

Research Article

Study on Some Yield and Biochemical Attributes of Four Varieties of Strawberry (*Fragaria X Ananassa Duch*) Under Jhalawar Condition of Rajasthan

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Abstract

A field experiment was conducted to study the performance of four varieties of strawberry (*Fragaria x ananassa Duch*) namely Winter Dawn, Sweet Charlie, Fortuna, and Eliyana under open field conditions. The results revealed significantly maximum number of fruit/plant (22.71) and fruit yield/plant (242.79 g) in Winter Dawn. Maximum fruit weight (22.50g), minimum acidity (0.71 per cent), and maximum TSS/Acid ratio (11.36) were there in Eliyana, maximum TSS (8.13°Brix), chlorophyll content (2.07 mg/g) and Vitamin-C content (51.94 mg / 100g) was recorded in Sweet Charlie. Seeing yield performance, variety Winter Dawn was found better in comparison to Eliyana, Fortuna, and Sweet Charlie and Sweet Charlie was found best concerning quality parameters.

Keywords: Strawberry, Winter Dawn, Sweet Charlie, Fortuna, Eliyana, Yield, biochemical attributes

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Introduction

Strawberry (*Fragaria x ananassa Duch.*) is one of the most delicious, attractive, nutritious, and refreshing soft fruits of the world [1] and is liked by people due to its specific taste, pleasant flavor and rich food value. Nutritionally, strawberries are rich in vitamin C and provide fibre [2] Strawberries are a good source of natural anti-oxidant [3].

In addition to the usual nutrients such as vitamins and minerals, strawberries are also rich in anthocyanins, flavonoids and phenolics [4]. In India, the strawberry was introduced during the early sixties but could not be popularized for several reasons [5]. However, in the past decade and a half, it has become a favorite fruit among growers because of its remunerative prices and higher profitability [6]. It is one of the important soft fruits suitable for growing under wide agro-climatic conditions of the world. It is grown in Maharashtra, Karnataka, Andhra Pradesh and Himachal Pradesh. Recently its cultivation has been started in Haryana, Punjab, Western Uttar Pradesh [7], and some parts of Rajasthan like Jhalawar. Jhalawar district is located at 23°4' to 24°52' N-Latitude and 75°29' to 76°56' E-Longitude in South-Eastern Rajasthan. Agro-climatically, the district falls in Zone V, known as Humid South Eastern Plain. About 84.22 per cent population of the district is rural whose main occupation is agriculture. The average rainfall in the region is 954.7 mm. Maximum temperature range in the summer is 43-48°C and the minimum 1.0- 2.6°C during winter. The detail of weather variables as observed under different growing environments is presented in **Table 1**.

Strawberry is an important fruit crop whose cultivation has ample scope near cities and fruit preservation factories [8]. Strawberry is the only fruit that starts providing earnings to the farmers within the first 100 days after its planting. However, no information is available on the bearing behavior and yield of strawberry cultivars in subtropical areas of Jhalawar. The high yield of good quality berry production depends on adequate mineral nutrition, weather terms and cultivars [9]. In the light of the documented facts, it is confirmed that the season and cultivar affect the nutrient accumulation in fruits [10]. Cultivar choice is the most important single factor for strawberry production as choosing the wrong cultivar inevitably leads to problems [11]. Therefore, an attempt was made to evaluate the yield and biochemical characteristics of strawberry cultivars under the Jhalawar condition of Rajasthan.

