

Seed Source Variation and Genetic Estimates in Different Genotypes of Wild Apricot (*Prunus armeniaca* Linn.) at Nursery Stage

A. H. MUGHAL*, M. A. KHAN, J. A. MUGHLOO, P. A. SOFI AND A. A. MIR

*Faculty of Forestry, University of Agricultural Sciences & Technology-K
 Shalimar, Srinagar 191121, India
 E-mail : ahmughal1@rediffmail.com
 Correspondence

Abstract

The study was conducted during 2005-06 and a total of 17 seed sources of wild apricot were evaluated from Kashmir and Ladakh region of Jammu and Kashmir in the nursery. Results revealed significant seed source variation in different genotypes. Maximum germination and survival of 68.33 and 64% respectively were recorded in Manasbal genotype from Kashmir valley. Height during one growing season recorded maximum (160 cm) in Onegam (Baramullah). Diameter also recorded significant variations. Genetic estimates also recorded variation and overall estimate of genotypic coefficient of variation was less in magnitude than phenotypic coefficient of variation. Heritability (broad sense) of 28.92 was recorded maximum for height. The study concludes that all the characters studied can be considered as an important trait for the selection.

Key words : *Prunus armeniaca*, Genotypes, Germination, Genetic estimates, Seed source variation.

The apricot fruit (*Prunus armeniaca*) ranks second next to plum among the stone fruits in India in area, production and popularity. It is a drought resistant, salt tolerant, hardy plant being rather less susceptible to pests and diseases. It is an important tree of multiple use such as feed, fodder, fuel and oil. As regards the distribution of species, it is occurring throughout north-west Himalaya between altitude of 1,000—3,000 m. The tree has assumed greater significance in the recent past because of its being a potential source of edible oil, as the kernels yield up to 53% of edible oil (1). The per capita consumption of edible oil is around 10 kg per year and India imports about 5.0—5.5 million tonnes of vegetable oil annually, which is about 40% of domestic edible oil requirement. The demand of edible oil is expected to grow by 3—4% per year over the next five to ten years. In spite of wild apricot being an important tree borne oil seed no effort for the genetic improvement of this species have been made. Variability studies are the prerequisite for genetic improvement of a tree species, under various agro-climatic conditions (2, 3). Selection of best provenance of desired species for a given site or region is necessary for achieving maximum production both in plantation and agro-forestry systems.

The significance of variation studies and seed source testing in forest tree improvement has been well realized (4, 5). Source tests in native species are desirable to screen the available variation for higher productivity and future breeding work (6). An effective selection program is based on an evaluation of the amount and type of variation at each level and then selecting the best individual based on that evaluation. Seed source variation and tree to tree differences greatly account for bulk of genetic variation found within a tree species. An attempt was made in the present study to evaluate seed source variation at nursery stage and also to estimate genetic variation and heritability in different seed sources of wild apricot.

Methods

An extensive survey was conducted during 2004-05 to screen natural populations of wild apricot in different districts of Jammu and Kashmir viz. Anantnag, Pulwama, Budgam, Srinagar, Baramulla, Kupwara, Kargil and Leh. Materials for the present study consisted of 17 seed sources of wild apricot collected from these sites. These sites greatly vary in their altitude, latitude and longitude (Table 1).

Table 1. Geographical description of seed sources.

	Source	District	Altitude (m)	Latitude	Longitude
1	Arwani	Anantnag	1,638	33°-43' N	75°-09' E
2	Shopian	Pulwama	1,815	33° -50' N	74°-44' E
3	Malangpora	Pulwama	1,638	33°-50' N	74°-44' E
4	Budgam	Budgam	1,700	35°-56' N	74°-36' E
5	Ganderbal	Srinagar	1,850	34°-05' N	74°-50' E
6	Manasbal	Baramulla	1,620	34°-12' N	75°-22' E
7	Chitternar	Baramulla	1,650	34°-12' N	75°-22' E
8	Onegam	Baramulla	1,600	34°-12' N	75°-22' E
9	Kupwara	Kupwara	2,000	34°-40' N	74°-24' E
10	Uri	Baramulla	1,300	34°-03' N	74°-02' E
11	Poyen	Kargil	2,700	34°-34' N	76°-08' E
12	Akchmal	Kargil	2,800	34°-34' N	76°-08' E
13	Minjee	Kargil	2,800	34°-34' N	76°-08' E
14	Saspool	Kargil	3,030	34°-34' N	76°-08' E
15	Leh	Leh	3,514	34°-09' N	77°-34' E
16	Zangash	Leh	3,514	34°-09' N	77°-34' E
17	Rambhirpur	Leh	3,514	34°-09' N	77°-34' E

In the selected stands (seed source) of wild apricot, fruits were harvested from phenotypically superior trees, depending upon the availability of the ideal types (fruit size, disease free, which were 100 to 300 m apart to avoid narrowing down the variation in samples due to relatedness or inbreeding (7). The seeds from each site/source were extracted from fruits, washed and sun dried. The seeds were kept in cotton bags, separately with proper identity of the site and stored at temperature of 4 ± 1 C till their sowing in November.

