

“Pusa Khor” Walnut Suitable for Diversified Horticulture

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ABSTRACT: Walnut (*Juglans regia* L) a member of Juglandaceae family is one of the finest nuts of temperate regions. It is the oldest cultivated fruit in the world and seedling trees of walnut (*Juglans regia* L) are found growing in all parts of North Western Himalayan Region at 1200-2200 meters elevation and trees exhibit considerable variation in respect of vegetative growth and fruit characters. Also, as an oil yielding crop plant is very important for economic growth of the agricultural sector. The oilseeds containing unusual fatty acids are industrially important, as they are used in protective coatings, dispersants, pharmaceuticals, cosmetics, soaps and a variety of synthetic intermediates as stabilizers in plastic formulations. Walnut production is expected to gradually rise in the next 3-5 years, as new trees with improved varieties reach bearing age and as acreage is also increased. Per capita consumption is relatively negligible. “Pusa Khor” is being evaluated by the scientists of IARI Regional Station, Shimla. This particular accession has started bearing in the third year of its grafting. The walnut normally takes 10-12 years even more to come into bearing. The fruit appears to be borne in lateral position as well as terminally. This is characteristic of newly evolved early and heavy bearing walnut cultivars. However, no such cultivar is reported in India so far. It is semi-vigorous in growth habit. Plant height is 320 cm and its spread varies from 130 to 170 cm. and annual shoot increment recorded 105cm and trunk diameter was measured 27cm. The fruit weight with husk was 49gm; where as, without husk (nut) weight recorded 23gm. The length of the fruit with husk recorded 54.78 cm where as, without husk (fresh nut) it was 42.33 cm. The nut is thin shelled and weight measured 13gm. Kernel colour is light yellow and good in taste. The kernel weight recorded 6.5 gm. It is an early, regular; heavy bearing and good quality walnut collection in comparison walnut plants of comparable age are not bearing any fruit as yet. The oil percentage and shelling percentage recorded was 55.0 and 50.0, respectively. High development costs for establishing a walnut orchard demand the planting of cultivars that bear large crops at an early age. Lateral bearing walnut cultivars tend to be precocious and are better suited to high yielding, high density plantings.

INTRODUCTION

Seedling trees of walnut (*Juglans regia* L) are found growing in all parts of North Western Himalayan Region at 1200-2200 meters elevation and trees exhibit considerable variation in respect of vegetative growth and fruit characters. Use of this variability in the selection of superior seedlings with desirable traits will be of paramount importance in the expansion of walnut cultivation in this country. These seedling selections will not only produce nuts of desirable quality, but are also well adapted to the local climatic and soil conditions. Persian walnut is one of the most important nut crop grown in temperate region and produces edible nuts having higher nutritional value. In India there is no systematic orchards of walnut and trees of seedling origin are grown which exhibit wide

intraspecific diversity for tree, foliage, floral, nut and kernel characters. The variation provides better opportunity for selection of unique walnut tree (s). The multiplication of these elite trees through vegetative propagation will play an important role in broadening the genetic base of nut crops.

Iran is ranked fourth in the world after USA, China and Turkey in walnut production (Anonymous, 2008). Hamedan province was the first walnut producer per hectare and provided one of the most desirable and high grade walnut of world (Anonymous, 2009). Nutrients such as potassium, magnesium, phosphorus, iron, calcium, zinc, copper, vitamins B9, B6, E, A, and other substances have been found in walnuts (Koyuncu *et al.*, 2004). The amount of energy used in agricultural production, processing

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and distribution is extremely high. Sufficient supply of the right amount of energy and its effective and efficient use are necessary for an improved agricultural production. It has been realized that crop yields and food supplies are directly linked to energy (Stout, 1990). In the developed countries, increase in the crop yields has been mainly due to increase in the commercial (but often subsidized) energy inputs in addition to improved crop varieties (Faidley, 1992).

