



Varietal Comparison of Different Walnut Varieties in the Weather Conditions of Lower Murree Hills

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ABSTRACT

Walnut (*Juglans regia*) is primarily important dry fruit belongs to family Juglandaceae. Its nutritional importance cannot be denied due to its high omega fatty acids. The fruit gains an essential part of confectionaries, sweets and bakery products because of immense nutritional value and appealing flavor. Walnut fruit is variable of variety, rootstock, climate and soil etc. The present protocol was designed to check the quality criteria of different varieties in the Murree Hills. Six different Walnut varieties were analyzed in the Murree (Tret, 4000 ft) weather conditions namely Odum, Hartley, Payne, Murree Walnut I, Murree Walnut II, Murree Walnut III. The experiment was laid out according to randomized complete block design (RCBD), with three replications and three plants per treatment for the consecutive three years. Data regarding time of flowering, time of fruit set, time of fruit bark colour change, number of fruits per plant, yield per plant, fruit length, breadth, fruit weight, Kernel weight fruit hard shell weight, Kernel skin colour and organoleptic test was evaluated. Odum showed superior results regarding early blooming (End of March), fruit set (Start of May), fruit maturity (end of July), number of fruits per plant (5160), yield plant per plant (43kg/plant), fruit length (32.49 mm) and fruit width (31.5 mm), fruit weight (12 g), kernel weight (8 g), fruit hard shell weight (4 g), taste and fruit nut quality in the climatic conditions of Murree. The present study will helpful for the boost of walnut production and industry development by specifying the different variety characteristics according to variable climatic conditions.

Keywords: Fruit gains, Murree, Yield, Odum, Hartley, Walnut.

INTRODUCTION

Walnut is a single seed stone fruit belongs to family Juglandaceae. The fruit carries a precious value because of its rich nutritional significance, good fatty acids and flavorful taste. Walnut is used in bakery products, confectionaries, chocolates, pies, desserts (Hassani, D., et al., 2020 and Inobatov, A. 2024). Walnuts are packed with a high index of polyphenols (flavonoids and phenolic acids), polyunsaturated fatty acids, minerals, essential amino acids and bioactive peptides with a low glycemic ratios declares them as a super food to a greater extent. They are anti-inflammatory and fight against cancer,

cholesterol, diabetes, age-related neurological stress if consumed in appropriate amounts (Fallah, M., et al., 2024, Fallah, M., 2019 and Adkison, C., et al., 2021).

By its healthful benefits the walnuts are getting essential part of diet in different communities. To cope up the day by day increasingly walnut consumption and demand many countries have increased their area of cultivation for this dry fruit. For this sake the efficacy and occurrence of different varieties are tested for the selection of high quality and best yielding varieties on commercial platforms. During past few years the China, USA, Ukraine, Chile and turkey were considered the top best countries for walnut production and exports (FAO, 2023). Worldwide production of walnut in the year 2025 is 2.69 million metric tons and among the total worldwide production China is contributing almost 56 % of the total production which is 1.5 million metric tons (Botu et al., 2019 and Anonymous, 2025). Walnut occurrence in Pakistan is in Gilgit Baltistan, Malakand division, Azad Kashmir and Murree. While Murree has more dispersed and smaller plantation of walnut. According to an overview Pakistan annually produces 14,862 metric tons and a major proportion of walnut crop comes from different areas of Khyber Pakhtun Khwa (KPK) province and Gilgit baltistan. In Pakistan its production suddenly dropped since 2021 which has affected the exports crieterias of this specific crop (Anonymous, 2025).

Walnut is immensely important fruit due to its nutritional value. It is a dry fruit and can be store for a long time, this quality also prevent the fruit quality losses during its supply to market and consumer chain. Well drained clay loam soils are preferred for the plantation of walnut. The tree contains a vigorous growth habit and shows dichogamy nature of flowering. Which prefers the cross pollination as well as the presence of two or more varieties to ensure the proper cross pollination aspects (Hassan et al., 2023). There are so many varieties of the walnut around the world and like all other crops, their performance is also highly dependent of climate, altitude, topography and suitable rootstock (Aleta et al., 2014). The profit in terms of quality and productivity can only be attained in terms if to found the best cultivar for a specific area (Botu et al., 2019). The present study was conducted to find out the best suited variety for the climatic conditions of Murree and Pothwar region. This protocol will help to boost the walnut production and industry development by specifying the different variety characteristics according to variable climatic conditions.

MATERIALS AND METHODS

The present protocol was designed to check the quality criteria's of different walnut fruit varieties in the Murree Hills. Six different Walnut varieties were analyzed in the Murree (Tret, 4000 ft) weather conditions namely Odum, Hartley, Payne, Murree Walnut I, Murree Walnut II, Murree Walnut III. The protocol was designed in the 2022 to check the fruit quality difference among the different walnut varieties and for this walnut trees (8 years) of same age were selected. The experiment was laid out according to randomized complete block design (RCBD), with three replications and three plants per treatment for the consecutive three years. Data regarding time of flowering, time of fruit set, time of fruit bark colour change, number of fruits per plant, yield per plant, fruit length, fruit breadth, fruit weight, Kernel weight, fruit hard shell weight, Kernel skin colour and organoleptic test was evaluated.

