Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(6): 1494-1496
Received: 22-09-2017
Accepted: 24-10-2017

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Performance of strawberry (*Fragaria x ananassa* Duch.) genotypes for quality and biochemical traits under naturally ventilated polyhouse conditions

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Abstract
An experiment was conducted for Evaluation of different genotypes for growth, yield and quality of strawberry (*Fragaria X ananassa* Duch.) in low cost polyhouse of the department of Fruit Science, College of Horticulture, Mudigere, during 2015-16. The experiment was laid out according to Randomized Complete Block Design with seven treatments replicated thrice. The result reveals that, the number of fruits per plant (22.36) and yield per plant (380.29 g) was recorded maximum in genotype Sabrina. The maximum fruit weight (20.01 g), diameter (3.28 cm) and volume (24.37 cc) was recorded in genotype Fortuna. The fruit quality parameters like total soluble solids was maximum (11.53 °Brix) in Safari, the ascorbic acid content was maximum (73.30 mg/100g) in Sabrina, total sugars was maximum in genotype Fortuna (7.50 %), sugars to acid ratio was maximum (12.20) in Elyana and minimum titratable acidity (0.50 %) was recorded in Fortuna. The genotype Fortuna resulted in maximum Cost: benefit ratio (1: 2.56). Among different genotypes evaluated the Sabrina accounted maximum for growth and yield parameters of strawberry.

Keywords: strawberry, quality and biochemical traits, polyhouse conditions

Introduction
Strawberry (*Fragaria* x *ananassa* Duchesne) is one of the most delicious, refreshing and nutritious soft fruits of the world. It belong to family Rosaceae is native to America (Galletta *et al.*, 1990) [1]. The modern cultivated strawberry (*Fragaria* x *ananassa* Duch.) belong to family Rosaceae. Strawberry is an herbaceous perennial and short day plant. It was first introduced by the NBPGR Regional Research Station, Shimla (Himachal Pradesh) in the early sixties. Strawberry is highly nutritious fruit. The fruit contain fair amounts of iron, anticancer compound called ellagic acid, vitamin C and vitamin A (60 IU/100 g of edible portion). Basically the crop is suited to cool weather conditions. Higher pectin contains (0.55%) in the form of calcium pectate serves as an excellent ingredient for making jelly. In addition to fresh consumption, the strawberry is in special demand by the fruit processing units for preparing jam, ice-cream, syrup, quick freezing and canning. Being a rich source of vitamins and minerals coupled with delicate flavour, Strawberry has now become an important table fruit of millions of people around the world (Sharma and Singh, 1990) [7].
The study is conducted with an objective of finding the performance of different genotypes for hilly situations under poly house conditions. Hence, the present study was carried out at Mudigere, a true representative of hill zone.

Material & Methods
Seven genotypes of strawberry were evaluated for their feasibility under hill zone situations by adopting randomized block design with three replications during 2015-16. The genotypes include Winter dawn, Sweet Charlie, Safari, Fortuna, Cristle, Elyana and Sabrina. Apart from yield, observation like total soluble solids (TSS) measured by hand refractometer, reducing, non reducing and total sugars estimated by Anthrone reagent method, the ascorbic acid estimated by titration method as suggested by (Ranganna, 1986) [5], total titratable acidity determined in terms of citric acid by titrating against standard NaOH solution were considered for the study. The sugar to acid ratio was also calculated by dividing the total sugars content by the titrable acidity.

Results & Discussion
The result revealed that the significant differences observed in the yield and quality parameters

