

Performance of strawberry cultivars grown on different mulching materials under sub-humid subtropical plateau conditions of Eastern India

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ABSTRACT

A study was conducted to test the performance of 33 promising genotypes with different mulching materials under sub-humid subtropical plateau region of eastern India. Strawberry cultivars introduced from IARI Regional Station, Shimla were evaluated for their performance on three different mulches (black polythene, paddy straw and *Deenanath* grass). Irrespective of type of mulches, the cultivar Seascape recorded the maximum plant height at flower initiation stage. With respect to leaf number, the maximum number of leaves per plant at flower initiation stage was recorded in case of cv. Dil Pasand. At the end of fruiting stage, the maximum average plant height on different mulches was recorded in cultivars Missionary, Seascape and Addie. The maximum number of leaves per plant was observed in case of cv. Missionary. The average number of runners per plant varied from 0.3 (Phenomenal) to 9.4 (Addie). The earliest flower initiation stage was observed in cultivars Phenomenal, Florida and Douglas when grown on black polythene mulch. The earliest onset of peak fruit set stage was recorded in cultivars Phenomenal and Belrubi on black polythene mulches. The average of TSS on different mulches ranged from 6.78°B (Florida) to Phenomenal and No-1 (11.48°B). Irrespective of mulches, maximum average fruit weight was observed in case of Douglas (6.58 g) which was at par with that in case of Etna. On all the mulches, cultivar Etna recorded the maximum yield. On polythene mulches the yield of cv. Douglas was at par with that in case of Etna whereas on paddy straw and *Deenanath* grass mulches, the yield of cv. Douglas followed that of Etna.

Key words: Strawberry, mulching, black polythene, paddy straw, *Deenanath* grass.

INTRODUCTION

Strawberry is one of the most delicious and refreshing temperate fruit cherished in gardens and commercial plantations for its beautiful and attractive red fruits. Though the cultivated strawberry was introduced to India in early sixties, its cultivation in the tropical and subtropical parts of the country deserves wider spread. Since its cultivation is greatly influenced by specific regional adaption due to critical photoperiod and temperature requirement, the suitability of cultivars and its cultural practices are highly variable (Sharma and Sharma, 9). The Chotanagpur plateau region of Jharkhand provides ample opportunity for successful cultivation of strawberry due to its mild climatic conditions. However, meagre information is available on suitability of cultivars for the region. Mulching is an important component of strawberry production system. Many synthetic and organic types of mulch are being used for strawberry cultivation in different parts of the country based on the climatic conditions and availability of raw materials. Himelrick (4) showed that plants grown on black polythene produce more runners and fruits than that with bare soil. Different workers have reported beneficial effects of organic mulches on strawberry

production (Rebandel and Przysiccka, 7; Badiyala and Aggarwal, 1; Hassan *et al.*, 3; Lille *et al.*, 5; Sharma and Sharma, 9). Keeping this in view, the study was conducted to test the performance of 33 promising genotypes due to different mulching materials under sub-humid subtropical plateau region of eastern India.

MATERIALS AND METHODS

The experiment was conducted at HARP, Ranchi during 2004-05. Thirty three strawberry cultivars introduced from IARI, Regional Station, Shimla were evaluated for their performance on three different mulches (black polythene, paddy straw and *Deenanath* grass). The experiment was laid out in a Split Plot Design with three mulches as main plot and 33 strawberry genotypes as sub plot with three replications per treatment. Each replication consisted of raised beds of 20 cm height, 1.0 m width and 2.0 m length having plants (runners) of one genotype planted on a mulching material during 15th to 20th September 2004 at a spacing of 30 cm x 30 cm accommodating 10 plants per m² (20 plants per bed). For black polythene mulching, UV-stabilized polythene sheets of thickness 150 micron having holes of diameter 6.0 cm made at a spacing of 30 cm x 30 cm were fixed on the raised beds before planting. The runners were planted in each hole after the mulching material was laid out. Both the organic

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mulches were laid out on the bed at a thickness of approximately 10 cm after the plants have established (emergence of first new leaf).

In each bed, the first five plants were tagged for recording data on different plant growth parameters, fruit yield and different phenophases of the plant. The last five plants of each bed were tagged for recording data on different fruit quality parameters. The plant growth parameters like plant height, number of leaves, spread (east-west) and spread (north-south) were recorded during the flower initiation stage and end of fruiting stage of each treatment. The data on number of runners per plant was recorded only during the end of fruiting stage. The date of initiation of flowering was recorded on the day of first flower opening among the first five plants. The date of peak fruit set was recorded on the day having maximum number of firm ripe fruits in the plants. The end of fruiting stage was recorded on the day after which no fruit set was observed for next 15 days. Each fruit from the tagged plants were harvested for recording data on fruit yield, which was expressed as yield per 10 plants (kg).

