Himachal Journal of Agricultural Research 35 (1):57-60 , 2009

Studies on variability and nut characteristics of seedling walnuts (*Juglans regia* L.) growing in Ladakh region of India

O. C. Sharma, L. Ali, N. A. Ganai and Deldan Namgyal
Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir
Krishi Vigyan Kendra and Regional Agricultural Research Station
P. Box No. 146, Leh, Ladakh-194 101 (J&K).

Abstract

Forty two seedling trees of Persian walnut growing at Domkhar area of Ladakh region of India were evaluated for various nut and kernel characters to know the extent of variability for various traits and selection of elite types for high altitudes. The coefficient of variability observed for various characters like nut weight, nut width, nut height, nut thickness, index of roundness, pad thickness, pad width, shell thickness, kernel weight, kernel width, kernel height, kernel thickness and kernel percentage were 20.28, 8.62, 10.61, 9.73, 8.70, 22.95, 19.72, 19.18, 22.50, 10.01, 12.84, 12.41 and 16.04 per cent, respectively. Tree No. 1 produced nuts which are superior for most of traits and can be used as future cultivar to boost walnut cultivation at such high altitudes.

Key words: Walnut, *Juglans regia*, nut, variability.

Introduction

Walnut (*Juglans regia* L.) belongs to family Juglandaceae and is one of the most important nut crops grown in India. In India mostly walnuts were grown in Jammu & Kashmir, Uttranchal, Himachal Pradesh and upto limited extent in North Eastern states. Jammu & Kashmir has monopoly in area and production of walnut. The walnut production in India is associated with a lot of problems and still mostly walnuts of seedling origin are being grown. The walnuts have high nutritional value containing high contents of protein and fats. Walnut is found successfully growing from 1200 to 2200 m asl, but in present survey it was found growing at altitude more than 3000 meters. Ladakh region of India which includes Leh & Kargil districts of J&K is cold arid region and climatic conditions are very harsh. The choice of growing fruits is also very limited due to poor adaptability of fruit plants taken from other parts of country. The growing season is also limited to five months only, so very limited increment in annual growth takes place. As walnut is monoecious tree and cross pollination took place through wind. Continuous cross pollination and seed propagation gives an opportunity to select elite types which can be used as cultivar in future. Variability is the pre-requisite for any breeding programme to screen out elite types. So, in present study effort has been made to study the extent of variability in nut & kernel characters of seedling walnuts so that better types can be solated to release them as cultivars to high altitudes of cold arid region of India.

Material and Methods

Survey study was carried out during 2006 in a walnut growing area of Ladakh named as Domkhar area. The area was situated at $34^0$24.179'N & $76^0$45. 995'E having altitude of about 3045 meters above mean sea level. A sample size of 20 sun dried nuts was used from each seedling tree for recording data on 26 nut and kernel characters. Nuts were collected from 42 bearing seedling trees. Data on various nut characters was recorded as per descriptor of UPOV (1988) and IPGRI (1994). The mean, standard deviations and coefficients of variability were calculated as per method given by Panse and Sukhatme (1985).

Results and Discussion

Data on various metric nut and kernel characters of different seedling trees along with coefficient of variability are presented in Table.1.The nuts produced by Tree No.1 had maximum nut weight (16.64g), nut width (35.61 mm), nut thickness (36.39 mm) and kernel weight (6.14g). The minimum nut weight (6.08g), nut width (22.29 mm) and nut thickness (22.13 mm) were recorded in Tree No.19 while minimum kernel weight (2.60g) was found in Tree No.33. The respective coefficients of variability for these characters were 20.28, 8.62, 9.73, and 22.50 per cent. The nut height, index of roundness, pad thickness, pad width and shell thickness ranged between 26.92 mm (Tree No 3) to 42.72 mm (Tree No31), 0.74 (Tree No 22) to1.00 (Tree No 8), 2.69 mm (Tree No 19) to 6.89mm (Tree No 28), 2.31 mm (Tree No 6) to 6.91 mm (Tree No 29) and 0.97 mm (Tree No 7) to 2.34 mm (Tree No 31), respectively.

Table 1. Nut and kernel characters of various seedling trees growing at Domkhar area of Ladakh.

