

Influence of Rootstocks on "Red Delicious" Apple Grown in Balochistan

Muhammad Javed Tareen, ¹Abdul Qadir Tareen, Faiz Ullah Khan

²Abdul Razaq Raisani and Javed Ahmed Kamal

Directorate of Agriculture Extension, Balochistan, Quetta, Pakistan

¹Seed Farm Agriculture Research Institute, Balochistan, Quetta, Pakistan

²Directorate of Horticulture, Agriculture Research Institute, Balochistan, Quetta, Pakistan

Abstract: Influence of two dwarfing rootstocks viz. MM-106 and M-9 on apple cultivar red delicious was studied. Rootstocks MM-106 significantly increased percentage of fruit set, pre-harvest fruit drop proper stage of maturity and yield as compared to M-9. While M-9 increased only seed colour as compared to MM-106. Where as there was a little difference in fruit shape and size, fruit weight, skin colour of fruit, No. of seeds per fruit, fruit firmness, TSS and consumer's acceptability between the two rootstocks. Rootstock MM-106 was found partially better than rootstock M-9 on cultivar red delicious.

Key words: Rootstocks MM-106, M-9, cultivar red delicious

Introduction

Apple (*Malus sylvestris*) is a deciduous fruit crop. Apples are not only consumed as fresh fruit but also used for making jam, jellies, marmalade, cider, beverages and preserver. Apples are also canned in syrup after peeling. In Indo Pak sub-continent apples are grown in the hilly tracts of north-western Himalayas. In Pakistan Quetta, Pishin, Ziarat, Mustang, Kashmir, Parachinar, Skardu, Gilgit, Murree hills, Chitral, Swat, Hunza and other localities over 1000m above the sea level are apple-growing regions. In Pakistan apple is grown on about 39.5 (000) ha (Agri. State of Pakistan, 1993-94) with an annual production of about 442.4 (000) m t, where as Balochistan contributes about 356.2 (000) m t (Agri. State of Pakistan, 1993-94) of apple per annum from 31.2 (000) ha. Apples are caused for approximately 50% of total out put of deciduous fruit in the country. With rising cost of production there is greater interest of fruit growers in recent years in smaller trees. Although dwarf fruit trees have been grown in Europe for centuries and recently they have evoked little attention in North America. Dwarf trees can be more easily and economically pruned, sprayed, thinned, harvested and usually they come into fruiting at a much earlier age than standard trees. These advantages more compensate initial cost involved in the purchase and planting of more dwarf trees per hectare. Small trees required less space and if not crowded too much, will produce a high percentage of well colour fruit. A project on influence of rootstocks on percentage of fruit set, pre-harvest fruit drop, proper stage of maturity, yield, fruit shape and size, fruit weight, fruit colour, No. of seeds, seed colour, fruit firmness, total soluble solids and consumer's acceptability of apple cultivar red delicious had been designed to find out the suitable rootstock and productive scion cultivars for Balochistan apple growing regions.

Materials and Methods

This research experiment was conducted at horticultural farm, Deciduous Fruit Development Centre, Quetta, Balochistan, during the year 1995.

Experimental design: The experiment was laid out according to randomized complete block design which included two rootstocks (MM-106 and M-9) and one cultivar red delicious of ten years old uniform trees. All the trees were spaced evenly (20x20 ft²), trained to central ladder system and had been grown using standard commercial cultural practices, were selected for the experiment.

Percentage of fruit set: Percentage of fruit set data was taken

from each treatment. First of all branches of every replicated tree of cultivar red delicious were marked with paint from four different sides of equal diameter and length, designated east, west, north and south and then the average was calculated.

Pre-harvest fruit drop: Every replicated trees of cultivar red delicious were observed for fruit drop. When the fruit drop started the data was taken fortnightly 4 times.

Determination of proper stage of maturity: Data on determination of proper stage of maturity was determined by visual colour and size of the fruit. The fruits were picked when they attained average colour and size for picking.

Yield: Yield in kg of each treatment was noted on a weighing machine separately and then this average was calculated.

Fruit shape and size: Average fruit shape was measured selecting ten fruits randomly from each treatment and their average was calculated for fruit shape with the help of matching the shape of fruit with the fruit shape chart (Shapes of Apple Chart p: 17. Modern Fruit Science by Norman Childers).

Fruit size: Ten fruits were randomly selected from each treatment and were measured by means of vernier calliper and the average was then calculated. Data was noted both horizontally and vertically in millimetres.

