



EVALUATION OF DIFFERENT STRAWBERRY CULTIVARS FOR YIELD AND QUALITY CHARACTERS IN HIMACHAL PRADESH

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ABSTRACT

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The experiment was conducted in semi-temperate agro-climate at Solan in Himachal Pradesh with fifteen strawberry cultivars were evaluated for yield, fruit and quality attributes during 2010-2011 and 2011-2012. The results revealed that cultivar "Chandler" exhibited maximum fruit length (3.49 cm), breadth (3.14 cm), berry weight (9.62 g), yield (1.18 kg/per) and total sugars (6.81%). 'Pajaro' exhibited higher T.S.S. (12.17°B) and T.S.S./ acid ratio (14.02°B). Acidity was found highest (1.14%) in 'Catskill', while sugar/acid ratio was found highest (11.04) in 'Selva'. With regard to yield, fruit and quality characters, cultivar Chandler and 'Selva' stand promising in mid hills of Himachal Pradesh

INTRODUCTION

Strawberry (*Fragaria ananassa*) is an important fruit of family *Rosaceae* and occupies an important place among the small fruits. There is a considerable variation among different strawberry cultivars for their adaptability in a particular set of agro-climatic conditions. Besides quick returns, strawberry fruits are attractive with distinct and pleasant flavour/aroma, rich in vitamin-C and minerals. Strawberry fruits have a special demand by fruit processing industrial for preparing various products. The strawberry cultivation is associated with many problems. Among all characters fruit character have always remained of prime importance and are much influenced by environmental factors. Since strawberry is a crop of temperate regions of the world, its cultivation has been extended to subtropical regions like Maharashtra, Punjab, and Haryana. However, no information was available on the cropping behavior of strawberry cultivars in the semi temperate climate of mid hills. Therefore, in the present study, an attempt has been made to evaluate different strawberry cultivars for their yield, fruiting and quality characters.

MATERIALS AND METHODS

The experiment was conducted in semi-temperate agro-climate at Solan in Himachal Pradesh. Healthy and uniform runners of fifteen strawberry cultivars viz. Addie, Belrubi, Blakemore, Brighton, Chandler, Dana, Etna, Fern, Howard, Pajaro, Selva, Shasta, Tioga and Torrey were planted in replicated trial on 29th October, 1999 and 2000 with spacing of 45 × 30 cm, twelve plants in double rows on a

raised bed (15 cm) constituted one plot. Length and breadth of berry was measured in cm with Verniers calliper and mean was calculated. The weight of the representative fruits of each cultivar from each plant was recorded and average weight per berry was worked out. The yield per plot was calculated by multiplying the mean weight with average number of fruits harvested per plant. Total soluble solids were recorded from the juice obtained from randomly selected berries from all the cultivars in each replication with the help of refractometer of 0-32° Brix range. Acidity and sugar contents were calculated by the method given by A O A C (1984). Total soluble solid acid ratio and sugar/acid ratio was estimated by dividing total soluble solids and sugars by titratable acidity. All statistical analysis was performed as per Panse and Sukhatme (1995).

RESULTS AND DISCUSSION

Results pertaining to TSS, acidity and TSS/acid ratio are presented in Table-1. Cultivar 'Pajaro' exhibited highest TSS (12.17°B) closely followed by 'Blackmore' and 'Tioga' (11.85°B). The highest acidity (1.14%) was observed in cultivar 'Catskill' followed by 'Howard' (1.08%). On the other hand, lowest TSS and acidity was registered in 'Selva' (7.55° B and 0.57%, respectively). The possible explanation for difference may be due to the fact that cultivars grown under sunny days and cool nights have better TSS and acid contents than grown under cloudy, humid and warm nights (Avidov, 1986; Kindmor *et al.*, 1996).

Different strawberry cultivars showed significant variation among themselves with respect to total soluble solid

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which ranged from 9.26 in 'Catskill' to 14.02 in 'Pajaro' and 'Selva'. Similarly, significant differences in various strawberry cultivars with regard to TSS/Acid and sugar/acid

TSS/acid ratio ranged from 5.10 in 'Catskill' to 13.27 in ratio have been reported in earlier study (Bringhurst, 1990).

Table 1 Evaluation of different strawberry cultivars for fruit length, breadth, weight, total yield and marketable yield

