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Effect of different types of mulches on vegetative growth characters in Strawberry (*Fragaria x ananassa Duch.*) cv. Chandler

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Abstract

A field experiment was conducted to evaluate the efficacy of mulching on the performances of Strawberry (*Fragaria x ananassa*) with respect to the vegetative growth parameters during 2019-20 at Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University situated at Vidya- Vihar, Rae Bareilly Road, Lucknow is geographically situated in the subtropical tract of Central Uttar Pradesh. The experiment was laid out in RBD having three replications with following treatments: T₁ (Control), T₂ (Yellow polythene mulch), T₃ (White polythene mulch), T₄ (Black polythene mulch), T₅ (Green polythene mulch), T₆ (News-paper mulch), T₇ (Wood husk mulch), T₈ (Serpat grass mulch), T₉ (Jute bag mulch), T₁₀ (Red polythene mulch). The result revealed significantly highest plant height (15.81 cm), number of leaves (17.52), length of leaf with petiole (25.35 cm), length of leaf (15.70 cm), length of petiole (23.65 cm) and width of leaf (13.90 cm) in treatment T₄ (Black polythene mulch) followed by the treatment T₂ (Yellow polythene mulch) at 90 Days after planting. However, treatment T₁ (control) witnessed poor performance with respect to all vegetative growth parameters. Hence, the result led to the conclusion that adoption of Black polythene mulch in Strawberry enhances all growth attributing parameters and Yellow polythene mulch is the second-best mulching material.

Keywords: Strawberry, black polythene mulch, vegetative growth, mulching, RBD

Introduction

Strawberry (*Fragaria × ananassa* Duch.) is an herbaceous perennial plant with a compressed stem called crown. The leaves, flowers and stolons originates from the crown (Mouhu *et al.*, 2013) [1]. The fruit belongs to the family of Rosaceae. Strawberry originated from the hybridization between two American species (*Fragaria chilionensis* Duch. x *Fragaria virginiana* Duch.) in 17th century at France. It is very much liked for its attractive shape, distinct pleasant aroma and refreshing nature (Ali and Gaur 2007) [2]. It is a short-day plant grown predominantly in the temperate climate but it can also be grown in the tropical and subtropical climatic conditions (Bakshi *et al.* 2014) [4]. Strawberry bears flower mainly in clusters. In cultivated strawberry two types of flower occurs *viz.* hermaphrodite and pistillate (Chattopadhyay 2013) [5].

The fruits of strawberry are attractive with distinct aroma and pleasant flavor, rich source of vitamin C, Vitamin B, Proteins and minerals like P, K, Ca and Fe (Joolka and Badiyala, 1983) [7]. According to Aykroyd *et al.* (1996) fruits possess 96% edible portion having 87.8% moisture, 0.7% protein, 0.2% fat, 1.1% fiber, 9.8% other carbohydrates, 0.4% minerals and give 44 calories from 100g of edible portion. They also reported that fruits are rich source of vitamins as its 100g edible portion gives 30 IU Vitamin A, 0.03 mg Thiamine, 0.01 mg Riboflavin, 0.2 mg Nicotinic acid and 52 mg Ascorbic acid. The most important aroma compounds are ethyl hexanoate, methyl hexanoate, ethyl heptanoate, ethyl propionate, ethyl butanoate, methyl butanoate and linalool. The red colour of the fruit is mainly due to the presence of an anthocyanin, pelargonidin 3-monoglucoside and traces of cyanidin. Essential oil can also be extracted from strawberry leaves.

The plant thrives on loam, well-drained soils with a pH of 5.5–6.5. Temperature requirements are in the range of 10 to 30 °C and average rainfall of 900 to 1200 mm (Kasperbauer, 2000) [9]. The crop is ready for harvesting within six months of planting and gives quick and very high returns per unit area on the capital investment among the fruit crops.

The versatility of strawberries in fresh and processed forms has played an important role in their adoption in diets with a special demand for preparation of jam, ice-cream, syrups and canning by the fruit processing units.

The mulching is a practice, which helps in proper growth and development of the plants by modifying soil temperature, by providing better nutrient availability and by better moisture conservation (Kher *et al.*, 2010) [10]. The mulching has strong influence on yield, quality and duration of harvesting, which is primarily due to better soil and moisture conservation, changes in soil temperature, improved nutrient availability, and suppression in number and growth of weeds, protection from frost injury and reduction in number of dirty and diseased berries (Sharma, 2002) [12]. Plastic mulches (polyfilms) are often used in the raised-bed culture of strawberries to warm the soil, conserve moisture, control weeds, and keep fruits clean (Kasperbauer, 2000) [9]. The most commonly used polyfilm is black, which promotes the best root growth, water use efficiency, and nutrient uptake, compared to clear (transparent) and organic mulches. Karsten, (2015) [8] observed that transparent polyfilm raises soil temperature significantly, whereas organic mulch reduces it. Mulches reduce soil evaporation and increase yield through increasing water use efficiency (Adekalu *et al.*, 2006) [1]. Mulches cover the soil surface, providing a microclimate favorable for plants. They also influence plant growth when added to the soil surface by reducing evaporation, increasing water infiltration, controlling soil erosion, and improving soil structure (Arun, 2016). The method of increasing water use efficiency by synthetic mulch and organic mulch is different.

