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Selection of seedling pecan [*Carya illinoensis* (Wang) K. Koch.] trees for better nut and kernel quality characters

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Abstract

The present study was undertaken on 60 pecan [*Carya illinoensis* (Wang) K. Koch.] bearing trees from seedling pecan nut population growing in Jammu province. Based on the characterization and evaluation of nuts and kernels pecan trees excelled in major economically important characteristics. All the 60 seedling pecan nut trees exhibited extreme variation for individual traits. Nut length varied from 20.3 mm to 52.40 mm lateral nut width varied from 15.50 mm to 28.40mm, ventral nut width varied from 15.50 to 33.40 mm, thickness of shell varied from 0.30 mm to 1.89 mm, kernel weight varied from 2.06 gm to 6.95 gm, kernel length varied from 11.21 mm to 39.27 mm and nut weight varied from 3.56 gm to 8.63 gm. The present effort aims at highlighting the importance of selected pecan trees of seedling origin in previously unexplored region for conservation and breeding point of view.

Keywords: Pecan nut, kernel, diversity

Introduction

Pecan [*Carya illinoensis* (Wang) K. Koch.] an important edible nut crop, belongs to family Juglandaceae. Pecan is one of the most important deciduous horticultural nut crop in the world and is valued nut for high calorific value (~680 calories/100 g kernel). Pecan is superior to walnut in quality (flavour, 65-70% fats, 8-10% proteins, high in phosphorous, potassium and vitamins A, C, E and B complex) and thrives best in the areas, which are considered somewhat lower and hotter for walnut cultivation (Herrera, 1995; Sparks, 2000; Singh *et al.*, 2009) [1, 8, 5]. In India, its cultivation is limited to mid-hill areas of Himachal Pradesh, Jammu & Kashmir, Uttarakhand and climatically similar areas of North-Eastern states and Nilgiri hills of Tamil Nadu. Its importance lies in nuts having relatively thin shell, which cracks easily and having high nutritional value of the kernel in terms of more than 11 to 12 per cent protein, 70 per cent fat, good amount of phosphoric acid and high calorific value. Pecan nut has been introduced in J&K from Himachal Pradesh by State Horticulture Department.

These pecan nut trees raised from seeds being highly heterozygous provide an enormous wealth for carrying out the selection of desirable strains to improve the varietal wealth of pecan. However, still this nut crop could not assume commercial status for the want of suitable cultivars among orchardists due to many constraints such as lack of ideal varieties. Almost all pecan plantations in Jammu division owe their origin to un-descriptive seedlings and are extremely heterogeneous in quality attributes. The existing population comprising the trees of seedling origins exhibit tremendous variability in growth, yield and quality attributes there by providing a platform for exploitation of vast gene pool (Singh *et al.*, 2009) [5]. Nevertheless, there is huge potential of this nut crop to commercialize being hardy to climatic vagaries and having export value. Meagre efforts have been made for selection of superior seedling pecan genotypes with desirable traits especially economically important nut and kernel traits. To commercialize this nut crop following strategies should be made such as development/selection of ideal varieties of pecan nut. There is a need to identify suitable trees from native seedling populations or to introduce cultivars from other countries, which are suitable for the different climatic conditions prevailing in the state of Jammu and Kashmir.

Materials and Methods

The present investigation was carried out in the Division of Fruit Science, FoA, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Chatha, J&K to study the extent of variability and selection of superior pecan trees from a population of seedling

origin in Jammu Division during year 2017-18. Various locations of Rajouri (33.77°N 74.1°E) and Poonch (33°23'N 74°18'E) districts of Jammu Division, which are at elevation of 915 and 981 m, respectively were surveyed for selecting pecan nut trees of seedling origin. Out of total population 60 seedling origin pecan nut genotypes have been selected based on superior nut and kernel characteristics. The observations on nut and kernel characters were recorded using the pecan nut descriptors given by UPOV so as to estimate the extent of genetic relationship by morphological characterization. The

selected genotypes have been named as SKJPP (SKUAST Jammu Pecan nut Poonch), SKJPR (SKUAST Jammu Pecan nut Rajouri) and SKJPM (SKUAST Jammu Pecan nut Miran Sahib) and have been given numbers for the ease of identification. Physical dimensions of nut and kernels were determined using Mitutoyo digital Vernier callipers as per Thompson and Grauke (2003) ^[10]. The kernel recovery was worked out as average of 20 randomly selected nuts from each selection using formula: % Kernel recovery = Kernel wt./ Nut wt. × 100.

Table 1: Values of various nut and kernel traits in pecan nut (*Carya illinoensis* K.) selections.