among the seven genotypes tested are presented in table-1 and table-2. the number of fruits per plant (22.36) and yield per plant (380.29 g) was recorded maximum in genotype Sabrina while, minimum number of fruits per plant (14.67) and yield per plant (191.77 g) was recorded in genotype Safari, the weight of fruit was maximum (20.01 g) in Fortuna followed by Sabrina (16.01 g) while, minimum (12.87 g) was observed in genotype Cristle, the maximum (4.43 cm) fruit length was recorded in genotype Cristle followed by Fortuna (4.12 cm) where as minimum (3.11 cm) was recorded in Sabrina, the breadth and volume of fruit was observed maximum in genotype Fortuna that was 3.28 cm and 24.37 cc respectively where as minimum was recorded in genotype Safari that was 2.55 cm and 12.12 cc respectively recorded in Winter Dawn. the minimum number of trifoliate leaves (15.27), leaf area (100.59 cm^2), leaf area index (1.70), plant dry weight at harvest (18.45 g), chlorophyll content (1.67 mg/100 g of fresh weight), number of fruits per plant (14.67) and yield per plant (191.77 g) was recorded minimum in genotype Safari where as the number of runners per plant was maximum (10.70) in Cristle where as minimum (1.67) was reported in genotype Sabrina, weight of fruit was maximum (20.01 g) in Fortuna followed by Sabrina (16.01 g) while, minimum (12.87 g) was observed in genotype Cristle, the maximum (4.43 cm) fruit length was recorded in genotype Cristle followed by Fortuna (4.12 cm) where as minimum (3.11 cm) was recorded in Sabrina, the breadth and volume of fruit was observed maximum in genotype Fortuna that was 3.28 cm and 24.37 cc respectively where as minimum was recorded in genotype Safari that was 2.55 cm and 12.12 cc respectively. Among the biochemical traits, the total soluble solids (11.53 ºB) were found maximum in genotype Safari while that of the minimum (6.70 ºB) was found in Fortuna. The finding was comparable with that of Das *et al.*, (2007) [3]. The maximum ascorbic acid content (73.30 mg/100 g) was recorded in Sabrina followed by Fortuna (60.08 mg/100 g), while Winter Dawn genotype recorded minimum ascorbic acid content (38.41 mg/100 g). The difference may be due to genetic variability and acclimatization of genotypes to that area. Safari recorded maximum reducing sugar (6.36 %), total sugar (7.50%) and titrable acidity (0.81%). Similarly, the maximum non reducing sugar (1.22%) was recorded in Cristle. Genotypes differed in their content for different traits mainly because of effect of cultural practices on different bio synthetic pathways. The maximum sugars: acid ratio (12.00%) was recorded in Sweet Charlie genotype. The minimum sugars: acid ratio (7.63%) was observed in Winter Dawn. Fruit composition is highly dictated by availability of light and night temperature as different genotypes differ in their requirement. The similar results were obtained by Chandel and Badiyala (1996) [2], Das *et al.* (2007) [3], Sharma *et al.* (2014) [6], Kumar *et al.* (2011) [4]. Among the genotypes tested, Sabrina recorded significantly higher fruit yield (380.29 g/plant) followed by Fortuna (367.24 g/plant). The differences are purely because of its adoptability for the given location and for the cultural practices.

Table 1: Quality parameters of seven genotypes of strawberry

Genotypes	TSS (ºB)	AA (mg/100 g)	RS (%)	NS (%)	TS (%)	TA (%)	S:A
Winter dawn	9.27	38.41	4.55	1.07	5.65	0.74	7.63
Sweet Charlie	11.50	42.07	5.53	1.10	6.70	0.58	12.00
Safari	11.53	41.97	6.36	1.14	7.50	0.81	9.42
Fortuna	6.70	60.08	4.75	1.05	5.80	0.50	11.73
Cristle	9.73	39.06	5.23	1.22	6.36	0.59	10.92
Elyana	9.50	44.39	4.32	1.12	5.41	0.55	9.52
Sabrina	10.70	73.30	5.61	1.09	6.70	0.73	9.19
S Em ±	0.69	0.76	0.30	0.02	0.31	0.05	1.27
C D5%	2.14	2.35	0.92	0.05	0.95	0.15	3.92

TSS-Total soluble solids, **AA**-Ascorbic acid, **RS**-Reducing sugar, **NS**-non reducing sugar, **TS**-Titrable acidity, **S: A**- Sugar to acid ratio

Table 2: Performance of strawberry genotypes for yield attributes

Genotypes	Number of fruits per plant	Fruit weight (g)	Length of fruit (cm)	Diameter of fruit (cm)	Volume of fruit (cc)	Yield per plant (g)
Winter Dawn	14.83	12.94	3.49	3.10	16.39	192.73
Sweet Charlie	19.24	13.45	3.15	3.05	13.50	259.65
Safari	14.67	13.07	3.11	2.55	12.12	191.77
Fortuna	20.91	20.01	4.12	3.28	24.37	367.24
Cristle	18.09	12.87	4.43	2.56	12.07	237.83
Elyana	15.53	15.03	3.27	2.93	14.07	233.87
Sabrina	22.36	16.01	3.67	3.16	17.72	380.29
S. Em ±	0.35	1.43	0.18	0.12	1.58	25.86
C. D. (P = 0.05)	1.08	4.42	0.56	0.38	4.87	79.70

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