Seed Variability in Ber (*Zizyphus* Species) Collected from Different Localities of India

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Ber (*Zizyphus mauritiana* Lamk.) is grown under rainfed conditions in arid and semi-arid regions. It is becoming very popular because of its pleasant taste and nutritive value. The improved cultivars are budded on wild stocks. The rootstocks generally used are *Zizyphus rotundifolia*, *Z. mauritiana* var. Tikadi, *Z. mauritiana* var. Sukhawani, *Z. mummularia*, *Z. spinichristii*, *Z. regosa*, *Z. xylocarpa* and *Z. oenplia* (Chundawat and Shrivastava, 1978; Bankar and Prasad, 1992 and Annon, 2000). Seed size has been found to be under strong genetic influence that is mainly maternal. Seed weight and size offer a rough approximation to the supply of potential energy available for the seedling. The seed weight gives an idea of the good reserves available to the embryo for its growth and development and size affects the vigour and establishment of a plant species (Shukla *et al.* 2000).

Further, there is paucity of information on seed viability potential, seed germination, seedling growth and vigour of various ber rootstocks to be used for plant multiplication. Therefore, an attempt was made to study the variability in seed trait, germination and vigour of different *Zizyphus* species.

Five ber species namely, *Z. oenoplia*, *Z. mummularia*, *Z. rotundifolia*, *Z. mauritiana* var. Tikadi and *Z. mauritiana* var. Sukhawni were evaluated at Department of Horticulture, Institute of Science, Varanasi during the year 1990-2000. The seeds were collected from CAZRI, Jodhpur; CCS, HAU, Hisar; IIAH, Bikaner and Dryland Agricultural Research Station GAU, Sardar Krushinagar, (Gujarat). Well-matured and ripe stones were collected from plus tree during March, 1999. Seeds (Kernel) were extracted by breaking the stones and stored in plastic containers. For seed variability studies, seed weight, size, thickness, viability and germination percentage, time taken for commencement of germination and full germination, earliness, index, growth and vigour index were recorded. Weight of seed was taken from electronic balance, while size of seed was recorded with Vernier

Table 1. Mean values for various seed traits, germination and seedling growth in different *Zizyphus* species

Species	Seed Weight (mg)	Seed length (mm)	Seed breadth (mm)	Seed thick-ness (mm)	Time taken for commence-ment of germination (Days)	Time taken for full germination (Days)	Viability (%)	Germination	Shoot length 18 DAS	Root length 18 DAS	Earliness Index	Vigour Index
Z. oenoplia	70.51	4.55	3.51	1.89	3.25	15.00	85.00	56.00	3.37	3.10	0.600	368.32
Z. mummularia	85.00	5.75	5.00	2.00	3.00	13.50	86.00	60.95	4.26	3.96	0.620	513.75
Z. rotundifolia	180.00	6.75	5.75	2.50	2.25	11.00	100.00	74.35	6.91	6.46	0.761	994.18
Z. mauritiana var. Tikadi	176.00	7.77	5.02	2.45	2.25	11.00	96.50	71.84	6.80	6.41	0.702	949.27
Z. mauritiana var Sukhawni	162.00	6.34	5.78	2.31	3.00	13.00	93.40	70.12	5.44	5.08	0.650	727.35
Mean	134.70	6.23	5.01	2.23	2.75	12.70	92.18	66.77	5.35	5.00	0.666	710.57
Range	70.51	4.55	3.51	1.89	2.25	11.00	85.00	56.00	3.37	3.10	0.600	368.32
	180.00	7.77	5.78	2.50	3.25	15.00	100.00	74.35	6.91	6.46	0.761	994.18
Variance	11.10	1.90	0.36	0.24	0.15	0.20	7.81	6.05	0.84	0.64	0.001	380.19
SEm ±	1.49	0.60	0.27	0.22	0.17	0.20	1.25	1.10	0.41	0.36	0.015	8.72
CD (P=0.05)	3.43	1.38	0.62	NS	0.42	0.49	2.90	2.53	0.94	0.83	0.034	20.10

