

## Effect of Different Growing Conditions on Yield and Quality of Strawberry (*Fragaria x ananassa* Duch.)

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**ABSTRACT:** An experiment was conducted to evaluate the yield and quality of strawberry (*Fragaria x ananassa* Duch.) in different growing conditions of Kerala. The various growing systems viz., openfield, greenhouse and fan and pad system and two time of planting viz., last week of September planting and last week of October planting and two mulches viz., transparent polyethylene sheet and black polyethylene sheet were evaluated under FRBD with three replications. In high ranges, planting in the last week of September with black mulch in open field recorded maximum number of fruits (8.97), maximum yield per plant (110.07 g), average fruit weight per plant (8.79 g) and total sensory score (58.9). In central midlands, planting in last week of September with black mulch in open field resulted in significantly higher number of fruits (5.43), early harvest (99.33 days), maximum days to final harvest (163.25 days), maximum total sugars (6.03%) and total sensory score (49.61). Comparing the two locations, fruits from high ranges were found to be superior in colour and appearance than fruits from central midlands.

**Key words:** Strawberry, Growing systems, Yield, Quality.

### INTRODUCTION

Strawberry (*Fragaria x ananassa* Duch.) is known as one of the most delicious and refreshing soft fruit. Being the rich source of vitamins and minerals coupled with delicate flavour, strawberry has become an important table-fruit of millions of people around the globe (Sharma and Singh, 1999). Strawberry fruit grows rapidly and may take 20-60 days for ripening, depending upon the fruit habit of the cultivar, environment and pollination. Considerable changes in pigments, sugars, organic acid, total soluble solids, vitamin C and volatile constituents take place during fruit development. Sugar provides energy for metabolic changes and play vital role in flavor synthesis. Sugars and organic acids are important for flavor synthesis in strawberry and sugar:acid ratio is often used as an index for commercial acceptability (Sprayed and Morri, 1981). Keeping these facts in view, the present investigations was undertaken to study the effect of different growth conditions on yield and quality of strawberry in Kerala.

### MATERIALS AND METHODS

The present investigation was carried out at two locations in Kerala viz., central midlands (Thrissur,

10° 31'N, 76° 3'E and 22.25 m altitude, enjoys a typical warm humid tropical climate) and high ranges (Wayanad, 11.37°N, 76.12°E and 1000m altitude, enjoys mild sub-tropical climate) during September 2013 to March 2014. The experiment was laid out in 3 x 2 x 2 randomized block design (RBD) with three replications. The treatments comprised of three growing systems viz., open field, greenhouse and fan and pad system, two mulches viz., transparent polyethylene sheet and black polyethylene sheet and two time of planting viz., last week of September and October planting. One month old tissue cultured strawberry variety winter dawn was taken for the study. The details of soils of experimental site were analysed for salient properties following standard methods. The soil was of sandy loam texture having 1.99% organic carbon with acidic reaction (pH5.7) in central midlands and was of sandy clay loam texture having 0.96% organic carbon with acidic reaction (pH4.95) in high ranges. Twelve raised beds of size 1.5m x 1m x 0.3m were taken in each growing system. FYM @ 10 t ha<sup>-1</sup> was applied in the beds taken for planting. N: P: K @ 75:80:50 kg ha<sup>-1</sup> was given in two equal splits, first as basal and second 45 days after

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planting. Double row hill system of planting was done with a spacing of 30cm x 40cm. Holes were made on the mulch depend on spacing and planting was done by hand. Ten plants were planted in each plot. Observations were recorded from five randomly selected plants on number of fruits, yield (g), average fruit weight per plant (g), days to first harvest, days to final harvest, TSS ( $^{\circ}$  Brix), Acidity in percent (Ranganna, 1997), TSS/ Acidity, total sugars in percent (Ranganna, 1997) and sensory evaluation (Jellinek, 1985).