Tree No.	Nut weight (g)	Nut width (mm)	Nut height (mm)	Nut thickness (mm)	Index of roundness	Pad thickness (mm)	Pad width (mm)	Shell thickness (mm)	Kernel weight (g)	Kernel width (mm)	Kernel height (mm)	Kernel thickness (mm)	Kernel percentage
1	16.64	35.61	37.54	36.39	0.96	5.64	4.97	1.74	6.14	23.21	31.1	29.81	36.90
2	14.48	33.79	34.40	33.92	0.98	4.46	6.90	2.26	5.20	19.17	28.07	26.44	35.91
3	12.17	25.57	26.92	24.99	0.94	5.91	5.32	2.15	4.54	20.27	26.16	25.13	37.30
4	12.09	32.27	31.98	29.27	0.96	3.09	4.63	1.78	5.15	21.61	26.37	25.81	42.60
5	11.13	28.61	33.32	28.67	0.86	3.32	3.40	1.42	5.59	21.56	28.93	25.27	50.22
6	10.54	28.54	35.54	28.81	0.81	3.23	2.31	1.39	5.37	20.96	29.28	23.38	50.95
7	9.77	25.96	32.08	26.65	0.82	3.15	4.63	0.97	4.88	18.94	27.22	22.29	49.95
8	7.86	29.44	29.81	29.91	1.00	4.49	4.27	1.34	3.77	20.44	22.13	24.37	47.96
9	7.84	27.45	28.07	27.37	0.98	4.99	4.20	1.62	2.69	16.32	19.47	20.65	34.31
10	10.59	28.94	28.96	27.95	0.98	3.20	4.35	1.75	3.56	22.78	25.41	21.61	33.62
11	10.07	28.07	34.70	27.14	0.80	4.70	4.77	1.31	4.31	19.74	28.82	22.70	42.80
12	13.42	30.79	34.48	32.60	0.92	5.71	2.50	2.03	4.84	20.98	24.75	26.39	36.07
13	10.68	31.03	36.50	26.89	0.79	3.51	6.06	1.71	3.32	18.31	26.13	21.83	31.09
14	12.87	30.49	32.32	30.60	0.95	5.77	5.44	1.77	4.68	19.95	29.26	26.46	36.36
15	10.04	28.41	28.71	28.23	0.99	3.61	4.79	1.66	4.11	21.44	21.33	21.97	40.94
16	10.18	31.8	41.18	31.17	0.76	4.09	4.46	1.42	3.44	22.55	32.14	25.97	33.79
17	12.28	34.19	34.56	30.10	0.93	5.31	5.62	1.49	5.25	21.64	24.98	23.42	42.75
18	12.43	27.88	35.62	25.85	0.75	2.83	5.16	2.03	4.89	20.38	27.51	24.09	39.34
19	6.08	22.29	27.54	22.13	0.81	2.69	3.31	1.05	3.06	16.83	20.04	18.39	50.33
20	11.56	28.52	31.64	29.84	0.92	4.16	5.32	1.94	4.13	19.85	21.31	20.71	35.73
21	13.61	34.07	36.43	34.89	0.95	4.54	6.11	1.75	5.40	21.68	24.98	23.95	39.68
22	11.55	28.97	40.51	30.71	0.74	3.71	5.31	1.79	3.92	20.31	25.70	21.01	33.94

Contd...

23	6.42	31.17	34.61	30.85	0.90	5.54	5.24	2.04	2.64	21.20	28.15	21.12	41.12
24	9.20	30.32	31.53	27.63	0.92	3.62	6.21	1.47	3.17	20.36	23.29	22.83	34.46
25	11.24	28.51	31.64	30.39	0.93	4.64	4.72	1.76	4.63	22.21	25.48	24.16	41.19
26	12.70	28.79	36.09	30.81	0.83	4.37	4.40	2.31	4.15	18.92	27.12	22.96	32.68
27	9.88	28.26	32.82	30.55	0.90	3.01	5.04	1.57	3.30	17.52	23.72	23.44	33.40
28	12.20	30.55	35.35	30.94	0.87	6.89	4.09	1.76	4.65	19.96	27.68	23.74	38.11
29	14.45	33.41	35.98	34.14	0.94	4.63	6.91	2.26	5.29	22.17	23.29	29.46	36.61
30	10.30	30.15	35.27	30.23	0.86	3.97	5.56	1.39	3.80	18.08	27.75	24.71	36.89
31	13.80	31.41	42.72	35.78	0.79	4.12	5.63	2.34	5.88	21.62	32.43	28.89	42.61
32	12.20	28.21	36.97	28.77	0.77	4.58	4.75	1.99	4.57	17.75	27.96	22.26	37.46
33	8.60	29.87	30.33	28.21	0.96	4.47	5.43	1.95	2.60	18.54	19.42	21.59	30.23
34	13.29	32.01	35.88	32.34	0.90	3.71	5.94	2.05	4.93	20.12	25.01	23.30	37.10
35	8.55	30.18	31.44	27.77	0.92	4.13	4.91	2.02	2.67	17.02	20.75	19.54	31.23
36	11.80	31.96	38.09	33.18	0.86	2.91	4.40	2.01	3.56	22.61	26.95	33.44	30.17
37	14.60	30.85	38.98	31.10	0.79	5.72	4.34	1.70	5.52	24.20	30.97	24.85	37.81
38	11.16	29.05	36.08	28.04	0.79	3.37	5.09	1.94	3.20	17.30	24.51	20.56	28.67
39	9.20	28.89	34.09	28.05	0.84	3.98	5.26	1.55	4.90	20.12	24.18	22.72	53.26
40	10.88	27.30	35.32	29.16	0.80	5.15	5.51	1.43	5.00	16.46	28.72	24.28	45.96
41	9.90	28.65	35.96	27.97	0.79	4.38	4.88	1.80	3.50	18.51	24.28	20.82	35.35
42	8.42	26.04	30.40	27.23	0.88	4.51	3.87	1.22	3.64	16.97	22.65	21.42	43.23
Range	6.08-16.64	22.29 - 35.61	26.92 - 42.72	22.13 - 36.39	0.74 - 1.00	2.69 - 6.89	2.31 - 6.91	0.97 - 2.34	2.60-6.14	16.32 - 24.20	19.42 - 32.43	18.39 - 33.44	28.67 - 53.26
SD	2.25	2.56	3.62	2.89	0.08	0.98	0.97	0.33	0.96	2.00	3.32	2.95	6.22
Mean	11.11	29.72	34.10	29.70	0.88	4.28	4.91	1.74	4.28	20.01	25.84	23.76	38.81
COV	20.28	8.62	10.61	9.73	8.70	22.95	19.72	19.18	22.50	10.01	12.84	12.41	16.04

