

SHORT COMMUNICATION

Characterization of Apple (*Malus pumila* Mill) Germplasm**VD Verma*, K Pradheep, SK Yadav¹, JC Rana and Ram Chander**

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¹ Division of Germplasm Evaluation, National Bureau of Plant genetic Resources, New Delhi-110 012**Key words: Apple, *Malus pumila*, Characterization, Germplasm**

Apple is a predominant temperate fruit crop of India and it accounts for about 10 per cent of the total fruit production of the country (Gautam *et al.*, 2003). Even though clonally propagated, sufficient variability has been generated over the years. Identification of genotypes which carry horticulturally desirable traits and transfer of these genes from old or less widely grown cultivars is essential to synthesize new genotypes for cultivation (Way *et al.*, 1990). An attempt was made to characterize 88 accessions augmented from exotic and indigenous sources, with easy and quick identification of phenotypes and correlate with practical utilization.

Present study was carried out at field gene bank of National Bureau of Plant Genetic Resources (NBPGR), Regional Station, Phagli, Shimla (31°05' 924" N latitude, 77°09' 580" longitude, 1924 m asl). Eighty eight accessions comprising 76 exotic (from 14 countries) and 12 indigenous were taken up for the present study. All the accessions were 8-12 years old, maintained with the spacing of 3.5x3.5 m. Observations were recorded on 15 qualitative characters (Table 1) and eight quantitative characters (Table 2). Total soluble solids (TSS) in the fruit pulp were measured by using Digital hand-held pocket refractometer 'PAL-1'. Descriptor states for qualitative characters were followed as per the descriptor developed by NBPGR (Mahajan *et al.*, 2002). Fruit data were recorded by randomly selected ten fruits from each accession. Mean values of three years (2002-2004) evaluation data were taken in to consideration to draw the conclusion. Frequency distribution of qualitative characters and variability parameters in quantitative characters were also worked out.

Characterization of germplasm (Table 1) indicated that out of 15 qualitative characters, absolute frequency was high (>70 %) for regular flowering, followed by smooth fruit apex. More than half the entries had upright tree habit, weak tree vigour, medium leaf size, broad-elliptic leaf shape, green-yellow fruit ground colour, low

level of fruit lenticels, medium level of juiciness and low productivity status. Existence of all the descriptor states of descriptors such as leaf size, bearing habit, fruit base and fruit base cavity depth, fruit skin lenticels, pulp texture and taste, juiciness, regularity of flowering and productivity status in the germplasm indicate rich diversity in the present germplasm.

More than fifty per cent accessions had either conical/globose-conical/globose shaped fruits, red/dark red colour distribution over the fruits at the time of maturity and medium sweet/sweet fruit taste. More than one third of the accessions had borne fruits in spurs, which can offer immense scope for high density planting along with quality fruits. Eight accessions were found to be acidic and could be used for making sauce or slices. Thirteen accessions showed absence of lenticels on the fruit skin.

Fruit weight ranged from 31.9 to 181g and exhibited a maximum coefficient of variability of 34.3 per cent (Table 2). The traits *viz.* fruit length and width also showed a considerable amount of variation (16.60 per cent). There lies two months difference in fruit maturity of the germplasm studied. The present holding had extra early and early maturing accessions; no late maturing variety after third week of August were available in the present germplasm. This warrants the need for introducing germplasm of late maturing types to prolong the market potential.

Wide range fruit maturity, fruit weight and TSS in apple were also reported by various workers (Chadha and Sharma, 1978; Om *et al.*, 1978). Numbers of promising accessions available for various quantitative characters are given in Table 2.

Variation was noticed in the present germplasm for various characters due to the involvement of material from different source countries and quantum of genetic improvement work put forth for the past 200 years. Characterization and evaluation for specific fruit quality characters and screening for abiotic and biotic stress

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Table 1. Frequency distribution of 88 acq. of apple for various qualitative characters

