

Performance Evaluation of Various Sweet Orange Varieties under the Agro-climatic Conditions of Haripur Hazara

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Abstract: Performance of twelve sweet orange varieties (Casagrande, Sanguinello, Valencia late x Feutrell early, Pineapple, Jaffa x Valencia late, Pineapple x Musambi, Robel, Moro, Navelina, Mineola, Blood red and Ruby blood) was evaluated for their morphological and fruit quality characters during 2012-14. Valencia late x Feutrell early borne maximum number of fruits per plant (223.75), maximum number of segments per fruit (14.25), maximum TSS (12.35°brix) and sugar acid ratio (12.08), while the number of seeds per fruit was minimum (3.0). Robel and Jaffa x Valencia late proved more acidic (2.08%). Mineola plant was the tallest (3.33 m) while Moro was shortest (2.32 m). The shoot of Navelina was thick (1.47 cm) and internode length was also maximum (2.07 cm). The fruits of Pine apple were bigger (7.20 cm) while Blood red had heavier fruits (257.50 g).

Keywords: Acidity, citrus, musambi, TSS

INTRODUCTION

Pakistan is blessed with ideal climatic conditions to grow a wide range of horticultural crops. Among these, the citrus is the major and prized fruit holding number one position among all the fruits in respect of area and production. The Punjab province is the major contributor to the total citrus production followed by Khyber Pakhtunkhwa. In Pakistan, citrus are grown on an area of 194.5 thousand hectares with the total production of 1982.2 thousand tones, while in Khyber Pakhtunkhwa citrus are grown on an area of 4.01 thousand hectares with the total production of 32.29 thousand tones (Anonymous, 2011). In Khyber Pakhtunkhwa citrus is mainly grown in the District Haripur. The sweet orange variety Blood Red produced in Haripur is famous in all over the world due to its best quality, unique taste and appearance.

In Khyber Pakhtunkhwa, sour orange is extensively employed as a rootstock, which confers resistance to soil inhabiting fungi responsible for gummosis and foot rot diseases.

The aim of the present study was to assess the performance of Sweet orange varieties under the agro-climatic conditions of Haripur Hazara.

MATERIALS AND METHODS

The study was carried out at Germplasm Unit (GPU) Haripur. Twelve sweet orange varieties namely Casagrande, Sanguinello, Valencia late x Feutrell early, Pineapple, Jaffa x Valencia late, Pineapple x Musambi,

Robel, Moro, Navelina, Mineola, Blood red and Ruby blood were evaluated. The experiment was laid out in Randomized Complete Block Design (RCBD) and replicated thrice. Each replication had three plants per variety. All the plants were of the same age budded on sour orange. Throughout the growing period, same standard cultural practices were applied, while plant protection measures were taken when needed.

Morphological data was taken on No. of fruits per plant, Plant height (m), shoot thickness (cm) and internode length (cm). To determine fruit quality characters such as Fruit diameter (cm), Weight of fruit (g), No. of segments per fruit, No. of seeds per fruit, Total Soluble Solids (TSS) and Acidity (%), five fruits per plant of each variety were randomly selected and picked as and when the variety matured.

All the data was subjected to statistical analysis and means were separated by using LSD test as described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

No. of fruits per plant: In terms of Number of fruits per plant (Table 1), Valencia late x feutrell early borne maximum number of fruits per tree (223.75) followed by Casagrande (209.25) and Sanguinello (204). The data showed that minimum number of fruits per plant were harvested from Ruby blood (189.5) followed by Navelina (191) and Mineola (192.5).

Plant height (m): The data regarding plant height also showed significant differences among the means

Table 1: Mean of no. of fruits per plant, Plant height (m), shoot thickness (cm) and internode length (cm), Fruit diameter (cm)

Variety Name	No. of fruits/plant	Plant height (m)	Shoot thickness (cm)	Inter node length (cm)	Fruit Diameter
Valencia late x F. Early	223.75 a	3.07 bc	1.20 c	1.30 cde	6.43 f
Sanguinello	204 c	2.50 e	1.30 b	1.20 ef	6.6 d
Casagrande	209.25 b	2.85 d	1.10 d	1.28 de	7.07 c
Pine apple	199.5 f	3.02 cd	1.21 c	1.53 b	7.20 a
Jaffa x Valencia late	202.75 d	3.22 ab	1.10 d	1.40 bcd	6.20 g
Pine apple x Musambi	200.75 e	2.63 e	1.10 d	1.10 f	6.41 f
Robel	195.50 g	3.05 bc	1.20 c	1.23 ef	6.50 e
Moro	192.88 h	2.32 f	1.20 c	1.31 cde	6.43 f
Navelina	191 i	2.60 e	1.47 a	2.07 a	7.11 b
Mineola	192.5 h	3.33 a	1.30 b	1.39 bcd	7.10 bc
Blood Red	195.25 g	2.91 cd	1.50 a	1.39 bcd	6.20 g
Ruby Blood	189.5 j	2.85 d	1.30 b	1.45 bc	6.03 h
LSD (0.05)	1.15	0.18	0.25	0.15	0.03

