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Seed Source Variation and Correlation Studies in Wild Apricot (*Prunus armeniaca* Linn.) Genotypes of Kashmir and Ladakh Region

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

Faculty of Forestry, SK University of Agricultural Sciences & Technology-K
Shalimar, Srinagar 191121, India
E-Mail : ahmughall@rediffmail.com

Abstract

The study was conducted during the year 2005-06 and a total of 17 seed sources of wild apricot were evaluated from Kashmir and Ladakh region of Jammu and Kashmir. Results of the study revealed significant seed sources variation in different genotypes. Maximum stone and kernel weights of 147.45 g/100 and 49.91 g/100 respectively were recorded in Minji genotype from Kargil. Germination of seeds in the field also recorded variations and maximum germination of 68.33% was recorded in Saspool (Kargil). Percent oil yield which was one of the important criteria of the present study varied between 40.35% in Onegam (Baramulla) to 52.42% in Budgam seed source. Correlation studies among various traits was also worked out and a significant positive correlation of stone weight and kernel weight with their respective length, width and diameter was recorded. The study further suggests that seeds with large morphological dimensions should be collected for oil extraction purposes as they will yield higher oil percentage.
Key words : *Prunus armeniaca*, Genotypes, Tree borne oil seed, Oil content.

The center of origin of apricot is believed to be North East China. The distribution of cultivated apricot, its wild forms and allied species is reported in temperate zone of Asia between 33° and 70° E longitude and 53° and 30° N latitude (1). In India it is found almost naturalized in the North West Himalayas, particularly in the states of Jammu and Kashmir, Himachal Pradesh and Uttranchal. In Jammu and Kashmir wild apricot is grown through out the state except in Jammu district. Major apricot growing belts are in Leh, Kargil, Anantnag and Pulwama districts.

Wild apricot (*Prunus armeniaca*) is an important stone fruit and ranks second next to plum among the stone fruits in India in area, productions and popularity (1). It is commonly known as Khubani or Chuli. It is multipurpose in its use and is a prominent tree bone oil seed crop (TBO). The tree has assumed greater significance in the recent past because of its being a potential source of edible oil, as the kernels yield about 50% of edible oil (2). 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. Plantation of wild apricot on degraded lands will not only increase the green cover but also increase edible oil production, thus bridging the gap between demand and supply of edible oil. Research, based on wild apricot as a source of tree borne oil crop is quite scanty but none the less there are a few studies which suggest that the kernel of apricot yield edible oil between 40—50%. The oil has 90—93% unsaturated fatty acids and is rich in oleic and linoleic acids (3). Wild apricot is naturalized in many parts of the J and K state and genetic variation is expected in fruit, seed, seedlings and tree characteristics, which if studied will help in developing effective tree breeding and improvement strategies. Kernel weight which is directly related with oil yield is a complex character and is dependent on a number of nut components, therefore, information on the association of different characters among them self and their relationship with kernel weight are of paramount importance for making the selection. The significance of variation studies and source testing in forest tree improvement has been well realised (4, 5). Source tests in native species are desirable to screen the available variation for higher productively and further breeding work. The significance of source

Table 1. Variation in Biometrical traits and germination percent of wild apricot genotypes (stone).

