

Survey, Collection and Evaluation of Water Chestnut (*Trapa natans* var *bispinosa* Roxb.) Mohanlalganj Block of Lucknow Region

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Abstract

As a result of survey of different villages of Mohanlalganj block of Lucknow region, 19 genotypes were identified. Based on the observations it was found that the wide range of variability in physico-chemical properties of fruit samples collected during identification of water chestnut genotypes. The data indicated that the fruit length (3.65—4.89 cm), fruit breadth (3.94—4.87 cm), cheek diameter of fruit (3.73—4.41 cm), fruit weight (17.02—28.0 g), fruit volume (15.18—25.73 ml), specific gravity of fruit (1.01—1.17), kernel length (2.85—4.89 cm), kernel breadth (3.24—4.84 cm), cheek diameter of kernel (3.27—4.13 cm), weight of kernel (9.40—17.50 g), kernel volume (6.31—13.68 ml), specific gravity of kernel (1.20—1.57), peel weight (4.74—12.10 g), kernel : peel ratio (0.91—2.79), TSS (4.33—10.55 °Brix), ascorbic acid (8.040—9.703 mg/100 g) and acidity (0.093—0.106%).

Key words : Water chestnut, Survey, Collection, Evaluation.

Water chestnut (*Trapa natans* var *bispinosa*) is commonly known as Singhara or Paniphal in India and it is an important minor fruit of India which belongs to family Trapaceae (1, 2). 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 I.U. Vitamin A (3). In North India it comes in market in September—October when other locally grown fresh fruits are not available. Water chestnut is mainly cultivated in water logged areas where its cultivation is done on commercial basis. In India, it is cultivated in UP, Bihar, Tamil Nadu, West Bengal, Assam, Orissa and Jammu and Kashmir. The climate of central UP region is quite conducive for the cultivation of water chestnut. Since, no attempt has been made to find out the suitable water chestnut cultivars with good physical and biochemical parameters for this region, the present study was undertaken on the physico-chemicals characters of some cultivars of water chestnut collected from different villages to establish existing variability in the germplasm and to evaluate the cultivars for their performance.

Methods

A survey was conducted during the year 2006

by Department of Applied Plant Sciences (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow to identify elite type of water chestnut genotypes from different villages of Mohanlalganj block of Lucknow region. During the survey nineteen genotypes were identified. While identifying the elite genotypes, nine fully ripe fruits were randomly collected from the ponds and subsequently fruits were analyzed or physico-chemical characteristics. The physical characters viz. length, breadth, cheek diameter of fruits and kernels were measured with the help of vernier caliper. Weight of fruits, kernels and peel were recorded with the help of electronic balance, volume, specific gravity of fruit and kernel was measured using standard methods (4, 5). The kernel : peel ratio were recorded by weight of kernel divided by weight of peel. The total soluble solids were determined by using hand refractometer (0—32 °Brix, Erma Japan). Titrable acidity was estimated by titrating 10 ml juice against 0.1 N NaOH using phenolphthalein as an indicator and expressed in terms of percent anhydrous citric acid (4). Ascorbic acid content of fruits was determined by using 2, 6 dichlorophenol-indophenol dye titration method and expressed as mg/100 g of pulp (4).

Table 1. Physical characteristics of fruit of water chestnut (*Trapa natans* var. *bispinosa* Roxb.) collected from Mohanlalganj block of Lucknow region.

