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Evaluation of pecan nut varieties for high yielding and quality parameters grown in Peshawar Valley

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The study was conducted to evaluate the performance of eight variety for high yield and physical properties of pecan fruits at Agriculture Research institute Tarnab, Peshawar. This study included, physical parameters of pecan fruits such as nut length, nut weight, nut diameter, shell thickness, nut weight, shell weight, No of nuts kg⁻¹ and yield/kg tree⁻¹. The results revealed that "Mohawk" variety resulted in higher nut weight (15.96 gm), shell weight (6.45 gm), kernel weight (7.59 gm) and shell thickness (6.95 mm) and was found superior, while Habib-96 variety exceeded in other parameters such as fruit length (60.00 mm), Burkett variety recorded highest shell weight (6.90 gm), fruit diameter (29.03 mm). Mohawk, Iftikhar 20 and Habib-96 are recommended for cultivation in Peshawar valley.

Keywords: Pecan nut cultivars, physical properties, Yield

INTRODUCTION

Pecan (Carya illinoensis) belongs to the walnut family. It is native to the warm southern states of the U.S.A. and accordingly has low chilling requirements (Pena, 1995). Pecan also is commercially grown in Australia, South Africa, Israel, Argentina, Chile and Brazil; therefore, it may be highly productive under Egypt environmental conditions compared to Persian walnuts and other nut trees (Wood, 1994). The small acreage of this crop is mostly due to scant knowledge of varieties, cultivation and growth habit of pecan tree (Andersen, 1995). Pecan requires about 600 chilling hours (Lagarda, 1987) and can successfully be grown in the plains area of the Khyber Pakhtunkhwa. Pecan is considered among very high cash crops which are beneficial for both the grower and the national economy if right varieties are chosen when establishing a pecan orchard (Hamoda, 1978). Some factors that have to be taken into consideration when selecting a variety are regular production capacity, tree growth, branching properties, nut size and quality, kernel percentage, maturity and pollination characteristics (Yao et al. 2004 and Thompson, 2005). In Khyber Pakhtunkhwa there are up to twelve different pecan cultivars growing in different regions of Khyber Pakhtunkhwa like Charsadda, Nowshera. Harichand and Peshawar and these cultivars

are physically different from each other due to genetic variations. However, the literature describing the physical Properties such as whole nut weight, fruit length, fruit diameter etc. of different cultivars are limited. Therefore, the present study was designed to evaluate the physical properties of eight Pecan cultivars grown in Peshawar, Pakistan.

MATERIALS AND METHODS

2.1 Experimental site

The study was conducted in 2020 to evaluate eight pecan (Carya illinoinensis) varieties for physical properties at Agriculture Research Institute (ARI) Tarnab, Peshawar (34° 00' 44.32 N, 71 42' 26.57 E) Pakistan. These varieties were introduced from USA during 1980 and were planted at ARI Tarnab Peshawar. Eight Pecan varieties were studied namely: Shawnee, Wichita, Mohawk, Iftikhar 20, Burkett, Habib 96, Choctaw and Western shelly. Varieties were of the same age (15 years old) and planted 20 \times 20 feet apart. Each variety (5 trees per variety) was planted at a Randomized complete block design. All the field operations (weed control, irrigation etc.) were kept same for all the trees. The soil samples were collected and analyzed for physical and chemical properties of soil (Table 1).

Table 1: Physical and chemical properties of the experimental site

Physical Properties of soil					
Sand %	6				
Silt %	68				
Clay %	26				
Texture	Silt Ioam				
Chemical properties of soil					
	7.7				
E	0.07				
Soluble Solid (mg kg ⁻¹)					
	0.008				
Р		6.8			
	136				
	0.022				
C	4.25				
Orgar	0.17				

RESULTS AND DISCUSSION

Nut weight (g)

Pecan cultivars revealed significant differences for pecan nut weight (Table 2). The cultivar Mohawk (15.96 g) resulted in higher whole nut weight in comparison to other cultivars, followed by cultivar Habib-96 (14.94 g), Choctaw (14.73 g), Burkett (13.33 g), Shawnee (10.79 g), Iftikhar 20(10.14 g), Wichita (9.08 g) whereas the cultivar Western shelly (6.37 g) produced lower nut weight. These results are in line with Attia & Wafaa (2007) and Grauke & Thompson (2007), they stated that whole nut weight is a genetic controlled trait.

Fruit length (mm)

Fruit length is significantly affected by pecan cultivars (Table 2). Maximum fruit length were noted in pecan cultivar Habib-96 (60.00 mm) which is followed by cultivar by Choctaw (49.42 mm), Wichita (48.57 mm), Iftikhar 20 (46.16 mm), Shawnee (46.05 mm) Mohawk (45.86 mm), Burkett (36.37mm), while shorter fruits were recorded in Western Shelly (32.76 mm), Fruit length is a genetic factor. Hence the genotype and suitable environment interaction brings variation in fruit length. These findings are in confirmity with Rehman et al. (2000). These findings are in similarity with those of (Abu Taleb et al. 2004; Thompson, 2005) they stated that differences in fruit length might be due to variation in varietal characteristic that expresses differently from each other.

Fruit diameter (mm)

Pecan cultivars revealed significant differences for pecan fruit diameter (Table 2). The cultivar Burkatt (29.03 mm), resulted in higher nut weight in comparison to other cultivars, which is followed by pecan cultivar Mohawk (26.39mm), Choctaw (26.10 mm), Habib-96 (24.35 mm), Shawnee (23.10 mm), Wichita (21.44 mm), Iftikhar 20 (20.95 mm) and whereas the cultivar Western shelly (20.61 mm) produced lower fruit diameter.