Fruit weight: Ten fruits were randomly selected in grams with the help of electronic weighing machine and then the average was calculated.

Fruit colour: The data was collected from ten randomly selected fruit of each treatment (variety had 4 treatments of each rootstock and in each treatment there were three trees). Skin colour data was taken by giving points to each colour quality attribute. Light red colour (1-3), red colour (4-6) and dark red colour (7-9).

No. of seeds per fruit: Seeds of ten fruits randomly selected from each treatment were counted and then the average was calculated.

Seed colour: Colour of seeds from ten randomly selected fruits of each treatment was noted visually.

Fruit firmness: Data was collected for fruit firmness from ten randomly harvested apples, selected from each treatment. Data of fruit texture/firmness was evaluated with the help of Penetrometer in Kg. A thin circular portion of the skin was removed to accommodate the plunger tip on each two sides of the fruit.

Total soluble solids of fruit: Total soluble solids data was recorded from ten randomly selected fruits of each treatment by dropping a drop of juice of a fruit on the plate of refractometer.

Consumer's acceptability: Consumer's acceptability or Organoleptic evaluation acceptability data was evaluated through organoleptic evaluation method. A proforma was prepared and filled in by ten different judges who were given the fruit of cultivar red delicious on the two rootstocks.

Results and Discussion

Percentage of fruit set: For maximum fruit set (24.23%) was recorded on rootstock MM-106 while minimum fruit set was recorded (17.00%) in rootstock M-9 (Table 1). Increase in percentage of fruit set may be due to the cultivar characteristics some cultivars produce more flowers/spur while some less.

Table 1: Effect of rootstocks MM-106 and M-9 on the percentage of fruit set, preharvest fruit drop, proper stage of maturity, yield, fruit shape and size, fruit weight, skin colour, No. of seeds per fruit, seed colour, fruit firmness, total soluble solids of fruit and consumer's acceptability of red delicious apple cultivar

Cultivars	Root stocks	
	MM-106	MM-9
red delicious		
Percentage of fruit set	24.23A	17.00B
Pre-harvest fruit drop	11.33A	4.58B
Proper stage of maturity	145.30A	141.00B
Yield	221.58	161.75
Fruit shape and size	6.92	6.42
Fruit weight	139.25a	142.15A
Skin colour	5.21A	6.54A
No. of seeds per fruit	6.74	6.70
Seed colour	5.75B	8.75A
Fruit firmness	8.32	7.54
TSS	60.75	59.95
Consumers' acceptability	5.80	5.71

Figures bearing different letters are statistically different at 5% level of significance.

Pre-harvest fruit drop: Maximum fruit drop (11.33) was recorded in rootstock MM-106 while minimum fruit drop (4.58) was recorded on rootstock M-9 (Table 1). Maximum pre-harvest fruit drop on rootstock MM-106 may be poor vigour of tree. Excess of water is also a cause of pre-harvest fruit drop.

Proper stage of maturity: Maximum days to maturity (145.30) were taken by red delicious on rootstock MM-106 while minimum days to maturity (141.00) were taken by red delicious on rootstock M-9 (Table 1). Westwood (1978) also reported that all delicious strains of apple take 140-160 days to maturity from flowering fewer days or more days to maturity between two rootstocks may be due to either increase or decrease in number of leaves and difference in time of fruit set.

Yield: Maximum yield (221.58 Kg) was recorded on rootstock MM-106 while minimum yield (161.75 Kg) was recorded on M-9 (Table 1). Eijden and Eidjan (1990) also reported that on M-9 the yield per tree was considerably lower.

Fruit shape and size: Rootstocks are partially significantly different

from each other. Maximum fruit size (6.92) was in red delicious recorded on rootstock MM-106 while minimum fruit size (6.42) was recorded in red delicious was little reduction in fruit size (Table 1). Size of fruit either increased or decreased may be due to less or more percent of fruit set. Kosina (1988) also reported that rootstock effect on fruit size was small.

For the shape of the red delicious fruit was matched with the fruit shape chart of Childers (1983). Red delicious fruit is round-oblate in shape.

Fruit weight: Maximum average fruit weight (142.15 gm) was recorded in red delicious on rootstock M-9 while minimum average fruit weight (139.25 gm) was recorded in red delicious on rootstock MM-106 (Table 1). Difference in fruit weight between the two rootstocks may be due to less or more number of fruit set.