| Cultivars | Length of fruit (cm) | Breath of fruit (cm) | Cheek dia- meter of fruit (cm) | Weight of fruit (g) | Speci- fic gravity of fruit | Volume of fruit (ml) | Peel weight (g) |
|-----------|----------------------|----------------------|--------------------------------|---------------------|-----------------------------|----------------------|-----------------|
| Kadma-1 | 3.82 | 4.62 | 3.87 | 17.39 | 1.01 | 17.08 | 7.98 |
| Singree-1 | 3.89 | 4.87 | 4.24 | 26.22 | 1.17 | 22.46 | 12.07 |
| Kadma-2 | 4.25 | 4.27 | 4.29 | 18.3 | 1.07 | 17.02 | 8.34 |
| Kadma-3 | 3.65 | 4.09 | 3.73 | 17.02 | 1.12 | 15.18 | 6.71 |
| Kadma-4 | 3.75 | 4.03 | 3.94 | 18.09 | 1.11 | 16.36 | 8.75 |
| Desi | | | | | | | |
| Lalla-1 | 4.06 | 4.65 | 4.12 | 22.41 | 1.08 | 20.84 | 10.35 |
| Kadma-5 | 4.25 | 4.49 | 4.37 | 22.71 | 1.01 | 22.3 | 10.41 |
| Kadma-6 | 4.19 | 4.04 | 4.23 | 20.01 | 1.12 | 17.85 | 7.54 |
| Kanpuria | | | | | | | |
| Red-1 | 4.00 | 4.46 | 4.18 | 21.64 | 1.10 | 19.70 | 9.50 |
| Ratni | 4.89 | 4.57 | 4.86 | 28.00 | 1.09 | 25.73 | 12.10 |
| Singree-2 | 4.42 | 4.62 | 4.41 | 27.23 | 1.08 | 25.13 | 9.72 |
| Desi | | | | | | | |
| Lalla-2 | 3.84 | 4.11 | 3.92 | 20.67 | 1.04 | 19.73 | 7.72 |
| Kadma-7 | 4.14 | 4.02 | 4.29 | 17.51 | 1.10 | 15.86 | 5.21 |
| Singree-3 | 3.96 | 3.97 | 4.00 | 18.03 | 1.03 | 17.4 | 4.74 |
| Shakkar | | | | | | | |
| Chini-1 | 4.04 | 4.10 | 3.84 | 17.69 | 1.06 | 16.76 | 7.26 |
| Shakkar | | | | | | | |
| Chini-2 | 4.34 | 4.13 | 4.21 | 18.75 | 1.07 | 17.56 | 7.55 |
| Kanpuria | | | | | | | |
| Red-2 | 4.29 | 4.37 | 4.04 | 23.21 | 1.08 | 21.46 | 8.94 |
| Shakkar | | | | | | | |
| Chini-3 | 4.10 | 3.94 | 3.85 | 18.41 | 1.08 | 19.93 | 6.21 |
| Kadma-8 | 4.47 | 4.09 | 4.29 | 20.57 | 1.04 | 19.76 | 10.77 |
| SE (mean) | 0.12 | 0.19 | 0.20 | 2.00 | NS | 2.09 | 0.96 |
| CD at 5% | 0.24 | 0.36 | 0.4 | 4.06 | - | 4.25 | 1.96 |

Table 2. Physical characteristics of Kernel of water chestnut (*Trapa natans* var. *bispinosa* Roxb.) collected from Mohanlalganj block of Lucknow region.

