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Influence of mulches on yield and quality of Strawberry (*Fragaria* x *ananassa Duch.*) cv. Chandler

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ABSTRACT

The quality of strawberry is highly hampered by improper crop management, which can only be solved by using different types of mulches. It is very rare in literature, where the different types of mulches are used for the quality assessment. To carry out this new strategy to sustain the quality of strawberry the present study was carried out using various kind of mulches *viz.,* white polythene mulch, yellow polythene mulch, black polythene much, green polythene mulch, news-paper mulch, wood husk mulch, serpat grass mulch, red polythene mulch, jute bag mulch comprised of 10 treatments and 3 replications under the randomized block design. The findings revealed that the application of black plastic mulch significantly increased the total number of fruit (12.67), length of fruit (6.21 cm), width of fruit (4.20 cm), weight of fruit (16.30 g), yield plant^{-1} (200.10g), yield plot^{-1} (3.20kg), total soluble solids (11.85%), total sugar (8.58%), reducing sugar (7.90%), non-reducing sugar (1.75%) and vitamin C (45.91 mg 100g^{-1}). It is pertinent to infer that the application of the mulches (either black or yellow) performed and better over control.

Key words: *Chandler, Mulches, Quality, Strawberry, Yield*

Introduction

Strawberry *(Fragaria x ananassa* Duch) is one of the most delicious and high economic value fruits in the world (Sharma and Sharma, 2004). However, during last decade, it has become favourite fruit among growers because of its remunerative prices and higher profitability. It's an attractive fruit due to distinct aroma and pleasant flavor, while also being high in vitamin C, Vitamin B, Proteins and minerals like P, K, Ca and Fe (Joolka, 1983). The physio-chemical changes which are mainly associated with fruit ripening, take place when fruit is still attached to the plant being non-climacteric in nature. Strawberry is grown on an area of 3 million hectares in India, with an annual yield of 13.52 million metric tonnes per hectare and productivity of 4.50 million tonnes per hectare. (Anonymous, 2020). Production of strawberry with mulching is considered as the most important cultural practice as it plays essential role in soil moisture conservation, weed control, regulation of soil-hydrothermal regime, besides

keeping the delicate fruit neat and clean (Hancock *et al.*, 1999). 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 (Shukla *et al.*, 2021). The mulching has a significant impact on yield, quality and duration of harvesting, owing to improve soil moisture conservation and modification in soil temperature, enhance nutritional value, control weeds, protection from frost injury and keep fruit clean (Sharma, 2002).

In raised-bed strawberry cultivation, plastic mulches (poly films) are frequently used to warm the soil, retain moisture, prevent weeds, and maintain the cleanliness of the fruit (Kasperbauer, 2000). In comparison to clear (transparent) and organic mulches, black polyfilm—which is the most frequently used—promotes the best root growth, water use efficiency, and nutrient uptake. By lowering evaporation, it reduces the amount of water needed, and as it decomposes, grass mulch enhances the soil's quality and nutrient content. Mulches cover the soil surface, creating a favourable microclimate for plants, and when added to the soil surface, they influence plant growth and yield by reducing evaporation, increasing water infiltration, controlling soil erosion, and improving soil structure (Arun, 2016).

Despite all these benefits of different types of mulches on yield attributing characters of strawberry (*Fragaria x ananassa*) farmers from Uttar Pradesh, India are still unaware to use it in strawberry to fetch a maximum return. Based on the context an experiment was executed to assess Influence of mulches on yield and quality of Strawberry (*Fragaria* x *ananassa Duch.*) in Uttar Pradesh, India.

Materials and Methods

Experimental location: During the academic year 2019–20, the experiment was carried out at the Horticulture Research Farm of the Babasaheb Bhimrao Ambedkar University in Lucknow. The climate is subtropical, with hot, dry summers and chilly winters, and temperatures ranging from 3.5 ºC to 45 ºC with 50-77% (RH), and an average annual rainfall of 650-750 mm. The soil of experimental farm was saline with soil pH less than 7.9, Electrical conductivity more than 4.0, sodium exchangeable percentage less than 15.0, obtainable nitrogen (115.50 kg ha^{-1}), available P_2O_5 (42.50 kg ha^{-1}), available K_2O (180.40 kg ha^{-1}).

