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Studies on variability in physico-chemical properties of aonla (*Emblica officinalis* Gaertn) genotypes

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ABSTRACT : The present investigation was conducted on different genotypes of aonla to assess the variability in physico-chemical properties of fruits. These plant were planted in the campus of Banaras Hindu University, Varanasi, U.P. The experiment was arranged in Randomized Block Design with 12 treatments and four replications. The observations recorded during experiment showed that genotype 6 and 7 were found most superior, in terms of physic- chemical properties of fruits. The maximum pulp content (88.25%), pulp: stone ratio (8.24) and ascorbic acid content (679.25 mg/ 100g) was recorded in genotype 7. Where as, highest TSS (12.18%), lowest acidity (1.80%) and maximum sugar (3.50%, 2.50% and 6.0% reducing, non-reducing and total sugar, respectively) was found in genotype 6.

KEY WORDS : *Emblica officinalis*, Genotypes , Physico-chemical properties, Variability

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Aonla or Indian gooseberry (*Emblica officinalis* Garten.) is an important indigenous fruit tree which belongs to family Euphoarbiaceae. It is successfully grown under both tropical and subtropical conditions with wide range of tolerance against salinity of the soil. It has been recognized as " Amritphal'' in an ancient literature. Triphala and Chyavanprash preparation of aonla are well known indigenous medicines in Ayurveda. It is one of the richest sources of vitamin-c among fruits after Barbados cherry and also useful for general improvement of health and medicinal purposes. The fruit are generally used for making Murabba, Candy, Chyavanprash, dried chips, jelly, pickles, toffee, powder etc. The fruit contains 'gallic acid'' and ''leucoanthocyanin'' which has an anti-oxidant property. Considering the high productivity per unit area, hardy nature, medicinal values and number of uses, there is every possibility that aonla will be one of the most important fruit of 21st century.

For the quality improvement programme in aonla, the physico-chemical composition of aonla fruits of different genotype needs to be thoroughly investigated and studied. The texture, size and physico-chemical composition are the main attributes, which decide the quality of aonla fruits. Any crop improvement including breeding method and traditional methods for propagation needs to have enough information about variability among aonla genotypes. The study of variability among aonla genotypes will help to develop cultivars of desired traits and fruit quality (Shukla *et al.*, 2005). Hence, the present experiment was carried out to assess the variability in physico-chemical quality of aonla for further improvements.

RESEARCH METHODS

The present investigation was carried out in the campus of Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P) during the year 2003-04. Regarding experimental materials, 12 genotypes of 15 years old seedling type aonla trees with uniform growth and vigour were selected for the study. Four branches were tagged in four directions for observation of each genotype. These plants received uniform cultural operations during the course of experimentation. The trial was laid out in randomized block

design with four replications. Fresh fruit sample of known weight was kept in hot air oven and dried to their constant weight at 65^0 C and dry weight was recorded and then computed by using the formula as given under:

$$\text{Moisture content} = \frac{\text{Dry weight}}{\text{Fresh weight}} \times 100$$

Stone pulp ratio was calculated on the basis of pulp percentage and stone percentage in fruits. For total soluble solids in fruit was determined by using "hand Refractometer" of 0-32 per cent and expressed as per cent in juice. Acidity of fruits was analyzed by titration the aliquot against o.1 N NaOH with using phenolphthalein an indicator, the appearance of light pink colour marked the end-point. The ascorbic acid content (mg/100 g) was determined by methods given as AOAC (1980). Total sugar and reducing sugar were estimated by Fehling's solution method as given by Lane and Eynon (1923). Non-reducing sugar was estimated by deducing the quantity of reducing sugar from the total sugar and multiplicated by a factors 0.95. The results were expressed as per cent sugar. Observations on variability in physico-chemical properties of fruits were recorded and the data were statistically analyzed.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarised under following heads:

Physical characters:

A perusal of data given in Fig. 1 showed wide range of variability in various aonla genotypes studied for moisture content which varied significantly from 80.00 to 84.50 per cent in genotype 10 and genotype 7, respectively. The pulp content of aonla fruits were also significantly varied in different genotypes and maximum pulp content (88.25%) was found in genotype 7 followed by genotype 8 (85.30%) and genotype 1 (85.25%). However, the lowest moisture (73.50%) was recorded in genotype 6 against mean value of 80.27%. Similarly, the stone content in aonla fruits also differed significantly which ranged from 10.70% to 26.60%. The higher stone content (26.50%) was recorded in genotype 6 followed by genotype 5 (25.76%) and genotype 7 (10.70%), was found significantly superior to other genotypes for having minimum stone per cent.