DAS: Days after sowing

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calliper. Viability of seed was estimated by tetrazolium test. Seeds were germinated in autoclaved petridishes (190 cm), inside layered with filter paper. The whole set *i.e.* 5 species/3 replications were evaluated daily. Time taken for commencement of germination and for full germination were recorded in each replication. Shoot length and root length were recorded 18 days after sowing when there was no further improvement in per cent seed germination. Earliness index was recorded following the method given by Bavappa *et al.* (1964) and vigour index was calculated as per method suggested by Abdul-Baki and Anderson (1973).

The mean, range and variance of five species for 12 characters are presented in Table 1. The range of seed weight varied from 70.51 mg *in Z. oenoplia* to 180.00 mg in *Z. rotundifolia* seed length (4.55 in *Z. oenoplia* to 7.77 mm in *Z. mauritiana* var. Tikadi); seed breadth (3.51 in *Z. oenoplia* to 5.78 mm in *Z. mauritiana* var. Sukhawni); seed thickness (1.89 in *Z. oenoplia* to 2.50 mm in *Z. rotundifolia*. Time taken for commencement of germination 2.25 in *Z. rotundifolia* 3.25 days in *Z. oenoplia*. Time taken for full germination (11.00 in *Z. rotundifolia* to 15.00 days in *Z. oenoplia*). Range for seed viability (85.00 to 100.00%), Germination (56.00 to 74.95%), shoot length (3.37 to 6.91 cm), root length (3.10 to 6.46 cm). earliness index (0.600 to 0.761) and vigour index (368.32 to 994.18) were recorded with *Z. oenoplia* and *Z. rotundifolia*, respectively.

Data revealed that significantly maximum values for seed weight (180.00 mg), seed thickness (2.50 mm), viability (100%), germination (74.35%), shoot length (6.91 cm), root length (6.46 cm), earliness index (0.761) and vigour index (994.18) were recorded with *Z. rotundifolia* followed by *Z. mauritiana* var. Tikadi and *Z. mauritiana* var Sukhawni while, lowest value was recorded with *Z. oenoplia*. Seed length (7.77 cm) and seed breadth (5.78 cm) were found significantly maximum with *Z. mauritiana* var. Tikadi and *Z. mauritiana* var. Sukhawni. Time taken for commencement of germination (2.25 days) and time taken for full germination (11.00 days) were recorded significantly minimum with *Z. rotundifolia* and *Z. mauritiana* var. Tikadi. Maximum time taken for both the traits were recorded with *Z. oenoplia*. Estimates of phenotypic variance were high for vigour index, seed weight, send length, viability and seed germination. In character association analysis (Table 2) some of the important combinations showed positive and significant relationship such as seed weight with seed germination, seedling height and vigour index; seed germination with earliness index and vigour index; Time taken for commencement of germination with time taken for full germination and seedling height and diameter with vigour index. However, negative and significant correlation was recorded between time taken for commencement of germination with vigour index and seedling diameter. Relationship between heavy and bolder seeds with high seed germination and seedling vigour have also been reported in case of mango (Giri, 1966) and *Prosopis cineraria* (Shukla, 2000).

Based on the present study, it can be concluded that a significant amount of genetic variability for various seed traits is present in *Zizyphus* species. Seed weight was found to be associated positively with seed germination and seedling vigour. Seeds of *Z. rotundifolia* followed

Table 2. Correlation coefficient for 8 characters of *Zizyphus* species

Characters	Seed weight (mg)	Seed germination (%)	Time taken for full germination (days)	Time taken for commencement of germination (days)	Earliners Index	Vigour Index	Seedling height (cm)
Seed germination (%)	0.9547*	–					
Time taken for full germination (days)	-0.7288	-0.8157	–				
Time taken for Commencement of Germination (days)	-0.7967	-9039	0.9939*	–			
Earliness Index	0.7767	0.9586*	-0.8696	-0.9459	–		
Vigour Index	0.9583*	0.9536*	-0.9279	-0.9688*	0.9055	–	
Seedling height (cm)	0.9586*	0.8652	-0.8917	-0.9043	0.7683	0.9672*	–
Seedling diameter (cm)	0.8139	0.8185	-0.2933	-0.9834*	0.7971	0.9604*	0.9639*

* Significant at 5% level

by Z. mauritiana var Tikadi had high expression of most of the seed traits. Thus, the study of genetic variability and inter relationship of characters may lead to effective selection of rootstock for commercial multiplication of ber plants.