Table 1. Mean weekly temperature (°C), relative humidity (%) and light intensity (× 100 Lux) of open field during the experiment period (from October 2014 to April 2015)

Duration	Open field								
	Temp			R.H			Light intensity		
	9:00 AM	12:00PM	3:00 PM	9:00 AM	12:00 PM	3:00 PM	9:00 AM	12:00PM	3:00 PM
Oct., 2014	28.15	33.4	35.75	10.98	10.00	10.24	522.87	605.38	645.99
Nov., 2014	32.66	34.45	36.75	15.34	15.98	19.24	598.25	642.25	650.35
Dec. 2014	24.68	26.7	29.04	22.03	19.862	22.36	496.56	556.08	547.44
Jan. 2014	22.69	24.25	24.45	39.455	26.715	18.15	371.75	644.25	613.75
Feb., 2014	28.65	28.95	25.39	13.95	14.45	15.13	590.25	682.18	646.75
March, 2014	37.75	41.85	39.25	14.455	14.85	15.5	638.75	677.25	624.12
April, 2014	38.16	42.67	40.75	10.56	10.98	10.75	653.65	669.25	658.25

Materials and Methods

A field experiment was conducted during *rabi* 2014-2015 at the Department of Fruit Science and the Protected Cultivation Unit, College of Horticulture & Forestry, Jhalrapatan city, Jhalawar (Rajasthan), to study the performance of four varieties of strawberry (*Fragaria x ananassa* Duch); namely Winter Dawn, Sweet Charlie, Fortuna and Eliyana under open field condition. The crop was grown on raised beds at 60 x 30 cm spacing on drip. Each treatment consisted of three plants. The recommended dose of NPK (19:19:19) as liquid fertilizers were applied through a fertigation machine. The experiment was laid out under an RBD design comprising four varieties; Winter Dawn, Sweet Charlie, Fortuna and Eliyana. The observations were recorded on characters; namely fruit/plant, fruit yield/plant (g), fruit weight (g), TSS (°Brix), titratable acidity (per cent), TSS/Acid ratio, chlorophyll content (mg/g) and Vitamin- C (mg/100g).

The yield was evaluated by counting a number of fruits per plant and fruit weight in each harvesting and then average data were taken. Biochemical parameters like TSS (°Brix) was recorded using a hand refractometer, Titratable acidity (%) by titrating the juice against standard alkali solution (0.1N NaOH), Vitamin C (mg/g) with 2, 6-dichlorophenol-indophenol method and Chlorophyll content was measured as per method as suggested by [12]. The statistical analysis of the data was carried out by using standard statistical method of analysis of variance [13].

Results and Discussion

Yield parameters

Data presented in **Figure 1** revealed that the various plant yield parameters were significantly influenced by different varieties.

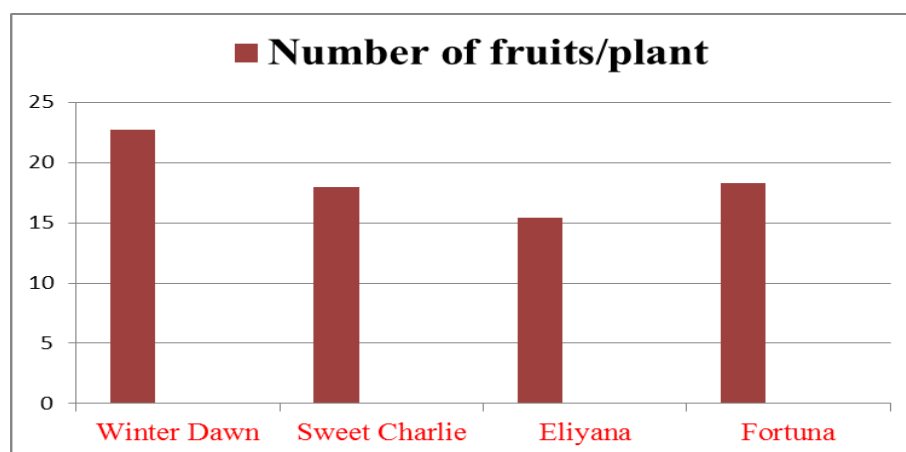


Figure 1 Effect of different varieties on the number of fruits/plants of strawberry (*Fragaria x ananassa* Duch.) cv. Winter Dawn

Fruit per plant and fruit yield/plant (g)

Among the four cultivars evaluated in the present experiment maximum number of fruit/plant (22.71) and fruit yield/plant (242.79g) were observed in Winter Dawn, while the minimum number of fruit/plant (15.39) and fruit

yield/plant (148.55g) in Eliyana and Sweet Charlie respectively. These differences in yield may be ascribed to the differences in adaptation of these varieties to that particular agro-climatic conditions and the genotypic variation [14]. These results are agreed with the findings reported by [15].