S. No	Selections	Nut length (mm)	Lateral Nut width (mm)	Ventral nut width (mm)	Thickness of shell (mm)	Kernel weight (g)	Kernel length (mm)	Nut weight (g)
1	SKJPR 1	35.92	18.67	20.35	1.60	4.00	20.11	5.40
2	SKJPR 2	36.00	20.63	24.19	1.57	3.21	25.11	5.72
3	SKJPR 3	34.64	15.50	20.59	1.46	2.06	20.15	4.23
4	SKJPR 4	37.43	18.25	23.30	1.58	4.20	23.15	5.26
5	SKJPR 5	20.03	18.00	19.55	0.30	2.80	11.21	3.56
6	SKJPR 6	37.38	18.82	15.54	1.60	4.29	26.43	5.79
7	SKJPR 7	27.54	16.53	21.50	1.80	3.29	14.21	4.43
8	SKJPP 8	52.40	26.25	32.84	1.30	6.42	39.27	8.63
9	SKJPP 9	34.82	20.14	22.03	1.52	3.61	19.23	5.15
10	SKJPP 10	34.63	18.10	21.69	1.50	4.61	16.21	4.21
11	SKJPP 11	31.85	19.96	16.32	1.80	3.49	20.34	5.74
12	SKJPP 12	35.43	17.97	21.84	1.55	2.49	18.11	4.55
13	SKJPP 13	39.00	23.84	29.98	1.71	6.03	27.11	7.37
14	SKJPP 14	31.34	20.38	21.67	1.78	4.62	18.11	5.12
15	SKJPP 15	32.98	18.07	22.89	1.82	3.29	16.81	5.39
16	SKJPP 16	36.95	19.02	20.12	1.72	3.91	22.25	5.20
17	SKJPP 17	34.45	16.57	21.99	1.65	3.53	20.15	5.32
18	SKJPP 18	35.66	17.50	22.17	1.55	3.10	19.21	4.69
19	SKJPP 19	34.93	20.09	19.76	1.63	3.34	21.32	5.57
20	SKJPP 20	34.93	18.45	20.11	1.60	4.37	17.15	4.92
21	SKJPM 21	42.40	28.40	32.53	1.55	6.95	34.50	8.03
22	SKJPP 22	37.25	18.17	23.12	1.46	3.06	21.15	4.57
23	SKJPP 23	35.71	24.77	30.53	1.65	5.05	26.21	8.05
24	SKJPP 24	39.56	23.93	26.91	1.89	5.00	27.98	6.28
25	SKJPP 25	46.63	25.57	33.40	1.40	6.41	32.43	8.08
26	SKJPP 26	42.85	22.07	28.13	1.70	4.98	30.00	6.30
27	SKJPP 27	35.37	16.66	20.08	1.64	4.37	24.21	5.88
28	SKJPP 28	36.10	19.51	18.72	1.53	4.38	23.11	5.53
29	SKJPP 29	36.48	16.53	19.57	1.50	3.27	20.15	4.43
30	SKJPP 30	35.45	20.12	19.69	1.60	3.51	22.11	5.55
31	SKJPP 31	34.41	19.89	24.07	1.68	3.15	23.45	5.46
32	SKJPP 32	28.85	19.00	28.70	1.73	3.90	16.15	5.21
33	SKJPP 33	32.87	20.60	21.28	1.36	3.91	21.56	6.34

Table 2: Values of various nut and kernel traits in pecan nut (*Carya illinoensis* K.) selections.

S. No	Selections	Nut length (mm)	Lateral Nut width (mm)	Ventral nut width (mm)	Thickness of shell (mm)	Kernel weight (g)	Kernel length (mm)	Nut weight (g)
34	SKJPP 34	36.39	21.10	20.57	1.62	3.35	26.20	5.85
35	SKJPP35	40.78	22.35	31.62	1.50	3.37	29.38	7.83
36	SKJPP 36	40.47	18.35	18.64	1.49	2.52	25.11	4.07
37	SKJPP 37	40.93	23.92	30.97	1.49	5.63	28.33	7.82
38	SKJPP 38	43.29	21.88	23.88	1.40	4.50	33.15	5.57
39	SKJPP 39	40.72	24.34	30.94	1.42	5.63	29.00	7.91
40	SKJPP 40	36.13	18.37	16.27	1.50	4.37	30.11	5.09
41	SKJPP 41	39.40	21.56	18.79	1.05	3.32	26.00	5.93
42	SKJPP 42	39.67	21.83	20.49	1.38	2.71	28.78	4.83
43	SKJPP 43	38.16	19.02	21.46	1.48	3.35	36.11	5.11
44	SKJPP 44	40.59	24.66	30.81	1.30	5.42	29.29	7.62
45	SKJPP 45	33.15	21.89	19.14	1.79	3.22	21.45	5.59
46	SKJPP 46	43.96	24.53	25.52	1.46	5.85	33.13	6.59
47	SKJPP 47	32.84	22.94	20.14	1.81	3.32	20.13	5.98

