

EFFECT OF SPACING AND MULCHING ON QUALITY OF STRAWBERRY UNDER JORHAT CONDITION

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ABSTRACT

An experiment entitled “Effect of spacing and mulch material on quality of Strawberry” was carried out at Dhankhuloi village of Jorhat district, Assam, India during the year 2019-20 and 2020-21 with twenty treatments of five spacings viz., 20 cm x 30 cm, 30 cm x 30 cm, 30 cm x 40 cm, 40 cm x 40 cm, 40 cm x 60 cm, and four mulch materials i.e. paddy straw, red mulch, silver black mulch and no mulch in randomized block design. The results revealed that the wider spacing of 40 cm x 40 cm and silver black mulch recorded significantly maximum TSS, total sugar, reducing sugar, ascorbic acid, fruit juice pH and minimum titratable acidity whereas, 40 cm x 40 cm spacing with red mulch recorded maximum non reducing sugar.

(Key words: Strawberry, quality, spacing, mulch)

INTRODUCTION

Strawberry (*Fragaria × ananassa* Duch.) is a natural hybrid species which belongs to the Rosaceae family that is extensively cultivated in the temperate as well as subtropical regions of the world (Sharma and Badiyala, 1980). Strawberry consumption has been associated with health benefits as it is a good source of antioxidant, antibiotic and anticarcinogenic properties and gaining popularity among all age group consumers (Wang *et al.*, 1996). In recent times, strawberry owing to its remunerative prices has become very popular among the growers, paving way for area expansion under the crop (Singh and Asrey, 2005). However, due to various reasons growers do not maintain proper plant spacing leading to high percentage of under sized, unmarketable fruits which affect fruit quality. For obtaining better quality along with growth and yield, plant density plays an important role (Jadhav *et al.*, 2014; Sowjanya *et al.*, 2014). Strawberry is highly responsive to the enhanced soil temperature or light reflectance produced by the mulches. Mulch helps in better root proliferation, in addition to checking weed growth, retaining soil moisture around the plants (Sonkar *et al.*, 2012; Kanthaswamy and Venkadeswaran, 2020). Very little research work has been carried out in Strawberry under Assam condition and hence sufficient information on different techniques followed in this crop is not available. Therefore, the present investigation was carried out to find out the suitable spacing and mulch material for better quality fruits under Jorhat condition.

MATERIALS AND METHODS

A field investigation was carried out at farmers' field in Dhankhuloi village of Jorhat district of Assam, India during the consecutive years 2019-2020 and 2020-21 to study the effect of spacing and mulch material on quality of Strawberry fruit with the twenty treatments and three replications laid out in Factorial Randomized Block Design. The treatments comprised of five spacings viz., S1 -20 cm x 30 cm, S2 -30 cm x 30 cm, S3 -30 cm x 40 cm, S4 -40 cm x 40 cm, S5 -40 cm x 60 cm and four mulch materials i.e. M1 -paddy straw, M2 - red mulch, M3 -silver black mulch and M4 - no mulch. The experimental plot was brought to fine tilth by ploughing, clod crushing and harrowing and vermicompost @ 2.5 t ha⁻¹ was mixed uniformly in the soil during bed preparation. No fertilizers were applied, foliar spray of NPK 19-19-19 @ 5g l⁻¹ was applied at ten days interval along with micronutrients. Various quality parameters were recorded and the data was statistically analyzed using SPSS software. TSS was measured by Zeiss Hand Juice Brix Refractometer and Sugars were estimated by Fehling 'A' and 'B' solution method as described by Ranganna (1977). Titratable acidity was estimated using standard method of Anonymous (1980) and Ascorbic acid content was estimated by using method of Freed (1966). The pH measurements were made using a digital pH meter and the moisture content of the edible part of fruit was estimated by using the method of Anonymous (2000).

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RESULTS AND DISCUSSION

Quality parameters

The pooled data presented in Table 1 revealed that, different spacings and mulch treatment combinations had significant effect on quality parameters *viz.*, TSS, total sugar, reducing sugar, non reducing sugar, titratable acidity, ascorbic acid, fruit juice pH and moisture content in strawberry.

Total Soluble Solids (TSS) showed non significant effect due to spacing and higher TSS (11.39 °Brix) noted with wider spacing of 40 cm x 40 cm, whereas the lowest TSS (11.16 °Brix) was recorded with the closest spacing of 20 cm x 30 cm. This could be due to less interplant competition for light under wider spacing and wider spacing provides larger canopies which provide more photoassimilates, thus increasing TSS. On the other hand, TSS was significantly higher in silver black mulch (12.75 °Brix), while lowest in no mulch (9.31 °Brix). TSS might be more in plastic mulches due to the fact that plastic mulches concentrate CO₂ around the plant canopy and this accumulated CO₂ concentration might have accounted for increased TSS. Similar results were also obtained by Wee *et al.* (2018), who reported higher Total

Soluble Solids (11.96 °Brix) under wider spacing of 0.60 m in rockmelon and Helaly *et al.* (2017) noticed higher TSS in husk tomato plants from mulching treatment.

