

Evaluation of Water Chestnut (*Trapa natans* var *bispinosa* Roxb.) Under Central Uttar Pradesh

S. L. PAL¹ AND NEERAJ KUMAR VERMA

Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow, India
¹*Department of Horticulture, RSM (PG) College, Dhampur (Bijnor) 246761, UP, India*

Abstract

An experiment was carried out during 2006-07 in the ponds of Gosainganj block of Lucknow region; 18 cultivars were studied on the basis of physical and chemical parameters of the fruit. On the basis of overall performance, water chestnut cultivars Lalla, Singree-2, Singree-3, Shakkar chini-1 and Shakkar chini-3 were found to be better and more suitable for commercial cultivation under Lucknow region, since they have maximum fruit weight, fruit volume, kernel : peel ratio, fruit breadth, kernel length, kernel cheek diameter and minimum peel weight and peel thickness parameters as compared to other cultivars.

Key words : Evaluation, Water chestnut, Central UP.

Water chestnut (*Trapa natans* var *bispinosa* Roxb.) is commonly known as Singhara or Pani Phal all over India and is a minor fruit of India. It is an aquatic nut crop usually grown in rainy season (June-July) in ponds and lakes of different part of India like UP Bihar, West Bengal, Assam, Tamilnadu, Orissa, and Jammu and Kashmir and its edible part is the mature kernel. The fruit is a one seeded, top shaped drupe, fleshy pericarp of which is delicious and covers a large two or four horned stony endocarp (pyxena). It is an important nutritive fruit due to its starchy nature. The pulp contains 70% moisture, 23.9% carbohydrate, 4.7% protein, 0.2% fat, 1.1% minerals and 20 IU vit A. It has 9.8 mg/100 g vit C, TSS 7^o Brix and acidity 0.09%. *Trapa* contains 0.6% fiber, calcium 20 mg, phosphorus 150 mg, iron 0.8 mg, copper 1.27 mg, Mn 5.7 mg, Mg 5.8 mg, Na 49 mg, K 650 mg/100 g. Vitamins contained in the kernels are thiamine 0.05 mg; riboflavin 0.07 mg and nicotinic acid 0.6 mg/100 g edible fruit (1). *Trapa* has been reported to be an important food for many people. Processed kernels are used for break fasting and seem to be easily digestible. Its flour is used for making sweets, bread, halwa and biscuit. Flour is used for treatment of diarrhea and abdominal pain.

Methods

The experiment was conducted at Gosainganj block of Lucknow region during 2006-07 with an ob-

ject to evaluate the fruits of water chestnut cultivars for their physico-chemical parameters. Fruits of water chestnut from different villages of Gosainganj block of Lucknow region were collected in October—November. Collected fruits were subjected for physico-chemical analysis in the Horticulture laboratory of Department of Applied Plant Science, Babasaheb Bhimrao Ambedkar University, Lucknow. The experiment comprised 18 treatments with three replications under complete randomized design. Nine healthy water chestnut fruits of uniform size which were free from disease, pest and physical damage were selected from different ponds. Selected fruits were washed thoroughly keeping under running tap water and were dried in air to remove adhering water. The data recorded during observation were used for analysis to test the level of significance.

Results and Discussion

The evaluation of different water chestnut germplasm with respect to fruit (length, breadth, weight, cheek diameter, volume, specific gravity) and kernel (length, breadth, weight, cheek diameter, volume, specific gravity) weight of peel, thickness of peel and kernel : peel ratio was critically analyzed. Very little work has been done on physical and chemical parameters of water chestnut. However, germplasm studied on ber (2), aonla (3) : litchi (4), almond (5), and guava (6) indicates that the variability can be estab-

Table 1. Morphological and physical attributes in water chestnut cultivars.