Ten firm ripe fruits with well developed red colour and free from defects and decay were harvested at about 9.00 am from each plot at five days interval during the fruiting season for quality analysis. The total soluble solids was estimated by using table top temperature regulated refractometer. The content of reducing and total sugars was measured by using the Lane and Eynon method (Ranganna, 8). The titratable acid content was estimated by titrating the juice against N/10 NaOH till a pH of 8.2. The ascorbic acid content was measured by using 2,6-dichlorophenol indophenol dye method (Ranganna, 8). The statistical interpretation of the data was carried out by carrying out the analysis of variance (Panse and Sukhatme, 6).

RESULTS AND DISCUSSION

The data on plant growth characters of strawberry genotypes on different mulches at flower initiation stage has been presented in Table 1. Significant differences were observed on plant height of different genotypes at flower initiation stage. Irrespective of type of mulches, the cultivar Seascope recorded the maximum plant height (14.2 cm) at lower initiation stage which was at par with that observed in case of Phenomenal (13.4 cm) and Chandler (13.1 cm). The average of plant height of different cultivars was the highest in case of black polythene mulching. With respect to leaf number, significant differences were observed among the cultivars. Irrespective of mulches, the maximum number of leaves per plant at flower initiation stage was recorded in case of cv. Dil Pasand (34.0). Among the different mulches, the maximum number of leaves was observed in case of black polythene. The average

spread (east-west) among all the mulches ranged from 16.8 cm (No-5) to 29.1 cm (Seascope). With respect to spread (north-south), the maximum average value of all the mulches was observed in case of Seascope (30.8 cm). Irrespective of cultivars, the maximum spread (east-west) and spread (north-south) was observed in case of black polythene mulch.

The data on plant growth characters of strawberry genotypes on different mulches at end of fruiting stage has been presented in Table 2. At the end of fruiting stage, the maximum average plant height on different mulches was recorded in cultivars, Missionary, Seascope and Addie. Irrespective of cultivars, the maximum plant height was recorded in case of paddy straw mulching. The highest number of leaves per-plant at the end of fruiting was observed in case of cv. Missionary. Among the different mulches, the average number of leaves was the maximum in case of black polythene. The cultivar Pajaro recorded the maximum average plant spread (east-west) while it was in case of cv. V.L. in case of average spread (north-south). Irrespective of cultivars, the plant spread in both the direction was the maximum on black polythene mulch. With respect to number of runners per plant at the end of fruit set, the cultivars differed significantly. The average number of runners per plant on polythene mulch was significantly higher that was recorded on paddy straw and *Deenanath* grass mulch.

The data on different growth phases of the plant and pattern of yield distribution has been presented in Table 3. With respect to date of initiation of (flowering, marked differences have been observed within a variety on different mulches. In case of 20 cultivars on paddy straw mulch and 23 cultivars on *Deenanath* grass mulch, the flower initiation was delayed than that on black polythene mulch. Birkeland *et al.* (2) also reported delayed ripening in strawberry with organic mulches as compared to black polythene mulches. The earliest onset of peak fruit set stage was recorded in cultivars Phenomenal and Belrubi on black polythene mulches. On paddy straw and *Deenanath* grass mulches, it was recorded in cultivars S-1 and Dil Pasand, respectively. Per cent of total yield before peak fruiting is an indicator of the pattern of yield distribution in a cultivar. The cultivars with higher per cent of total yield before peak fruiting stage (>80%) were generally prolonged bearers. Irrespective of mulches, the cultivar No-5, had the maximum per cent of total yield produced before peak fruiting stage. Significant difference in yield distribution pattern within a cultivar on different mulching was noticed in case of cultivars, Florida, Dana, Douglas, Larsan, Blackmore, S-1, Addie, Majestic, V.L. and Fern. Different mulches probably led to differences in canopy temperature, soil temperature, moisture content and the quantity and

Table 1. Plant growth characters at flowering initiation stage in strawberry cultivars grown with different mulches.

