.10(3)	1.36(2)	3.07(1)	1.38	1.40(2)	0.65(2)	12
15	Dalhousie	8.24	0.16(1)	12.89(1)	0.77(1)	1.32(1)	0.68	0.71(1)	0.36(1)	6
16	Solan	14.84	0.19(2)	23.01(3)	1.37(2)	3.73(2)	1.73	1.41(2)	0.67(2)	13
17	Darlaghat	7.86	0.15(1)	13.38(1)	0.70(1)	1.37(1)	0.63	0.67(1)	0.34(1)	6

Values in parenthesis indicate index score for each character at each location

The second group consisted of single stand from Mandi. The score average was 7 which was characterized by low shoot and root dry weight and seedling height. The variation was almost at par with group one.

The third group possessed the genotypes of Jaunaji, Kullu, Chail, Shimla and Dharamsala stands, which comprised better shoot dry weight and seedling height than those of group I and II. However, the group variation ranged from 6 to 10 and the index score ranged from 9 to 13.

The fourth group comprised Subathu, Palampur and Fagu stands was characterized by medium seedling height and dry shoot and root weight. The variation in the score, within the group ranged from 11 to 12. Group five included three representative stands of Rajgarh, Gohar and Solan. It projected

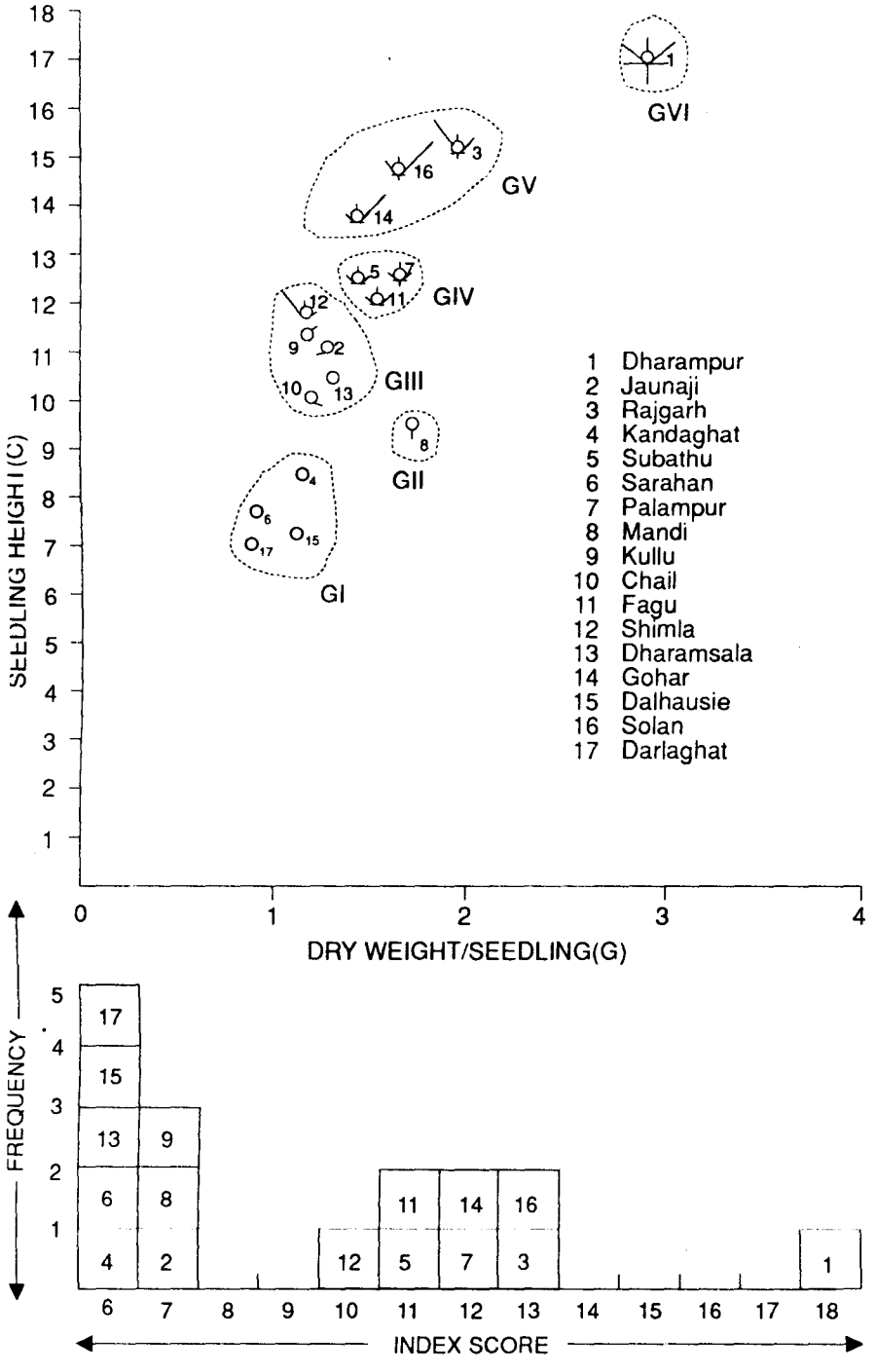

Fig. 2. Scatter diagram of metroglyph representing 17 seed stands of *Berberis lycium* Royal

medium height followed by high shoot dry weight and the index score ranged from 11 to 13 thus indicating the within group variation.

Table 2. Class intervals, index score values and signs for six characters in seventeen stands of *Berberis lycium*

Sr. No.	Character	Range of Means	Score-1 value less than	Sign	Score-2 value less than	Sign	Score-3 value less than	Sign
1	Diameter	0.15 to 0.25	≥0.18	0	0.18 to 0.21		0.21	
2	Number of leaves	12.00 to 26.15	≥17.00	0	17.00 to 22.00		22.00	
3	Internodal length	0.70 to 1.17	≥1.15	0	1.15 to 1.40		1.40	
4	Shoot fresh weight	1.32 to 6.73	≥3.12	0	3.12 to 4.92		1.40	
5	Root fresh weight	0.67 to 2.17	≥1.17	0	1.17 to 1.67		1.67	
6	Root dry weight	0.34 to 0.99	≥0.55	0	0.55 to 0.76		0.76	