Fruit weight (g)

Maximum fruit weight (22.50g) was recorded in variety Eliyana. While minimum (17.47g) in Sweet Charlie. The reason behind the comparatively more fruit weight in Eliyana could be linked to efficient absorption of plant nutrients by the roots and faster cell division and elongation due to favorable temperature during harvesting time [16]. These findings are in close proximity to that of [17].

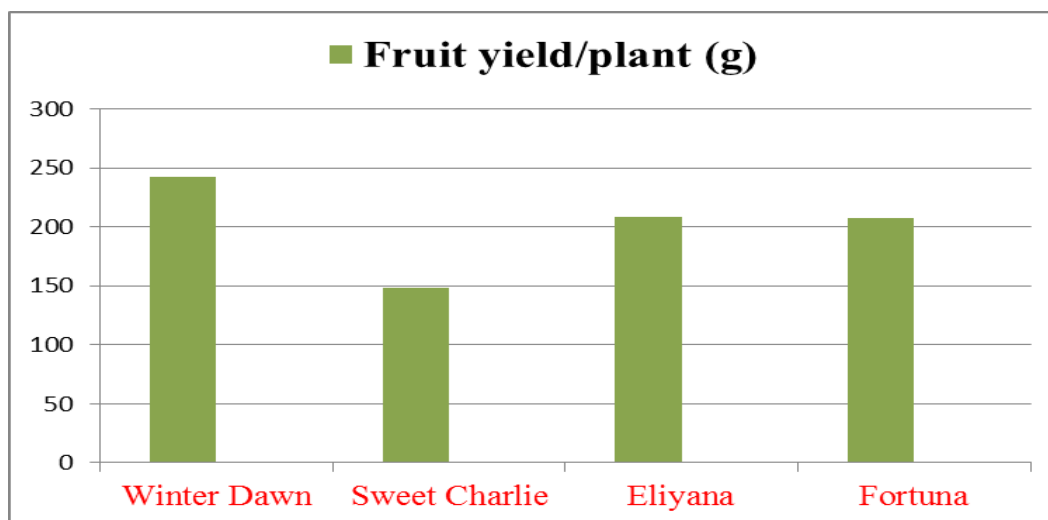


Figure 2 Effect of different varieties on fruit yield/plant (g) of strawberry (*Fragaria x ananassa* Duch.) cv. Winter Dawn