Cultivar	Plant height (cm)			Number of leaves			Spread (E-W) (cm)			Spread (N-S) (cm)			
	Black polythene		Paddy straw	Deenanath grass		Black polythene	Paddy straw	Deenanath grass		Black polythene	Paddy straw	Deenanath grass	
	10.2	15.0	13.0	6.4	11.6	22.6	22.2	11.6	22.6	23.0	26.8	15.0	17.4
1. Sweet Charlie	10.2	15.0	13.0	6.4	11.6	22.6	22.2	11.6	22.6	23.0	26.8	15.0	17.4
2. Phenomenal	15.0	13.0	14.2	11.0	20.2	29.8	28.4	20.2	29.8	29.8	28.2	22.4	25.4
3. North West	13.0	14.8	10.6	7.2	16.2	27.2	27.6	16.2	27.2	29.4	27.2	19.4	22.4
4. Sasta	14.8	8.2	11.0	10.8	21.6	28.4	22.6	21.6	28.4	29.2	27.4	24.4	24.4
5. No-7	8.2	13.8	7.8	12.2	19.8	18.4	17.0	19.8	18.4	21.8	21.8	21.4	23.2
6. Etna	13.8	8.6	9.8	12.8	30.6	31.2	24.4	30.6	31.2	31.6	25.0	24.0	25.2
7. Redcoat	8.6	13.6	9.2	10.6	10.0	18.6	22.8	10.0	18.6	20.4	22.8	15.8	17.4
8. Florida	13.6	10.2	10.6	10.4	19.8	26.8	21.6	19.8	26.8	27.2	22.0	22.2	24.4
9. No-5	10.2	15.6	7.6	7.6	11.4	18.8	11.4	11.4	18.8	20.8	18.4	15.8	18.4
10. Belrubi	15.6	14.8	8.6	11.2	10.0	31.2	21.6	10.0	31.2	32.2	23.8	20.2	22.8
11. Dana	14.8	11.8	6.6	10.8	14.8	31.2	15.2	14.8	31.2	30.8	18.2	20.2	22.4
12. Dil Pasand	11.8	16.8	13.6	11.6	19.0	26.0	44.2	19.0	26.0	27.0	27.4	21.6	24.6
13. Hayword-17	16.8	11.8	9.0	10.2	9.8	35.2	21.4	9.8	35.2	33.0	21.0	19.0	20.2
14. Katrain Sweet	11.8	9.0	8.6	10.0	15.0	26.2	18.8	15.0	26.2	26.8	19.0	19.0	21.6
15. Douglas	9.0	13.0	6.8	9.8	10.0	21.2	10.4	10.0	21.2	20.6	19.0	19.4	19.8
16. Shiria Delicious	13.0	12.8	8.2	13.0	23.8	26.0	18.8	23.8	26.0	27.4	23.0	23.4	25.0
17. Jutogh Special	12.8	10.0	7.4	12.8	23.0	27.0	16.0	23.0	27.0	26.4	20.0	23.2	26.0
18. Larsan	10.0	14.2	10.6	8.8	16.8	21.8	24.2	16.8	21.8	23.6	25.6	19.2	22.2
19. Blackmore	14.2	12.4	10.3	9.4	20.5	26.4	14.4	20.5	26.4	28.0	27.6	15.8	14.6
20. S-1	12.4	13.8	7.2	7.0	15.6	25.8	10.0	15.6	25.8	25.4	19.2	19.8	21.2
21. Missionary	13.8	13.0	11.2	11.4	32.0	29.8	24.2	32.0	29.8	29.8	26.4	26.4	27.6
22. Torrey	13.0	16.0	12.2	9.2	8.4	21.8	29.6	8.4	21.8	23.4	28.4	13.8	15.8
23. Seascope	16.0	10.8	12.8	14.0	23.2	31.6	26.6	23.2	31.6	32.0	30.8	28.0	29.8
24. No-1	10.8	11.6	8.2	7.2	10.2	25.6	18.8	10.2	25.6	27.4	21.8	20.8	22.4
25. Addie	11.6	11.6	13.0	12.4	22.6	23.4	26.4	22.6	23.4	24.4	30.2	26.0	26.8
26. Majestic	11.6	8.0	9.6	10.8	12.2	27.0	23.2	12.2	27.0	27.8	22.8	16.0	19.2
27. Catskill	8.0	13.0	7.2	12.0	21.0	20.4	11.8	21.0	20.4	20.4	19.2	21.0	24.0
28. V.L.	13.0	15.0	10.0	13.6	25.8	29.0	21.6	25.8	29.0	33.0	26.6	29.6	30.2
29. Chandler	15.0	12.2	12.0	12.4	15.6	30.4	22.2	15.6	30.4	31.6	22.2	22.8	24.2
30. Fairfax	12.2	9.8	8.8	11.6	17.6	28.2	14.2	17.6	28.2	28.0	23.4	25.0	27.8
31. Selva	9.8	14.2	7.0	10.4	11.2	24.4	10.4	11.2	24.4	24.8	17.0	18.8	21.2
32. Fern	14.2	13.0	8.4	9.8	17.6	26.6	14.4	17.6	26.6	25.4	20.6	20.2	23.4
33. Pajaro	13.0	10.8	9.4	13.8	25.8	25.6	26.8	25.8	25.6	26.4	27.0	29.0	29.0
CD at 5%			0.239		1.085		1.085		0.480		0.336		
Cultivar			1.119		3.642		3.642		1.864		1.873		
Mulch x Cultivar			1.938		6.308		6.308		3.229		3.212		