References

Abdul Baki AA and JD Anderson (1973) Vigour determination in soybean seed multiple criteria. *Crop Sci.* **13:** 630-633.

Anonymous (2000) Proceedings, Tenth Group Workers Meeting of All India Co-ordinated Research Project on Arid Zone Fruits held at Acharya NG Ranga Agricultural University, Hyderabad.

Banker GJ and RN Prasad (1992) Relationship between stomatal distribution and growth of ber root stock. *Indian J. Hortic.* **49:** 169-373.

Bavappa KVA, PR Ramchandar and E Valappan (1964) Correlation studies in *Areca catechu* L. Time of germination, Bartletts index, vigour of sprouts and seedling. *Arecanut J.* **15:** 62-66.

Chundawat BS and HC Srivastava (1978) *Haryana Mein Ber ki Kheti.* Hindi. Directorate of Extension, Haryana Agricultural University, Hisar, 38p.

Giri A and MN Chaudhary (1996) Relation of mango stone weight to its germination and seedling vigour. *Pakistan J. Sci.* **18:** 148-50.

Pareek OP (1978) *Grow Ber for Higher Income in Arid Region.* Central Arid Zone Research Institute, Jodhpur, Leaflet No. 1, p 4.

Shukla JK, A Chauhan, PK Kasera, S Mohammed and DD Chawan (2000) Seed variability in *Prosopis cineraria* collected from different localities of Indian desert, *Sci. Cult.* **66:** 163-164.

Partial Resistance among Fastigiate Germplasm of Groundnut and their Utility in Rapid Screening for Rust

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Rust disease of groundnut caused by *Puccinia arachidis* Speg. has gained much attention because of its rapid spread to almost all the major groundnut growing countries. Efforts to find genetic resistance have been successful and several sources have been identified. Most (90%) of the resistant sources belong to only fastigiate germplasm (*Arachis hypogaea* sub-species *fastigiata).* Before exploiting resistant germplasm in breeding programmes, it becomes essential to understand the differences in the components of resistance and the nature of relationship among them. Hence, an experiment was conducted to understand the components of resistance in 15 fastigiate germplasm lines and four highly susceptible genotypes following detached leaf technique (Subrahmanyam *et al.* 1980).

The experimental material consisted of a fully expanded undamaged leaf excised with intact petiole through the pulvinous from each plant at the third node from the terminal bud of the main stem. The leaves were washed with sterile water and inserted in a layer of sterilized sand in plastic trays (45x30x14 cm). The sand was moistened with Hogland's nutrient solution and for each genotype four replications were maintained. The uredospores were collected from the diseased plants of TMV 2 using a cyclone spore collector. Suspensions of uredospores were prepared (50000 spores/ml) in sterile water containing the wetting agent Tween 80 (0.2 ml/l of water). The spore suspensions were atomized over the leaves inside the tray and covered with 250 gauge polythene sheets. The trays were then placed in plant growth chamber adjusted to 25°C and a 12 h photoperiod. Five components of rust resistance namely incubation period, infection frequency, number of pustules, pustule diameter and rust score were recorded from 10 plants selected at random from each of the four replications for a monocyclic infection.

For the purpose of comparison the genotypes were placed according to their mean field rust score as resistant (scores of 2.0-3.0), moderately resistant (3.1-7.0) and susceptible (7.1-9.0). Significant genotypic differences existed between and within the germplasm lines for each resistance component. Incubation period differed

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