## RESULTS AND DISCUSSION

**High ranges:** Growing systems significantly influences yield attributes *viz.*, number of fruits, yield per plant, average fruit weight, days to first harvest and days to final harvest (Table 1). Plants in the open field recorded significantly higher number of fruits (8.97), yield per plant (80.35 g), average fruit weight per plant (8.79 g) and earliness in harvesting (81.17 days). A significantly higher number of flowers and clusters per plant were recorded under open field might have resulted in maximum number of fruits and yield per plant. Greenhouse recorded maximum days to final harvest (173 days). The days to final harvest was significantly influenced by time of planting. Last week of October planting recorded maximum days to final harvest (160.94 days). Mulches had no significant influence on yield characters. Among interactions, open field with black polyethylene mulch recorded maximum number of fruits (10.53) and yield per plant (102.17 g). It may be attributed to synergistic and interactive influence of black polyethylene mulch under open field on creation of comparatively favourable environment and better moisture conservation, suppression in weed growth etc., which might have resulted in comparatively better growth of plants than other combinations (Badiyala and Aggarwal (1981); Gupta and Acharya (1994); Hassan *et al.* (2000); Singh and Asrey (2005); Kheret *et al.*, 2010). The harvesting period was extended to 171 days when strawberry planted during the last week of October using the transparent polyethylene sheet. Among the quality attributes, planting in the greenhouse recorded significantly higher TSS (11.07), TSS/acidity (86.46), total sugars (5.88) and acidity (0.13). Time of planting had no significant influence on quality attributes of strawberry. Maximum total sugar content (5.31%) was observed when plants are mulched with transparent polyethylene sheet. Among the interactions, last week of September planting

under greenhouse recorded maximum TSS (11.47  $^{\circ}$ Brix) and total sugar (6.0%) content of fruits. Transparent polyethylene sheet under greenhouse resulted maximum TSS (11.32  $^{\circ}$ Brix) while transparent polyethylene sheet under open field recorded maximum total sugar content (5.98%) of fruits. The highest total sensory score (58.9) was recorded in fruits obtained from open field planted during last week of September with black polyethylene mulch (Table 6).

**Central midlands:** Growing system significantly influences yield characters *viz.*, the number of fruits per plant, days to first harvest and days to final harvest (Table 1). Maximum number of fruits per plant (5.87) was recorded under fan and pad system. Green house recorded earliness in harvesting (82.67 days). Among different time of planting, planting in the last week of September resulted in maximum number of fruits per plant (5.43) primarily because September planting resulted in better growth of plants which may resulted in the production of maximum fruits (Singh *et al.*, 2007). Mulch had no significant influence on yield characters. Among interactions, transparent polyethylene sheet under fan and pad system recorded early harvest (81.67 days) while transparent polyethylene sheet in open field had extended harvesting period (166.5 days). Among different quality attributes, open field recorded maximum total sugars (6.03 %) (Table 3). Maximum intensity of light (Table 8) was recorded in open field which might have resulted in high total sugar content (Lee and Kader, 2000). Planting time significantly influences the TSS content. Planting in the last week of September recorded maximum TSS content (9.34  $^{\circ}$ Brix). Better quality fruit from early planting may be associated with sufficient time for fruit development and accumulation of sugars (Lee and Kader, 2000). Among interactions, last week of September planting with transparent polyethylene sheet resulted in maximum TSS (9.49  $^{\circ}$ Brix) and TSS/acidity (74.13) in fruits. Strawberry planted in last week of October with transparent polyethylene sheet resulted in fruits with higher total sugar content (5.54). The highest total sensory score (49.61) was recorded in fruits obtained from open field planted during last week of September with transparent polyethylene sheet (Table 5).

Comparing the two locations, fruits from high ranges were found to be superior in colour and appearance than fruits from central midlands (Table 7). This might be due to low temperature and high light intensity prevailing in the high range conditions of Kerala (Table 8).

Effect of Different Growing Conditions on Yield and Quality of Strawberry (*Fragaria x ananassa* Duch.)

**Table 1**  
Effect of growing systems, time of planting and mulch on yield attributes of strawberry cv. Winter Dawn at two locations

Treatments		Location I (Central midlands)					Location II (High ranges)				
		No. of fruits per plant	Yield per plant (g)	Average fruit weight per plant (g)	Days to first harvest	Days to final harvest	No. of fruits per plant	Yield per plant (g)	Average fruit weight per plant (g)	Days to first harvest	Days to final harvest
Growing systems (S)	S <sub>1</sub>	4.55	32.67	7.35	132.83	163.25	8.97	80.35	8.79	81.17	153.33
	S <sub>2</sub>	3.31	23.75	7.35	82.67	139.50	7.82	61.27	7.76	86.75	173.00
	S <sub>3</sub>	5.87	40.90	6.67	84.50	153.00	6.33	41.52	6.56	103.17	137.42
CD		1.82	NS	NS	9.44	7.36	1.88	17.49	0.88	5.43	8.61
Time of planting (P)	P <sub>1</sub>	5.43	38.19	6.98	99.33	154.78	7.59	58.65	7.51	88.44	148.22
	P <sub>2</sub>	3.72	26.69	7.27	100.67	149.06	7.82	63.45	7.90	92.28	160.94
CD		1.49	NS	NS	NS	NS	NS	NS	NS	NS	7.03
Mulch (M)	M <sub>1</sub>	4.09	27.93	6.81	104.94	150.67	7.69	57.92	7.38	91.39	158.11
	M <sub>2</sub>	5.06	36.95	7.44	95.06	153.17	7.72	64.17	8.03	89.33	151.06
CD		NS	NS	NS	13.35	NS	NS	NS	NS	NS	NS