48	SKJPP 48	32.57	15.81	26.42	1.78	3.34	17.25	4.91
49	SKJPP 49	36.62	20.63	20.45	1.59	3.25	24.21	5.73
50	SKJPP 50	37.27	22.17	26.50	1.64	3.19	26.20	5.99
51	SKJPP 51	39.36	21.38	18.51	1.51	3.15	24.21	5.66
52	SKJPP 52	42.77	19.19	21.27	1.30	3.51	27.15	5.03
53	SKJPP 53	42.24	21.26	22.16	1.61	3.88	27.21	5.82
54	SKJPP 54	40.54	23.74	24.32	1.65	4.90	31.89	6.90
55	SKJPP 55	38.46	20.63	23.18	1.62	4.35	26.11	5.94
56	SKJPP 56	35.69	20.86	0.88	1.55	3.51	23.11	5.62
57	SKJPP 57	38.67	19.06	19.27	1.25	3.58	26.12	5.50
58	SKJPP 58	38.30	21.59	23.07	1.58	3.12	30.11	5.93
59	SKJPP 59	31.17	21.15	20.57	1.86	3.56	19.33	5.81
60	SKJPP 60	31.55	21.87		1.85	3.73	19.23	5.92
	General mean	37.00	20.57	20.93	1.55	4.00	24.28	5.77
	SE m±	1.16	0.81	0.89	0.13	0.34	0.76	0.47
	CV	5.43	6.84	6.60	14.34	14.58	5.42	14.22
	CD	3.25	2.27	2.47	0.36	0.94	2.13	1.33

Results and Discussion

Observations on variation in nut and kernel traits (metric) of seedling pecan selection (Table 1) indicate that nut length ranged from 20.03 mm in SKJPR5 to 52.40 mm in SKJPP8 with overall general mean of 37.00 mm. Nut width in lateral view showed significant differences among selections. It ranged from 15.50 mm in SKJPR3 to 28.40 mm in SKJPM21 with the overall general mean of 20.57 mm. Selection namely SKJPP8 (26.25 mm) was found to be statistically at par with SKJPM21. The selections differed significantly for nut width in ventral view. It was found minimum in SKJPR6 (15.54 mm) and maximum in SKJPP25 (33.40 mm) with overall general mean of 23.18 mm. Selection namely SKJPP8 with 32.84 mm ventral nut width and SKJPM21 with 32.53 mm ventral nut width were statistically at par with SKJPP25. The observations recorded for the shell thickness depicted significant differences among the various selections studied. The minimum shell thickness was recorded in SKJPP5 (0.30 mm) and maximum in SKJPP24 (1.89 mm) with overall general mean of 1.55 mm. The average kernel weight ranged from 2.06 g in SKJPR3 to 6.95 g in SKJPM21 with overall general mean of 4.00. Kernel weight of selections SKJPP 8 (6.42 g), SKJPP13 (6.03 g) and SKJPP25 (6.41 g) was found to be statistically at par with SKJPM21. The mean performance of various selections for nut weight (g) varied from 3.56 g in SKJPR5 to 8.63 g in SKJPP8 with overall general mean of 5.77 g. Selections namely SKJPP25 (8.06 g) and SKJPM21 (8.03 g) was found to be statistically at par with SKJPP8.

These differences indicated the presence of substantial amount of variability and considerable scope for improvement for various characters namely nut length, lateral nut width, ventral nut width, thickness of shell, kernel weight, kernel length and nut weight in the material under study. These results are in accordance with the findings of Singh *et al.* (2011)^[7] who also observed wide range of variability in pecan tree selections of seedling origin for various traits.

Considerable amount of variability was observed in sixty diverse selections of pecan nut under investigation. In case of nut length a wide range of variation was recorded. These findings are in line with the results of earlier workers namely Kumar *et al.* (2013)^[3], Soundouri *et al.* (2009). Lateral nut width and ventral nut width showed significant amount of variation among selections studied. Similar results were also reported by Singh *et al.* (2011)^[7]. The mean performance of thickness of shell showed wide range of variation among

selections and these results are in accordance with the findings of Singh *et al.* (2012)^[6]. Wide range of variability was observed for kernel weight and kernel length. These results are in conformity with the findings of Shah *et al.* (2010)^[14]. The results revealed that nut weight exhibited a wide range of variability, which has also been reported by Kaushal and Sharma (2005)^[2].

Conclusion

The existing population of pecan nut, a valued nut for high calorific value comprising the trees of seedling origin exhibit tremendous variability in growth yield and quality attributed thereby, providing a platform for exploitation of vast gene pool.

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