Himachal Journal of Agricultural Research 35 (2):183-187, 2009

Evaluation of different strawberry cultivars for growth, yield and quality characters under wet temperate high hills of Himachal Pradesh

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Abstract

Field experiment was conducted on nine cultivars of strawberry in the KVK, Rohru (Shimla Hills) field to evaluate the best cultivars of strawberry under sub-temperate high hill condition. Recommended dose of N, P_2O_5 and K_2O was broadcasted and mixed with soil at the time of preparation of bed. Second dose of N as CAN was given as top dressing in the first week of March. Observations on fruit yield, berry vegetative growth and biochemical characteristics were recorded and it was observed that all the cultivars gave variable results in terms of its growth, fruit yield and quality. Based on the comparison of results of all these cultivars it was found that Chandler cultivar performed better followed by cultivars Confitura and Fern.

Key words: Strawberry, fruit yield, sucker length, quality parameters.

Introduction

Strawberry is a delicious fruit and is widely acclaimed for its characteristic aroma and flavour. The berries are highly perishable and mainly used for making jam and juices besides table consumption. Although it is reported to originate in Europe yet many wild strawberry species exist in the temperate Himalayan ranges thereby that the agro-climatic condition prevailing in the region are propitious and conducive to its successful cultivation. Its scientific cultivation in Himachal Pradesh dates back to early sixties when some promising cvs. such as Senga, Sengana and Elista were introduced in Kangra and Mandi district under Indo-German Agricultural Project. However both these varities being highly acidic could not find favour with the consumers. Subsequently more cvs. such as Tioga, Torrey, Blackmore, Robinson, Florida-90, Howard-17 and Shasta were introduced at Palampur through NBPGR and after a few year of observation Tioga and Torrey were identified to be the most promising. Recently Krishi Vigyan Kendra, Rohru laid trials on few commercial cvs. of strawberry namely Chandler, Confitura, Fern, Selva, Brighton, Douglas, Addie, Gorella and Pajro, for their performance in sub-temperate high hills of Himachal Pradesh.

Production of strawberry is generally influenced by agro-climatic condition, system of planting and cultural practices. Strawberry is a surface feeder and therefore, moisture and temperature condition of the upper layer of the soil have great bearing on the growth and development of the crop. Water status maintenance of the top layer of soil is very crucial for its optimum growth, production of good quality berries and improved runners. Strawberry being shallow rooted, surface feeder thus nutrient status of top layer of soil is very vital to sustain optimum growth and production of crop. Nutritional requirement of strawberry is relatively high especially nitrogen and depend upon many factors which vary from region to region.

Material and Methods

Land selected for the cultivation of different cvs. of strawberry was almost leveled with gentle gradient which favored controlled runoff and soil erosion, making cultural operation easier. The experimental field was more or less uniform in soil fertility. The texture of soil was clayey with a poor rate of percolation and drainage. Experimental plots for the cultivation of nine cvs. of strawberry were prepared of the size of 12x3 m. The beds were made sunken due to clayey soil texture and non-availability of assured irrigation water. However, drainage channel on the top and side of the bed was prepared for the runoff of excess rain water. Recommended dose of N, P_2O_5 and K_2O was broadcasted and mixed with soil at the time of preparation of bed. Second dose of N as CAN was given as top dressing in the first week of March. However, irrigation to all the plots was given depending upon the availability of water. During September, 2006 plants of all the nine cvs were planted in the bed at a distance of 30 x 60 cm. All the planted runners were disease free, uniform size age and vigour.