RESULTS AND DISCUSSION

Data analyzed about the different walnut varieties showed that among the six varieties odum given comparatively superior results than the other varieties (Table I and II). Along with this Murree Walnut Selection III also proved good results regarding fruit yield, number of fruits and fruit quality parameters with reference to taste. Walnut variety Odum showed early blooming (End of March), fruit set (Start of May) and fruit maturity (as colour of fruit change in end of July) as well in comparison to the other five varieties. Overall, number of fruits per plant (5160), yield plant per plant (43kg/plant), fruit length (32.49 mm) and fruit width (31.5 mm), fruit weight (12 g), kernel weight (8 g), fruit hard shell weight (4 g) and comparative results regarding fruit nut quality and taste crieterias found more pronounced and higher than the other walnut varieties kept to analysis. After this the another variety Murree Walnut Selection III found better with the early blooming (late March), early fruit maturity (End July), number of fruits per plant (4375), yield of fruit per plant (38 kg) yield, fruit length (29.64 mm), fruit width (29.64 mm), fruit weight (11 g), kernel weight (6 g) and good quality crieterias of taste as well.

Fruit of the Payne variety found to be the smaller than all other walnut varieties analyzed with fruit length (24.55 mm), fruit width (23.85 mm) and with total average fruit weight of 4 g. This walnut variety also proved the inferior due to its kernel weight (2.5 g) and Nut hard shell weight of 1.5 g. Yield and overall performance is not only restricted to the choice of variety but it can also varies from year to year due to variable climate faced by the same variety during its different fruit developmental phases as explained by the Akca et al., 2018. Climate and topography plays a pivotal role on a variety to a

specified area in a way that the same variety perform differently in the different topographic and altitude conditions as well explained by the Hasan et al., 2023.

Table 1: Analysis of different walnut varieties on the basis of blooming and yield characteristics.

Varieties	Time of flowering	Time of fruit set	Time of fruit bark colour change	Number of fruit per plant	Yield per plant (kg/plant)	Fruit length (mm)	Fruit breadth (mm)
Odum V1	End of March	Start of May	End of July	5160	43	32.49	31.5
Hartley V2	Mid May	June	Late Aug	4125	33	28.92	28.77
Peyne V3	Mid May	June	Late Aug	3520	22	24.55	23.85
Murree Walnut Selection I V4	Start April	Mid May	Start of Aug	3840	30	28.89	28.05
Murree Walnut Selection II V5	Late March	Mid May	End July	4375	38	29.64	27.23
Murree Walnut Selection III V6	Late March	Late May	Start of Aug	2890	29	26.17	24.47

Table 2: Analysis of different walnut varieties on basis of fruit weight and quality parameters.

Varieties	Fruit weight (g)	Kernel weight (g)	Fruit hard shell weight (g)	Kernel skin colour	Organoleptic Evaluation
Odum V1	12	8	4	Yellowish colour	Sweet Kernel with complete ease to removal from nut shell
Hartley V2	9	4	4	Light Brown	Little bit pungent kernel with difficulty to remove from nut shell
Peyne V3	4	2.5	1.5	Dark Brown	Little bit pungent kernel with difficulty to remove from nut shell
Murree Walnut I V4	8	4	4	Light Brown	Sweet Kernel with little bit difficulty to removal from nut shell
Murree Walnut II V5	11	6	5	Yellowish to light brown colour	Sweet Kernel with complete ease to removal from nut shell
Murree Walnut III V6	6	3	3	Light Brown colour	Sweet Kernel with little bit difficulty to

The rootstock also impacts a lot and makes a great sense to enhance productivity and resistance to the diseases, as overall the narrated factors (climate, topography) are directly linked to the crop performance and the same idea was described by the study of Aleta et al., 2014. As the crop is dichogamy behavior and prefer cross pollination, so yield and crop quality is also promoted by the presence of sufficient walnut varieties grafted on subsequent rootstocks (Botu et al., 2019). Shell thickness and kernel weight were the parameters directly correlated to the variety or genotype and the same finding were explained by Li *et al.* 2009 and past some researches also exclaimed that walnut shell thickness and kernel weight ratios are devoid of climatic factors, and overall shell thickness reduces the kernel percentage in a manner that if the shell thickness is high it will ultimately reduce the kernel ratio in any genotype, while thin shelled walnuts are more preferred (Amiri *et al.*, 2010; Bayazit, 2012).



Figure 1: Walnut fruiting on Tree



Figure 2: Walnut with and without shell.

CONCLUSIONS

The present protocol with the past research references illustrates that different varieties with a genetic difference act differentially in a range of environmental set up. This much criteria make it essential to choose a specific variety for an area. Walnut carries a lot of varieties and a by the choice of a high-quality variety for a specified area is essential to get the productivity and quality aspects. Walnut is a dry fruit with immense nutrition and flavorful value; it can be stored for a long time and proper storage also prevent the post-harvest losses for its uptake to the market chain. Need of the hour is to elevate these varieties in the different topographic ranges of our country leading towards a boost of its commercialization.

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AUTHOR CONTRIBUTIONS

All the authors contributed equally in the manuscript.

COMPETING OF INTEREST

The authors declare no competing interests.