Table 2. Plant growth characters of strawberry cultivars grown on different mulches at the end of fruiting stage.

Cultivar	Plant height (cm)		Number of leaves		Spread (E-W) (cm)		Spread (N-S) (cm)		Number of runners				
	Polythene straw		Paddy Deenanath		Paddy Deenanath		Paddy Deenanath		Paddy Deenanath				
	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black			
1. Sweet Charlie	12.4	19.0	12.4	40.0	49.2	29.2	24.4	28.2	35.0	24.6	4.4	5.2	3.4
2. Phenomenal	19.4	16.2	19.4	65.4	39.0	37.6	32.4	37.2	34.2	31.4	0.0	0.0	1.0
3. North West	19.4	20.6	15.6	67.0	44.2	37.8	33.2	36.2	34.4	31.4	7.4	4.0	1.6
4. Sasta	22.8	21.0	19.2	71.0	65.4	38.0	37.2	38.8	37.0	35.8	13.0	4.0	6.4
5. No-7	12.6	16.0	19.0	27.8	29.2	25.6	36.8	25.4	32.4	37.0	4.8	3.8	5.0
6. Etna	16.0	12.4	14.2	75.8	24.8	33.2	28.6	31.8	24.2	26.4	1.4	0.4	0.6
7. Redcoat	10.8	16.6	16.8	23.8	31.4	22.4	32.0	22.2	30.6	30.4	1.8	3.0	3.2
8. Florida	18.6	18.4	21.2	67.4	66.2	39.8	37.4	38.0	36.8	36.0	8.2	3.0	4.2
9. No-5	11.8	17.6	17.6	28.6	33.8	23.2	32.8	25.6	34.0	34.0	9.6	7.0	7.0
10. Belrubri	18.2	17.2	20.2	63.4	31.8	38.8	34.8	39.2	29.4	32.4	2.4	1.8	7.2
11. Dana	16.4	16.4	12.8	51.6	28.0	32.8	22.0	33.8	30.2	24.8	1.8	1.0	0.6
12. Dil Pasand	12.6	23.2	16.6	41.4	73.6	25.6	24.8	25.8	41.0	26.2	4.0	4.0	2.6
13. Hayword-17	22.4	17.4	17.6	78.0	40.2	41.4	30.6	38.4	34.0	30.8	9.0	1.8	4.8
14. Katrain Sweet	16.8	15.8	15.0	54.2	27.6	34.6	26.2	34.8	31.6	28.8	7.6	4.6	2.0
15. Douglas	12.0	16.4	13.0	13.4	26.8	24.8	10.2	25.0	30.6	19.6	0	4.4	1.0
16. Shimia Delicious	17.0	16.8	17.2	43.2	31.8	34.0	44.8	35.2	31.8	31.8	4.6	1.8	2.6
17. Jutogh Special	15.8	15.6	18.2	44.4	25.4	32.8	53.8	33.0	30.2	33.0	5.4	4.0	4.4
18. Larsan	15.0	17.4	14.2	47.6	37.6	35.4	26.8	34.8	34.4	28.6	6.6	5.2	2.2
19. Blakemore	23.2	20.8	14.8	78.4	46.4	45.2	34.4	40.0	27.0	25.2	12.8	3.6	1.2
20. S-1	18.2	15.2	16.4	53.2	22.4	33.6	23.6	34.4	29.8	29.2	4.2	1.0	0.4
21. Missionary	22.0	22.0	22.2	79.6	66.6	36.6	79.8	36.8	30.6	36.8	11.4	4.0	4.0
22. Torrey	15.2	20.6	15.6	39.4	71.6	32.0	12.0	27.4	33.2	27.8	7.8	3.0	3.6
23. Seascape	22.8	20.8	22.4	63.8	56.2	40.8	56.2	38.0	30.0	36.6	8.6	4.2	5.2
24. No-1	22.0	18.2	17.0	57.0	38.0	41.4	39.8	38.4	26.4	31.6	7.8	0.4	1.8
25. Addie	21.2	24.6	20.2	52.6	66.8	37.8	68.0	40.0	38.4	38.6	16.4	5.0	6.8
26. Majestic	18.2	20.4	14.8	35.4	44.8	33.6	18.2	25.8	36.8	28.2	11.0	5.0	3.4
27. Catskill	12.4	12.0	12.0	21.8	17.2	23.8	18.0	18.0	19.2	21.0	0.8	0.4	0.0
28. V.L.	18.0	22.4	19.2	81.0	60.0	34.0	44.2	34.6	42.8	35.4	4.0	5.8	1.2
29. Chandler	15.8	17.2	16.0	42.8	35.2	32.0	31.8	32.2	32.2	32.2	0.8	2.4	4.4
30. Fairfax	18.2	21.4	16.2	50.4	43.6	34.6	28.0	33.2	34.2	32.0	11.2	6.8	2.8
31. Selva	15.4	16.2	14.2	41.8	34.8	30.4	26.6	29.2	28.6	28.8	5.2	3.4	2.8
32. Fern	18.0	18.8	15.6	52.4	37.4	35.8	32.0	34.6	34.0	29.6	6.6	2.4	3.6
33. Pajaro	20.2	22.2	23.2	56.2	61.0	34.0	76.6	41.6	37.8	38.4	8.6	3.4	4.6
CD at 5%		0.443		2.337		0.917		0.772		0.772		0.467	
Mulch Cultivar		1.612		7.854		2.802		2.503		2.503		1.867	
Mulch x Cultivar		2.792		13.604		4.854		4.338		4.338		3.234	

