VARIETAL IMPROVEMENT IN FEUTRELL’S EARLY THROUGH HYBRIDIZATION

Muhammad Afzal Javaid*, Malik Mohsin Abbas**, Tanveer Ahmad Mohar*** and Muhammad Zaman Awan****

ABSTRACT

A study was carried out at Horticultural Research Institute, AARI, Faisalabad, Pakistan to find out some new hybrid in mandarin with elite characters. At least 500 flowers of Feutrell’s Early were emasculated, crossed (Feutrell’s Early x Kinnow), bagged and tagged. After getting F₁ fruits, seeds were extracted and sown. At bearing stage, physico-chemical analysis was carried out. Newly formed hybrid (Feutrell’s Early x Kinnow) was more juicy (55.79%) than its parents (Kinnow and Feutrell’s Early) and it contained less number of seeds (11). This new hybrid had less average weight (120.54g) and size (27.33 cm) than parents but showed more acidity (0.69%) than Feutrell’s Early and less than that of Kinnow.

KEYWORDS: Citrus reticulata; hybridizing; F₁ hybrids; Pakistan.

INTRODUCTION

Citrus fruits are important due to their dietetic and therapeutic values. These fruits are rich source of vitamins and minerals as well. Besides their consumption as fresh fruits, citrus fruits are used for preparing many byproducts. Mandarins (Citrus reticulata Blanco) belong to Rutaceae family. The word “mandarin” in citrus fruits is used for easy-to-peel and loose skin fruits like Kinnow, Honey and Feutrell’s Early. Mandarins include as diverse group of citrus fruits that are characterized by bright peel and pulp colour, excellent flavour and segments that separate easily.

Feutrell’s Early, a promising variety of citrus, was introduced in Pakistan alongwith several other citrus varieties during 1940s. In Pakistan, it is liked due to its profuse bearing flavour, colour and good taste. It is an early season variety and when it ripens, no other mandarin variety comes in the market.

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Along the merits, Feutrell's Early has also some limitations like small fruits with poor juice quality, accepted for lack of alternatives and slight problem of raciness. Due to a very soft rind (skin), fruits are damaged during harvesting and shipping which results in heavy post-harvest losses. It has a short crushing season for juice makers (5). A long term breeding programme was initiated to improve Feutrell's Early by genetic means preserving its promising characters.

There are different means to resolve issue like conventional hybridization, which include use of monoembryonic parents, use of dominant markers (trifoliate leaf) in pollen parent, interploid hybridization, mutation breeding and selection of natural mutants, chimeras and bud strain/sports (variants among a clonal population). Out of these techniques the conventional hybridization method was used. Numerous species of genera in the subfamily Aurantioidae of family Rutaceae are both cross and graft compatible to many commercially important citrus cultivars. Hybridization is the sexual mating of plants containing desirable character. The objective is to combine in a single variety the useful characteristics of two or more lines, varieties or species. The first and most important step in hybridization is the wise selection of parents for a cross, which is made on the basis of traits to be combined and their model of inheritance. A lot of improvement in fruit varieties has been brought out by intercrossing of various varieties and species. Although in fruits, it is a long term and lengthy process, yet several excellent varieties have been produced as a result of hybridization.

Breeders have produced large number of hybrids in Florida, from many combinations of varieties and species (9, 10). Several citranges were produced, which were backcrossed with sweet orange, giving citrangors. However, none was obtained, which could combine a high degree of hardiness with good orange fruit quality. The most promising citranges appeared to be a partial substitute for the lemon (9).

Ibrahim (4) reported that 175 hybrids of orange and oraneloes were made and eight were selected. These hybrids produced good quality fruit with abundance of juice (50%) and TSS/acidity ratios and pineapple were palatable and acceptable. Hussain et al. (3) reported that a cross of pine apple x Musambi produced fruits having excellent quality, high juice percentage (42.27), TSS (9.71%), acidity (0.66%) and yield (400 fruits/plant) and matured in early December.

By crossing King Mandarin with Willow Leaf, Kinnow was released as hybrid in 1915. After partition of the sub-continent, Kinnow replaced the old variety Santra.
Three hybrids viz. Fair Child, Fremont and Fortune were developed with brick colour giving outstanding performance (2).
The present study was aimed to evolve new hybrid having more yield and better quality with good commercial value. Feutrell’s Early and Kinnow cultivars of mandarin were selected to obtain a hybrid with desired characters.