**Table 2**  
Effect of P x M, S x P and S x M interactions on yield attributes of strawberry cv. Winter Dawn at two locations

Treatments		Location I (Central midlands)					Location II (High ranges)				
		No. of fruits per plant	Yield per plant (g)	Average fruit weight per plant (g)	Days to first harvest	Days to final harvest	No. of fruits per plant	Yield per plant (g)	Average fruit weight per plant (g)	Days to first harvest	Days to final harvest
P x M	P <sub>1</sub> M <sub>1</sub>	4.56	31.78	6.98	102.00	153.78	7.39	52.76	7.09	90.67	145.22
	P <sub>1</sub> M <sub>2</sub>	6.30	44.59	6.98	96.67	155.78	7.80	64.54	7.93	86.22	151.22
	P <sub>2</sub> M <sub>1</sub>	3.62	24.09	6.65	107.89	147.56	8.00	63.08	7.67	92.11	171.00
	P <sub>2</sub> M <sub>2</sub>	3.82	29.30	7.90	93.44	150.56	7.63	63.81	8.13	92.44	150.89
CD	NS	NS	NS	NS	NS	NS	NS	NS	NS	9.94	
S x P	S <sub>1</sub> P <sub>1</sub>	5.93	38.09	6.12	131.33	163.17	8.40	77.20	8.97	77.50	147.33
	S <sub>1</sub> P <sub>2</sub>	3.17	27.26	8.58	134.33	163.33	9.53	83.50	8.62	84.83	159.33
	S <sub>2</sub> P <sub>1</sub>	3.55	27.60	8.00	82.00	146.83	7.50	54.87	7.24	85.50	169.67
	S <sub>2</sub> P <sub>2</sub>	3.07	19.90	6.70	83.33	132.17	8.13	67.67	8.29	88.00	176.33
	S <sub>3</sub> P <sub>1</sub>	6.80	48.87	6.82	84.67	154.33	6.88	43.88	6.33	102.33	127.67
	S <sub>3</sub> P <sub>2</sub>	4.93	32.92	6.53	84.33	151.67	5.78	39.17	6.80	104.00	147.17
CD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
S x M	S <sub>1</sub> M <sub>1</sub>	3.53	23.27	6.58	151.33	166.50	7.40	58.53	7.84	80.17	147.67
	S <sub>1</sub> M <sub>2</sub>	5.57	42.08	8.12	114.33	160.00	10.53	102.17	9.75	82.17	159.00
	S <sub>2</sub> M <sub>1</sub>	2.73	19.05	7.32	81.83	132.50	9.03	71.87	7.80	89.67	175.17
	S <sub>2</sub> M <sub>2</sub>	3.88	28.45	7.38	83.50	146.50	6.60	50.67	7.73	83.83	170.83
	S <sub>3</sub> M <sub>1</sub>	6.00	41.48	6.54	81.67	153.00	6.65	43.36	6.51	104.33	151.50
	S <sub>3</sub> M <sub>2</sub>	5.73	40.31	6.81	87.33	153.00	6.02	39.69	6.62	102.00	123.33
CD		NS	NS	NS	13.35	10.41	2.66	24.62	NS	NS	12.17

**Table 3**  
Effect of growing systems, time of planting and mulch on quality attributes of strawberry cv. Winter Dawn at two locations

