Himachal Journal of Agricultural Research Vol. 32(1) : 99-103, 2006

Studies on the variation in physico-chemical characteristics of clones of Dashehari mango growing in different parts of Himachal Pradesh

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Abstract

The study was undertaken in the Department of Fruit Breeding and Genetic Resources, Dr. Y.S. Parmar University of Horticulture & Forestry, Nauni, Solan, Himachal Pradesh during 2002 and 2003 in three locations viz. Dhaulakuan, Jarol and Jachh. The marked variation was recorded in physico-chemical characters of fruits in these locations. The fruit weight ranged between 149.57 to 209.54g, fruit length 9.51 to 11.54 cm, fruit breadth 5.31 to 5.92 cm, fruit thickness 4.83 to 5.28 cm, specific gravity 0.99 to 1.03, pulp 66.40 to 73.18%, peel 12.85 to 17.93%, stone 12.13 to 16.34%, stone length 8.46 to 10.31 cm, stone breadth 2.62 to 3.09 cm, stone thickness 1.70 to 2.16 cm, pulp/ stone ratio 4.22 to 6.00, TSS 18.40 to 21.54°B, acidity 0.14 to 0.34%, ascorbic acid 11.55 to 16.60 mg/100g, reducing sugars 2.72 to 3.96%, non-reducing sugar 13.10 to 16.26%, total sugars 17.21 to 20.34% and TSS/acid ratio 60.25 to 152.54. The coefficient of variation among these characters ranged between 0.64 to 17.05%.

Introduction

Mango is one of the most important fruits grown in India. It has excellent flavour, attractive fragrance, beautiful shades of colour and taste. The world production of mango in 2005 was 27,966,749 MT with an area of 3,870,200 ha whereas the production of India was 10,800,000 MT with an area of 1,600,000 ha (FAO, 2005). Mango is grown in almost all states of India and accounts for 10.1 per cent of total production of fruit crops. In Himachal Pradesh, Dashehari is main cultivar of mango under cultivation. However, there is an extreme variation in tree of this cultivar which results in low production of inferior quality fruits. But it has also been noticed that some trees have better quality fruits with higher yield. In case such trees are selected, both yield and quality can be enhanced. Hence, the present studies were aimed to study the variation in physico-chemical characters of different clones for selection of desirable ones.

Material and Methods

A field survey was carried out in a process to select superior clones of mango cv. Dashehari in three locations viz. Dhaulakuan (Sirmour), Jarol (Mandi) and Jachh (Kangra) during 2002 and 2003. Dhaulakuan area is 468 m above sea level having 35°5'N latitude and 75°50'E longitude. Data during 2002 were recorded on 93 trees out of which only 23 trees were marked for recording data in 2003. Jarol area is 612 m above sea level having latitude of 30°16'N and longitude of 75°52'E. The data during 2002 were recorded on 70 trees out of which 22 trees were marked in 2003 for recording observations on physico-chemical characteristics of the fruit. Jachh area is 428 m above sea level having latitude of 32°18'N and longitude of 75°52'E. Data on 94 trees were recorded in 2002, out of which 22 were marked for recording data during 2003. The chemical analysis of fruits was carried out as per methods suggested by AOAC (1980). Statistical analysis to find out the mean, standard deviation, coefficient variation was done by following standard procedures (Panse and Sukhatme, 1985).

Results and Discussion

Physical characters

It is apparent from Table 1 that in district Sirmour the fruit weight ranged between 149.57 to 183.82g, fruit length 9.51 to 10.58 cm, fruit breadth 5.31 to 5.70 cm, fruit thickness 4.83 to 5.10 cm, specific gravity 0.99 to 1.03, pulp 67.20 to 73.18 per cent, peel 13.18 to 17.27 per cent, stone 12.13 to 15.58 per cent, stone length 8.46 to 9.44 cm, stone breadth

Table 1. Variation in physical characters of fruits in mango cv. Dashehari under different locations of Himachal Pradesh