Experimental details

The runners of Chandler variety of strawberry were brought from the Dr Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (H. P.) were hardened for two days in the shade and planted in four rows with spacing of 45cm X 30cm. The experiments were laid out in randomized block design having ten treatments *viz*: Control (T_1), yellow polythene mulch (T_2), white polythene mulch(T_3), black polythene mulch (T_4), green polythene mulch (T_5), newspaper mulch (T_6) wood husk mulch (T_7), serpat grass mulch (T_8), jute bag (T_9) and red polythene mulch (T_{10}) with three replications.

Observation recorded

The total number of fruits was recorded at 15days' interval by counting total fruit set and harvested fruit from same plant.

Total number of fruits = fruit set + fruit harvest

% fruit set = No. of fruits /No. of flower X 100

Fruit length and breadth were measured with the help of a digital Vernier Calliper and expressed in a centimetre (cm). The weight of the above-sampled fruits was taken on physical balance and the average was expressed as gram per fruit. The fruit yield per plant was recorded from each bed at the time of harvesting and average weight of fruit per plant was calculated and expressed in gram, while the berry weight, the above selected ten berries were weighted and the average weight of berry was calculated and expressed in grams (g). Total soluble solids were estimated at ambient temperature by digital hand refract meter (ATAGO Pocket 3810, PAL-1). The estimation of titratable acidity, ascorbic acid, total sugar, reducing sugar and non-reducing sugars was estimated by the method designated by (Ranganna, 2010). The statistical studies accomplished by the analysis of variance (ANOVA) for randomized block design (RBD) based on the guidelines given by Gomez and Gomez (1984). Fisher and Yates' table was used to compare "F" values and calculate the crucial difference (CD) at the 5% level of significance.

Results and Discussion

Fruit yield parameters

The effect different mulches on number of fruits

plant are given below in Fig 1. It is clearly observed that mulches significantly affect number of fruits plants. The maximum number of fruits per plant (12.67) witnessed underblack polythene mulch (T_4) which at par with yellow polythene mulch (T_2), whereas the minimum number of fruits (7.65) was found in control. The results corroborated with finding of Rehman *et al*. (2015). The minimum length of fruit (3.31 cm) recorded in control (Fig. 2). The similarly result also found in findings of Bakshi *et al.* (2014), Singh and Ahmed (2013) and Kher *et al.* (2010) under black polythene mulch. Width of fruit varies from 2.25 to 4.6 cm with highest fruit width (4.60 cm) was recorded in T_4 followed by T_7 (4.25 cm). The minimum fruit width (2.25 cm) found in control (Fig. 3). Similar observations on fruit width and fruit length under black polythene have also been reported by Bakshi *et al.* (2014), Mathad and Jholgiker (2003) and Kumar *et al.* (2012). Perusal of Table 2 revealed the fruit yieldvaries from 1.28 to 3.20 kg with maximum fruit yield (3.20 kg) found under black polythene mulch followed by yellow polythene mulch (3.13 kg) and minimum fruit yield in control (1.30 kg). The results in accordance with findings by Rannu *et al* (2018), Singh and Ahmed

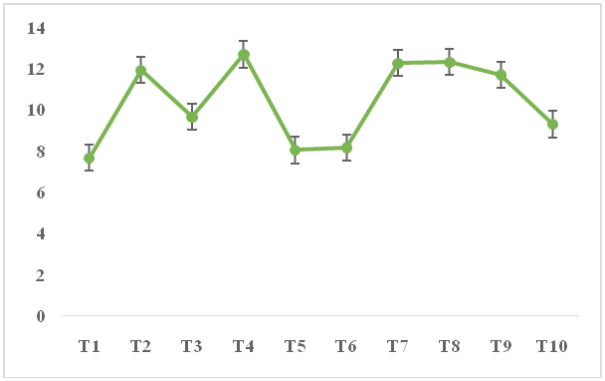

Fig. 1. Effect of different mulches on total number of fruits per plants of strawberry *cv.* 'Chandler'

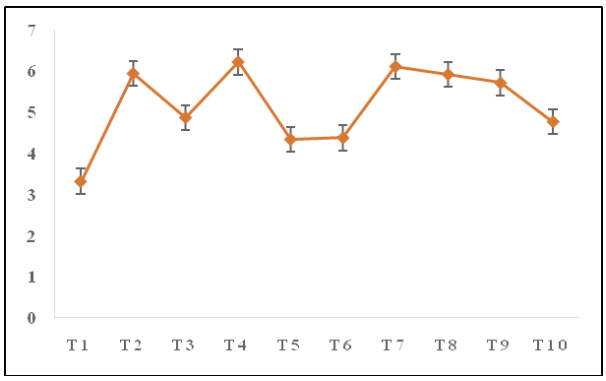

Fig. 2. Effect of different mulches on fruit length of strawberry *cv.* 'Chandler'