The data also indicate that pulp:stone ratio of fruits varied significantly. The maximum pulp: stone ratio (8.24) was calculated in genotype 7 followed by genotype 8 (6.24). However, the minimum pulp: stone ratio (2.77) was recorded in genotype 6 followed by genotype 10 (2.98) against mean value of 4.67. The stone per cent fully depends on fruit weight and pulp per cent. If pulp per cent is more, definitely stone per cent will be less and *vice-versa*. The pulp: stone ratio is an important aspect for selection of superior genotype by breeder. Similar results were also reported by Granade *et al.* (1998) and Kumar *et al.* (1993).

Chemical composition:

The data presented in Fig. 2 indicate that total soluble solid content of fruits varied significantly in different genotypes. The highest TSS (12.18%) was recorded in genotype 6 followed by genotype 3 (12.15%) and genotype 2 (11.85%) and lowest TSS (9.14%) was found in genotype 8. Regarding the acidity of aonla fruits, it ranged from 1.80 per cent to 2.46 per cent in genotype 6 and genotype 7. In this way genotype 6 (1.80%) was found superior followed by acidity of genotype 8 (1.81%) and genotype 1 (1.82%). This is a fact in many fruits that if total soluble solids are increased definitely acidity will be decreased, these findings were partially supplemented by Devi *et al.* (2002). Similarly, the ascorbic acid content of aonla genotype ranged from 459.90 to 679.25 mg/100 g. The maximum ascorbic acid content (679.25 mg/100 g) was noticed in genotype 7 followed by genotype 3 (675.25 mg/100 gm) and genotype 8 (673.80 mg/100 g). The minimum ascorbic acid (459.90

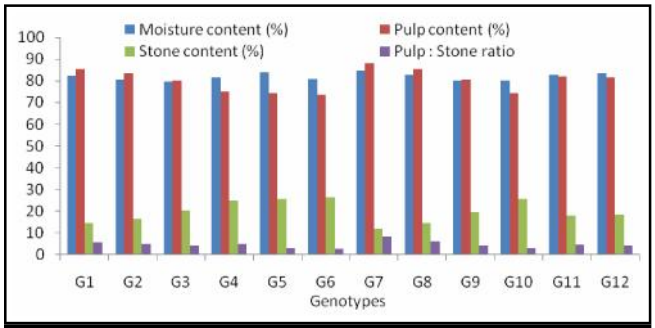

Fig. 1 : Variability in physical composition of fruit in aonla genotypes

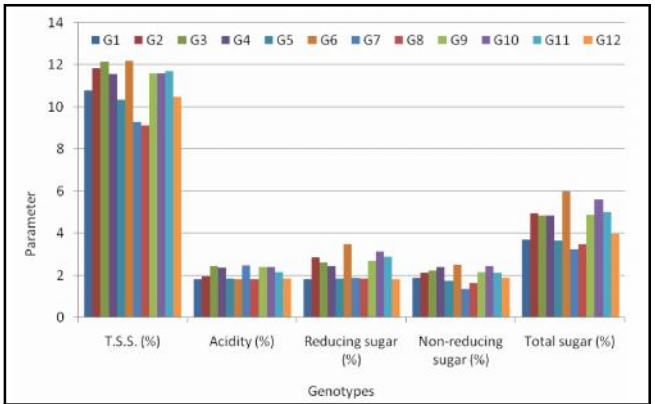

Fig. 2 : Variability in chemical composition of fruit in aonla genotypes

mg/100 g) was found in genotype 6 against the mean ascorbic acid content of 604.95 mg/100 g). All genotype were significantly superior except genotype 5 and genotype 6. The data presented in Fig. 2 also reveal that genotype 6 had significantly higher level of reducing sugar (3.50%), non reducing sugar (2.50%) and total sugar (6.00%) followed by genotype 10 (3.15%, 2.44% and 5.59% of reducing, non reducing and total sugar, respectively). However, the minimum reducing sugar was determined in genotype 1 (1.80%) and lowest non reducing (1.36%) as well as total sugar (3.23%) were recorded in genotype 7. Genotype 6 was significantly better over all the genotype with respect to reducing, non-reducing and total sugar. It is a fact that, if total soluble solids content increase, the ascorbic acid contents of fruit also increase because the precursor of ascorbic acid is glucose-6 phosphate and sugar content varied which might be due to genetic make up. These findings are in conformity with the results of Roy *et al.* (1999) and Bajpai (2002).

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