Group six depicted single genotype from Dharampur which consisted of highest index score value of 18 and was found quite divergent from all other groups. It also reflected highest mean value and index score for all the morphological traits (Table 3).

Table 3. Group means for eight characters in *Berberis lycium*

Group	Seedling Height (cm)	Collar Diameter (cm)	No. of Leaves	Internodal Length (cm)	Shoot Fresh Weight	Shoot Dry Weight	Root Fresh Weight	Root Dry Weight
G1(6)	8.25	15.75	13.04	0.75	1.67	0.80	0.83	0.49
G2(7)	9.66	0.17	13.92	1.02	3.41	1.64	1.06	0.49
G3(9)	10.43	0.17	16.73	1.05	2.15	1.00	0.85	0.49
G4(11)	12.96	0.20	18.36	1.26	3.15	1.49	1.31	0.60
G5(13)	14.61	0.19	21.92	1.46	3.88	1.76	1.48	0.69
G6(18)	16.50	0.25	26.15	1.73	6.73	3.12	2.17	0.99

Values in the parenthesis indicate mean index score for the groups

The overall index scores ranged from 6 (Kandaghat, Sarahan, Dharamsala, Dalhousie and Darlaghat) to 18 (Dharampur) indicating wide range of variability between the seed stands. Five seed stands were found in the index score

range of 11 to 13. Thus it can be concluded that the range of variability observed in the present investigation was mainly due to few extreme seed stands. This suggested to generate variability through hybridization and/or mutation for wider spectrum of selection in a productive breeding programme. The study revealed that the seed stands of group IV, Vand VI were divergent and exhibited desired medium to high index scores. These genotypes may be utilized for raising shrubbery of this species while the seeds of Dharampur stand would be ideal donor for raising improved plantations of this shrub as a biofence and/or to improve the degraded and denuded sites in the state.

REFERENCES

Anderson, E. 1957. A semigraphical method for the analysis of complex problems. *Proceedings of National Academy of Sciences*, Washington DC **43** : 923-927

Anonymous. 1974. *Seeds of woody plants of United States*. April Handbook No 450 US Dept of Agril Foest Services pp 247-251

Anonymous. 1976. *Medicinal plants of India*. ICAR, New Delhi 132-135

Kirtikar, K.R. and B.D. Basu. 1975. *Indian Medicinal Plants* Vol II. New Delhi 104-105