	Seed source Village (district)	Weight (g)/ 100 seeds	Length (mm)	Width (mm)	Dia-meter (mm)	Germi-nation (%)
1.	Arwani (Anantnag)	117.76	20.41	15.89	10.56	47.66
2.	Shopian (Pulwama)	125.22	20.62	16.34	10.59	48.66
3.	Malangpora (Pulwama)	116.00	20.39	15.00	10.34	54.00
4.	Budgam (Budgam)	116.50	20.21	15.61	10.82	55.33
5.	Ganderbal Srinagar)	114.14	20.49	17.27	10.74	52.53
6.	Manasbal (Baramulla)	138.08	21.67	16.89	11.29	68.33
7.	Chitternar (Baramulla)	113.80	18.22	14.38	9.63	58.66
8.	Onegam (Baramulla)	114.42	19.91	15.04	10.17	48.66
9.	Kupwara (Kupwara)	105.40	14.25	10.43	5.14	53.33
10.	Uri (Baramulla)	116.18	20.92	14.87	9.74	56.26
11.	Poyen (Kargil)	73.50	18.43	15.82	9.48	59.33
12.	Akchmal (Kargil)	95.02	18.51	14.96	10.01	62.00
13.	Minjee (Kargil)	147.54	21.60	16.85	10.92	59.33
14.	Saspool (Kargil)	122.38	18.55	15.56	10.15	68.33
15.	Leh (Main city) (Leh)	114.70	20.78	15.35	9.97	58.33
16.	Zangash (Leh)	135.48	19.21	16.31	11.36	60.33
17.	Rambhir pur (Leh)	143.12	19.51	16.42	11.20	55.66
Range	Max	147.54	21.67	17.27	11.36	68.33
	Min	73.50	14.25	14.38	5.14	47.66
	SE ±	1.1	0.22	0.18	0.05	1.31
	CD 5%	7.27	1.43	1.23	0.39	8.59

variation in seed and seedling traits has been documented well by a good number of authors in a number of tree species viz. *Pinus banksiana* lamb (6), *Albizia chinensis* (7). The best and highly adaptable seed

Table 2. Variation in Biometrical traits and oil content of wild apricot genotypes (kernel).

	Seed source Village (district)	Weight (g)/100 seeds	Length (mm)	Width (mm)	Dia-meter (mm)	Oil content (%)
1.	Arwani (Anantnag)	37.42	13.33	9.60	6.01	43.62
2.	Shopian (Pulwama)	36.55	13.29	9.76	5.51	49.32
3.	Malangpora (Pulwama)	36.16	12.37	9.12	5.73	50.90
4.	Budgam (Budgam)	37.00	12.86	9.33	6.10	52.42
5.	Ganderbal (Srinagar)	36.90	13.36	9.32	5.69	48.12
6.	Manasbal (Baramulla)	42.30	13.88	9.97	5.63	49.01
7.	Chitternar (Baramulla)	39.40	13.52	9.57	6.11	48.11
8.	Onegam (Baramulla)	33.47	12.96	9.32	5.44	40.35
9.	Kupwara (Kupwara)	34.64	13.23	9.72	5.55	48.13
10.	Uri (Baramulla)	38.80	14.02	9.49	5.74	45.57
11.	Poyen (Kargil)	34.11	12.94	9.79	5.77	50.23
12.	Akchmal (Kargil)	33.88	13.02	9.59	5.48	52.01
13.	Minjee (Kargil)	49.91	14.67	11.30	6.09	50.25
14.	Saspool (Kargil)	33.76	13.41	9.77	5.65	47.51
15.	Leh (Main city) (Leh)	34.98	13.61	9.98	5.25	50.61
16.	Zangash (Leh)	38.90	12.86	10.11	6.08	52.18
17.	Rambhir pur (Leh)	39.22	13.31	10.35	6.43	51.89
Range	Max	49.91	14.67	11.30	6.43	52.42
	Min	33.47	12.37	9.12	5.25	40.35
	SE ±	0.40	0.11	0.06	0.15	0.02
	CD 5%	2.64	0.73	0.43	0.31	0.15

Table 3. Correlation coefficient between various stone and kernel characteristics of wild apricot genotypes. ** Significant at 1% ; * Significant at 5%.

	Stone					Kernel				
	Weight	Length	Width	Dia-meter	Germi-nation	Wei-ght	Len-gth	Wi-dth	Dia-meter	Oil con-tent
Stone										
Weight	–									
Length	0.336**	–								
Width	0.318**	0.586**	–							
Diameter	0.427**	0.693**	0.754**	–						
Germination	0.107	0.021	0.102	0.099	–					
Kernel										
Weight	0.541**	0.375**	0.242*	0.305**	– 0.009	–				
Length	0.222**	0.264*	0.094	0.062	0.119	0.452**	–			
Width	0.344**	0.197	0.177	0.155	0.165	0.518**	0.584**	–		
Diameter	0.292**	0.098	0.094	0.253*	– 0.110	0.303**	0.010	0.332**	–	
Oil content	0.083	– 0.024	0.128	0.163	0.256*	0.155	–0.086	0.243*	0.199	–

