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SELECTION OF PERSIAN WALNUT (*Juglans regia* L.) VARIETIES IN SHIMLA DISTRICT OF HIMACHAL PRADESH

D. R. GAUTAM, Dr. Y. S. Parmar University of Horticulture and Forestry, Temperate Horticultural Research Station, Kotkhai, Distt. Shimla 171 202 (Himachal Pradesh)

Population of Persian walnuts (*Juglans regia* L.) in north-eastern part of India represents important genetic resources consisting large number of seedling trees. Improved varieties of walnut were also introduced in the state in early seventies from USA and erstwhile USSR. Recent attempt has been made to survey seedling trees in important walnut growing localities of Shimla district of Himachal Pradesh. For comparative purpose nut, samples were collected only from 27 types having good nut characters and best yield performance to select most promising strains/varieties. These were compared with already selected Indian and other exotic walnut varieties. On the basis of nut and kernel characteristics and shelling quality, three strains viz No. 10, 22 and 23 have been selected and on the basis of their sources respectively named as K.S. Bagh, Nand and Partap walnuts with nut wt of 11.7g, 17.1 and 24.4g and kernel contents of 62.2, 49.7 and 47.1 per cent respectively. These have smooth light amber coloured nuts with excellent shelling quality and light yellow delicious kernel.

Key words : Walnut, nut, kernel, shelling quality, exotic, indigenous

Walnut (*Juglans regia* L.) is grown in all over the temperate region of India where climate and soil conditions are more or less favourable. Almost entire plantations are of seedling origin and a large number of these occur in Jammu and Kashmir from where nearly 1,194 tonnes of kernels and 58 tonnes of shell walnuts worth Rs. 12.50 crores were reported to be exported each year (Anon, 1989). However, this production does not conform to the well defined commercial standards due to traditional practice of raising the trees through seeds. Himachal Pradesh is the next largest producer with nearly 2,474 tonnes dry fruits each year (Anon, 1996). Large number of seedlings in these temperate areas are found growing in forests alongwith oak trees and a few with quality nuts are grown by orchardists on their farm. Some varietal orchards have been planted on government farms and research stations, but suitable varieties are lacking which could be used for regular orchards.

In view of the vast diversity in walnut seedling trees, selections were made within them and standard germplasm with desirable attributes were developed. Some attention has already been given on this aspect in Jammu and Kashmir (Queshi and Dalal, 1985, Bhat *et al.*, 1992). The present study deals with seedling selections in prominant localities of Shimla district in comparison to already selected strains within country and elsewhere.

MATERIALS AND METHODS

Survey of four important localities of Shimla district namely Chirgaon, Jubbal, Kotkhai and Theog, was carried out during mid September 1994-95 when walnuts are generally ready for harvest in these areas. The fruits of indegenous varieties were collected from Horticultural

Development Station, Boktu, Kinnaur and that of the exotic varieties from National Bureau of Plant Genetic Resources, Regional Station, Shimla. The data were recorded of a random sample of 10 nuts from each of 35 types drawn after proper drying of nuts. The various parameters were determined as per procedure listed below :

Nut weight : Weight of the inshell nuts; nut size : represents nut length (height), width (suture diameter) and thickness (cheek diameter); nut colour : A -amber, DA-dark amber, LA-light amber shell; nut smoothness : R- rough, S-Smooth and kernel colour and shelling quality : 5 excellent, 4-very good, 3-good, 2-fair and 1-poor.

RESULTS AND DISCUSSION

The importance of nut and kernel characters of walnut has significant role in international market. The data on various characteristics of nut quality is given in Table 1.

Nut weight : Nut weight ranged from 8.2 to 24.4 g. Maximum nut weight was recorded in seedling 23 followed by 7 (21.5g), 19 (19.0g) and 11 (18.0g). All the indigenous and exotic varieties had lower nut weight. Gouzhen and Yang (1990) reported nut weight of 5.8 g with the smallest nuts and 25 to 27 g of the largest sized nuts in China. Nut weight can serve as good parameter for selection provided the shelling percentage norms are fulfilled by higher nut weight types. Minimum standard for nut weight is above 12.0 g. A large number of seedlings confirm this criteria.