Design of experiment	-	RBD
Plot size	-	12 x 3 m
Planting distance	-	30 x 60 cm
No. of runner per plot	-	300 plants

Cvs. under evaluation-

Chandler	Selva	Addie
Confitura	Brighton	Pajro
Fern	Douglas	Gorella

Observations on fruit yield, berry vegetative growth and quality characteristics were recorded during the year 2006 and 2007. Harvesting was done when berry developed normal colour. However, three pickings were taken for every crop. For taking the yield of each cv. harvested berries were weighed on the top pan balance for each picking and the average yield was worked out. Quality characteristic of each of the cvs. was recorded for their performance and liking among the consumers and the data is given in the Table-1,Table-2, Table- 2.1 and Table- 3

Results and Discussion

Growth performance: A trial to test nine cultivars of strawberry under sub-humid high hill condition was laid out in September 2006 and 2007 at KVK farm Karalash and the performance of different cvs. of strawberry in term of growth character and quality parameters are given in Tables 1, 2, 2.1 and 3.

Table 1. Performance of different Strawberry cultivars for growth characters

Cultivars	% survival		Plant height (cm)		No. of suckers per plant		Length of sucker (cm)	
	2006	2007	2006	2007	2006	2007	2006	2007
Chandler	92	89	8.1	9.2	5.8	6.5	46.5	50.2
Confitura	98	94	11.2	12.2	8.0	9.2	69.5	72.5
Fern	95	90	11.5	12.4	5.8	7.5	32.0	34.3
Selva	90	90	7.5	9.3	5.0	6.2	31.9	33.2
Brighton	65	60	8.3	9.5	3.8	4.5	73.7	78.4
Douglas	78	75	9.2	9.6	4.5	5.6	55.0	56.2
Addie	82	80	8.5	10.2	4.3	5.2	64.4	68.6
Gorella	85	84	9.5	10.6	4.0	4.8	68.2	70.4
Pajro	86	82	8.9	9.8	4.1	5.7	57.7	61.2
CD (P=0.05)	8.9	7.6	1.4	2.3	1.3	1.9	15.7	16.8

Table 2. Quality characteristics of different strawberry cultivars during year- 2006

Cultivars	Yield/plot 12 x 3 m (kg)	Fruit length (cm)	Fruit breadth (cm)	Average berry wt.(g)	TSS (B^0)	Marketable yield/ plot
Chandler	3.5	3.52	3.24	10.25	11.15	3.25
Confitura	4.0	3.46	3.20	9.96	11.02	3.50
Fern	3.8	3.42	3.08	9.90	8.95	3.15
Selva	2.7	3.39	2.95	9.20	7.80	2.00
Brighton	0.5	3.36	2.80	7.56	10.90	0.40
Douglas	1.2	2.86	2.13	5.58	6.53	0.90
Addie	1.6	2.52	1.86	5.65	9.95	1.10
Gorella	2.0	2.46	1.90	6.50	7.05	1.40
Pajro	2.2	2.90	1.85	6.25	11.65	1.60
CD (P=0.05)	1.2	0.09	1.02	2.13	2.06	1.05

Table 2.1 Quality characteristics of different strawberry cultivars during year- 2007

Cultivars	Yield/plot 12 x 3 m (kg)	Fruit length (cm)	Fruit breadth (cm)	Average berry wt.(g)	TSS (B^0)	Marketable yield/ plot
Chandler	4.2	3.75	3.60	12.20	11.52	3. 50
Confitura	5.8	3.62	3.56	11.25	11.15	3.70
Fern	5.6	3.58	3.28	10.20	9.05	3.25
Selva	3.6	3.46	3.10	9.55	8.85	2.25
Brighton	1.5	3.42	3.05	8.64	10.95	0.50
Douglas	1.8	2.90	2.33	6.75	6.95	1.02
Addie	2.5	2.62	1.96	6.90	10.02	1.25
Gorella	3.2	2.50	1.90	7.20	7.25	1.50
Pajro	2.8	3.15	2.55	6.95	11.80	1.75
CD (P=0.05)	1.7	0.07	1.00	2.25	1.96	1.15

Table 3. Evaluation of strawberry cultivars for quality characters (on the basis of panel point of ten person)

