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Performance of Different Genotypes for Economized Strawberry (*Fragaria* x *ananassa* Duch.) Production in Hill Zone of Karnataka, India

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A B S T R A C T

The present study was made for economized strawberry production in sub-tropical areas with the use of different genotypes namely Winter Dawn, Sweet Charlie, Safari, Fortuna, Cristle, Elyana and Sabrina were evaluated. The maximum plant height (32.30 cm), number of leaves (30.40), plant spread North-South and East–West (48.47 cm and 53.93 cm respectively), leaf area (206.04 cm^2), leaf area index (6.95), total dry weight (29.04g), maximum total chlorophyll content (2.33 mg/g of fresh weight) was observed maximum in genotype Sabrina, while the Cristal accounted maximum runners per plant (10.70). The genotype Elyana took minimum number of days for flowering (53.37) whereas, genotype Sabrina took longest duration for flowering (69.80 days). The maximum number of flowers per plant (29.06), number of fruits per plant (22.36) and yield per plant (380.29 g) was recorded in genotype Sabrina. The maximum fruit weight (20.01 g), diameter (3.28 cm) and volume (24.37 cc) was recorded in genotype Fortuna. Among different genotypes evaluated, Fortuna resulted in maximum benefit cost ratio (2.56).

Introduction

Strawberry (*Fragaria* x *ananassa* Duchesne) is one of the most delicious, refreshing and nutritious soft fruits of the world. It belongs to family Rosaceae and native to America (Galletta *et al.*, 1990). In India, Strawberries were first introduced by National Bureau of Plant Genetic Resources, Regional Research Station, Shimla (Himachal Pradesh) in the early sixties. At present, the strawberry is being grown in a wide range of climatic zones extending to temperate, Mediterranean, Sub-tropical zones. Due to octaploid nature, considerable variations exist in various cultivars and these cultivars helped the crop to spread in cool place of India. This crop give quicker yield per unit area, as a crop is ready for harvest within six months of planting. The work on identification of suitable high yielding variety of strawberry for different agro-climatic conditions remains scanty in literature. With the introduction of new cultivars, it was therefore felt imperative to evaluate for its feasibility and record pomological descriptions of strawberry cultivars for their proper identification and highlighting useful characters, which could be exploited for bringing about improvement in strawberry production in the state. Availability of runners, late in the season affects its yield due to poor plant development before flowering. Keeping in view the poor or late plant growth, present studies were carried out under sub-tropical conditions, to observe the effect of different genotypes on growth,

yield and quality characteristics of strawberry and to analyze the economic feasibility of strawberry genotype on production.

Materials and Methods

The present investigation entitled "Performance of different genotypes for economized strawberry (*Fragaria x ananassa* Duch.) production in hill zone of Karnataka" was carried out at college of Horticulture Mudigere, from October 2015 to march 2016, the experiment was laid out in completely randomized block design. In the present study seven genotypes of strawberry and considered each as single treatment and replicated thrice. The genotypes taken for evaluation are Winter Dawn, Sweet Charlie, Safari, Fortuna, Cristle, Elyana, Sabrina. The beds of 45 cm height, 60 cm width was prepared and mulched with black polythene. The planting was done at spacing of 30 cm x30 cm, the morphological observation was recorded at an interval of 30, 60, 90 and 120 days after planting. The prices of all inputs prevailing at the time of their use and the labour cost were considered to work out the cost of cultivation, the gross income was worked out based on the prevailing market price of Strawberry fruits. Net income (Rs per 1032 m^2) was calculated for each treatment by subtracting cost of cultivation from gross income. Cost benefit ratio for each treatment was calculated by dividing gross income with cost of cultivation (Table 1).

Results and Discussion

The various vegetative parameters like plant height, number of trifoliate leaves, plant spread, number of runners per plant, leaf area, leaf area index, plant dry weight at harvest, chlorophyll content, number of fruits per plant, yield per plant, weight of fruit, length of fruit, diameter of fruit and volume of fruit were recorded, among them the genotype Sabrina accounted maximum plant height (32.30 cm), number of trifoliate leaves (30.40), plant spread (48.47 cm in north and south direction whereas 53.93 cm in east and west direction), leaf area (206.04 cm^2), leaf area index (6.95), plant dry weight at harvest (29.04 g), chlorophyll content (2.33 mg/100 g) (Table 2), number of fruits per plant (22.36) and yield per plant (380.29 g). The genotype Fortuna was on par with Sabrina for all the above parameters, whereas the minimum plant height was recorded in Winter Dawn that is 21.50 cm, the minimum plant spread (31.87 cm in east and west direction whereas 32.37 in north and south direction) was 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 whereas 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) whereas 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 whereas minimum was recorded in genotype Safari that was 2.55 cm and 12.12 cc respectively (Table 3), Ankita *et al.*, (2014) and Kumar *et al.*, (2011).