Walnut (*Juglans regia* L.) a member of Juglandaceae family is one of the finest nuts of temperate regions. It is the oldest cultivated fruit in the world and grown spontaneously almost all over Turkey [Sen *et al.*, 1986; Ca glar, 2003; Ozkan and Koyuncu, 2005]. Also, oil yielding crop plants are very important for economic growth of the agricultural sector. The oilseeds containing unusual fatty acids are industrially important, as they are used in protective coatings, dispersants, pharmaceuticals, cosmetics, soaps and a variety of synthetic intermediates as stabilizers in plastic formulations [Hosamani and Sattigeri, 2000; Eganathan *et al.* 2006]. Walnut production is expected to gradually rise in the next 3-5 years, as new trees with improved varieties reach bearing age and as acreage is also increased. Per capita consumption is low in India. Most of the marketed walnuts are consumed whole, with only a limited amount being processed [Anonymous, 2006]. Ripe walnuts are mostly eaten as dessert nuts or used in cakes, desserts and confectionery of all kinds from ice cream. The walnut plant has a high nutritional value and high quality wood. Although walnuts are rich in fat, a diet supplemented with walnuts had a beneficial effect on blood lipids, lowering blood cholesterol and lowering the ratio of serum concentrations of low density lipoprotein: high density lipoprotein by 12% [Sabate *et al.* 1993; Savage, 2001]. Walnut kernels generally contained about 60% oil [Prasad, 1994] but this can vary from 52 to 70% depending on the cultivar, location grown and irrigation rate [Greye *et al.* 1992; Garcia *et al.* 1994; Beyhan *et al.* 1995]. Most nuts are rich in oleic acid while walnuts are also high in two polyunsaturated fatty acids linoleic acid and α -linolenic acids. The major fatty acids found in walnut oil are oleic, linoleic and linolenic acids [Zwarts *et al.* 1999]. The fatty acid profile of walnut oil varies between cultivars. It is important to identify these differences in locally grown cultivars and to identify which fatty acids give the best nutritional qualities [Greye *et al.* 1992; Zwarts

et al. 1999]. Recently, Abbey *et al.* have shown that the supplementation of a background diet (based on a reference Australian diet) with 68 g of walnuts/day reduced the total and low-density lipoprotein cholesterol by 5 and 9%, respectively. These reductions would have some positive effect in reducing the risk of coronary heart disease. So, it has a very important place in public nutritional habits. Few published studies have been carried out on the quality and fruit properties such as chemical composition and fatty acid contents of walnuts [Olez, 1971; Sen, 1983; Sen and Beyhan, 1993; Koyuncu, 1999]. Walnut oil, which is cold pressed from the meat of dried walnuts, has a strong and distinctive walnut flavor. It is generally used as a flavoring for baked goods and for some sauces. It can provide a bold flavor to salad dressing or it can be added to mildly flavored oils to create a subtle taste [Anonymous, 2006].

MATERIALS AND METHODS

Survey of the walnut germplasm was carried out during the year 2001 in the Chamba district of Himachal Pradesh. Out of the total population of seedling trees, 8 (Eight) genotypes were selected on the basis of nut and kernel characteristics and yield potential. Observations on various vegetative and nut characters were recorded following the standard guidelines (UPOV, 1988). The size of sample of stratifications was determined by Neyman technique (Zangeneh *et al.*, 2010; Yamane, 1967). Thirty nuts were selected randomly from the tree after these were sun dried to edible stage. Fat content was estimated by the method as suggested by Folch *et al.* (1957). Biochemical analysis was done by the method as mentioned by AOAC. (1984), AOAC, (1990), AOAC, (1995).

RESULTS AND DISCUSSION

A unique walnut (Pusa Khor) plant is being evaluated at the IARI Regional Station, Shimla. It was collected from the Chamba region of Himachal Pradesh. This plant came into bearing in the third year of its grafting. The walnut normally takes 10 to 12 years even more to come into bearing. The fruit is borne in lateral position as well as terminally. Terminal bearing is associated with initiation of new growth early in the season which culminates in a mixed bud (with both floral and vegetative primordial). This is a characteristic of newly evolved early, good quality