sources can be identified for further breeding program with emphasis on germination and oil yield from the seed and kernel respectively. Since the tree has been recognized as an important tree borne oil crop for the temperate region for bridging the gap between demand and supply of edible oil, so in the first instance it was thought appropriate to study seed source variation in seed and kernel characteristics of different wild apricot genotypes in Kashmir and Ladakh region, so that high oil yielding sources can be identified. The present study was carried out at Faculty of Forestry SKUAST-K, Shalimar under NOVOD, Board sponsored project.

Methods

The study was conducted during 2005-06 and the experimental sites for the study were located in the state of Jammu and Kashmir situated between 32° 17´ and 37° 6´North latitude and 73° 26´ and 80° 36´ East longitude. A total of 17 seed sources were selected in Kashmir and Ladakh region with altitude varying between 1,620 and 3,524 m above msl. The sources varied both in altitude and altitude.

Seeds were collected from 10 trees at least 100 m away from each other. Seeds so collected were bulked together for recording observations. Following observations were recorded during the course of study. Weight of stone and kernel, recorded on top of sensitive digital balance ; 100 seeds each in eight replications were used for determining stone and kernel weight. Length, width and diameter of stone and kernel were recorded by digital vernier calliper. Randomly 50 seeds each in four replications were used for recording morphological characters. Germination percent of seeds was recorded after sowing the seeds in the nursery beds in winter. A total of 500 seeds in four replications were used for the test. Observations with regard to germination percent were recorded after germination was complete in spring. Percent oil content was determined by using Soxhlet apparatus and 50 g each of well ground kernels in four replications were used for determining the oil percentage from the kernels. The analysis of data was done following standard statistical methods, simple Pearson correlation was used for working out relation among different stone and kernel characteristics.

Results and Discussion

Tables 1 and 2 reveal significant source variation with respect to weight, length, width, diameter and germination percentage of both seed and kernel. Seed weight recorded a range of 73.5 and 147.54 g/100 seed. Maximum stone weight of 147.54 g/100 seeds significant at 5% level was recorded in Minji

(Kargil) followed by 143.12 g / 100 seeds in Rambirpur (Leh). Lightest seed was that of Poyen (Kargil) i.e. 73.50 g / 100 seeds. Maximum stone length of 21.67 mm was recorded for Manasbal (Baramulla), while maximum width of 17.27 mm was recorded in Ganderbal source. Diameter of stone was recorded to be maximum in zangash (Leh) (11.36 mm), while minimum diameter of 5.14 mm was recorded in Kupwara. Germination was recorded to be maximum (68.33%) in Manasbal (Baramulla) and Saspool (Kargil) provenance followed by 62% in Akchmal (Kargil). However, it was at par with the germination percent recorded in Manasbal and Saspool. Minimum germination percent of 47.66 was recorded in Arwani (Anantnag). Kernel weight was also recorded to be maximum in Minji (Kargil) i.e. 49.91 g / 100 seeds while lightest kernel was that of Onegam (Baramulla) (33.47 g / 100 seeds). Similarly significant variations were recorded in kernel length, width and diameter. Maximum length and width of 14.67 and 11.30 mm respectively were recorded in Minji (Kargil) seed source. Maximum kernel diameter of 6.43 mm was recorded in Rambirpur (Leh). In an earlier study, Sofi and associates (8) also recorded significant differences for all the characters studied viz. weight, length, breadth and diameter of both kernel and stone in 25 cultivars of grafted apricots from Kargil. So it is expected that the wild apricot sources are also bound to have variation.

Percent oil content recovered from the kernels also recorded significant variations and the oil content ranged between 40.35% in Onegam (Baramulla) to 52.42% in Budgam seed source of Kashmir region, whereas in Leh region Zangash recorded maximum oil content of 52.18% and minimum of 47.01% was recorded in Saspool seed sources. Although more than 12% variation was observed in maximum and minimum oil content of various seed sources but eight seed sources yielded more than 50% oil content, which is a welcome aspect and can be exploited for oil improvement program.