The benefit cost ratio in different genotypes of strawberry differed significantly (Table 4) the genotype Fortuna accounted maximum net income (Rs. 472008.48 for 1032 m^2area, Subraya, 2015) which was followed by Cristal (Rs. 394837.14 for 1032 $m^2$of poly house

area) and was found to be lowest (Rs. 163745.15 for 1032 $m^2$of poly house area) in Winter Dawn Rakesh *et al.,* (2012). The maximum benefit cost ratio (2.93) was obtained from the genotype Fortuna which was followed by Cristal (2.45) whereas, lowest benefit cost ratio (1.01) was observed in Winter Dawn.

Table.1 Economics of strawberry cultivation under naturally ventilated polyhouse (1032m^2)

Sl. No.	Particulars	Total cost (Rs.)	Depreciation cost (Rs./7months)
I.	**Non-recurring contingency (NRC) (for a life span of 10 years)**		
1	**Construction of polyhouse @ 800/m^2** Top : UV stabilized polyfilm Side : 70% Agro shade net	825600	48160
2	**Irrigation system and other**		
a)	Irrigation system including foggers, 2 HP motor and electric charges	160000	11333
b)	Irrigation equipments and fertilizers storage	30000	1750
	Total of NRC	**1015600**	**61243**
II.	**Recurring contingency (ORC) for a life span of one season (1032 m^2).**		
1	**Inputs**		
a)	Planting material (9166 plants/1032 m^2 @ 9 Rs. /plant)	82494	
b)	Fertilizers (RDF- 80:40:40 kg NPK/ha, FYM- 20 t/ha)		
	Urea @ 6/kg	107.46	
	Rock phosphate @ 8.4/kg	123.84	
	MOP @ 16.88/kg	115.96	
	FYM @ 800/ton	1600	
c)	Soil sterilization	3000	
d)	Plant protection chemicals	1200	
2	**Labour charges**		
a)	Bed preparation (10 labours)	1800	
b)	Planting, weeding, mulching, harvesting and transportation.	9000	
	Total	**99441.26**	
	Grand total (NRC + ORC)	**160984.26**	

Table.2 Performance of strawberry genotypes for vegetative characters

Genotypes	Plant height (cm)	Number of leaves	Plant spread (cm)		R/P	LA (cm^2)	LAI	TDMW (g)	Chlorophyll content (mg/100g)
			N – S	E – W					
Winter Dawn	21.50	15.40	31.87	32.37	4.10	115.37	1.97	18.87	1.71
Sweet Charlie	26.27	21.20	43.60	46.37	4.83	165.72	3.90	22.24	1.94
Safari	24.87	15.27	33.63	36.20	4.17	100.59	1.70	18.45	1.62
Fortuna	27.63	22.50	41.20	42.40	8.33	182.69	4.50	25.07	2.06
Cristle	27.30	20.50	40.40	47.37	10.70	162.85	3.70	20.38	1.92
Elyana	26.50	19.43	40.10	37.83	6.70	129.84	2.80	19.28	1.85
Sabrina	32.30	30.40	48.47	53.93	1.67	206.04	6.95	29.04	2.33
S. Em ±	**0.34**	**0.47**	**0.62**	**0.64**	**0.49**	**9.69**	**0.13**	**0.36**	**0.11**
C. D. (P = 0.05)	**1.05**	**1.45**	**1.90**	**1.96**	**1.49**	**29.87**	**0.40**	**1.10**	**0.33**

Table.3 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**

Table.4 Economics of Strawberry genotypes cultivation (per 1032 m^2)

Genotypes	Total cost of cultivation (Rs. /1032m^2)	Fruit yield (kg per 1032m^2)	Number of runners per 1032 m^2	Gross income (Rs. / 1032m^2)	Net income (Rs. /1032m^2)	Benefit: Cost
Winter Dawn	160984.26	1766.56	37580.60	324729.38	163745.15	1:1.01
Sweet Charlie	160984.26	2379.95	44271.78	418409.34	257425.08	1:1.59
Safari	160984.26	1757.76	38222.22	325598.22	164613.96	1:1.02
Fortuna	160984.26	3366.12	76352.78	632992.74	472008.48	1:2.93
Cristal	160984.26	2179.94	98076.20	555821.40	394837.14	1:2.45
Elyana	160984.26	2143.65	61412.20	441474.60	280490.34	1:1.74
Sabrina	160984.26	3485.73	15307.22	464209.26	303225.00	1:1.88

Even though the genotype Sabrina accounted higher yield and very week in runner production whereas genotype Fortuna recorded yield which was on par with Sabrina but highest in runner production which leads to higher net income (Rs. 472008.48 for 1032 m^2area) which accounts for maximum benefit cost ratio (2.93). Form this it can be concluded that genotype Fortuna is good for economized strawberry cultivation.

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