Cultivars	Appearance	Size	Colour	Acidity	Sweetness	Overall Performance (Average points)	Ranks (on points basis)
Chandler	7.4	7.4	7.6	6.6	7.8	7.4	1st
Confitura	6.4	7.2	6.4	5.0	5.8	6.2	2nd
Fern	7.2	7.0	6.1	5.0	5.2	6.1	3rd
Selva	4.2	4.2	4.8	4.0	3.6	4.2	9th
Brighton	4.6	5.2	4.8	7.0	4.2	5.2	5th
Douglas	4.8	5.0	4.6	6.8	5.0	5.3	4th
Addie	5.2	5.2	5.1	4.6	4.8	5.0	6th
Gorella	4.4	3.6	4.4	4.8	4.2	4.3	8th
Pajro	5.6	4.4	4.5	4.4	4.6	4.7	7th
CD (P=0.05)	1.2	1.4	1.0	1.1	1.2	-	-

Plant height: A perusal of data presented in Table 1 on the growth performance of berries revealed that maximum plant height 11.5 cm during the year 2006 and 12.4 cm during the year 2007 was recorded with cv. fern and minimum plant height 7.5 cm during the year 2006 was recorded with cv. Selva whereas, during the year 2007 was observed with the cv.Chandler as 9.2cm. The height of other cvs also varies from each others. The maximum plant height 11.5 cm and 12.4 cm observed with cv. Fern during both the years under study is significantly higher than the growth of other cvs like Chandler, Selva Brighton, Douglas, Addie, Gorella and Pajro but was found statistically at par with the cv.Confitura during both the years under study.

Per cent survival: The plants of all the nine cvs. were planted in the bed at a distance of 30 x 60 cm and their percent survival and performance was recorded during both the years under study. It was observed that maximum number of plants of cvs. Chandler, Confitura and Fern survived and percentage of survival was 92, 98 and 95 % during the year 2006 and during the year 2007 the same figured as 89, 94 and 90 percent and minimum number of percentage survival was recorded in the cvs. Brighton and Douglas during both the years.

Suckers length: The data given in Table 1 shows that suckers length varied with the cultivars. Maximum sucker length 73.7 cm and 78.4 cm was observed in the cv. Brighton during both the years which was at par with the cvs. Gorella and Confitura where, suckers length was 68.2 cm; 70.4 cm and 69.5 cm; 72.5 cm, but significantly higher than all other cultivars. The minimum sucker length 31.9 cm; 33.2 cm and 32.0 cm; 34.3 cm was observed in the cvs. Selva and Fern. Maximum number of suckers 8.0 and 9.2 were observed in cv. Confitura followed by cvs. Chandler and Fern during both the years where the suckers number on average basis were 5.8 each during 2006 and 7.5 and 6.5 numbers during the year 2007. Growth is generally considered to include linear increase in weight, increase in dimension, gain in organic mass and cell multiplication and this growth may vary from variety to variety. In variety showing better growth might be due to better root growth and nutrient uptake. Growth responses have also been observed by Agafonov et al (1981), Beniwal et al (1989) and Ram and Yadav (2006).

Fruit yield: Fruit yield as per plot size was recorded in kg and the data is given in Table 2 and Table 2.1. Maximum fruit yield 4.0 kg and 5.8 kg per plot was observed in cv. Confitura during both the years followed in cvs Fern and Chandler, where the yield was observed 3.8 kg; 5.6 kg in cv. Fern and 3.5 kg and 4.2 kg in cv. Chandler, which were also statistically at par with each- other. Minimum fruit yield 0.5 kg and 1.5 kg per plot was observed in cv. Brighton, which may be due to more vegetative growth, as far as sucker length is concerned, followed by cv. Douglas and Addie, where the yield was observed to be 1.2 kg and 1.8 kg per plot. The yield obtained in cvs. Confitura; Chandler and Fern were significantly higher than other cvs. like Selva; Brighton; Douglas; Addie; Gorella and Pajro. Maximum fruit yield obtained in cultivars may be due to the effect of improved fruit set and nutrient uptake by the berries depending upon the rooting system of the cultivars. Since, all the cultivars were given uniform dose of fertilizers, but the variation in fruit yield may be due to variation in varieties for nutrient uptake. Chandler and Confitura variety might have given better fruit yield in comparison to other varieties due to better root system, which helps in the uptake of more nutrient elements. Bruchholz and Fidler (1979) reported that with better fertilizers as per recommendation, the fruit yield increase by 6-7 per cent in comparison to control. Similarly,