The study was conducted at forest nursery of Faculty of Forestry SKUAST-K, Shalimar. The experimental site is situated between 34° and 34°-30' north latitude and 74°-30' and 75° east longitude at an elevation of 1,570 m above mean sea level. The soil at the experimental site is silty clay loam in texture with good water holding capacity with a pH of 6.5. Seeds of wild apricot before their sowing were subjected to float test for 48 hours and floating seeds were discarded. Sowing was done in November 2005 and 100 seeds each in three replicates were used.

Germination percent of seeds was recorded in the nursery beds till the germination ceased. The morphological parameters of the seedlings were recorded after the completion of one growing season. The experiment was laid out in randomized block design and the analysis of data was done as per standard statistical methods (8).

Results and Discussion

Source variation in germination and seedling morphological characteristic in wild apricot is presented in Table 2. Statistical analysis shows significant variation among seed sources for all the characteristics studied.

Germination recorded a variation between 47.66 and 68.33%. Maximum germination of 68.33% was recorded in Manasbal (Baramulla) and Saspool (Leh) followed by 62% in Akchmal (Kargil). Only two seed sources i.e. Arwani (Anantnag) and Shopian (Pulwama) recorded germination percent of less than 50%. Survival after one growing season ranged between 37.33 and 66.33%. Maximum survival (66.33%) was again recorded in Manasbal followed by 64% in Saspool and both the sources stood at par in as far as survival is concerned.

Regarding growth in terms of height and diameter during one growing season, significant differences were observed. Maximum height of 160 cm was recorded in Onegam (Baramulla) seed source followed by 151.1 cm in Rambhirpur (Leh) source and both the sources differed significantly from all other sources. Minimum height of 125.5 cm was recorded in Poyen (Kargil) seed source. Maximum diameter of 10.66 mm differing significantly from all other sources was recorded in Kupwara followed by 8.86 mm in Onegam (Baramulla). Budgam source recorded a minimum di-

Table 2. Seed source variation in germination, survival and morphological parameters of wild apricot (*Prunus armeniaca*) of Kashmir and Ladakh region at nursery stage.

Source	Germination (%)	Survival (%)	Average height (cm)	Average collar diameter (mm)	Av. no. of branches/plant
1 Arwani	47.66	37.33	146.8	7.78	13.30
2 Shopian	48.66	45.71	149.7	8.36	9.80
3 Malangpora	54.00	49.33	142.2	8.05	11.20
4 Budgam	55.33	50.00	132.8	7.10	8.10
5 Ganderbal	50.33	49.33	131.1	7.20	9.60
6 Manasbal	68.33	66.33	139.1	8.01	9.10
7 Chitternar	58.66	55.00	146.7	8.55	11.00
8 Onegam	48.66	37.33	160.0	8.86	10.80
9 Kupwara	53.33	52.00	140.7	10.66	9.60
10 Uri	56.66	52.33	129.5	7.12	10.76
11 Poyen	59.33	57.33	125.5	7.72	9.13
12 Akchmal	62.00	60.00	128.1	7.86	10.76
13 Minjee	59.33	57.00	123.7	7.12	8.76
14 Saspool	68.33	64.00	129.8	7.67	10.70
15 Leh	58.33	53.33	128.8	7.61	9.96
16 Zangash	60.33	55.66	139.6	7.61	7.13
17 Rambhirpur	55.66	52.00	151.1	8.35	11.63
Range Maximum	68.33	66.33	160.0	10.66	13.30
Minimum	47.66	37.33	125.5	7.10	7.13
SE \pm	1.31	2.35	2.38	0.27	0.60
CD 5%	2.66	4.77	4.83	0.54	1.22

iameter of 7.10 mm. Number of branches was recorded maximum (13.30) in Arwani (Anantnag) while as minimum 7.13 was recorded in Zangash (Leh).

A basic knowledge about the nature and extent of source variation in relation to germination, survival and growth parameters is useful for the production of quality seedlings. It has been demonstrated that seeds of a single species when collected from different sources or from different altitudes, differ in viability, germination, growth and biomass performance (5, 9, 10). Variations in seed and seedling traits among and within sources suggest that selection among sources might result in rapid genetic gain for the traits (11).

Genetic estimates for different parameter were also estimated (Table 3). The values of phenotypic coefficient of variation and genotypic coefficient of variation ranged from 10.00 to 29.87 and 5.04 to 9.55 respectively. Over all the estimate of genotypic coefficient of variation was less in magnitude than phenotypic coefficient of variability. Genotypic coefficient of variability was maximum in collar diameter (9.55) followed by 8.16 in germination percent. Envi-

ronmental coefficient of variability in different parameter ranged between 8.72 in height to 29.38 in number of branches.