Cultivars	TSS (°B)	Acidity (%)	TSS/acid ratio	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)	Sugar/acid ratio
Addie	10.18	0.87 (1.21)	11.39	5.31 (2.30)	0.82 (1.14)	6.13 (2.47)	6.26
Belrubi	10.65	0.93 (1.19)	11.34	5.56 (2.35)	0.93 (1.19)	6.45 (2.54)	6.92
Blakemore	11.85	0.98 (1.21)	12.01	5.17 (2.27)	0.76 (1.12)	5.94 (2.43)	6.02
Brighton	10.73	0.97 (1.21)	10.99	5.76 (2.40)	0.91 (1.18)	6.69 (2.58)	6.88
Catskill	10.63	1.14 (1.28)	9.26	5.30 (2.30)	0.59 (1.04)	5.85 (2.41)	5.10
Chandler	11.10	0.93 (1.19)	11.95	6.10 (2.47)	0.71 (1.10)	6.81 (2.60)	7.36
Dana	10.80	0.85 (1.16)	12.66	5.01 (2.24)	0.83 (1.15)	5.85 (2.41)	6.87
Etna	10.60	1.07 (1.25)	9.82	5.18 (2.27)	0.61 (1.05)	5.80 (2.40)	5.37
Fern	10.16	0.94 (1.19)	10.74	5.65 (2.37)	0.51 (1.00)	6.17 (2.48)	6.52
Howard	11.20	1.08 (1.25)	10.34	5.32 (2.30)	0.99 (1.22)	6.31 (2.51)	5.81
Pajaro	12.17	0.86 (1.16)	14.02	5.30 (2.30)	0.67 (1.08)	5.98 (2.47)	6.88
Selva	7.55	0.57 (1.03)	13.27	5.25 (2.29)	1.00 (1.22)	6.26 (2.50)	11.04
Shasta	10.48	1.00 (1.22)	10.44	5.35 (2.31)	0.68 (1.08)	6.04 (2.45)	6.02
Tioga	11.85	1.04 (1.24)	11.29	6.04 (2.45)	0.42 (0.95)	6.47 (2.54)	6.24
Torrey	8.66	0.91 (1.19)	9.44	6.11 (2.47)	0.63 (1.06)	6.74 (2.54)	7.40
CD ($P=0.05$)	0.49	0.01	0.56	0.02	0.04	0.02	0.40

Table 2 Evaluation of strawberry cultivars for total soluble solids, acidity and TSS/acid ratio reducing, non-reducing, total sugars and sugar/acid ratio (Pooled data)

Cultivars	Fruit length (cm)	Fruit breadth (cm)	Average berry weight (g)	Yield/plot (kg)	Marketable yield/plot (kg)
Addie	2.83	2.20	4.53	0.48	0.45
Belrubi	2.81	2.11	5.70	0.55	0.46
Blakemore	3.27	2.14	5.52	0.61	0.52
Brighton	2.62	1.84	6.36	0.65	0.50
Catskill	3.32	2.86	4.80	0.73	0.64
Chandler	3.49	3.14	9.62	1.18	1.00
Dana	2.43	2.08	5.69	0.58	0.49
Etna	2.80	2.06	4.86	0.38	0.31
Fern	2.84	2.56	6.01	0.48	0.40
Howard	3.33	2.84	6.10	0.48	0.40
Pajaro	3.41	2.56	5.36	0.63	0.51
Selva	3.27	2.75	8.87	1.11	0.96
Shasta	3.18	2.61	6.15	0.84	0.73
Tioga	3.37	2.60	5.90	0.82	0.73
Torrey	3.23	2.56	6.99	0.53	0.45
CD ($P=0.05$)	0.05	0.07	1.03	0.11	0.11

The highest total sugars (6.81) reducing sugars (6.11 %) and non-reducing sugars (1 %) was observed in cultivars Chandler, Torrey and Selva, respectively (Table-1). The lowest total sugar and reducing sugars were observed in cultivars Etna and Dana (5.80 and 5.01, respectively), whereas, non-reducing sugars was lowest in cv. Tioga (0.42 %). The reasons for deviation in fruit sugar may be described due to the differences in growing conditions and climatic variation (Sharma and Thakur, 2008).

All the strawberry cultivars differed significantly with regard to fruit length, breadth, berry weight and yield (Table-2). Cultivar Chandler produced the longest fruits (3.49 cm) followed by 'Pajaro' (3.41 cm). Fruit breadth was also found to be higher in 'Chandler' (3.14 cm). Cultivars 'Dana' and 'Brighton' exhibited least fruit length and breadth of 2.43 cm and 1.84 cm, respectively. Some of these cultivars were tested in the studies at Hissar (Beniwal *et al.*, 1989). The differences in fruit size were primarily due to plant vigour, competition among fruits, the inflorescence, number and size of developed achiness, climatic condition and plant nutrient (Janick and Eggert, 1968; Moore *et al.*, 1970).

Different cultivars also showed significant variation in their berry weight and yield per plot. The maximum berry weight was obtained in cv. Chandler (9.62 g) followed by 'Selva' (8.87 g). The maximum fruit weight of 4.53 g was obtained in cultivar Addie. The fruit weight registered in these studies was more than that reported earlier (Beniwal *et al.*, 1989, Kikas and Libek, 2004).

The maximum yield per plot to the tune of 1.18 kg was obtained in 'Chandler'. Cultivar Selva with a yield of 1.11 kg/plot was found next in order. The minimum yield of 0.38 kg/plot was recorded in cultivar 'Etna'. However, in rest of the cultivars, the yield per plot was found to range from 0.48 kg/plot in 'Fern' to 0.89 kg/plot in 'Howard'. However, these figures for yield in different cultivars of strawberry are not in agreement with strawberry grown elsewhere. These variations in the yielding potential may be ascribed to the fact that strawberry yields are markedly influenced by environmental parameters like photoperiod, temperature and light intensities. The present investigation

showed that among 15 cultivars Chandler, Selva, Tioga and Shasta were the best in physico-chemical and yield attributes at Himachal Pradesh conditions.

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