Sharma and Thakur (2008) evaluated the fifteen cultivars of strawberry for their quality performance and fruit yield and observed that Chandler cultivar performed better in comparison to all other cultivars under study. The fruits which were excellent in shape, size and colour, their weight were recorded as marketable yield. It was observed that in Confitura variety marketable fruits were highest followed by Chandler cultivar (Table 2 and 2.1). The minimum number of marketable fruits was found in cultivar Brighton followed by Douglas.

Quality Characteristics: Quality characteristics for all the nine cultivars were also observed for various characters like fruit length, fruit breadth, average berry weight and TSS contents and the data is given in Table 2 and Table 2.1 The perusal of data given in Tables showed that fruit length, breadth, average berry weight and TSS contents varied from variety to variety. Highest average berry weight was found in cultivar Chandler 10.25 g and 12.20 g during both the years under study. The minimum average berry weight 5.58 g and 6.75 g was found in the cutivar Douglas during both the years. Highest average berry weight was found in cultivar Chandler during both the years was at par with cultivars Confitura, Fern and Selva but significantly higher than all other cutivars. Regarding the TSS contents maximum content 11.65 B° and 11.80 B° was observed in the cultivar Pajro followed by cultivars Chandler, Confitura and Brighton during both the years. The minimum TSS content 6.53 B° and 6.95 B° was observed in the cultivar Douglas which is significantly lower than the TSS content of other cultivars like Chandler, Confitura and Brighton. Asrey and Singh (2004) also evaluated the different cutivars of strawberry and found similar result interms of quality characteristics. In fruit appearance Chandler variety ranked number one but was at par with varieties Confitura and Fern, showing better performance to all others varieties under study. The other major point for fruit quality was size and fruit colour and their acceptance among the consumers. Again fruit size and colour was found better in cvs. Chandler followed by Confitura during both the years under study. If the ranking of varieties is done based on quality parameters Chandler cvs. was ranked first followed by cv. Confitura. Other cvs. were found medium in quality. In cvs. Showing more size, good colour and sweetness, may accumulate more carbon dioxide in photosynthesis, which subsequently help in the synthesis of carbohydrates, which ultimately increases the size and fruit colour. The other reason for increase in fruit size may be higher cell division and photosynthetic activities. Photosynthates are supplied to the fruits by leaves and fruit act as metabolic sink for taking maximum photosynthates and other materials. Sharma and Thakur (2008) evaluated fifteen cultivars of strawberry for fruit yield and quality and observed that Chandler cultivar exhibited maximum fruit length, breadth, berry weight, yield per plot and TSS contents was found to be highest in the cultivar Pajro. Similar results were found by Dhiman (2003) and Bhat *et al.* (2005). For the quality performance on the basis of consumer liking a panel of ten person was constituted for evaluating the berry quality for various characters like appearance, size, colour, acidity and sweetness and the data is given in Table 3. The points were given out of ten for each varieties depending upon the consumer preference and quality parameters. Consumer preference also ranked Chandler cultivar best among all closely followed by cultivars confitura and Fern. Lowest points were given to the cultivar Selva closely followed by Gorella and Pajro.

From foregoing results it can be concluded that all the cultivars gave variable results in terms of its growth, fruit yield and quality. Based on the comparison of results of all these cultivars it was found that Chandler cultivar performed better followed by cultivars Confitura and Fern in the present studies.

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