Nut size : Nut size especially diameter at suture line is an important character. For commercial grading, a standard nut diameter at suture line not less than 3.13 cm is essential (Serr and Ford, 1956). The size of nuts ranged from 2.68 to 3.94 cm and as much as 16 seedling selections confirmed the standards laid out by these research workers.

Shell thickness : Shell thickness is an important characteristic which determines the crack quality of the nuts. Nuts with shell thickness less than 1.5 mm are considered thin shelled and 1.5 to 2.0 rated as medium shelled. In the present studies, seedling No. 22 seems to be thin shelled and eight seedlings (7, 9, 10, 12, 16, 22, 23 and 24) as medium shell. All others were observed hard shelled which is not a good character from market point of view.

Nut shape : Nuts having round or oval shape are much preferred due to their better filling. Seedling 23, 7, 11 had ovoid to oblong shapes with attractive appearance, whereas seedling 19 has long conic nuts though of good size but with poor filling.

Nut colour and surface : Nut colour and surface of seedling 10, 22, 23 was much attractive with blight coloured nuts having smooth surface. The seedling 7 and 11 which also had larger nuts were amber coloured with rough surface and hence can not be graded promising.

Crack and shelling quality : The nuts with thin shell are considered easily crackable. Minimum shell thickness (1.4) was recorded in seedling 22, followed by 10(1.6), 27(1.5) 23 and 14(1.7). These are comparable in shell thickness with various indigenous and exotic varieties. Shelling quality i.e., case of kernel extraction was superior in seedling 2, 7, 9, 10, 12, 14, 16, 22 and 23. This is an important criterion for selection of walnut for domestic and export use.

Kernel colour and taste : Light coloured kernel is most preferred for domestic as well as export. Seedling 5, 6, 7, 8, 10, 11, 13, 17, 18, 22, 23, 25 and 26 had light kernel, however the taste was only superior in 8, 10, 14, 15, 16, 19, 21, 22, 23. Exotic varieties had inferior taste and kernel colour. Govind was found between in these attributes.