MATERIALS AND METHODS

This breeding work was started at Horticultural Research Institute, AARI, Faisalabad, Pakistan during the month of February, 1991 to have a new hybrid in mandarin with elite characters. For this purpose seven years old matured plants of Feutrell’s Early and Kinnow were selected as parents. The project was undertaken to add some elite characters in Feutrell’s Early by using conventional breeding approach. Feutrell’s Early was kept as female parent and Kinnow as male parent. These plants were checked for insect, pest and disease. During the flowering season, about 500 flowers of Feutrell’s Early were emasculated and crossed with the flowers of Kinnow. After crossing, flowers were wrapped in butter paper till the fruit set to avoid foreign interruption and 80 hybrid fruits of Feutrell’s Early x Kinnow were obtained during August, 1991. After getting F₁ fruits, seeds were extracted and sown in earthen pots. As a result three seedlings of Feutrell’s Early x Kinnow were obtained and transplanted in the nursery during 1995. These plants were transplanted in the fields in RCBD and after their juvenile stage the plants started to bear. Ten fruits of each hybrid plant were taken at random from all four sides of the trees and were analyzed during 2007 to 2008. The means of the both years were interpreted.

Data were analyzed statistically using Fishers analysis of variance and treatments were compared using the least significant difference (LSD) test at 5 percent probability level (7). There were three treatments, which were repeated five times making a total of 15 experimental units.

RESULTS AND DISCUSSION

The data on average weight and size of fruit indicated that fruit weight (120.54 g) and size (27.33 cm²) of newly developed hybrid, Feutrell’s Early x Kinnow, remained less than both of parents i.e. Kinnow and Feutrell’s Early (Table 1). The newly developed hybrid also showed less peel thickness (0.342 cm) than Kinnow and Feutrell’s Early (parents). The peel thickness of Kinnow and
Feutrell’s Early was 0.378 cm and 0.358 cm, respectively. The surface of peel of new hybrid was more smooth and attractive in colour than parents.

### Table. Physio chemical analysis of Feutrell’s Early x Kinnow compared with parents.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Average weight of fruit (g)</th>
<th>Average size of fruit (cm)</th>
<th>Peel thickness (cm)</th>
<th>Juice %age</th>
<th>TSS %age</th>
<th>Acidity %age</th>
<th>TSS/acidity ratio</th>
<th>Average No. of seeds/fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinnow</td>
<td>200.00a</td>
<td>48.14a</td>
<td>0.378a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feutrell’s. Early</td>
<td>138.59b</td>
<td>32.1b</td>
<td>0.358b</td>
<td>26.00a b</td>
<td>47.65b</td>
<td>9.5b</td>
<td>16.52b</td>
<td>16b</td>
</tr>
<tr>
<td>Feutrell’s Early x Kinnow</td>
<td>120.54c</td>
<td>27.33c</td>
<td>0.342b</td>
<td>28.15a</td>
<td>55.79a</td>
<td>0.69b</td>
<td>17.39b</td>
<td>11c</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td>5.409</td>
<td>2.44</td>
<td>0.0184</td>
<td>2.192</td>
<td>0.921</td>
<td>0.055</td>
<td>1.231</td>
<td>2.381</td>
</tr>
</tbody>
</table>

The physico-chemical analysis showed that Feutrell’s Early x Kinnow had 25.56 percent peel which was also less than either of its parents. Juice percentage Feutrell’s Early x Kinnow was higher (55.79%) than parents (Kinnow 47.65% and Feutrell’s Early 45.67%) (Table).

The newly developed hybrid showed more TSS (12.5%), than both the parents. The data regarding acidity showed that Feutrell’s Early, one of the parents, was less acidic than hybrid (0.69%) which was less than that of Kinnow (0.75%). TSS/acidity ratio of hybrid (17.39) was also less than Kinnow (21.11).
Number of seeds in both Kinnow and Feutrell’s Early is limiting factor from export point of view. The consumers and exporters demand the fruit with less number of seeds, less acidity with more yield potentials. The promising factor of newly developed hybrid was that it contained less number of seeds (11) as compared to Feutrell’s Early (16) and Kinnow (24).

REFERENCES