



## Evaluation of various apple (*Malus x domestica* Borkh) cultivars for fruit characters

Girish Sharma<sup>1</sup>, Ashok Yadav<sup>2\*</sup> and Manish Thakur<sup>3</sup>

<sup>1,2 & 3</sup> Department of Fruit Science, Dr. Y.S. Parmar University of Horticulture and Forestry,  
Nauni- Solan (Himachal Pradesh) INDIA

\* Correspondance: E-mail: [ashokkumartherock@gmail.com](mailto:ashokkumartherock@gmail.com)

(Received 25 May, 2015; Accepted 10 July, 2015; Published 22 July, 2015)

**ABSTRACT:** Investigations were carried out on 16 cultivars of apple during 2010-2014 for various fruit characters to screen promising cultivars based on various fruit characters. These cultivars under study differed significantly with each other for various characters. Fruits of cultivar ‘Neomi’ had maximum fruit length (6.38 cm), fruit diameter (7.27 cm), fruit weight (131.50 g), total sugar (8.28 %), low acidity (0.39 %) and high reducing sugar (7.79 %). Maximum flesh firmness (12.99 kg/cm<sup>2</sup>) was recorded in the cultivar ‘Red Fuji’. Maximum total soluble solid (12.34 °Brix) content was recorded in the cultivar ‘Jonadel’. Maximum number of seeds (9.0) was recorded in the cultivar ‘Ruspippin’.

**Keywords:** Apple; cultivars; evaluation; productivity.

**INTRODUCTION:** Apple (*Malus x domestica* Borkh) member of family Rosaceae and subfamily pomeoideae is an important fruit crop of temperate regions with regard to acreage, production, economic value and above all popularity among the society. In India it is the prime commercial fruit crop of Jammu and Kashmir, Himachal Pradesh, Utrakhand, and some parts of North Eastern states including Arunachal Pradesh, Sikkim, Meghalaya and Nilgiri hills of Tamil Nadu. In Himachal Pradesh, apple productivity has gradually declined and numbers of factors are responsible for it. To overcome the problem of low productivity, one way is to overcome various problems while cultivation of new high yielding commercial cultivars which are adapted to various climatic conditions. Breeding and Genetic Resources has the mandate for introduction and evaluation of cultivars of different fruit crops for various desirable fruit characters to isolate the promising types depending upon various climatic conditions of the region.

**MATERIAL AND METHODS:** The present investigations were undertaken in the Department of Fruit Science, Dr Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh during the year 2010-14. The experimental site was located at an elevation of 1250 meters above mean sea level and situated at 31 °N latitude and 77 °E longitude with an

average annual rainfall of about 1200 mm. The plant material consisted of 16 apple cultivars planted in Randomized Block Design with three replications. All the recommended package of practice was followed during study period. Data were recorded for two years for various fruit characters to isolate elite cultivar. All standard methods were used to record the data. Acidity and sugars were analyzed as per AOAC, 1980. Statistical analysis was performed as per Panse and Sukhatme, 1961.

**RESULTS AND DISCUSSION:** The data on various physico-chemical fruit characters of various cultivars is presented in Table 1 and 2. Maximum fruit length was recorded in the cultivar ‘Neomi’ (6.38 cm) which differed statistically from rest of the cultivars while minimum fruit length value was recorded in the cultivar ‘Crimson Gold’ (4.78 cm). Fruit diameter varied from 5.62 cm to 7.27 cm. The cultivar ‘Neomi’ (7.27 cm) registered the highest value for fruit diameter which differed statistically from rest of the cultivars while the cultivars ‘Crimson Gold’ (5.62 cm) and ‘Elstar’ ( 5.62 cm) showed the lowest value. Maximum and minimum fruit weight was measured in cultivars ‘Neomi’ (131.5 g) and ‘Crimson Gold’ (56.10 g) respectively and significantly differs from other cultivars.

Similarly differences were also recorded for flesh firmness. Maximum fruit firmness (12.99 kg/cm<sup>2</sup>) was recorded in cultivar 'Red Fuji' while it minimum (10.21 kg/cm<sup>2</sup>) in cultivar 'Fuji'. Number of seeds per fruit varied from 4.00 to 9.00. the cultivar 'Ruspippin'

(9.00) produced maximum number of seeds which was statistically at par with cultivar 'Summered', 'Fuji', 'Spartan', and 'Spijon' while cultivar 'Sinta' (4.00) produced minimum number of seeds.