Treatments		Location I (Central midlands)					Location II (High ranges)				
		TSS (° Brix)	Acidity (per cent)	TSS/ acidity	Total sugars (per cent)	Shelf life (days)	TSS (° Brix)	Acidity (per cent)	TSS/ acidity	Total sugars (per cent)	Shelf life (days)
Growing systems (S)	S <sub>1</sub>	8.86	0.13	69.21	6.03	3	10.49	0.15	74.80	5.81	3
	S <sub>2</sub>	8.84	0.14	65.97	4.40	3	11.07	0.13	86.46	5.88	3
	S <sub>3</sub>	9.23	0.13	72.07	5.02	3	8.48	0.56	15.46	3	3
CD		NS	NS	NS	0.54	NS	0.58	0.04	8.83	0.11	NS
Time of planting (P)	P <sub>1</sub>	9.34	0.14	70.93	5.04	3	10.1	0.26	59.22	5.23	3
	P <sub>2</sub>	8.61	0.13	67.23	5.26	3	9.93	0.29	58.6	5.21	3
CD		0.54	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mulch (M)	M <sub>1</sub>	8.83	0.13	69.01	5.17	3	9.82	0.26	58.85	5.31	3
	M <sub>2</sub>	9.12	0.14	69.15	5.12	3	10.21	0.29	58.96	5.14	3
CD		NS	NS	NS	NS	NS	NS	NS	NS	0.09	NS

**Table 4**  
Effect of P x M, S x P and S x M interactions on quality attributes of strawberry cv. Winter Dawn at two locations

Treatments		Location I (Central midlands)					Location II (High ranges)				
		TSS (° Brix)	Acidity (per cent)	TSS/ acidity	Total sugars (per cent)	Shelf life (days)	TSS (° Brix)	Acidity (per cent)	TSS/ acidity	Total sugars (per cent)	Shelf life (days)
P x M	P <sub>1</sub> M <sub>1</sub>	9.49	0.13	74.13	4.80	3	9.84	0.24	61.13	5.36	3
	P <sub>1</sub> M <sub>2</sub>	9.20	0.14	67.73	5.27	3	10.36	0.30	57.31	5.11	3
	P <sub>2</sub> M <sub>1</sub>	8.18	0.13	63.89	5.54	3	9.80	0.28	56.58	5.26	3
	P <sub>2</sub> M <sub>2</sub>	9.03	0.13	70.57	4.98	3	10.06	0.28	60.61	5.17	3
CD		0.76	NS	6.20	0.63	NS	NS	NS	NS	NS	NS
S x P	S <sub>1</sub> P <sub>1</sub>	9.43	0.13	73.70	5.73	3	10.02	0.15	71.42	5.70	3
	S <sub>1</sub> P <sub>2</sub>	8.28	0.13	64.71	6.33	3	10.97	0.15	78.19	5.92	3
	S <sub>2</sub> P <sub>1</sub>	9.33	0.15	66.70	4.33	3	11.47	0.13	89.58	6.00	3
	S <sub>2</sub> P <sub>2</sub>	8.35	0.13	65.23	4.47	3	10.67	0.13	83.34	5.75	3
	S <sub>3</sub> P <sub>1</sub>	9.27	0.13	72.40	5.05	3	8.82	0.54	16.66	4.00	3
	S <sub>3</sub> P <sub>2</sub>	9.18	0.13	71.75	4.98	3	8.15	0.58	14.26	3.98	3
	CD		NS	NS	NS	NS	NS	NS	NS	0.15	NS
SxM	S <sub>1</sub> M <sub>1</sub>	8.63	0.13	67.45	6.15	3	10.25	0.15	72.59	5.98	3
	S <sub>1</sub> M <sub>2</sub>	9.08	0.13	70.96	5.91	3	10.73	0.15	77.02	5.63	3
	S <sub>2</sub> M <sub>1</sub>	8.60	0.13	67.19	4.35	3	11.32	0.13	88.41	5.95	3
	S <sub>2</sub> M <sub>2</sub>	9.08	0.15	64.74	4.46	3	10.82	0.13	84.51	5.80	3
	S <sub>3</sub> M <sub>1</sub>	9.27	0.13	72.40	5.03	3	7.90	0.52	15.56	3.99	3
	S <sub>3</sub> M <sub>2</sub>	9.18	0.13	71.75	5.01	3	9.07	0.60	15.37	3.99	3
CD		NS	NS	NS	NS	NS	NS	NS	0.15	NS	