Heritability (broad sense) estimates of all the parameter ranged between 5.5 in collar diameter to 28.92 in height. Sagwal (12) also recorded high heritability for height in *Pinus roxburghii*, besides Toda (13) observed high heritability for height and stem girth in *Cryptomeria japonica*. Seed germination percent recorded a heritability of 22.64. Broad sense heritability may give useful indication about the value of selection in the material at hand.

The observations recorded here show that seeds of wild apricot collected from 17 sources show variation in all the characteristics studied. This variation in various parameters under study could be explained as result of differences in rainfall, temperature, altitudes, latitude, longitude and soil types. These populations could have experienced differential selection pressures. Such variation in relation to habitat has also been reported in *Albizia lebbak* (14) *Picea glauca* (15) and *Albizia chinensis* (16). All the characters studied can be considered as important trait

Table 3. Genetic estimates of different parameters in wild apricot.

Parameters	Phenotypic coefficient of variation	Genotypic coefficient of variation	Environmental coefficient of variation	Broad sense heritability (%)
1 Germination (%)	17.16	8.16	15.10	22.64
2 Survival	23.65	7.11	22.57	9.03
3 Height	10.00	5.56	8.72	28.92
4 Collar diameter	17.73	9.55	17.23	5.5
5 No. of branches	29.87	5.04	29.38	2.94

for the selection. However, seed source selection should be on the basis of multi traits as reported by Ginwal et al. (17) and Vakshasya et al. (3).

References

- Anonymous. 1969. *The wealth of India, raw material*. Volume 8. CSIR, New Delhi, India. 256—261 pp.
- Sharma N. K., U. Burman, J. C. Tewara, M. D. Bhora and L. N. Harsh. 1994. Variability studies in pod and seed characteristics of *Prosopis juliflora* (S.W) D.C *Indian J. of forestry* 17 : 161—165.
- Vakshasya R. K., O. P. Rajora and M. S. Rawat. 1992. Seed and seedling traits of *Dalbergia sisso*. Roxb. : Seed source variation studies among ten sources in India. *For. Ecol. Manag.* 48 : 265—275.
- Salazar R. 1989. Genetic variation of 16 provenances of *Acacia mangium* at nursery level in Turrialba, Costa Rica. *Commonwelth. For. Rev.* 68 : 263—272.
- Isik K. 1986. Altitudinal variation in *Pinus brutia* Ten : Seed and seedling characteristics. *Silvae Genetica* 35 : 58—67.
- Burley J. and P. J. Wood. 1976. *A manual of species and provenance research with particular reference to the tropics*. CFI. *Trop. For. Paper* No. 10. Univ. Oxford, UK.
- ISTA. 1996. *International rules for seed testing*. Seed Sci. and Technol. Volume 24. Supplement. Int. Seed Testing Assoc., Zurich.
- Gomez K. A. and A. A. Gomez. 1984. *Statistical procedures for agricultural research*. 2nd edition. John. Willey and Sons. Inc., New York, USA. 680 pp.
- Todaria N. P. and A. K. Negi. 1995. Effect of elevation and temperature on seed germination of some Himalayan tree species. *Pl. Physiol. and Biochem.* 22 : 178—182.
- Chauhan S., A. K. Negi and N. P. Todari. 1996. Effect of provenance variation and temperature on seed germination of *Alnus nepalensis*. *Pl. Physiol. and Biochem.* 23 : 94—95.
- Dangasuk O. G., P. Seurei and S. Gudu. 1997. Genetic variation in seed and seedling traits in 12 African provenances of *Faidherbia albida* (Del), A Chev. At lodwar, Kenya. *Agrofor. Syst.* 37 : 133—141.
- Sagwal S. S. 1991. Genetic variation and heritability in chir pine (*Pinus roxburghii*) at P. B. IV stage. *J. Trop. For.* 7 : 165—168.
- Toda R. 1958. Variation and heritability of some quantitative characters in *Cryptomeria*. *Silva Genet.* 7 : 87.
- Kumar N. and O. P. Toky. 1996. Variation in seed germination and juvenile growth of 12 provenances of *Albizia lebbek* (L) Benth. in arid India. *Ind. J. For.* 19 : 123—128.
- Khalil M. A. K. 1986. Variation in seed quality and some juvenile characters of white spruce (*Picea glauca*. Moeneu Voss). *Silva Genet.* 35 : 78—85.
- Dhanias C. S., A. K. Uniyal and N. P. Todaria. 2003. Source variation in *Albizia chinensis* (Osbeck) Mer : Seed and seedling characteristics : *Silva Genet.* 52 : 5—6.
- Ginwal H. S., M. Gera and R. L. Srirasta. 1996. Seed source variability in some seed and seedling characteristic of twenty provenance of *Acacia nilotica* willd. Ex. DEL. *Range. Mgmt. and Agrofor.* 17 : 49—59.