Character	Sirmour			Mandi			Kangra		
	Range	Mean ± SE	CoV	Range	Mean ± SE	CoV	Range	Mean ± SE	CoV
Fruit weight (g)	149.57-183.82	172.98±1.75	4.86	151.88-197.33	174.54±2.32	6.21	174.66-209.54	192.67±1.99	4.85
Fruit length (cm)	9.51-10.58	10.01±0.06	2.70	10.12-10.76	10.42±0.03	1.49	10.31-11.54	10.78±0.07	3.02
Fruit breadth (cm)	5.31-5.70	5.53±0.02	1.78	5.44-5.78	5.60±0.02	1.67	5.53-5.92	5.78±0.02	1.95
Fruit thickness (cm)	4.83-5.10	4.99±0.02	1.59	4.92-5.23	5.06±0.02	1.55	4.94-5.28	5.15±0.02	1.59
Specific gravity	0.99-1.03	1.01±0.01	0.98	1.00-1.03	1.01±0.01	0.61	1.00-1.03	1.01±0.01	0.64
Pulp (%)	67.20-73.18	70.60±0.31	2.09	66.40-71.98	69.17±0.25	1.72	69.80-73.18	71.36±0.20	1.33
Peel (%)	13.18-17.27	15.53±0.25	7.81	14.24-17.93	16.10±0.17	5.03	12.85-15.99	14.60±0.17	5.44
Stone (%)	12.13-15.58	13.72±0.19	6.73	12.97-16.34	14.74±0.17	5.55	12.77-15.20	14.05±0.15	5.03
Stone length (cm)	8.46-9.44	8.95±0.05	2.93	8.99-9.58	9.27±0.03	1.53	9.17-10.31	9.60±0.07	3.20
Stone breadth (cm)	2.62-2.96	2.81±0.02	3.62	2.74-3.09	2.95±0.02	3.01	2.74-3.09	2.95±0.02	3.47
Stone thickness (cm)	1.70-2.04	1.87±0.02	4.84	1.79-2.16	1.97±0.02	5.32	1.79-2.14	2.03±0.02	4.36
Pulp/Stone ratio	4.32-6.00	5.20±0.08	7.78	4.22-5.54	4.72±0.07	6.98	4.71-5.87	5.12±0.07	6.60

2.62 to 2.96 cm, stone thickness 1.70 to 2.04 cm and pulp/stone ratio 4.32 to 6.00. The coefficient of variability for these characters ranged between 0.98 per cent for specific gravity of the fruit to 7.81 for peel percentage.

The variation in physical characters of fruit for Jarol area revealed that fruit weight varied between 151.88 to 197.33g, fruit length 10.12 to 10.76 cm, fruit breadth 5.44 to 5.78 cm, fruit thickness 4.92 to 5.23 cm, specific gravity 1.00 to 1.03, pulp percentage 66.40 to 71.98, peel percentage 14.24 to 17.93, stone percentage 12.97 to 16.34, stone length 8.99 to 9.58 cm, stone breadth 2.74 to 3.09 cm, stone thickness 1.79 to 2.16 cm and pulp/stone ratio 4.22 to 5.54. The coefficient of variation for these characters ranged between 0.61 for specific gravity to 6.98 per cent for pulp/stone ratio.

As is evident from the data present in Table 1 that for the mango trees grown in Jachh area of district Kangra, fruit weight varied between 174.66 to 209.54g, fruit length 10.31 to 11.54 cm, fruit breadth 5.53 to 5.92 cm, fruit thickness 4.94 to 5.28 cm, specific gravity 1.00 to 1.03, pulp percentage 69.80 to 73.18, peel percentage 12.85 to 15.99, stone percentage 12.77 to 15.20, stone length 9.17 to 10.31 cm, stone breadth 2.74 to 3.09 cm, stone thickness 1.79 to 2.14 cm and pulp/stone ratio 4.71 to 5.87. The coefficient of variation for these characters varied between 0.64 for specific gravity to 6.60 for pulp/stone ratio.