Skin colour: Maximum shin colour of fruit (6.54) was recorded in red delicious on rootstocks M-9 while minimum shin colour of fruit (5.21) was recorded in red delicious on rootstock MM-106 (Table 1). Colour of fruits fetches more price and attraction of consumers especially red colour apple fruits then yellow and golden. Difference in skin colour of fruit may be due to difference in scaffold of the tree branches, sunshine and shorter or longer period of fruit on the tree.

No. of seeds per fruit: There is no significant difference in No. of seeds however maximum number of seeds/fruit (6.74) was recorded in red delicious on rootstock MM-106 while minimum number seeds/fruit (6.70) was recorded in red delicious on root stock M-9 (Table 1). Number of seeds per fruit effects significantly on the size and shape of the apple fruit.

Seed colour: Maximum seed colour (8.75) was recorded in red delicious on rootstock M-9 while minimum seed colour (5.75) was recorded in red delicious on rootstock MM-106 (Table 1). Differences in seed colour may be due to mall fertilization of seeds. Healthy, complete in size and length seeds had attained more colours.

Fruit firmness: Maximum fruit firmness (8.32) was recorded in red delicious on rootstock MM-106 while minimum fruit firmness (7.54) was recorded in red delicious on rootstock M-9.

TSS: Maximum total soluble solids (60.75) was recorded in red delicious on rootstock MM-106 while minimum total soluble solids (59.95) was recorded in red delicious on rootstock M-9 (Table 1). Ystaas and Froynes (1993) also reported that rootstocks have influenced fruit total soluble solids content in a favourable manner. Rootstocks have shown non-significant differences for total soluble solids between them. However, maximum total soluble solids were partially found in rootstock MM-106 followed by rootstock M-9. Quamme and Brownlee (1993) also reported that rootstocks had little or no difference in total soluble solids content of fruit.

Consumer's acceptability: There is no significant difference in consumer's acceptability between the two rootstocks. However, maximum consumer's acceptability (5.80) was recorded in red delicious on rootstock MM-106 while minimum consumer's acceptability (5.71) was recorded in red delicious on rootstock M-9. Greulich *et al.* (1993) reported that trees on M-9, M-26 and MM-106 produced the highest and most regular yields of high quality apple fruits. The characteristics of rootstocks as tree dwarfness, tree vigour, less number of fruit on the tree etc. also effect the fruit quality for consumer's acceptability. For consumer's acceptability fruit is to be needed of good aroma,

Tareen *et al.*: Influence of rootstocks on the apple cultivars quality

texture, colour, enough total soluble solids content of fruit and shape and size of the fruit.

On the basis of one year study on these two rootstocks, MM-106 apple cultivar red delicious showed partially better performance than M-9 for fruit set, yield fruit shape and size, No. of seeds per fruit, fruit firmness, TTS and consumers acceptability. Whereas M-9 was partially better than MM-106 for yield fruit weight, skin colour and seed colour. In the ray of these results MM-106 can be recommended as a commercial rootstock for the commercial production of apple cultivar red delicious in the Quetta and Northern Balochistan regions.

References

- Agriculture State of Pakistan, 1993-94. Ministry of Food Agriculture and Co-operative Food and Agriculture Division Economics wing Islamabad, Pakistan, pp: 35.
- Childers, N.F., 1983. Modern Fruit Science, Orchard and small fruit culture. Hort. Publications, Gainesville, Florida, pp: 1,17, 19.
- Eijden, J.V. and V.J. Eijden, 1990. M-27 in another perspective. *Fruittelt-Den-Hang*, 81: 18-19.
- Greulich, E., H.J. Koch and G. Siele, 1983. Correlation between crown form, cultivar-rootstock combination, cropping regularity and pruning in orchards. *Gartenbau*, 30: 369-371.
- Kosina, J., 1988. influence of new apple clonal rootstocks on early orchard performance of three cultivars. *Acta-Horticulturae*. No. 224,331-335.
- Quamme, H.A. and R.T. Brownlee, 1993. Early performance of micropropagated trees of several *Malus* and *Prunus* cvs. On their own roots. *Canadian J. Plant Sci.*, 73: 847-855.
- Westwood, M.N., 1978. *Temperate Zone Pomology*, W.H. Freeman and Company, New York, pp: 280-281.
- Ystaas, J. and O. Froynes, 1993. Effects of the Polish rootstocks P2 and P22 on vigour, yield and fruit characteristics of the apple cultivar 'Gravesstein'. *Acta Agriculturae Scandinavica Section-B, Soil and Pl. Science*, 43: 244-246.