| Cultivars | Length of kernel (cm) | Bre- adth of kernel (cm) | Cheek dia- meter of kernel (cm) | Weight of kernel (g) | Volume of kernel (ml) | Spe- cific gra- vity of kernel | Ker- nel: peel ratio |
|-----------|-----------------------|--------------------------|---------------------------------|----------------------|-----------------------|--------------------------------|----------------------|
| Kadma-1 | 2.92 | 3.71 | 3.27 | 9.40 | 7.85 | 1.20 | 1.17 |
| Singree-1 | 3.31 | 4.38 | 3.94 | 14.13 | 9.16 | 1.57 | 1.17 |
| Kadma-2 | 3.18 | 3.69 | 3.55 | 9.95 | 6.70 | 1.52 | 1.19 |
| Kadma-3 | 2.96 | 3.56 | 3.39 | 10.30 | 7.18 | 1.51 | 1.53 |
| Kadma-4 | 2.85 | 3.24 | 3.30 | 9.34 | 6.53 | 1.47 | 1.07 |
| Desi | | | | | | | |
| Lalla-1 | 3.34 | 4.05 | 3.58 | 12.88 | 9.86 | 1.41 | 1.27 |
| Kadma-5 | 3.25 | 3.68 | 3.74 | 12.23 | 9.28 | 1.34 | 1.18 |
| Kadma-6 | 3.46 | 3.73 | 3.72 | 12.45 | 8.83 | 1.41 | 1.65 |
| Kanpuria | | | | | | | |
| Red-1 | 3.40 | 3.79 | 3.72 | 12.14 | 8.25 | 1.46 | 1.28 |
| Ratni | 3.84 | 3.82 | 4.13 | 14.40 | 10.00 | 1.46 | 1.22 |
| Singree-2 | 3.78 | 4.10 | 4.01 | 17.50 | 13.68 | 1.25 | 1.79 |
| Desi | | | | | | | |
| Lalla-2 | 3.31 | 3.70 | 3.68 | 12.44 | 8.71 | 1.48 | 1.70 |
| Kadma-7 | 3.55 | 3.66 | 3.92 | 12.30 | 9.11 | 1.35 | 2.35 |
| Singree-3 | 3.50 | 3.85 | 3.76 | 13.28 | 8.80 | 1.51 | 2.79 |
| Shakkar | | | | | | | |
| Chini-1 | 3.18 | 3.76 | 3.54 | 14.41 | 6.31 | 1.52 | 1.43 |
| Shakkar | | | | | | | |
| Chini-2 | 3.48 | 3.48 | 3.85 | 11.20 | 7.15 | 1.57 | 4.48 |
| Kanpuria | | | | | | | |
| Red-2 | 3.64 | 3.91 | 3.99 | 14.26 | 10.56 | 1.34 | 1.60 |
| Shakkar | | | | | | | |
| Chini-3 | 3.58 | 3.76 | 3.99 | 12.20 | 8.45 | 1.44 | 1.94 |
| Kadma-8 | 3.37 | 3.27 | 3.67 | 9.79 | 6.50 | 1.43 | 0.91 |
| SE (mean) | 0.14 | 0.13 | 0.17 | 1.33 | 0.49 | NS | 0.13 |
| CD at 5% | 0.29 | 0.27 | 0.35 | 2.70 | 0.99 | - | 0.27 |

Results and Discussion

As a result of survey of different villages of Mohanlalganj block of Lucknow region, 19 genotypes were identified. There was wide range of variability with regards to physico-chemical properties of fruit samples collected during identification of water chestnut cultivar. Variability with respect to various physical parameters as given in given Tables 1, 2 showed remarkable variation respect the maximum fruit length (4.890 cm) was recorded in cultivar Ratni, followed by 4.473 cm in Kadma-8. The minimum fruit length (4.473 cm) was observed in Kadma-3. The maximum fruit breadth (4.870 cm) was recorded in cultivar Singree-1, followed by 4.653 cm in Desi Lalla-1. The maximum

cheek diameter of fruit (4.863 cm) was recorded in Ratni followed by 4.410 cm in Singree-2. The minimum cheek diameter of fruit (3.736 cm) was observed in Kadma-3. The maximum fruit weight (28.00 g) was recorded in cultivar Ratni while, the minimum fruit weight (17.03 g) was recorded in cultivar Kadma-3. The maximum fruit volume (25.733 ml) was recorded in cultivar Ratni, while the minimum fruit volume (15.180 ml) was recorded in Kadma-3. The maximum kernel length (3.846 cm) was recorded in cultivar Ratni, while the minimum kernel length (2.850 cm) was recorded in cultivar Kadma-4. The maximum breadth (4.380 cm) was recorded in cultivar Singree-1 while, the minimum breadth of kernel (3.243 cm) was recorded in cultivar Kadma-4. The maximum cheek diameter of