Cultivars	Length of fruit (cm)	Breadth of fruit (cm)	Cheek diameter of fruits (cm)	Weight of fruit (g)	Vol. of fruits (ml)	Specific gravity of fruits	Length of kernel (cm)	Breath of kernel (cm)
Kadma-1	4.833	4.503	4.673	30.813	23.65	1.345	3.678	3.606
Singree-1	3.803	4.173	3.970	20.713	18.40	1.220	3.143	3.592
Kadma-2	3.783	4.230	3.946	23.755	20.71	1.186	3.146	3.633
Kadma-3	4.316	4.333	4.300	21.665	20.65	1.059	3.498	3.495
Ratni-1	4.020	4.496	4.093	21.833	21.13	1.025	3.163	3.705
Singree-2	4.136	4.600	4.263	37.956	36.86	1.032	3.356	3.948
Lalla	4.693	4.763	4.666	37.830	34.53	1.103	3.915	4.155
Shakkar chini-1	4.246	4.466	4.210	27.216	25.28	1.076	3.248	3.655
Ratni-2	4.180	4.266	4.190	21.830	19.70	1.150	3.275	3.472
Singree-3	3.896	3.950	3.713	20.773	17.28	1.204	3.460	3.498
Shakkar chini-2	4.613	4.143	4.063	20.940	19.16	1.117	3.553	3.723
Mithua	3.733	4.056	3.706	20.283	20.23	1.002	3.206	3.688
Shakkar chini-3	4.026	4.420	4.306	28.373	27.48	1.050	3.335	4.085
Kadma-4	3.840	4.063	3.741	19.900	15.55	1.321	2.813	3.368
Kadma-5	4.393	4.390	4.516	26.836	22.58	1.136	3.363	3.568
Ratni-3	4.400	4.530	4.293	24.506	22.233	1.114	3.456	4.010
Singree-4	3.816	3.966	3.880	20.616	18.68	1.118	3.295	3.658
Ratni-4	3.616	4.026	3.546	17.526	16.02	1.094	2.886	3.506
CD at 5%	0.4585	NS	0.4058	4.995	5.60	0.1562	0.282	0.4644

Table 1. Continued.

Cultivars	Cheek diameter of kernel (cm)	Weight of kernel (g)	Volume of kernel (ml)	Specific gravity of kernel	Peel weight (g)	Thickness of peel (cm)	Kernel : Peel ratio
Kadma-1	3.953	11.833	9.050	1.409	17.310	0.323	0.735
Singree-1	3.590	11.00	5.883	1.935	9.703	0.270	1.170
Kadma-2	3.612	12.116	8.767	1.436	11.577	0.225	1.075
Kadma-3	3.845	9.416	8.167	1.231	12.257	0.220	0.774
Ratni-1	3.586	9.666	7.400	1.339	12.162	0.255	0.798
Singree-2	3.873	13.083	10.967	1.250	24.820	0.388	0.531
Lalla	4.018	14.583	12.150	1.210	23.230	0.326	0.637
Shakkar chini-1	3.636	11.833	12.583	0.962	13.577	0.286	0.780
Ratni-2	3.678	9.916	8.317	1.260	11.737	0.246	0.834
Singree-3	3.560	11.833	10.917	1.120	8.973	0.172	1.335
Shakkar chini-2	3.796	10.916	10.550	1.036	10.027	0.197	1.084
Mithua	3.480	9.583	8.330	1.198	10.703	0.213	0.892
Shakkar chini-3	3.890	14.50	14.017	1.052	13.843	0.223	1.059
Kadma-4	3.261	8.00	8.650	0.936	11.983	0.247	0.672
Kadma-5	3.740	10.583	10.483	1.051	16.197	0.247	0.669
Ratni-3	3.818	10.166	8.867	1.238	14.507	0.250	0.699
Singree-4	3.540	9.583	10.950	0.987	10.863	0.185	0.943
Ratni-4	3.193	8.416	7.533	1.246	9.110	0.208	0.915
CD at 5%	0.3550	2.660	3.0536	0.3307	3.389	0.0649	0.3084

lished on the basis of physical and chemical parameters. Results are given in Table 1. The cultivar Kadma-1 (4.833 cm) had maximum fruit length, while the cultivar Ratni-4 (3.616 cm) had minimum fruit length. The

maximum breadth was recorded in cultivar Lalla (4.763 cm) and minimum in cultivar Singree-3 (3.950 cm). These results are supported by Sangeeta et al. (7) in aonla. The maximum cheek diameter was recorded