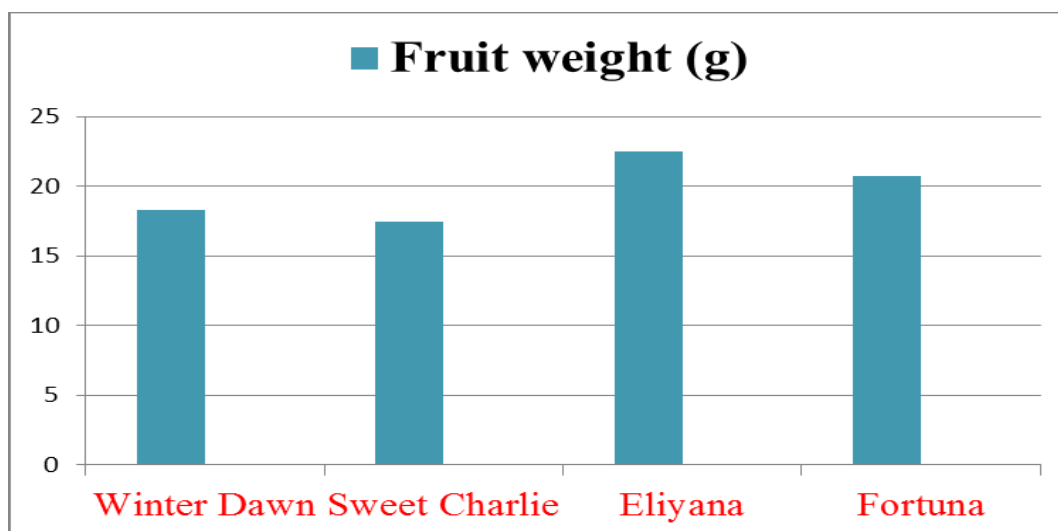


Figure 3 Effect of different varieties on fruit weight (g) of strawberry (*Fragaria x ananassa* Duch.) cv. Winter Dawn

Biochemical parameters

Data presented in Figure 1 revealed that the various biochemical parameters were significantly influenced by different varieties.

Titrateable acidity (percent) and TSS/Acid ratio

There was a maximum decrease in titrateable acidity (0.71 per cent) and TSS/Acid ratio (11.36) in Eliyana, while, a minimum decrease in titrateable acidity (0.78 percent) and TSS/Acid ratio (8.60) in Winter Dawn.

The factors which may significantly influence the strawberry composition viz. TSS/ Acid ratio and acidity is mineral and organic fertilization but this also depends upon weather conditions and variety. This could be the reason why different cultivars had shown differing performance under the black soil and sub-tropical climatic conditions of Jhalawar. Similar findings were observed by [18].

TSS (°Brix)

Maximum TSS (8.13 (°Brix) was found in Sweet Charlie and minimum TSS (6.73°Brix) was recorded from a variety Winter Dawn. Maximum TSS in variety Sweet Charlie may be taken as varietal and temperature effect during the peak harvesting period of January- February. The above-established finding was further confirmed. Strawberry exposed to high temperatures (22–30°C) was positively affected in respect to soluble solids up to a certain extent [19].

Vit-C content (mg/100g)

Higher Vit- C content in Sweet Charlie (51.94mg/100g) and minimum Vit-C content (46.71mg/100g) was recorded from variety Fortuna might be due to the reason that its peak harvesting time is January- February under Jhalawar condition. As fruits produced during chilly winter are rich in phytonutrients and secondary metabolites including ascorbic acid (AA). The greater difference in AA recovery during the late winter fruiting may be due to the cultivar and higher anabolism and catabolism ratio as favored by the temperature, inducing ascorbic acid biosynthesis [20, 21].

Chlorophyll content (mg/g)

An increase in chlorophyll content (2.07mg/g) in cultivar Sweet Charlie and minimum chlorophyll content (1.83mg/g) in variety Winter Dawn could be attributed to difference in plant species and increase in leaf thickness, which might lead to concentration of more chlorophyll content [22]. Similar results were observed by [23, 24].

Table 2 Effect of different varieties on TSS, Acidity, TSS/acid ratio, Chlorophyll content and Vitamin C content of strawberry (*Fragaria x ananassa* Duch.)

Treatments	TSS (°B)	Acidity (%)	TSS/ acid ratio	Chlorophyll content of leaves (mg/g)	Vitamin C (mg/100g)
Winter Dawn	6.73	0.78	8.60	1.83	50.22
Sweet Charlie	8.13	0.74	10.95	2.07	51.94
Eliyana	8.06	0.71	11.36	1.93	48.64
Fortuna	7.63	0.72	10.68	1.91	46.71
CD at 5%	0.90	0.07	1.73	0.13	2.81
SEM±	0.36	0.02	0.71	0.05	1.15

Conclusion

Thus the results of this study suggested that four varieties of strawberry have shown different performance for yield and quality parameters. Among all four varieties, Winter Dawn found best regarding yield and Sweet Charlie for quality parameters in strawberry under Jhalawar condition of Rajasthan. Therefore, these two varieties can be utilized for the commercial production of strawberry.

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