Table 3. Bio-chemical parameter of water chestnut (*Trapa natans* var *bispinosa* Roxb.) collected from Mohanlalganj block of Lucknow region.

| Cultivars | Total soluble solids (°Brix) | Ascorbic acid (mg/100 g) | Acidity (%) |
|-----------------|------------------------------|--------------------------|-------------|
| Kadma-1 | 6.60 | 8.28 | 0.106 |
| Singree-1 | 4.60 | 8.28 | 0.100 |
| Kadma-2 | 5.13 | 8.04 | 0.093 |
| Kadma-3 | 8.93 | 9.70 | 0.100 |
| Kadma-4 | 7.46 | 8.28 | 0.098 |
| Desi Lalla-1 | 4.33 | 8.28 | 0.106 |
| Kadma-5 | 6.33 | 8.99 | 0.098 |
| Kadma-6 | 7.20 | 9.46 | 0.097 |
| Kanpuria red-1 | 7.26 | 9.46 | 0.102 |
| Ratni | 7.66 | 8.28 | 0.097 |
| Singree-2 | 6.33 | 8.75 | 0.093 |
| Desi Lalla-2 | 8.93 | 8.28 | 0.102 |
| Kadma-7 | 6.86 | 8.75 | 0.095 |
| Singree-3 | 6.40 | 9.70 | 0.093 |
| Shakkar Chini-1 | 9.66 | 8.99 | 0.098 |
| Shakkar Chini-2 | 9.20 | 8.99 | 0.102 |
| Kanpuria red-2 | 8.93 | 8.04 | 0.102 |
| Shakkar Chini-3 | 10.53 | 8.99 | 0.095 |
| Kadma-8 | 7.20 | 8.75 | 0.093 |
| SE (mean) | 0.66 | 0.42 | 0.003 |
| CD at 5% | 1.35 | 0.86 | 0.007 |

kernel (4.130 cm) was recorded in cultivar Ratni while, minimum cheek diameter of kernel (3.276 cm) was recorded in cultivar Kadma. The maximum kernel volume (13.683 ml) recorded in cultivar Singree-2 while the minimum volume of kernel (6.316 ml) recorded in Shakkar Chini-1. The specific gravity of kernel varies from 1.579 to 1.207. The maximum specific gravity (1.579) was recorded in cultivar Singree-1 and minimum specific gravity of kernel (1.207) recorded in cultivar Kadma-1. The maximum peel weight (12.106 g) was recorded in cultivar Ratni and minimum peel weight (4.746 g) was recorded in cultivar Singree-3. The maximum kernel peel ratio (2.791) was recorded in cultivar Singree-3 while, the minimum kernel peel ratio (0.913) was recorded in cultivar Kadma-8.

A remarkable variability in water chestnut with respect to chemical parameters. Also recorded under

investigation in Table 3. Data shown the maximum TSS (10.53 °Brix) was recorded in cultivar Shakkar Chini-3 followed by 9.66 °Brix in Shakkar Chini-2, While the minimum TSS (4.33 °Brix) was recorded in cultivars Desi Lalla-1. The maximum ascorbic acid (9.703 mg/100 g) was found in the cultivars Kadma-3 and Singree-3, while the minimum ascorbic acid (8.046 mg/100 g) was recorded in cultivars Kadma-4 and Kanpuria-2 and the maximum acidity (0.106%) was found in the cultivars Kadma-1 and Desi Lalla-1 while, the minimum acidity (0.093%) was recorded in cultivars Kadma-2, Kadma-8, Singree-2 and Singree-3. The result was agreement with Jana and Mazumdar (6), Kapur et al. (7) and Dwivedi et al. (8).

Evidently, the genotypes Shakkar chini-1, 2 and 3, Singree-1, Singree-3, Kadma-1 Kadma-3 and Desi Lalla-1 seem to be superior with respect to several physical and quality parameters for crop improvement programs.

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