Table 3. Growth phases and temporal pattern of yield distribution of strawberry cultivars grown on different mulches

Cultivar	Date of initiation of flowering			Date of peak fruit set			Per cent of total yield before peak fruiting		
	Black polythene	Paddy straw	Deenanath grass	Black polythene	Paddy straw	Deenanath grass	Black polythene	Paddy straw	Deenanath grass
1. Sweet Charlie	1/3/05	18/2/05	10/2/05	28/3/05	1 5/3/05	22/3/05	81.87	71.21	78.82
2. Phenomenal	3/1/05	3/1/05	19/1/05	18/2/05	5/3/05	5/3/05	64.30	79.80	63.43
3. North West	18/2/05	11/3/05	18/2/05	28/3/05	28/3/05	23/4/05	80.04	63.10	91.21
4. Sasta	18/2/05	5/3/05	24/2/05	19/3/05	23/4/05	23/4/05	82.90	94.80	96.65
5. No-7	13/2/05	13/2/05	5/3/05	28/3/05	28/3/05	23/4/05	73.85	69.36	96.54
6. Etna	28/1/05	28/1/05	24/1/05	18/2/05	18/2/05	8/3/05	52.70	47.05	44.74
7. Redcoat	1/3/05	1/3/05	11/3/05	28/3/05	28/3/05	28/3/05	77.10	57.34	52.72
8. Florida	3/1/05	24/2/05	1/3/05	13/4/05	23/4/05	15/3/05	98.12	91.87	57.30
9. No-5	18/2/05	1/3/05	1/3/05	23/4/05	23/4/05	23/4/05	96.53	99.67	97.74
10. Belrubi	3/1/05	12/1/05	24/2/05	18/2/05	13/2/05	22/3/05	63.32	35.39	53.18
11. Dana	12/1/05	11/3/05	18/2/05	1/3/05	19/3/05	19/3/05	72.60	31.00	68.18
12. Dil Pasand	24/2/05	1/3/05	24/2/05	19/3/05	19/3/05	1/3/05	68.03	57.74	44.77
13. Hayword-17	3/2/05	5/3/05	1/3/05	15/3/05	19/3/05	23/4/05	57.07	57.42	91.65
14. Katrain Sweet	5/3/05	15/3/05	5/3/05	28/3/05	28/3/05	28/3/05	84.12	68.24	60.46
15. Douglas	3/1/05	1/3/05	3/2/05	8/3/05	13/4/05	23/4/05	57.79	90.91	93.48
16. Shimla Delicious	1/3/05	24/2/05	1/3/05	28/3/05	28/3/05	28/3/05	72.93	85.26	62.93
17. Jutogh Special	1/3/05	8/3/05	5/3/05	28/3/05	28/3/05	28/3/05	74.30	67.55	66.16
18. Larsan	3/2/05	24/2/05	1/3/05	28/3/05	15/3/05	15/3/05	78.49	35.39	43.44
19. Blakemore	8/2/05	15/3/05	5/3/05	15/3/05	13/4/05	23/4/05	59.15	93.25	98.11
20. S-1	18/2/05	3/2/05	8/3/05	22/3/05	1/3/05	13/4/05	89.76	29.01	92.90
21. Missionary	18/2/05	18/2/05	24/2/05	15/3/05	15/3/05	15/3/05	69.52	45.34	51.13
22. Torrey	10/2/05	24/2/05	24/2/05	28/3/05	15/3/05	13/4/05	62.80	54.43	83.86
23. Seascape	24/2/05	5/3/05	24/2/05	15/3/05	15/3/05	28/3/05	60.42	49.91	85.40
24. No-1	24/2/05	3/2/05	18/2/05	5/3/05	5/3/05	5/3/05	35.23	49.81	58.27
25. Addie	5/3/05	1/3/05	5/3/05	1/4/05	23/4/05	15/3/05	82.56	91.67	53.36
26. Majestic	5/3/05	24/2/05	8/3/05	28/3/05	15/3/05	13/4/05	81.14	36.34	61.81
27. Catskill	10/1/05	19/1/05	19/1/05	18/2/05	5/3/05	8/3/05	29.23	53.44	58.09
28. V.L.	1/3/05	24/2/05	12/1/05	28/3/05	19/3/05	3/2/05	93.31	60.63	37.92
29. Chandler	19/1/05	10/2/05	13/2/05	1/3/05	13/4/05	13/4/05	68.63	97.64	86.36
30. Fairfax	18/2/05	24/2/05	8/3/05	19/3/05	28/3/05	23/4/05	71.04	57.70	91.05
31. Selva	24/2/05	1/3/05	1/3/05	28/3/05	13/4/05	28/3/05	74.45	91.30	63.31
32. Fern	18/2/05	5/3/05	11/3/05	28/3/05	15/3/05	23/4/05	74.76	34.43	89.90
33. Pajaro	18/2/05	24/2/05	24/2/05	8/3/05	15/3/05	15/3/05	49.25	38.53	55.83
CD at 5%	Mulch							8.634	
	Cultivar							19.264	
	Mulch x Cultivar							32.643	