Correlation for all possible comparisons among various traits was also worked out (Table 3) and a significant positive correlation of stone weight with that of stone length, width and diameter was recorded. Similarly positive correlation of stone weight was revealed with kernel weight, length, width and diameter. Stone length also recorded positive correlation with stone width and diameter and also with weight and length of kernel. Width of stone also recorded positive correlation with diameter of stone and weight of kernel. Stone diameter also recorded positive correlation with weight and diameter of kernels. Similarly kernel weight also recorded significant positive correlation with length, width and diameter of kernel. Stone and kernel weights are dependent factors and have a positive correlation with length, width and diameter and the study is in conformity with the establishment norms. Chaudhary and Singh (9) also recorded significant and positive correlation of nut weight with nut length, nut breadth, nut thickness and seed weight in 25 single tree selections of grafted apricot from Shimla, Kinnaur and Lahaul-Spiti. Higher magnitudes of genotypic correlations, compared to their corresponding phenotypic correlation among different traits in apricot have been reported by Soft et al. (8). Significant and positive correlation studies have been found with fruit length, fruit check diameter, stone weight and kernel weight at both genotypic and phenotypic levels in 28 grafted apricot genotypes by Mir et al. (10). Another significant and important positive correlation was observed with width of kernel and oil content. Germination of seeds also had a positive correlation with oil content.

The main aim of the present study was to identify the sources yielding higher percentage of oil, which is first of its kind in the state. Budgam, Z angash, Akchamal, Rambirpore, Malangpora, Leh, Minji and Poyen are the best sources for the purpose, as all the sources yield more than 50% of oil and can be used in future breeding programs. In addition to this kernel width has a positive relationship with oil yield, therefore seeds with large morphological dimensions should be selected for oil purposes, thus increasing economic returns to the small and marginal farmers of Kashmir and Ladakh regions.

References

1. Bal J. S. 1997. Fruit growing. Kalyani Publ., Ludhiana, India.
2. Anonymous. 1969. The wealth of India. Raw Materials, volume 8. CSIR, New Delhi, India.
3. Sarin Y. K. and B. K. Kapahi. 1986. Commercial utilization of oil seeds from some west Himalayan trees. Pages 160—173 *in* H. C. Srivastava, Bhartendu Valsya and K. K. G. Menon, editors. Plantation crops opportunities and constraints. Oxford and IBH Publ.

Co. Pvt. Ltd., New Delhi, India.
4. Salazar R. 1989. Genetic variation of 16 provenances of *Acacia mangium* at nursery level in Turrialba, Costa Rica. Common Wlth For Rev. 68 : 263—272.
5. Isik K. 1986. Altitudinal variation in *Pinus brutia* Ten : Seed and seedling characteristics. Silvae Genetica 35 : 58—67.
6. Yeatman C. W. 1966. Germinant size of Jack pine in relation to seed size and geographic origin. Proc. 2nd Gen. Works. Soc. Am. For., US For Serv. Res. Pap. NC–6, pp. 28—36.
7. Dhania C. S., A. K. Uniyal and N. P. Todaria. 2003. Source variation in *Albizia chinensis* (Osbeck) Mer : Seed seedling characteristics. Silvea Genetica 52 : 5—6.
8. Sofi A. A., Z. Gul and M. S. Mir. 2001. Genetic variability and association of component characteristics for fruit weight in apricot (*Prunus armeniaca* L.) cultivars of Kargil (Ladakh). Indian J. Hort. 58 : 239—243.
9. Chaudhary V. K. and N. B. C. Singh. 1998. Investigations on variability, correlation and path analysis between kernel yield and other nut characters in Wild Apricot. Indian J. Agric. Res. 32 : 149—154.
10. Mir M. S., M. A. Dalal, Gul Zaffar and A. A. Khan. 2007. Correlation studies in vegetatively propagated apricot (*Prunus armeniaca*) genotype of Ladakh (J & K). SKUAST-J. Res. 9 : 133—137.