**Table 5**  
Sensory evaluation of strawberry fruits from Location I (Central mid-lands)

Treatments	Appearance (10)	Colour (10)	Flavour (10)	Texture (10)	Odour (10)	Taste (10)	After taste (10)	Total score (70)	Acceptability (10)
T <sub>1</sub>	7.27	<b>7.53</b>	6.91	7.21	7.06	<b>7.30</b>	<b>6.33</b>	<b>49.61</b>	<b>6.91</b>
T <sub>2</sub>	7.33	7.40	6.55	6.70	7.12	6.88	6.21	48.19	6.88
T <sub>3</sub>	7.00	6.93	6.39	7.15	<b>7.27</b>	7.00	6.27	48.01	6.79
T <sub>4</sub>	6.73	7.10	6.91	7.09	7.09	7.27	6.18	48.37	6.64
T <sub>5</sub>	6.97	7.40	6.67	6.64	<b>7.27</b>	6.97	6.18	48.1	6.45
T <sub>6</sub>	7.03	7.10	6.88	7.06	7.03	6.88	6.24	48.22	6.33
T <sub>7</sub>	6.93	6.80	6.73	7.18	7.09	6.85	6.24	47.82	6.21
T <sub>8</sub>	6.77	7.20	<b>7.18</b>	<b>7.36</b>	6.91	6.91	6.12	48.45	6.82
T <sub>9</sub>	7.28	7.40	6.91	7.06	6.85	7.06	6.15	48.71	6.36
T <sub>10</sub>	7.20	7.50	7.12	7.15	6.94	7.21	6.24	49.36	6.70
T <sub>11</sub>	7.00	6.87	6.79	7.00	6.64	6.94	6.09	47.33	6.55
T <sub>12</sub>	<b>7.37</b>	7.43	6.88	7.03	6.82	7.06	6.18	48.77	6.76

**Table 6**  
Sensory evaluation of strawberry fruits from Location II (High ranges)

Treatments	Appearance (10)	Colour (10)	Flavour (10)	Texture (10)	Odour (10)	Taste (10)	After taste (10)	Total score (70)	Acceptability (10)
T <sub>1</sub>	8.63	8.13	8.30	8.13	8.20	8.20	8.20	57.79	8.30
T <sub>2</sub>	<b>8.73</b>	8.30	<b>8.43</b>	8.33	<b>8.37</b>	<b>8.37</b>	<b>8.37</b>	<b>58.9</b>	<b>8.43</b>
T <sub>3</sub>	8.70	8.17	8.20	8.27	8.30	8.00	8.00	57.64	8.23
T <sub>4</sub>	8.57	<b>8.37</b>	8.20	<b>8.37</b>	8.40	8.10	8.10	58.11	8.23
T <sub>5</sub>	8.31	8.14	8.17	8.17	8.10	8.17	8.23	57.29	8.23
T <sub>6</sub>	7.34	8.11	8.13	8.13	8.13	8.17	8.20	56.21	8.13
T <sub>7</sub>	8.10	8.10	8.23	8.17	8.07	8.10	8.13	56.9	8.17
T <sub>8</sub>	8.47	8.07	8.13	8.17	8.17	8.07	8.07	57.15	8.03
T <sub>9</sub>	7.07	6.57	4.77	4.57	4.57	4.67	5.00	37.22	4.77
T <sub>10</sub>	7.00	6.90	4.70	4.53	4.57	4.60	4.63	36.93	4.63
T <sub>11</sub>	7.00	7.00	4.40	4.53	4.57	4.47	4.57	36.54	4.40
T <sub>12</sub>	7.20	6.90	4.93	4.63	4.57	4.63	4.77	37.3	4.93

**Table 7**  
**Mann-Whitney Test for sensory evaluation**

	<i>Appearance</i>	<i>Colour</i>	<i>Flavour</i>	<i>Texture</i>	<i>Odour</i>	<i>Taste</i>	<i>After taste</i>	<i>Acceptability</i>
Location I	8.54	9.92	10.50	10.50	10.50	10.50	10.50	10.50
Location II	16.46	15.08	14.50	14.50	14.50	14.50	14.50	14.50
C.D	0.005**	0.078**	NS	NS	NS	NS	NS	NS

