

## Evaluation of Some Walnut (*Juglans regia* L.) Seedling Germplasm from Himachal Pradesh

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Kotkhai and Theog area of Shimla district was surveyed and 104 seedlings were collected. Thirty seedlings with desirable traits were selected from the total population. Maximum nut weight, nut length, suture and cheek diameter were recorded in KW 020. KW 012 recorded minimum shell thickness (1.44 mm), excellent shelling quality, light yellow kernel colour, excellent taste and highest shelling percentage (58.5%). Based on the evaluation, one seedling KW 012 was identified as the most promising selection having traits at par with international standards.

**Key words:** *Juglans regia*, Seedlings, Walnut, Shell, Hull

Walnut is a priced nut crop and is grown in India in North-western Himalaya at an elevation between 1200 to 2000 m above mean sea level. At present 41,840 hectare area is under walnut cultivation in India and the production is 22000 metric tonnes (FAO, 1998). Still most of the walnuts are grown as scattered seedling trees and not in well laid-out orchards. The major hurdle in the expansion of area under walnut is non-availability of vegetatively propagated plants of superior strains/cultivars. Some efforts have already been made to select superior walnut seedlings from indigenous source (Nauriyal *et al.*, 1970; Lal and Singh, 1978; Chauhan and Sharma, 1979; Sharma and Chauhan, 1980; Pandey and Sinha, 1984) as well as to introduce improved cultivars from abroad. Seedling selections/cultivars of international standard are available to a limited extent. The present study was undertaken to evaluate best seedlings available in the Kotkhai and Theog area of Shimla district of Himachal Pradesh in India and to select any seedlings which can meet all the standards needed for the export of walnuts.

### Materials and Methods

A survey on walnut was conducted during 1999 in the Kotkhai and Theog area of Shimla district (altitude 1800 to 2000 m above mean sea level). 30 seedlings having desirable characters were selected out of 104 seedlings to carryout detailed studies. Data on thirty nuts selected randomly from the whole harvest of the tree after the nuts were dried to edible stage. The results were expressed on the basis of averages of triplicate sampling and analyzed statistically in a Completely Randomized Design. Nut size (represents, the nut length, suture diameter and the cheek diameter in millimeters) were measured with the help of Vernier Callipers. Weight of the in-shell nuts

was taken in grams. Kernel weight (in grams) was recorded from the same nuts used for recording the nut weight. Shelling quality and taste grades were rated on numerical scale such as 5-excellent, 4-very good, 3 good, 2-fair, 1-poor. Shelling percentage was also calculated.

### Results and Discussion

The data on nut and kernel characters has been discussed in detail. However same is presented in Table 1.

**Nut weight:** The average nut weight varied from 9.5 g to 21.4 g. The highest nut weight was found in KW 020 followed by KW 02. The lowest nut weight was recorded in KW 05. Gouzen and Yang (1990) reported a variation in nut size in germplasm from China from 5.8 g to 27 g. For international markets an ideal nut should weigh between 12 to 18 g (McGranahan and Leslie, 1990).

**Nut length:** The highest nut length (47.1 mm) was recorded in KW 020 which was significantly higher than all other seedlings. The lowest nut length (29.2 mm) was recorded in KW 015.

**Suture diameter:** Suture diameter was found to be maximum (38.9 mm) in KW 020 which was statistically at par with KW 013. The minimum suture diameter (29.2 mm) was recorded in KW 05. For commercial grading suture diameter should not be less than 3.13 cm (Serr and Ford, 1956). A suture diameter above 3.7 cm is not considered good, as there are chances of poor filling of larger nuts.

**Cheek diameter:** Nuts with maximum cheek diameter (39.1 mm) were obtained from KW 020. The minimum cheek diameter (29.0 mm) was found in KW04.