| Descriptor/descriptor state | Code | Absolute frequency | Per cent | Descriptor/descriptor state | Code | Absolute frequency | Per cent |
|--------------------------------|------|--------------------|----------|-----------------------------|------|--------------------|----------|
| Tree habit | | | | Fruit apex | | | |
| Upright | 3 | 50 | 56.82 | Smooth | 1 | 63 | 71.59 |
| Spreading | 5 | 38 | 43.18 | Wrinkled | 2 | 4 | 4.55 |
| Drooping | 7 | 0 | 0.00 | Grooved | 3 | 21 | 23.86 |
| Tree vigour | | | | Others | 99 | 0 | 0.00 |
| Extremely weak | 1 | 1 | 1.14 | Fruit ground colour | | | |
| Weak | 3 | 50 | 56.82 | Cream white | 1 | 1 | 1.14 |
| Intermediate | 5 | 23 | 26.14 | Yellow | 2 | 11 | 12.50 |
| Vigorous | 7 | 14 | 15.91 | Green yellow | 3 | 44 | 50.00 |
| Very vigorous | 9 | 0 | 0.00 | Green | 4 | 27 | 30.68 |
| Leaf size | | | | Orange | 5 | 0 | 0.00 |
| Small | 3 | 13 | 14.77 | Red | 6 | 5 | 5.68 |
| Medium | 5 | 59 | 67.05 | Others | 99 | 0 | 0.00 |
| Large | 7 | 16 | 18.18 | Fruit over colour | | | |
| Leaf shape | | | | Yellow (golden) | 1 | 8 | 9.09 |
| Oval | 1 | 18 | 20.45 | Pink | 2 | 8 | 9.09 |
| Ovate | 2 | 19 | 21.59 | Green | 3 | 5 | 5.68 |
| Broad elliptic | 3 | 51 | 57.95 | Orange | 4 | 3 | 3.41 |
| Others | 99 | 0 | 0.00 | Red | 5 | 35 | 39.77 |
| Regularity of flowering | | | | Dark red | 6 | 18 | 20.45 |
| Regular | 1 | 82 | 93.18 | Brown | 7 | 6 | 6.82 |
| Biennial | 2 | 4 | 4.55 | Purple | 8 | 3 | 3.41 |
| Irregular | 3 | 2 | 2.27 | Dark brown | 9 | 0 | 0.00 |
| Bearing habit | | | | Others | 99 | 2 | 2.27 |
| On spur | 1 | 39 | 44.32 | Fruit skin lenticel | | | |
| On shoot tips | 2 | 16 | 18.18 | Absent | 0 | 13 | 14.77 |
| On old shoots | 3 | 5 | 5.68 | Low | 3 | 44 | 50.00 |
| Mixed | 4 | 28 | 31.82 | Medium | 5 | 24 | 27.27 |
| Fruit shape | | | | High | 7 | 7 | 7.95 |
| Globose | 1 | 18 | 20.45 | Pulp texture | | | |
| Globose-conical | 2 | 25 | 28.41 | Soft | 3 | 24 | 27.27 |
| Short-globose | 3 | 0 | 0.00 | Intermediate | 5 | 39 | 44.32 |
| Flat | 4 | 13 | 14.77 | Firm | 7 | 25 | 28.41 |
| Flat-globose | 5 | 29 | 32.95 | Pulp taste | | | |
| Conical | 6 | 3 | 3.41 | Acidic | 1 | 8 | 9.09 |
| Long-conical | 7 | 0 | 0.00 | Sub acidic | 2 | 27 | 30.68 |
| Intermediate conical | 8 | 0 | 0.00 | Medium sweet | 3 | 42 | 47.73 |
| Ellipsoid | 9 | 0 | 0.00 | Sweet | 4 | 11 | 12.50 |
| Ellipsoid-conical | 10 | 0 | 0.00 | Juiciness | | | |
| Oblong | 11 | 0 | 0.00 | Less | 3 | 17 | 19.32 |
| Oblong-conical | 12 | 0 | 0.00 | Medium | 5 | 48 | 54.55 |
| Oblong-waisted | 13 | 0 | 0.00 | High | 7 | 23 | 26.14 |
| Others | 99 | 0 | 0.00 | Productivity status | | | |
| Fruit base | | | | Low | 3 | 53 | 60.23 |
| Narrow | 3 | 25 | 28.41 | Medium | 5 | 19 | 21.59 |
| Intermediate | 5 | 41 | 46.59 | High | 7 | 16 | 18.18 |
| Broad | 7 | 22 | 25.00 | | | | |
| Fruit base cavity depth | | | | | | | |
| Shallow | 3 | 37 | 42.05 | | | | |
| Medium | 5 | 34 | 38.64 | | | | |
| Deep | 7 | 17 | 19.32 | | | | |

Table 2. Variability parameters and promising accessions for different quantitative characters in 88 apple accessions

| Character | Range | Mean \pm SE | CV (%) | No. of promising accessions |
|-----------------------|--------------|------------------|--------|--|
| Start of flowering | March-April | - | - | - |
| End of flowering | March-April | - | - | - |
| Fruit harvest | June-August | - | - | 6 (< 3 rd June) 17 (1 st fortnight of July) |
| Days to fruit harvest | 90-137 | 115 \pm 1.10 | 8.90 | - |
| Fruit length (mm) | 30.60-75.80 | 48.60 \pm 0.90 | 16.60 | 2(>65) |
| Fruit width (mm) | 29.90-80.90 | 55.90 \pm 1.00 | 16.60 | 13(>65) |
| Fruit weight (g) | 31.90-181.00 | 81.50 \pm 3.00 | 34.30 | 7(>125) |
| TSS (%) | 9.50-17.90 | 12.50 \pm 0.20 | 13.30 | 10(>14) |

tolerance will lead to rapid utilization of the conserved germplasm.

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