**Table 8**  
**Weather parameters**

**Monthly mean temperatures (°C) during the period from September 2013 to March 2014 in different growing systems**

<i>Month</i>	<i>Open (S<sub>1</sub>)</i>				<i>Green house (S<sub>2</sub>)</i>				<i>Fan and pad (S<sub>3</sub>)</i>			
	<i>Central midlands</i>		<i>High ranges</i>		<i>Central midlands</i>		<i>High ranges</i>		<i>Central midlands</i>		<i>High ranges</i>	
	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>
September 2013	23.84	28.88	19.58	25.09	24.59	31.98	19.38	26.19	22.89	26.90	18.93	24.28
October 2013	24.25	29.98	19.90	25.18	25.07	32.10	19.81	26.43	23.73	27.58	19.02	24.41
November 2013	25.15	31.62	19.60	25.95	26.23	33.84	19.64	27.72	24.78	29.18	18.49	25.01
December 2013	23.60	31.83	18.01	26.35	25.90	33.38	18.12	28.06	21.39	30.45	20.10	24.17
January 2014	24.24	32.16	17.51	27.63	26.62	33.41	17.57	29.95	21.74	30.01	19.69	28.18
February 2014	24.10	33.61	18.21	28.45	26.11	34.98	18.40	30.61	21.84	31.85	20.03	28.69
March 2014	25.75	34.47	20.28	30.66	28.30	37.13	20.38	31.46	23.59	31.66	21.85	28.86
Mean	24.42	31.79	19.01	27.04	26.12	33.83	19.04	28.63	22.85	29.66	19.73	26.23

**Monthly mean relative humidity (per cent) during the period from September 2013 to March 2014 in different growing systems**

<i>Month</i>	<i>Open (S<sub>1</sub>)</i>				<i>Green house (S<sub>2</sub>)</i>				<i>Fan and pad (S<sub>3</sub>)</i>			
	<i>Central midlands</i>		<i>High ranges</i>		<i>Central midlands</i>		<i>High ranges</i>		<i>Central midlands</i>		<i>High ranges</i>	
	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>
September 2013	94.73	68.39	94.80	73.24	92.21	72.47	97.82	73.15	92.32	79.83	92.78	80.33
October 2013	95.87	69.68	95.32	78.16	92.94	71.68	98.32	79.16	92.55	80.19	93.32	84.16
November 2013	86.63	59.73	94.50	72.26	80.63	62.13	97.50	73.26	84.77	73.77	92.50	79.23
December 2013	75.97	49.90	90.71	61.39	74.00	51.94	93.71	63.61	77.68	65.16	88.71	68.71
January 2014	64.71	39.13	94.77	58.19	62.48	45.29	97.77	61.19	66.06	58.68	92.77	66.19
February 2014	72.36	42.75	96.23	59.19	71.46	45.32	98.87	62.19	74.29	54.50	93.87	67.19
March 2014	76.35	38.74	89.68	52.23	76.29	43.87	93.16	58.90	77.84	54.06	88.16	63.90
Mean	80.95	52.62	93.72	64.95	78.57	56.10	96.74	67.35	80.79	66.60	91.73	72.82

**Monthly mean light intensity (lux) during the period from September 2013 to March 2014 in different growing systems**

<i>Month</i>	<i>Open (S<sub>1</sub>)</i>		<i>Green house (S<sub>2</sub>)</i>		<i>Fan and pad (S<sub>3</sub>)</i>		<i>Central midlands</i>	<i>High ranges</i>
	<i>Central midlands</i>	<i>High ranges</i>	<i>Central midlands</i>	<i>High ranges</i>	<i>Central midlands</i>	<i>High ranges</i>		
	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>	<i>8.00 am</i>	<i>2.30 pm</i>		
September 2013	79878.50	93500.30	7384.82	9056.00	14053.37	18380.00	344.1	193.4
October 2013	80512.9	94158.06	7474.84	9375.00	14300.00	18487.10	369.8	15.6
November 2013	88926.67	93603.23	8481.67	9076.13	16696.67	18435.16	82.0	42.2
December 2013	93864.52	107597.42	8708.07	10153.55	17493.55	20855.16	0.5	2.4
January 2014	88803.23	103014.19	8006.45	9452.55	16574.19	20179.03	0.0	0
February 2014	74882.14	88817.42	6753.57	8900.97	14232.14	17942.58	0.0	5.2
March 2014	79083.87	86400.32	7270.97	8590.97	15277.42	18141.29	0.0	7.2

**CONCLUSION**

Results indicated that favorable conditions are prevailing for fruit setting of strawberry in central midlands and high ranges of Kerala. In high ranges, strawberry could be planted in last week of September with black polyethylene mulch in open field for higher

yield of better quality fruits. In central midlands, strawberry could be planted in last week of September with black or white polyethylene mulch in open field for maximum number of fruits of better quality. Comparing the two locations, fruits from high ranges were found to be superior in colour and appearance than fruits from central midlands.

## ACKNOWLEDGEMENT

Authors are thankful to the College of Horticulture, Vellanikkara and KrishiVigyan Kendra, Ambalavayal, Kerala Agricultural University, Thrissur, Keral, India for providing facilities for research.

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