quality of light transmitted, reflected or absorbed (Wang *et al.*, 10). These differences, in turn, may have affected plant growth, development and fruit quality in the strawberry plants.

Sugars and organic acids have an important impact on sensory quality of strawberry fruits. The data on

fruit quality of strawberry cultivars grown on different mulches has been presented in Table 4. The average of TSS on different mulches ranged from 6.78°B (Florida) to Phenomenal and No-1 (11.48°B). Among the different mulches the TSS did not differ significantly. With respect to reducing sugars, the content was the

Table 4. Fruit quality of strawberry cultivars grown on different mulches.

Cultivar	TSS (°Brix)			Reducing sugar (%)			Total sugars (%)			Titratable acidity (%)			Ascorbic acid (mg g ⁻¹)				
	Black Polythene		Paddy straw	Deenanath grass		Black polythene	Paddy Deenanath straw		Black polythene	Paddy Deenanath grass		Black polythene	Paddy Deenanath straw		Black polythene	Paddy Deenanath straw	
	12.15	10.50	11.13	3.58	3.95	4.58	4.54	4.76	5.62	0.49	0.56	51.25	64.62	61.25			
1. Sweet Charlie	12.39	10.71	11.35	4.86	4.42	4.12	5.59	6.63	5.52	0.54	0.35	68.75	93.75	56.25			
2. Phenomenal	10.03	8.67	9.19	4.48	5.61	4.33	5.16	5.41	6.39	0.58	0.63	80.63	51.25	51.25			
3. North West	10.03	10.11	12.35	3.38	3.07	3.56	7.15	6.49	5.27	0.45	0.29	83.44	45.00	68.75			
4. Sasta	10.85	9.38	9.94	3.63	3.30	3.83	4.21	4.42	5.22	0.58	0.38	68.75	83.44	68.75			
5. No-7	10.03	8.67	9.19	3.74	4.91	3.25	4.60	4.83	5.70	0.60	0.46	93.75	61.25	69.75			
6. Etna	10.85	12.59	10.45	3.63	3.30	3.83	5.36	4.93	4.88	0.54	0.63	53.12	56.25	83.44			
7. Redcoat	7.31	6.32	6.70	3.04	2.77	3.21	7.74	8.12	9.58	0.41	0.46	59.37	53.75	68.75			
8. Florida	12.34	10.66	11.30	6.48	5.90	6.84	8.01	8.41	9.92	0.74	0.42	64.62	64.62	64.62			
9. No-5	9.79	10.45	8.65	3.18	2.89	3.36	3.83	4.02	4.74	0.59	0.54	81.25	93.75	93.75			
10. Belrubu	9.79	8.46	8.97	3.63	4.56	2.78	4.43	4.65	5.49	0.54	0.45	90.62	51.25	51.25			
11. Dana	8.49	6.95	7.36	2.87	2.61	3.03	5.36	4.94	3.98	0.58	0.63	106.50	45.00	45.00			