Chemical characters

It is apparent from the data presented in Table 2 that the variation in chemical characters for Dhaulakuan area ranged between 18.55 to 21.20°B for TSS, acidity from 0.21 to 0.34 per cent, ascorbic acid 11.55 to 16.08 mg/100g, reducing sugars 2.74 to 3.86 per cent, non-reducing sugars 13.26 to 16.26 per cent, total sugars from 17.28 to 20.01 per cent and TSS/acid ratio between 60.25 to 107.23. The coefficient of variation varied from 3.08 per cent for TSS to 14.15 per cent for acidity.

The variation for chemical characters of the fruit of Jarol area of district Mandi showed that TSS varied between 18.40 to 21.07°B, acid content from 0.21 to 0.33 per cent, ascorbic acid 11.86 to 16.17 mg/100g, reducing sugars 2.72 to 3.96 per cent, non-reducing sugars 13.10 to 16.19 per cent, total sugars 17.21 to 19.83 per cent and TSS/acid ratio from 62.17 to 102.22. The coefficient of variation ranged between 2.99 for TSS to 11.51 for TSS/acid ratio.

The variation under Jachh area of Kangra district for TSS ranged between 19.24 to 21.54°B, acidity 0.14 to 0.25 per cent, ascorbic acid 12.19 to 16.60 mg/100 g, reducing sugars 2.77 to 3.85 per cent, non-reducing sugars 14.31 to 16.23 per cent, total sugars 18.50 to 20.34 per cent and TSS/acid ratio 84.26 to 152.54. The coefficient of variation ranged between 2.58 per cent for total sugars to 17.05 per cent for TSS/acid ratio.

There was significant variation in physical and chemical characters of the fruit under all the locations. The variation between and within locations was also noticed. This shows that even the trees growing under similar locations and getting uniform cultural practices behave differently. These differences in their performance may be attributed to some genetic changes which have taken place during the course of their cultivation. These changes may be responsible for the performance of a particular tree or clone. This variation in their overall performance provides an opportunity for the selection of clones which are superior in quality and production. The variations have been reported by Mukherjee *et al.* (1983) while surveying mangoes of West Bengal. Mukunda (1996) also suggested the crop improvement in mango through clonal selection. The variability in chemical constituents also has been reported by many workers in mango (Singh *et al.* 1985; Singh *et al.* 1988).

Table 2. Variation in chemical characters of fruits in mango cv. Dashehari under different locations of Himachal Pradesh

Character	Sirmour			Mandi			Kangra		
	Range	Mean ± SE	CoV	Range	Mean ± SE	CoV	Range	Mean ± SE	CoV
TSS (°Brix)	18.55-21.20	19.91±0.13	3.08	18.40-21.07	20.12±0.13	2.99	19.24-21.54	20.56±0.12	2.84
Acidity (%)	0.21-0.34	0.26±0.01	14.15	0.21-0.33	0.25±0.01	11.20	0.14-0.25	0.20±0.01	15.55
Ascorbic acid (mg/100g)	11.55-16.08	13.94±0.27	9.19	11.86-16.17	14.32±0.22	7.24	12.19-16.60	14.54±0.24	7.90
Reducing sugar (%)	2.74-3.86	3.28±0.06	8.76	2.72-3.96	3.20±0.07	9.74	2.77-3.85	3.18±0.07	10.63
Non-reducing sugar (%)	13.26-16.26	14.65±0.14	4.70	13.10-16.19	14.95±0.16	4.97	14.31-16.23	15.39±0.11	3.44
Total sugar (%)	17.28-20.01	18.70±0.13	3.28	17.21-19.83	18.94±0.13	3.12	18.50-20.34	19.37±0.11	2.58
TSS/Acid ratio	60.25-107.23	82.68±2.37	13.77	62.17-102.22	85.03±2.09	11.51	84.26-152.54	109.86±3.99	17.05

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