in cultivar Kadma-1 (4.673), while the minimum cheek diameter in the cultivar Ratni-4 (3.546 cm). The variability in weight of fruit was found to vary from 17.526 to 37.956 g. Maximum weight of fruit was recorded in cultivar Singree-2 (37.956 g), while minimum weight of fruit recorded in the Ratni-4 (17.526 g). The similar variability in weight has been reported in water chestnut (8) and in ber (2). Maximum volume of fruit was recorded in cultivar Singree-2 (36.86 ml), while minimum in the cultivar Kadma-4 (15.55 ml). Maximum specific gravity of fruit was recorded in cultivar Kadma-1 (1.172) while minimum in Mitua (1.002). The variability in kernel length was found to vary from 2.813 to 3.915 cm. Maximum kernel length was recorded in cultivar Lalla (3.915 cm) and minimum in cultivar Kadma-4 (2.813 cm). Similar results have been reported by Sharma (5) in almond. Maximum kernel breadth was observed in the cultivar Lalla (4.155 cm) while minimum was recorded in cultivar Kadma-4 (3.368 cm). Maximum cheek diameter of kernel was recorded in cultivar Lalla (4.018 cm) while minimum cheek diameter of kernel in cultivar Ratni-4 (3.193 cm). The variability in kernel weight was found to vary from 8.00 to 14.583 g. Maximum kernel weight was recorded in cultivar Lalla (14.583 g) while minimum in the cultivar Kadma-4 (8.00 g). The similar variability has been reported in almond (5). Maximum volume of kernel was recorded in cultivar Shakkari chini-3 (14.017 ml) while minimum in cultivar Singree-1 (5.883 ml). Variation in specific gravity of kernel might be due to variation in weight of kernel and volume of kernel of different water chestnut cultivars. Maximum specific gravity of kernel was recorded in cultivar Singree-1 (1.935) while minimum specific gravity of kernel was recorded in cultivar Kadma-4 (0.936). Maximum peel weight was recorded in cultivar Singree-2 (24.820 g) while minimum peel weight was recorded in cultivar Singree-3 (8.9739 g). Good quality cultivars should possess less peel weight. Similar variability in peel weight has been reported in mango (9). Maximum thickness of peel was recorded in cultivar Singree-2 (0.388 cm) while the minimum in cultivar Singree-3 (0.172 cm). The ker-

nel : Peel ratio was found to range from (0.53 to 1.335). Maximum kernel : peel ratio was recorded in cultivar Singree-3 (1.335) while minimum kernel : peel ratio was recorded in cultivar Singree-2 (0.531).

On the basis of overall performance it can be concluded that the water chestnut cultivars Lalla, Singree-2, Singree-3, Shakkari chini-1 and Shakkari chini-3 were better and more suitable for commercial cultivation under Lucknow region since they have maximum fruit weight, fruit volume, kernel : peel ratio, fruit breadth, kernel length, kernel cheek diameter and minimum peel weight and peel thickness parameter as compared to other cultivars.

References

1. Choudhary R. 1962. Nutritive value of Indian foods. *J. Inst. Chem. India* 34 : 89.
2. Gupta R. B., S. Sharma, J. R. Sharma and R. Goyal. 2004. Physico-chemical characters of fruit of some wild and cultivated form (*Ziziphus* spp.). *Haryana J. Hort. Sci.* 3 : 167—169.
3. Singh J. R. and J. S. Arora. 1967. Physico-chemical differences in two varieties of aonla (*Phyllanthus emblica* Linn.) at maturity. *Punj. Hort. J.* 7 : 145.
4. Biswas S. and B. M. Ray. 1983. Studies on maturity standards of litchi (*Litchi chinensis* Sonn.) cultivar Bombay. *Prog. Hort.* 15 : 187—189.
5. Sharma S. D. 1993. Physical character and quality of nuts of some almond cultivars and seedling selections grown under Kinnaur condition of Himachal Pradesh. *Haryana J. Hort. Sci.* 22 : 30—34.
6. Bal J. S. and K. S. Khera. 2005. Variability in germplasm of guava (*Psidium guajava* L.) from Punjab subtropics of India. 1st Int. Guava Symp. 5—8 Dec 2005. CISH. p. 17.
7. Sangeeta M., R. K. Godara, S. K. Bhatia and K. Surinde. 2002. Studies on physico-chemical characteristics of various cultivars of aonla (*Emblica officinalis* G.) under semi-arid conditions. *Haryana J. Hort. Sci.* 31 : 17—19.
8. Kapur K. L., S. K. Singh, M. P. Tripathi and R. A. Verma. 1980. Studies on processing of water chestnut. *Indian Food Packer* 34 : 27—28.
9. Kundu S. and S. M. Ghose. 1992. Physico-chemical characteristics of mango cultivars grown in the laterite tract of west Bengal. *Haryana J. Hort. Sci.* 21 : 129—131.