**Nut shape:** Three prominent shapes (conical, oblong and ovoid) were recorded in the nuts of different seedlings.

Table 1. Variation in nut characters of different walnut seedlings

Seedlings No./cultivar	Weight (g)	Length (mm)	Nut characteristics			Surface	Shell thickness (mm)	Shelling quality (grade)	Kernel characteristics		
			Suture diameter (mm)	Cheek diameter (mm)	Shape				Colour	Taste (grade)	Shelling percentage
KW01	10.7	35.2	31.4	29.2	Conical	R	2.52	3	V	2	37.5
KW02	20.2	44.1	37.2	39.7	Ovoid	R	1.91	4	V	4	42.3
KW03	14.6	38.4	33.2	31.9	Oblong	S	2.15	3	LY	5	38.3
KW04	12.9	33.2	28.4	29.0	Ovoid	S	1.97	5	Y	4	35.3
KW05	9.5	30.4	29.2	30.5	Ovoid	R	2.34	4	DY	4	39.3
KW06	15.7	40.3	32.8	34.2	Oblong	R	2.12	4	Y	3	41.8
KW07	11.5	36.5	33.4	32.2	Oblong	S	1.84	4	V	2	32.4
KW08	13.4	42.2	29.5	31.0	Conical	R	2.01	4	Y	4	46.5
KW09	14.6	39.5	34.3	31.8	Ovoid	R	2.52	3	Y	3	38.4
KW010	12.4	38.2	31.9	28.8	Conical	S	1.95	2	V	4	35.2
KW011	10.8	35.1	32.6	33.4	Oblong	R	2.46	3	DY	3	32.4
KW012	15.4	35.2	36.3	38.4	Ovoid	S	1.44	5	LY	5	58.5
KW013	19.4	42.5	38.8	38.7	Ovoid	R	2.31	3	LY	5	34.5
KW014	12.2	38.2	30.4	31.2	Oblong	R	2.18	4	Y	4	37.3
KW015	9.80	29.2	31.2	30.4	Conical	R	1.91	3	Y	4	33.4
KW016	14.3	35.0	36.4	32.2	Ovoid	R	2.13	4	LY	5	42.2
KW017	19.2	41.4	38.4	33.4	Oblong	S	1.88	5	V	3	48.4
KW018	11.3	33.4	32.2	30.7	Ovoid	S	2.08	5	Y	2	40.4
KW019	10.2	38.2	32.4	31.4	Oblong	R	1.95	4	Y	4	35.2
KW020	21.4	47.1	38.9	39.1	Oblong	R	2.28	4	V	3	47.3
KW020	21.4	47.1	38.9	39.1	Oblong	R	2.28	4	V	3	47.3
KW021	15.7	39.2	30.2	31.4	Conical	S	2.02	5	Y	4	43.7
KW022	14.8	37.2	34.4	33.2	Oblong	S	2.62	2	LY	5	28.3
KW023	13.3	36.5	33.0	32.1	Oblong	R	2.55	3	DY	3	29.4
KW024	11.7	38.2	30.2	29.4	Conical	R	1.83	4	Y	4	43.7
KW025	15.3	35.4	33.8	34.2	Ovoid	R	2.57	3	V	2	33.4
KW026	12.8	37.4	30.2	28.7	Conical	S	1.62	5	DY	3	44.2
KW027	13.7	35.0	33.2	32.4	Ovoid	R	2.44	4	LY	5	35.2
KW028	18.4	40.4	35.3	34.7	Oblong	S	2.36	4	DY	4	39.4
KW029	12.1	37.2	30.4	29.2	Conical	R	2.25	4	Y	3	41.4
KW030	11.2	33.4	32.2	31.4	Ovoid	S	1.81	4	LY	5	42.3
CD00:5	3.62	2.46	3.84	4.27	-	-	0.33	-	-	-	7.84

Nut surface: R-rough; S-smooth

Kernel colour: V-violaceous; DY-dark yellow; Y-yellow; LY-light yellow

Shelling quality: 5-excellent; 4-very good; 3-good; 2-fair; 1-poor

Sharma and Sharma (1998) also found wide variation in 125 seedling germplasm.

**Nut surface:** Out of 30 seedlings, the nut surface of 18 seedlings was rough and 12 was smooth. Shell surface varied from slightly grooved to deeply grooved. Nuts having minimum grooved surface were more desirable. Sharma and Sharma (1998) reported variation in shell surface as slightly grooved (72 trees), moderately grooved (46 trees) and deeply grooved (7 trees).

**Shell thickness.** Highest shell thickness (2.62 mm) was recorded in KW 022 whereas it was lowest (1.44 mm) in KW 012. Medium shell nuts can be marketed as in-shell and thin shelled nuts as kernels. Bhat *et al.* (1992) found that out of 20 seedlings, 4 were hard shelled, 14 were medium shelled and 2 were thin shelled.

**Shelling quality:** Shelling quality is a very important parameter as it determines whether the whole kernel

is removed neatly or as broken pieces. Excellent shelling quality was observed in KW 04, KW 012, KW 017, KW 018 and KW 026. Poor shelling quality was found in KW 010 and KW 022.

**Kernel colour:** For good quality walnuts, light yellow kernel is a desirable character. KW 03, KW 012, KW 013, KW 016, KW 022, KW 027 and KW 030 were accessions having light coloured kernels. Bhat *et al.* (1992) recommended light amber coloured kernel.

**Kernel taste:** Five local seedlings KW 03, KW 012, KW 013, KW 022 and KW 027 were found to have an excellent taste with numerical value of 5. Taste of KW 01, KW 07, KW 018 and KW 025 was observed to be the poor quality.

**Shelling percentage:** Highest shelling percentage (58%) was recorded in KW 012 which was significantly higher than other seedlings. The lowest percentage (29.4%) was,

however recorded in KW 023. According to Serr and Ford (1956) an ideal nut should have above 50 per cent kernel percentage. However, 50 to 60 per cent is desirable. Bhat *et al.* (1992) reported three seedlings namely Wossan-4, P-I and V-I having a shelling percentage of 63.60, 63.0 and 62.0 per cent, respectively.

The variability in all the characters is mainly due to the heterozygous nature of plants obtained from seed. Hansche *et al.* (1972) have reported that shell thickness, nut weight and kernel weight have high heritability characters. Therefore, these traits should be considered for seedlings selection programme. For international market an ideal nut should weigh between 12-18 g with a clean strong and thin shell with tight seal and easily removable light clear and plump kernel weighing at least 50 per cent of the in-shell nut (McGranahan and Leslie, 1990). In the present study the nut size of KW 012 was found to be medium (15.4 g) with the highest shelling percentage (58.5%). It is thin shelled (1.44 mm) and also possesses excellent shelling quality and taste. Its hull splits without leaving stain on the nut. Therefore, KW 012 was found to be the most promising selection going at par with international standard.

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