Kernel percentage : Kernel percentage in various

Table 1. Variation in nut characters of different walnut seedlings and cultivars

Seedling no./ cultivar	Nut characteristics									Kernel characteristics		
	Wt. (g)	Ht. (mm)	Width (mm)	Thick-ness (mm)	Shape	Colour	Surface	Shell thick-ness(mm)	Shelling quality (grade)	Colour	Taste (grade)	Kernel (%)
A) Seedling												
1.	13.8	36.2	34.2	31.2	Conical	DA	R	2.8	3	V	3	36.2
2.	8.8	36.8	29.2	29.0	Oblong	DA	S	1.9	5	LY	3	38.6
3.	10.2	37.0	31.4	32.0	Ovoid	A	S	2.0	4	Y	4	30.8
4.	13.2	37.8	33.0	32.1	Oblong	A	S	2.5	3	DY	3	21.2
5.	9.4	37.2	29.6	30.4	Conical	A	S	2.3	4	LY	3	35.7
6.	8.2	30.4	26.8	27.8	Ovoid	A	R	2.4	3	LY	4	29.3
7.	21.5	39.4	35.0	37.3	Ovoid	A	R	2.0	5	LY	3	40.3
8.	14.6	40.8	31.4	32.0	Oblong	A	S	2.2	4	LY	5	32.9
9.	14.5	39.0	33.8	33.0	Oblong	DA	S	2.0	5	Y	4	36.2
10.	12.7	32.2	31.7	34.3	Ovoid	LA	S	1.6	5	LY	5	62.2
11.	18.0	40.3	33.7	36.3	Oblong	A	R	2.4	3	LY	4	33.3
12.	14.0	35.0	32.2	36.3	Ovoid	A	R	2.0	5	V	3	47.1
13.	15.1	41.0	31.8	35.0	Oblong	A	R	2.1	4	LY	4	37.7
14.	11.2	34.0	29.6	31.0	Conical	LA	R	1.7	5	Y	5	50.0
15.	12.2	37.6	30.8	32.4	Oblong	LA	R	2.2	3	V	5	42.6
16.	13.0	38.0	31.5	21.2	Oblong	DA	S	1.9	5	V	5	30.8
17.	11.5	40.5	31.8	32.0	Conical	DA	S	2.0	2	LY	3	26.1
18.	14.3	34.5	31.0	32.3	Ovoid	A	S	2.3	2	LY	5	23.2
19.	19.0	42.8	35.2	36.0	Oblong	A	S	1.9	4	V	5	40.0
20.	11.4	42.0	29.6	31.6	Conical	DA	S	1.8	4	V	2	29.8
21.	12.0	32.4	32.0	35.4	Ovoid	LA	R	2.3	2	V	5	33.3
22.	17.1	41.4	35.2	37.2	Ovoid	LA	S	1.4	5	LY	5	47.1
23.	24.4	49.4	39.4	43.8	Oblong	LA	S	1.7	5	LY	5	49.7
24.	17.0	44.2	33.2	35.6	Oblong	A	R	1.8	4	V	4	35.3
25.	11.5	38.5	30.0	32.2	Conical	A	R	2.4	1	LY	1	30.4
26.	9.3	29.8	29.0	30.8	Ovoid	A	R	2.0	1	LY	2	22.2
27.	10.8	41.8	31.0	31.4	Oblong	A	R	1.5	4	LY	4	29.6
B) Indegenous												
R. K. Selection	16.3	45.0	34.7	33.4	Oblong	LA	S	2.0	5	V	4	41.5
Kashmir Budded	11.3	38.3	30.8	31.0	Conical	LA	S	1.8	5	Y	5	42.2
Govind	9.2	39.2	28.0	29.2	Ovoid	LA	S	1.3	5	LY	4	44.4
C) Exotic Cultivars												
Tutle - 16	9.3	31.0	26.4	29.2	Ovoid	DA	S	2.2	2	V	4	30.9
Psyne	9.0	32.5	30.2	30.0	Oblong	DA	S	1.9	4	V	2	30.9
K × Giant	12.6	47.2	30.6	36.8	Conical	DA	R	1.7	2	V	2	23.6
Hartley	6.8	32.2	28.4	29.9	Conical	A	S	1.4	4	DY	4	29.4
Lake English	6.1	26.0	24.4	26.2	Ovoid	DA	S	1.3	4	V	4	33.3

Legends:Shell Colour:A-amber, DA - dark amber, LA - Light amber; Nut surface - R rough, S - Smooth; Kernel colour : V-violaceus, DY-Dark yellow, Y-yellow, LY:Light yellow; Shelling quality; 5:excellent, 4;very good, 3-good, 2-Fair, 1: Poor; Taste: 5:excellent, 4-very good, 3-good, 2- Fair, 1-poor

selections ranged from 21.2 to 62.2. The highest kernel percentage (62.2%) was obtained in seedling 10, followed by seedling 14 (50.0%) seedling 23 (49.7%) and seedling 12 and 22 (47.1%).

Serr and Ford (1954) suggested that any selection should have above 50 per cent shelling percentage and 50 to 60 per cent is the reasonable goal. In the present study, seedling 10, 14 and 23 fulfill the standard. Abdul and Dalal (1985) reported 30-35 per cent kernel in Kashmir walnuts, whereas Bhat *et al.* (1992) reported high kernel percentage ranging from 54.2 to 63.2 in two indigenously selected and two exotic cultivars. Pieko and Czynczyk, (1990) reported 37.6 to 52.5 per cent kernel in selected varieties in Poland. In Italy, kernel content in 19 cultivars ranged from 40.5 to 53.1 per cent (Radicarti *et al.*, 1990). Chauhan and Sharma (1979) reported as high as 64.3 per cent kernel in a seedling from Kinnaur but the nut size of this selection was small. Highest kernel records of 67.0 per cent was reported from China (Sheng ke, 1990).

In the present survey, the seedling No. 10, 22 and 23 were observed superior in kernel content as compared to various indigenous and exotic varieties studied. On the basis of their source of collection these are named as K. S. Bagh, Nand and Partap selections.

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