Shell weight (gm)

Shell weight of pecan is significantly affected by pecan cultivars (Table 2). The heavier shells of pecan were noted in pecan cultivar Burkett (6.90 gm) which is followed by cultivar Mohawk (6.45 gm), Habib-96 (6.41gm), Choctaw (6.26 gm), Shawnee (5.16 gm), Iftikhar 20 (4.34 gm), Wichita (3.50 gm), while lighter shells were noted in cultivar Western Shelly (2.00gm). This might be due to variation in varietal characteristic. Our results are in confirmity with those of Attia and Wafaa (2007).

Kernel weight (gm)

Kernel weight of pecan is significantly affected by pecan cultivars (Table 2). The maximum kernel weight of pecan were observed in pecan cultivar Mohawk (7.59 gm) which is followed by cultivar Habib-96 (6.56gm), Choctaw (6.49 gm), Burkett (6.13), Shawnee (4.92 gm), Wichita (4.60 gm), Iftikhar 20 (4.52 gm), whereas the minimum kernel weight was noted in cultivar Western Shelly (2.65 gm).Statistically similar differences were noted in cultivar Habib-96, Burkett and Choctaw. These results are in similarity with (Yao et al. 2004; Thompson, 2005 and Maeda, 2006) they stated that, during selection of a variety some factors have to be taken in consideration such as, nut size and quality, kernel weight etc. because Kernel weight is a genetically controlled character of pecan fruit.

Shell thickness (mm)

Shell thickness is significantly influenced by different pecan cultivars (Table 2). Mean data showed that the maximum shell thickness is noted in pecan cultivar Mohawk (6.95 mm) which is statistically similar to Habib-96, Choctaw and Burkett (6.91 mm), (6.76 mm), (6.59 mm), Shawnee (5.66 mm), Pecan2020 (4.84 mm), Wichita (4.00 mm) while minimum shell thickness was noted in cultivar Western Shelly (2.65 mm). It could be due to the genetic characters of the variety. Similar findings were reported by Herrera (2005).

Nuts per Kg

Nuts kg⁻¹ of pecan is significantly affected by pecan cultivars (Table 2). The maximum Nuts kg⁻¹ of pecan were observed in pecan cultivar Western Shelly (160), Iftikhar 20 (129), Shawnee (114), Wichita (110), Burkett (93), Habib-96 (88) and Choctaw (82) whereas the minimum Nuts kg⁻¹ was noted in cultivar Mohawk (79). Our results are in line with those of Awad (2002) and Abou -Taleb et al. (2004) they stated that, this variability in nuts per kg is due to differences in some genetically related characters.

Varieties /Germplasm	whole nut weight (gm)	Fruit length (mm)	Fruit Diameter (mm)	shell weight (gm)	kernel weight (gm)	Shell Thickness (mm)	Nuts/kg	Yield/ tree/ kg
Shawnee	10.79 c	46.05 c	23.10 d	5.16 b	4.92 c	5.66 b	114 c	35.53 d
Wichita	9.08 de	48.57 b	21.44 ef	3.50 cd	4.60 c	4.00 d	110 d	37.53 c
Mohawk	15.96 a	45.86 c	26.39 b	6.45 a	7.59 a	6.95 a	79 h	39.43 b
Iftikhar 2020	10.14 c	46.16 c	20.95 f	4.34.bc	4.52 c	4.84 c	129 b	40.13 a
Burkett	13.33 b	36.37 d	29.03 a	6.90 a	6.13 b	6.59 a	93 e	30.4 e
Habib-96	14.94 ab	60.00 a	24.35 c	6.41 a	6.56 b	6.91 a	88 f	39.23 b
Choctaw	14.73 ab	49.42 b	26.10 b	6.26 a	6.49 b	6.76 a	82 g	34.08 d
Western Shelly	6.37 f	32.76 e	20.61 f	2.00 e	2.65 d	2.50 e	160 a	25.83 f
LSD	1.69	0.97	0.84	0.86	0.93	0.68	0.67	0.83

Table 2:	physiological dat	a of Various Pecan	Nut varieties/Germ	plasm and Rootstock
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Yield tree ⁻¹

Yield tree⁻¹ is significantly affected by pecan cultivars (Table 2). Higher yield tree⁻¹ was noted in pecan cultivar Iftikhar 20 (40.13 kg), Habib-96 (39.43kg), Mohawk (39.43 kg), Wichita (37.53 kg), Choctaw (34.08 kg), Burkett (30.43 kg) and Shawnee (35.53.03kg) while lower yield tree⁻¹ was noted in Western Shelly (25.83 kg). This could be due to the genetic plus environment interaction. Similar results were reported by Yao et al. (2004) and Thompson (2005).

CONCLUSION

On the basis of result it is concluded that Mohawk variety resulted in higher whole nut weight, shell weight, kernel weight and shell thickness and was superior in this concern, while Habib-96 variety exceeded in other parameters such as fruit length, shell thickness and shell weight. Choctaw variety recorded highest shell weight and shell thickness. Higher fruit diameter, shell weight and shell thickness were noted in Burkett variety. Mohawk, Iftikhar 20 and Habib-96 are recommended for cultivation in Peshawar valley.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

NS, HR, SZ, conducted the experiment and BH, IH, NN help in manuscript write up, Especially to SF, HS, and NZ for technical writing of the draft. Where's SM, MS, AS for statistical analysis. All authors read and approved the final version.

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