12. Dil Pasand	9.67	8.36	8.86	3.58	3.26	3.78	6.45	6.77	7.99	0.58	0.55	87.50	92.51	81.25			
13. Hayward-17	10.85	9.38	9.94	4.78	2.15	5.61	5.45	5.72	6.76	0.64	0.42	62.50	83.44	90.62			
14. Katrain Sweet	10.15	8.38	10.07	3.48	3.17	3.67	4.02	6.25	5.51	0.49	0.49	43.75	68.75	98.60			
15. Douglas	12.04	10.41	11.03	5.31	4.83	5.60	6.48	6.81	8.03	0.41	0.58	62.50	51.25	87.50			
16. Shimla Delicious	8.85	7.65	8.10	3.58	3.26	3.78	7.15	7.51	8.87	0.47	0.39	43.75	83.44	62.50			
17. Jutogh Special	8.49	7.34	7.78	3.18	2.89	3.36	4.43	3.19	4.63	0.58	0.64	37.60	45.30	53.75			
18. Larsan	11.21	9.69	10.27	3.10	4.26	3.22	5.62	5.90	6.96	0.42	0.51	64.62	68.75	64.62			
19. Blakemore	10.03	11.46	10.32	4.78	4.35	5.04	5.92	6.21	7.33	0.60	0.47	93.75	105.60	45.21			
20. S-I	8.37	7.24	7.67	3.70	3.36	3.90	6.64	6.97	8.23	0.42	0.59	83.44	83.44	92.51			
21. Missionary	10.14	8.77	9.29	3.18	2.89	3.36	5.62	4.99	4.28	0.58	0.67	61.25	68.75	83.44			
22. Torrey	10.26	8.87	9.40	3.18	2.89	3.36	5.62	4.99	4.28	0.58	0.67	61.25	68.75	83.44			
23. Seascope	12.39	10.71	11.35	3.48	3.17	3.67	7.85	8.24	9.73	0.60	0.54	83.44	43.75	92.51			
24. No-1	9.28	8.02	8.50	3.82	3.48	4.04	8.95	7.65	8.42	0.49	0.42	68.75	62.50	62.50			
25. Addie	12.03	10.40	11.02	3.10	4.26	3.52	9.21	9.67	11.41	0.55	0.35	64.62	83.44	61.25			
26. Majestic	9.20	7.95	8.43	5.31	4.83	5.60	6.78	7.12	8.40	0.69	0.40	61.25	68.75	56.25			
27. Catskill	11.91	10.30	10.92	4.04	3.68	4.27	4.77	5.01	5.91	0.58	0.49	93.75	63.75	63.75			
28. V.L.	10.38	8.97	9.51	3.87	3.52	4.09	5.62	5.90	6.96	0.67	0.36	53.12	53.75	53.75			
29. Chandler	11.21	12.11	9.51	3.48	2.89	3.36	4.15	5.41	4.91	0.61	0.49	64.62	58.27	43.75			
30. Fairfax	10.14	8.77	9.29	3.04	5.11	4.23	3.97	4.17	4.92	0.53	0.51	75.49	51.67	33.75			
31. Selva	10.38	8.97	9.51	5.12	4.66	5.41	5.85	6.14	7.25	0.49	0.46	86.36	45.08	62.58			
32. Fern	11.21	12.35	10.21	5.75	4.11	3.23	6.78	7.12	8.40	0.39	0.35	97.23	38.48	43.75			
33. Pajaro	CD at 5%	Mulch	NS		NS			NS			NS		3.691				
		Cultivar	2.491		2.361			2.657			NS		5.128				
		Mulch x Cultivar	3.427		3.414			3.264			NS		8.694				

Table 5. Fruit weight and yield of strawberry cultivars grown on different mulches.