**Table 1: Physical fruit characters of various apple cultivars (Pooled data).**

Cultivars	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Flesh firmness (kg/cm <sup>2</sup> )	Number of seeds/fruit
Arlet	5.53	5.86	74.30	12.46	6.00
Crimson Gold	4.78	5.62	56.10	10.79	5.33
Elstar	4.96	5.62	66.70	12.30	4.33
Fuji	5.60	6.17	75.10	10.21	8.00
Gala	5.97	6.51	96.90	11.25	5.16
Jonadel	6.12	6.67	126.90	1.68	4.66
Jonagold	5.72	6.33	88.80	11.32	5.00
Neomi	6.38	7.27	131.50	10.39	7.00
Quinte	5.57	6.49	76.10	12.07	6.00
Red Fuji	5.33	6.13	71.80	12.99	5.00
Royal Gala	5.22	5.78	70.80	11.74	5.00
Ruspippin	6.03	6.50	105.00	10.42	9.00
Sinta	5.53	6.31	80.60	11.47	4.00
Spartan	5.90	6.67	92.90	12.60	8.00
Spijon	5.79	6.32	77.20	11.08	8.00
Summered	5.82	6.76	92.30	11.87	8.83
Mean	5.64	6.31	86.40	10.97	6.20
CD <sub>0.05</sub>	1.17	0.16	6.83	0.65	2.20

**Table 2: Chemical characters of various apple cultivars (Pooled data).**

Cultivars	TSS (°Brix)	Acidity (%)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)
Arlet	11.94	0.73 (0.85)	7.01 (2.64)	6.05 (2.46)	0.76 (0.87)
Crimson Gold	11.07	0.79 (0.9)	6.47 (2.54)	5.68 (2.38)	0.56 (0.75)
Elstar	11.56	0.59 (0.77)	7.69 (2.77)	6.85 (2.61)	0.66 (0.81)
Fuji	11.38	0.59 (0.77)	7.64 (2.76)	6.84 (2.61)	0.66 (0.81)
Gala	11.52	0.57 (0.75)	7.86 (2.80)	6.88 (2.62)	0.78 (0.88)
Jonadel	12.34	0.73 (0.85)	7.00 (2.64)	5.86 (2.42)	0.89 (0.94)
Jonagold	11.11	0.55 (0.74)	7.89 (2.80)	6.29 (2.50)	0.13 (0.01)
Neomi	11.56	0.39 (0.62)	8.68 (2.94)	7.79 (2.79)	0.77 (0.88)
Quinte	11.05	0.66 (0.81)	8.35 (2.89)	7.34 (2.70)	0.80 (0.89)

Red Fuji	11.66	0.66 (0.81)	7.30 (2.70)	6.40 (2.53)	0.66 (0.81)
Royal Gala	11.67	0.53 (0.73)	8.17 (2.85)	7.20 (2.68)	0.77 (0.88)
Ruspippin	12.05	0.61 (0.78)	7.60 (2.75)	6.80 (2.60)	0.60 (0.77)
Sinta	11.79	0.71 (0.84)	7.09 (2.66)	6.53 (2.55)	0.86 (0.93)
Spartan	11.62	0.76 (0.87)	6.82 (2.61)	5.66 (2.37)	0.90 (0.94)
Spijon	11.27	0.80 (0.89)	6.51 (2.55)	5.52 (2.35)	0.77 (0.88)
Summered	11.36	0.70 (0.83)	7.09 (2.66)	6.21 (2.49)	0.71 (0.84)
Mean	11.55	0.64 (0.80)	7.44 (2.72)	6.49 (2.54)	0.70 (0.80)
CD <sub>0.05</sub>	0.11	0.010	0.004	0.06	0.009

*\*Figures in parenthesis are square root transformed values*

Maximum total soluble solid (TSS) content was recorded in the cultivar ‘Jonadel’ (12.34°Brix) followed by ‘Arlet’ (11.94°Brix), ‘Sinta’ (11.79°Brix) and differed statistically from one another and rest of the cultivars while minimum TSS recorded in the cultivar ‘Quinte’ (11.05 °Brix). Minimum per cent acidity was recorded in the cultivar ‘Neomi’ (0.39 %) while it was maximum in the fruits of ‘Spijon’ (0.80 %). Cultivar ‘Neomi’ recorded the highest value for total sugars (8.68 %) followed by ‘Quinte’ (8.35 %), ‘Royal Gala’ (8.17 %), ‘Jonagold’ (7.89 %) and they differed statistically from one another. Cultivar ‘Crimson Gold’ recorded the minimum value of total sugar content (6.47 %). Highest value of reducing sugar was recorded in the fruits of cultivar ‘Neomi’ (7.79 %) followed by ‘Quinte’ (7.34 %) and ‘Royal Gala’ (7.20 %). This cultivar differed statistically from one another. The lowest value was observed for the cultivar ‘Spijon’ (5.52 %). The per cent non-reducing sugar was recorded to be maximum in the cultivar ‘Spartan’ (0.90 %) followed by ‘Jonadel’ (0.89 %). Both the cultivars were statistically at par with one another but differed from rest of the cultivars. Minimum value for non reducing sugar was registered for ‘Jonagold’ (0.13 %). Various earlier workers who worked in different parts of world have also reported variations for various fruit characters in apple (Barua and Sharma, 2002; Chau, 2001; Nakayama and Satio, 1970; Bernkoff and Grauslund, 1990).

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