and heavy bearing walnut cultivars. However, no such cultivar is reported in India so far. The leaf size and annual shoot increment is also much less than other walnut germplasm collected during the same survey. Its height is 320 cm and its spread varies from 130 to 170 cm. Trunk diameter was measured 27cm (Table 1). The maximum plant height was recorded in Sel-2(572cm) whereas, minimum was found in Sel-6(210cm). The maximum width was observed in Sel-2(640cm) whereas, minimum was recorded in Sel-1(140cm). The maximum trunk diameter was recorded in Sel-2(52cm) whereas, minimum was found in Sel-6[(17.5cm) (table 1)]. The fruit weight with husk was 49gm; where as, without husk (fresh nut) weight recorded 23gm. The length of the fruit with husk recorded 54.78 cm where as, without husk (fresh nut) it was 42.33 cm. The nut is thin shelled and measured 6.5 gm in dry weight (Table 2). Kernel colour is light yellow and good in taste. The maximum fruit weight with husk was recorded in Sel-2(94gm) whereas, minimum was found in Sel-5(11gm). The maximum length with husk was observed in Sel-2 (56.72mm) whereas, minimum was found in Sel-5 (29.32mm). The maximum fresh nut weight was recorded in Sel-2(28gm) whereas, minimum was recorded in Sel-5(8gm). The maximum dry nut weight was observed in Sel-2(15gm) and minimum was found in Sel-5(6gm). The edible portion i.e. kernel meat weight varies from 3.3 gm in Sel-5 to 6.5 gm in Pusa Khor. An ideal nut should weight between 12-18 g has a clean, strong and thin shell with tight seal and easily removable light kernel, clean and plump kernel weighing at least 50 per cent of the in-shell-nut (McGranahan and Leslie, 1990). According to Ramos *et al.* (1984) selection of clones that produce pistillate flowers on lateral buds has resulted in significant yield increases in Persian walnut, *Juglans regia*. Lateral bearing Persian walnut cultivars tend

to be more precocious and are better suited to high yielding, high density plantings. Some eastern black walnut cultivars possess a characteristic known as lateral bud bearing (Sparks, 1982). These cultivars produce pistillate flowers on a profusion of short, spur type branches distributed along main scaffold limbs. With this growth pattern, both leaves and nuts are born throughout the tree canopy resulting in increased yield potential (Reid, 1986). The heritability of the lateral bearing characteristic is unknown for black walnut but Hansche *et al.* (1972) found this trait to have a moderate level of heritability in Persian walnut.

CONCLUSION

High development costs for establishing a walnut orchard demand the planting of cultivars that bear large crops at an early age. Cultivars displaying lateral bud fruitfulness generally come into production well in advance of non-lateral bearing cultivars. Shell thickness and structure are the most important determinant of percent kernel and nut crack-ability. The highest quality walnuts have a thin outer shell with no internal convolutions protruding into the nut meat. The inner shell partition between kernel halves should be very thin to allow easy removal of kernel pieces. The nuts of the tree collected from Chamba appear to meet this standard.

Table 1
Plant characteristics of different germplasm of walnut maintained at IARI Research Farm, Shimla

Plant No.	Height (cm)	Width (Av.)(cm)	Trunk Dia. (cm)
Sel-1	514	140	36
Sel-2	572	640	52
Sel-3	342	251	20
PUSA KHOR	320	170	27
Sel-5	340	200	18
Sel-6	210	130	17.5
Sel-7	430	310	20
Sel-8	472	410	35

Table 2
Fruit characteristics of different germplasm of walnut maintained at IARI Research Farm, Shimla

Pl.No.	With Husk			Without Husk(Fresh Nut)			Dry Nut			Kernel Wt(g)
	Wt(g)	Length (mm)	Width (mm)	Wt(g)	Length (mm)	Width (mm)	Wt(g)	Length (mm)	Width (mm)	
Sel-1	74	46.78	44.13	25	27.41	26.42	10	40.04	37.72	4.1
Sel-2	94	56.72	54.17	28	38.30	36.47	15	40.04	37.72	5.2
Sel-3	32	55.95	36.99	16	38.39	31.47	10	37.70	31.15	5.1
(Pusa Khor)	49	54.78	41.36	23	42.33	31.94	13	41.25	32.78	6.5
Sel-5	11	29.32	27.66	8	28.52	29.83	6	27.78	27.73	3.3
Sel-6	49	47.81	41.15	18	38.35	32.67	12	37.17	29.70	4.2
Sel-7	23	39.13	37.58	12	28.52	29.83	7	25.47	28.19	3.9
Sel-8	58	49.47	44.23	24	39.34	30.52	13	37.17	29.70	4.4

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