The corresponding coefficients of variability for these characters were 10.61, 8.70, 22.95, 19.72 and 19.18 per cent, respectively. Similarly kernel width, kernel height, kernel thickness and kernel percentage extremes between 16.32 mm (Tree No 9) to 24.20 mm (Tree No 37), 19.42 mm (Tree No 33) to 32.43 mm (Tree No 31), 18.39 mm (Tree No 19) to 33.44 mm (Tree No 36) and 28.67 % (Tree No 38) to 53.26 % (Tree No 39) with their respective coefficients of variability at the tune of 10.01, 12.84, 12.41 and 16.04 per cent.

Regarding non metric nut and kernel characters of different seedling trees, the nut shape in longitudinal section perpendicular to suture were short trapezoid, circular, ovate, obovate, elliptic, triangular, long trapezoid, and broad elliptic while through suture shapes were triangular, elliptic, broad elliptic, broad ovate, ovate, circular in nuts produced by different seedling trees. The nut shape in cross section was circular and broad elliptic. The shapes of nut bases were pointed, rounded, truncate and emarginae while apex shapes were pointed rounded and truncate. The pistil points of nuts were weak, medium, and strong while position of pad on suture were in upper half, upper 2/3 and whole length of nut. Shell surfaces were slightly grooved, moderately grooved, strongly grooved and embossed along with grooves along pad as shallow, medium and deep. The nuts of different seedling trees had weak, medium, strong and very strong adherence of two shell halves. The primary and secondary inner dividing membranes were thin, medium and thick. The removal of kernel from nuts was very easy, easy, medium, difficult and very difficult while the intensity of brown colour on kernel was very light, light medium, dark and very dark in different seedling trees.

In present study a great range of variability was observed for various nut and kernel characters. Similar types of variations were observed by various workers (Sharma and Sharma 1998, 2001; Mehta *et al.* 2005; Sharma and Sharma 2001). The nut shapes observed were as per UPOV (1988) descriptor. Different categories for various non metric characters were also observed by Sharma and Sharma (2000). This variation observed in present study for various characters might have been resulted due to continuous cross pollination followed by seed propagation and environment factors in earlier times. The present study may be useful for exploitation of new areas for walnut cultivation thus resulting more acreage and production. There are some seedling trees which are superior for nut and kernel characters and can be used as plus trees in future because superior cultivars introduced from other places might not do well at such high altitudes. Besides this, study also gave an idea of variability which is a prerequisite of any breeding programme and also gave idea to exploit other walnut growing areas to screen out some outstanding types to boost walnut cultivation in Ladakh.

References

IPGRI 1994. Descriptor for walnuts (*Juglans* spp.).

Mehta K, Sharma OC, Kashayap AS and Thakur BS 2005. Variability for various nut and kernel characters in some promising seedling walnuts (*Juglans regia* L.) in Himachal Pradesh. Acta Hort.**696**:91-95.

Panse VG and Suhhatme PV 1985. *Statistical Methods for Agricultural Workers*. ICAR, New Delhi , India.

Sharma OC and Sharma SD 2000. Variation for various non metric characters of walnuts (*Juglans regia* L.) of seedling origin growing in H. P. Him. J. Agric. Res. **26** (1&2): 156-65.

Sharma OC and Sharma SD 2001. Genetic divergence of seedling trees of Persian walnuts (*Juglans regia* L.) for various nut and kernel characters in Himachal Pradesh. Scientia Horticulturae **88**:163-71.

Sharma SD and Sharma OC 1998. Studies on variability in nuts of seedling walnuts (*Juglans regia* L.) in relation to tree age.Fruit Varieties J. **52** (1):20-23.

Sharma SD and Sharma OC 2001. Studies on variation in nut and kernel characters and selection of superior walnut seedling (*Juglans regia* L.) from Garsa and Jogindernagar area of Himachal Pradesh. Acta Hort. **544**:47-50.

UPOV 1988. General Information: International union for protection of new varieties of Plant/TG/125/1(proj), Geneva, Switzerland.