Materials and Methods

The present experiment entitled “Effect of different type mulches on vegetative growth of strawberry (*Fragaria ananassa* Duch.) cv. Chandler” was carried out at the Horticulture Research Farm of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareilly Road, Lucknow, Uttar Pradesh, India during the year 2019-20. The geographically situated in the subtropical tract of Central Uttar Pradesh at 80°55' East longitude and 26°56' north latitude. The average annual rainfall of 650 -750 mm which is distributed over a period of more than 100 days with peak period during July to August. It is also received scattered show during winter months. The temperature ranges from 3.5 °C to 45 °C. The coldest month is January while, the maximum temperature is observed during May and June. The relative humidity (RH) is 50-77% in different season of the year. Lucknow is characterized by sub-tropical climate with hot, dry summer and cold winter. The soil of experimental farm was saline with soil pH less than 8.2, Electrical conductivity more than 4.0 and sodium exchangeable percentage less than 15.0.

B.1. Experimental Material

The runners of Chandler variety of strawberry were brought from the Dr Y. S. Parmar University of Horticulture & Forestry, Nauni, Solan (H. P.) in the month of November, 2019. The runners were kept for two days in shade for hardening before transplanting in well- prepared beds under open field condition plots which were distributed randomly in three replications. Standard cultural practices were followed during the period of the experiment for maintaining the runners.

B.2. Experimental Design

Experiment was laid out in a Randomized Block Design with Ten treatments *viz.*: T₁ (Control), T₂ (Yellow polythene mulch), T₃(White polythene mulch), T₄ (Black polythene mulch), T₅ (Green polythene mulch), T₆ (News-paper mulch), T₇ (Wood husk mulch) T₈ (Serpat grass mulch) T₉ (Jute bag mulch) T₁₀ (Red polythene mulch) as presented in table 2. All the treatments were replicated thrice. The watering was done for seven continuous days with watering cane and gap filling was done up to one week. The different mulching materials were applied after two weeks of transplanting. Thirty plots each measuring 1.2 m X 2.25 m under each treatment were considered as single replication. Sixteen plants were planted in each plot and four plants were selected randomly for collecting data. The strawberry plants taken from runners were planted during 2nd week of November in the raised beds with a distance of 30cm X 45cm (presented in table 1).

Table 1: Description of field experiment

Experimental Design	RBD
Number of Replications	3
Number of treatments	10
Plot Size	1.2m x2.25m
Total number of plots	30 plots
Spacing	1. Row X Row=30cm 2. Plant X Plant=45cm
Number of plants per plot	16
Number of treatments	10
Number of replications	3
Number of plants/ replications	16

Table 2: Details of treatments and mulching materials

No. of treatments	Type of mulches
T ₁	Control
T ₂	Yellow polythene mulch
T ₃	White polythene mulch
T ₄	Black polythene mulch
T ₅	Green polythene mulch
T ₆	News-paper mulch
T ₇	Wood husk mulch
T ₈	Serpat grass mulch
T ₉	Jute bag mulch
T ₁₀	Red polythene mulch

Results and Discussion

Effect of different type mulches on vegetative growth of strawberry (*Fragaria ananassa* Duch.) cv. Chandler

C.1. Plant height (cm)

The plant height of various treatment combination has been presented in table 3, which was varied from (13.65) cm to (15.81) cm. In which, the maximum plant height was observed in treatment T₄ (Black polythene mulch) 15.81 cm followed by the treatment T₂ (Yellow polythene mulch) 15.63 cm. However, the minimum plant height was recorded in treatment T₁ (control) 13.65 cm. Younis *et al.* (2012) investigate the effect of different mulching materials such as transparent plastic sheet, rice straw and black plastic sheet on growth and flowering of Freesia cv. Aurora. The straw mulch produced maximum plant height. Deb *et al.* (2014) [6] the experimental findings revealed that the highest plant height (27.54cm) was observed under transparent polythene mulch and lowest results were observed in no mulch condition, based on evidence of the experimental findings transparent

polythene mulch can be advocated as a best mulch material and black polythene mulch is a better option for farmers to increase vegetative growth of Strawberry. Kumar *et al.* (2017)^[13] conducted the experiment on Influence of mulching materials on strawberry grown under protected condition and found the plant height 16.24, 17.75 and 20.18 cm, was

maximum at 30, 60 and 90 days after planting respectively in black polythene mulched plants. Kaur and Kaur (2017) observed that under black polythene mulch, silver polythene mulch, sugarcane trace, paddy straw, grass saw dust and control and found the maximum plant height 21.43 cm in black polythene mulch.