Cultivar	Average fruit weight (g)			Total yield per 10 plants (kg)		
	Black polythene	Paddy straw	Deenanath grass	Black polythene	Paddy straw	Deenanath grass
1. Sweet Charlie	3.77	4.70	3.42	1.04	0.70	0.51
2. Phenomenal	4.14	3.59	4.13	2.65	1.72	1.55
3. North West	4.46	4.04	3.93	0.83	0.60	0.59
4. Sasta	3.87	3.39	4.18	0.59	0.36	0.55
5. No-7	3.72	4.21	4.06	1.44	0.90	0.41
6. Etna	5.63	5.96	5.04	3.36	4.71	2.24
7. Redcoat	3.29	6.17	4.50	0.83	1.16	0.52
8. Florida	4.88	3.31	3.12	1.85	0.12	0.17
9. No-5	2.48	3.40	3.21	0.22	0.26	0.29
10. Belrubi	3.56	4.44	4.85	2.48	1.07	0.41
11. Dana	4.17	3.28	3.41	2.69	0.56	0.80
12. Dil Pasand	5.06	3.44	3.37	2.30	0.56	0.22
13. Hayward-17	4.67	3.15	5.29	0.99	0.61	0.66
14. Katrain Sweet	3.15	3.11	3.56	0.78	0.74	0.79
15. Douglas	7.28	5.16	7.31	3.09	2.89	1.88
16. Shimla Delicious	4.43	3.56	4.01	2.00	0.87	0.93
17. Jutogh Special	3.46	2.89	3.49	1.38	0.93	0.40
18. Larsan	4.17	5.94	3.41	1.43	1.13	0.74
19. Blakemore	4.32	4.06	2.86	0.41	0.69	1.03
20. S-1	3.19	3.88	3.13	0.23	0.28	0.32
21. Missionary	3.35	4.79	4.72	0.68	0.56	0.45
22. Torrey	4.23	3.65	3.99	1.93	0.29	1.25
23. Seascape	5.76	3.01	3.67	0.77	0.82	0.47
24. No-1	3.70	3.20	3.42	0.34	0.50	0.23
25. Addie	3.24	4.31	3.66	1.09	0.72	0.42
26. Majestic	3.70	3.79	3.15	1.44	0.73	0.61
27. Catskill	6.21	5.62	3.77	1.80	1.56	1.21
28. V.L.	4.07	4.47	4.06	2.02	1.48	1.91
29. Chandler	4.57	4.07	4.09	0.52	0.79	0.74
30. Fairfax	4.82	7.32	4.23	1.32	1.27	2.72
31. Selva	3.30	4.50	5.33	0.86	0.57	0.94
32. Fern	4.51	3.64	4.21	0.89	0.44	0.64
33. Pajaro	3.58	5.36	3.25	0.27	0.40	0.45
CD at 5%	Mulch	NS			0.361	
	Cultivar	1.153			0.432	
	Mulch x Cultivar	2.218			0.498	

maximum in case of genotype No-5 on all the type of mulches (6.48, 5.90 and 6.84% on black polythene, paddy straw and *Deenanath* grass mulches, respectively). Among the different mulches the content of reducing sugars did not differ significantly. Similar trend was also observed in case of content of total sugars in the fruit. With respect to titratable acidity, no significant differences could be observed among the different cultivars on different mulches. The cultivars

differed significantly with respect to content of ascorbic acid. On black polythene mulches, the maximum content of ascorbic acid was observed in case of Dil Pasand whereas on paddy straw and *Deenanath* grass mulches, the maximum content was observed in case of cultivars, S-1 and Douglas.

The data on fruit weight and yield of strawberry cultivars grown on different mulches has been presented in Table 5. Irrespective of mulches the

maximum average fruit weight was observed in case of Douglas (6.58 g) which was at par with that in case of Etna, Redcoat, Hayward-17, Catskill, Fairfax and Selva. Among the mulches the fruit weight did not differ significantly. Significant effects of mulches were observed on the yield of different cultivars. On all the mulches, cultivar Etna recorded the maximum yield. On polythene mulches, the yield of cv. Douglas was at par with that in case of Etna whereas on paddy straw and *Deenanath* grass mulches, the yield of cv. Douglas followed that of Etna. The average yield of strawberry cultivars was the maximum on black polythene mulch, whereas on paddy straw and *Deenanath* grass mulch, it did not differ significantly. However, during the summer months, heavy mortality of plants on black polythene mulches was observed due to wilting which was in significant in case of paddy straw and *Deenanath* grass mulches. Hence, keeping in view the yield, fruit quality, the cultivars Etna and Douglas were found to be most suitable for cultivation on all the three types of mulches under the sub-humid sub-tropical plateau region of eastern India.

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