Table 2: Mean of weight of fruit (g), No. of segments per fruit, No. of seeds per fruit, Total Soluble Solids (TSS), Acidity (%) and TSS/Acid ratio

Variety Name	Weight of fruit	No. of segments	No. of seed/fruit	TSS	Acidity	Sugar acid ratio
Valencia late x F. Early	210.25 c	14.25 a	3.0 e	12.35 a	1.02 d	12.08 a
Sanguinello	135.63 i	10.25 d	4.0 b	10.55 ab	1.91 ab	5.52def
Casagrande	174.25 g	14.00 a	4.0 b	9.30 bc	1.80 b	5.15 efg
Pine apple	189.75 e	14.25 a	3.0 e	7.77 c	2.01 ab	3.86 h
Jaffa x Valencia late	249.75 b	13.75 a	5.0 c	9.02 bc	2.08 a	4.34gh
Pine apple x Musambi	200.75 d	11.75 c	3.25 e	9.88 b	1.48 c	6.68 c
Robel	140.50 i	12.00 bc	4.25 d	8.80 bc	2.08 a	4.23gh
Moro	150.25 h	13.75 a	5.0 c	10.02 b	1.47 c	7.01 c
Navelina	181.00 f	12.25 bc	6.75 a	9.82 b	1.58 c	6.34 cd
Mineola	210.00 c	10.25 d	5.0 c	9.70 b	2.00 ab	4.84 fgh
Blood Red	257.50 a	12.00 bc	6.0 b	9.80 b	1.20 d	8.16 b
Ruby Blood	247.00 b	12.50 b	5.25 c	8.90 bc	1.47 c	6.25 cde
LSD (0.05)	6.06	0.70	0.41	1.87	0.21	1.11

(Table 1). The Mineola was tallest followed by Jaffa x Valencia late and Valencia late x Feutrellearly, while Moro attained minimum height i.e., 2.32 m followed by Casagrande and Ruby blood (2.85).

Shoot thickness (cm): The data in Table 1 shows that the variety Blood red has thick shoots (1.5) followed by Navelina (1.47). Casagrande, Jaffa x Valencia late and Pine apple x Musambi has thin shoots.

Internode length (cm): In case of internode length the data revealed that (Table 1) Navelina has maximum length (2.07) followed by Pine apple (1.53). However, minimum internode length was found in Pine apple x Musambi (1.10) followed by Sanguinello (1.20) and Robel (1.23).

Fruit Diameter (cm): It is evident from the data (Table 1) that pine apple fruit has higher diameter (7.20) followed by Navelina (7.11) and Casagrande (7.07), while Ruby blood showed lowest diameter (6.03) followed by Blood red (6.20).

Weight of fruit (g): The data presented in Table 2 shows that maximum fruit weight was attained by Blood red (257.50) followed by Jaffa x Valencia late (249.75) while Sanguinello (135.63) and Robel (140.50) got minimum fruit weight respectively. Similar studies were also conducted by Mohar *et al.* (2011) and Ishfaq *et al.* (1999). The results are in contrast, which might be due to the root stock effect.

No. of segments per fruit: The data (Table 2) revealed that the variety Valencia late x Feutrellearly showed maximum number of segments per fruit (14.25) followed by Casagrande (14). On the other hand, minimum number of segments per fruit was observed in Mineola and Sanguinello i.e., 10.25.

No. of seeds per fruit: The data (Table 2) showed that the maximum number of seeds per fruit were recorded in Navelina (6.75) followed by Blood red (6.00) while Valencia late x Feutrellearly and Pine apple have minimum number of seeds per fruit i.e., 3.00.

Total Soluble Solids (TSS): As shown in Table 2, the maximum percentage of TSS was measured in Valencia late x Feutrellearly (12.08) followed by Sanguinello (10.55). The Pine apple showed lowest percentage of TSS (7.77). The fruits having higher degree brix are highly valued and liked by masses.

Acidity (%): In case of acidity, Robel (2.08) and Jaffa x Valencia late (2.08) were less acidic while Valencia late x Feutrellearly was more acidic (1.02) followed by blood red (1.20) (Table 2).

Sugar acid ratio: The maximum Sugar Acid ratio was recorded in Valencia late x Feutrellearly (12.10) followed by Blood red (8.16), while the minimum ratio was observed in Pine apple (3.86) (Table 2).

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