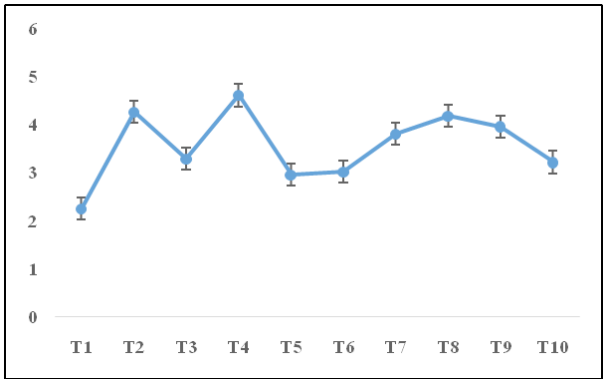

Fig. 3. Effect of different mulches on fruit width of strawberry *cv.* 'Chandler'

Table 1. Effect of different type of mulch on physical and chemical attributes of strawberry *cv.*'Chandler

Treatments	Fruit weight (g)	Yield/ plant (g)	Yield/ plot (kg)	T.S.S. (°Brix)	Total Sugar	Reducing Sugar %	Non-Reducing sugar (%)	Vitamin C (mg/100g)	Acidity %
T_1	10.31	81.80	1.30	8.51	5.85	3.56	1.41	27.11	0.34
T_2	15.65	196.50	3.13	11.51	8.25	7.01	1.72	45.57	0.35
T_3	14.87	160.65	2.57	11.35	7.43	5.52	1.71	40.23	0.55
T_4	16.30	200.10	3.20	11.85	8.58	7.90	1.75	45.91	0.65
T_5	14.12	130.46	2.08	9.38	6.63	5.13	1.61	31.31	0.53
T_6	14.55	150.01	2.40	10.80	7.35	5.31	1.61	38.45	0.4
T_7	15.25	182.41	2.92	11.40	7.50	6.21	1.71	41.94	0.38
T^8	14.04	116.20	1.84	8.86	6.45	4.95	1.51	29.62	0.52
T_9	14.36	132.16	2.11	9.93	7.60	5.31	1.61	35.91	0.54
T_{10}	13.36	109.10	1.74	8.66	6.43	4.64	1.44	28.83	0.54
SEm (±)	0.38	4.08	0.064	0.27	0.19	0.15	0.043	1	0.01
C.D. (P=0.05)	1.14	12.22	0.19	0.82	0.58	0.46	0.12	3	0.04

(2008), Castaned *et al.* (2008), Kher *et al*. (2010) and Berglund *et al*. (2006).

Quality parameters

Perusal of Table 1 revealed thatmaximum soluble solids content (11.85°Brix) was recorded under black mulch which at par withyellow mulching, whereas the mean minimum soluble solids content (8.51°Brix) was recorded under the control.Higher soluble solids content in strawberry with black polythene mulch might be due to favourable climatic conditions and creation of weed free environment. The maximum amount of acidity (0.65%) was estimated under black mulchand closely followed by white polythene mulch, whereas theminimum amount of acidity (0.34%) was recorded in control. Similar findings were also observed by Pandey *et al.* 2016 and Das *et al*. 2007.

The maximum reducing, non-reducingand total sugars (7.90,1.75 and 8.58 %, respectively) were noted under black mulch which was closely followed by yellow mulching. However, the control treatments showed minimum reducing, non-reducing and total sugars 3.56, 1.41 and 5.85%, respectively) over the period of investigations. Similar observations have been reported on reducing sugar (Das *et al.*, 2007), non-reducing sugar and total sugars.

The results revealed that different type mulches substantially influencethe ascorbic acid content of fruit. The mean maximum ascorbic acid (45.91 mg $100g^{-1}$) was exhibited in the under black mulch which is at par with yellow mulch, while minimum ascorbic acid content (27.11 mg $100g^{-1}$) was displayed in control. The increased ascorbic acid in strawberry with black polythene mulch was also reported by Mishra and Tripathi (2011) and Tripathi *et al.* (2015).

Conclusion

It is concluded from the studies that mulches help conserve water, keep fruit clean and eliminate weeds, consequentially enhancing quality and yield. Black and yellow mulches significantly increased the yield of strawberry plants as compared to control. Black and yellow plastic mulches increased fruit yields, fruit size, weight and improved fruit chemical composition (total soluble solids, total sugars, reducing sugars, ascorbic acid).

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