Table 3: Effect of different types of mulches on vegetative growth parameters

Growth Parameters DAP Treatments	Plant height (cm)			Number of leaves			Length of leaf with petiole (cm)			Length of leaf (cm)			Length of petiole (cm)		
	30	60	90	30	60	90	30	60	90	30	60	90	30	60	90
T ₁	3.52	8.32	13.65	2.31	10.3	14.66	8.15	12.85	21.05	3.25	5.28	11.25	6.70	12.9	18.41
T ₂	5.13	9	15.63	4.1	11.9	16.8	10.10	15.90	24.90	5.20	8.95	14.90	8.90	15.1	22.95
T ₃	4.72	9.25	15.2	3.55	11.3	15.61	9.92	15.08	24.61	4.73	7.57	14.65	8.35	14.1	22.60
T ₄	5.4	9.45	15.81	4.6	12.67	17.52	10.2	16.2	25.35	5.70	9.05	15.70	9.20	15.8	23.65
T ₅	3.82	8.56	14.84	3.31	10.6	15.32	9.05	14.01	22.25	4.40	6.01	13.30	7.49	13.35	21.31
T ₆	4.19	8.9	15.23	3.36	11.31	15.31	9.02	15.12	23.9	4.72	7.25	14.35	7.70	13.9	22.5
T ₇	4.78	9.32	15.52	3.93	11.3	15.65	9.97	15.35	24.85	4.85	8.30	15.10	8.35	14.45	22.84
T ₈	3.83	8.54	15.42	2.64	10.31	15.32	8.85	13.70	22.2	4.61	5.87	12.30	7.01	13.05	20.65
T ₉	4.0	8.89	15.19	3.31	10.65	15.31	9.05	14.65	23.51	4.62	5.85	13.37	7.60	13.72	21.45
T ₁₀	3.6	8.3	15.2	2.32	10.31	14.6	8.65	13.51	21.93	3.55	5.45	11.96	6.95	12.41	18.66
S.Em(±)	0.11	0.23	0.09	0.093	0.296	0.418	0.24	0.39	0.62	0.12	0.19	0.211	0.21	0.37	0.57
C.D. (P=0.05)	0.35	0.70	N/A	0.280	0.886	1.251	0.74	1.16	1.86	0.37	0.57	0.632	0.632	1.11	1.71

C.2. Number of leaves

Findings of number of leaves per plant as influenced by different treatment combinations and the relevant data are presented in table-2, application of different type mulch. Which recorded from 14.66 to 17.52 at the 90 days after planting. Minimum number of leaves was found in treatment T₁ control (14.66). The maximum number of leaves was recorded in treatment T₄ 17.52 (Black polythene mulch) followed by treatment T₂ Yellow Polythene mulch (16.8). Bakshi *et al.* (2014)^[4] evaluate the effect of different mulching materials on growth, yield and quality of strawberry cv. Chandler. All the treatments improved the vegetative growth, yield and quality of strawberry, but black polythene mulch gave the best results in term of number of leaves per plant (18.33). Singh *et al.* (2018)^[13] studied the impact of different mulching and planting density practices on the performance of strawberry. The highest number of leaves per plant obtained in Green mulch.

C.3. Length of leaf with petiole (cm)

The length of leaf with petiole show in the table number -3 influenced by application of Different type of mulch. The maximum length of leaf with petiole was found in the treatment T₄ (Black polythene mulch) 25.35 cm followed by length of leaf with petiole treatment T₂ Yellow polythene mulch (24.90) cm. The minimum length of leaf with petiole find out in the treatment T₁ Control (21.05).

C.4. Length of leaf of strawberry (cm)

The data regarding length of leaf under different treatment presented in table number-4, the maximum length of leaf was assessed in the treatment T₄ (Black polythene mulch) 15.70 cm followed by the length of leaf occurs in treatment T₂ Yellow polythene mulch (14.90) cm. The minimum length of leaf found in the treatment T₁ Control (11.25) cm.

C.5. Length of petiole (cm)

It is clear data presented in the table number-5 length of petiole varies from 18.41 cm to 23.65 cm. Maximum length of petiole observed in the treatment T₄ (Black polythene mulch) 23.65 cm followed by length of petiole treatment T₂

Yellow polythene mulch (22.95) cm. Lowest length of petiole regarded in treatment T₁ Control (18.41) cm. Deb *et al.* (2014) to study the effect of different mulches on Vegetative growth of strawberry. Highest petiole length(13.99cm) at 50 Days after planting was observed in black polythene mulch(T3).

C.6. Width of leaf (cm)

It is obvious from table number-6 that the width of leaf regarded from 8.73 to 14.03 cm. The highest width of leaf found in the treatment T₄ (Black polythene mulch) 13.90 cm after that width of leaf treatment T₂ Yellow polythene mulch (13.85). Lowest width of leaf found in treatment T₁ (8.70) cm.

Conclusion

From the investigation with different types of mulches *viz.*, Yellow polythene mulch, White polythene mulch, Black polythene mulch, Green polythene mulch, News-paper mulch, Wood husk mulch, Munja grass mulch, Jute bag mulch, Red polythene mulch on strawberry cv. Chandler it is witnessed that T₄ (Black mulch) significantly enhances all growth attributing parameters *viz.*, the Plant height, number of leaves per plant, Length of leaf with petiole, Length of petiole, Length of leaf of strawberry, Width of leaf whereas, Yellow polythene mulch is the second-best mulching material.

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