Maximum total sugar (6.31%) was observed under widest spacing of 40 cm x 60 cm, whereas minimum (6.12%) was recorded under closest spacing of 20 cm x 30 cm. Similarly, highest reducing sugar (5.59%) was noted in 40 cm x 40 cm spacing, whereas minimum reducing sugar (5.37%) was observed in 20 cm x 30 cm. Sugar content was recorded higher under wider spacing might be due to higher photosynthesis and availability of metabolites because of higher interception of Photosynthetically active radiation (PAR) by individual plant and better translocation and accumulation of nutrients. Maximum total sugar (6.38%) and reducing sugar (5.61%) under silver black mulch might be attributed to high soil temperature and higher nutrient availability which provided favourable microclimate for increased sugar content. The current findings are in consonance with results of Hazarika *et al.* (2019), who got total sugars (8.50%), reducing sugar (4.78%) in strawberry under wider spacing and Iqbal *et al.* (2015) reported total sugar (5.71%), reducing sugar (3.41%), non-reducing sugar (2.30%) in aonla.

Table 1. Effect of spacing and mulch on quality of strawberry (Pooled data of 2019-2020 and 2020-2021)

Treatments	TSS (°Brix)	Total Sugar (%)	Reducing Sugar (%)	Non Reducing sugar (%)	Titratable Acidity (%)	Ascorbic acid (mg 100g ⁻¹)	Fruit pH	Moisture content (%)
Spacing(S)								
20 cm x 30 cm (S ₁)	11.16	6.12	5.37	0.76	0.74	67.30	3.86	91.57
30 cm x 30 cm (S ₂)	11.23	6.18	5.44	0.74	0.74	71.87	3.86	91.70
30 cm x 40 cm (S ₃)	11.28	6.24	5.50	0.75	0.73	74.27	3.87	91.74
40 cm x 40 cm (S ₄)	11.39	6.30	5.55	0.76	0.72	77.61	3.91	91.70
40 cm x 60 cm (S ₅)	11.36	6.31	5.59	0.72	0.71	78.65	3.88	91.51
SEd(±)	0.10	0.01	0.01	0.01	0.02	1.47	0.01	0.22
CD(P=0.05)	-	0.02	0.02	-	-	2.92	-	-
Mulches(M)								
Paddy straw (M ₁)	11.06	6.15	5.42	0.74	0.80	65.73	3.84	92.05
Red mulch (M ₂)	12.02	6.31	5.52	0.78	0.65	82.67	3.92	91.04
Silver Black mulch (M ₃)	12.75	6.38	5.61	0.77	0.65	85.81	3.93	91.09
No mulch (M ₄)	9.31	6.08	5.39	0.69	0.83	61.53	3.81	92.40
SEd(±)	0.09	0.01	0.01	0.01	0.02	1.31	0.01	0.19
CD(P=0.05)	0.18	0.02	0.02	0.02	0.03	2.61	0.02	0.38

Titratable acidity was found to have non significant effect due to spacing. Higher titratable acidity (0.74%) was obtained under closer spacing of 20 cm x 30 cm and 30 cm x 30 cm, whereas minimum titratable acidity (0.71%) was recorded under wider spacing of 40 cm x 60 cm which might be due to shade effect where sugar conversion from organic acid is hampered due to lack of sufficient light in closer spacing. Least titratable acidity (0.65%) was found in silver

black mulch and red mulch which might be due to rapid conversion of organic acid to sugars and more reflection of photosynthetically active radiation (PAR) from plastic mulch into fruiting zone elevated conversion into sugars and reduction of acidity. Hazarika *et al.* (2019) obtained lowest titratable acidity (0.812%) under wider spacing of 50 cm x 40 cm and Mehraj *et al.* (2015) reported least acidity (1.40%) in plants under black polyethylene film and higher acid

content (1.52%) under unmulched plants during his study on plum.

Perusal of data revealed that the maximum Ascorbic acid (78.65 mg 100g⁻¹) was recorded in 40 cm x 60 cm which was at par with 40 cm x 40 cm (77.61 mg 100g⁻¹), while the minimum Ascorbic acid was recorded in 20 cm x 30 cm (67.30 mg 100g⁻¹). Higher ascorbic acid in wider spacing might be due to more light exposure and greater accumulation of photosynthates. Ascorbic acid content was significantly influenced by mulch treatments, with maximum Ascorbic acid (85.81 mg 100 g⁻¹) recorded in silver black mulch, whereas no mulch reported minimum Ascorbic acid (61.53 mg 100 g⁻¹). Improvements in ascorbic acid in polythene treatments may be due to promotion effect of plant growth and metabolic processes which led to increase in chemical composition. Reflection of light from polythene mulches might have played a role in modifying microclimatic conditions. The results are in conformity with the findings of Bhagyashree *et al.* (2018), who obtained higher ascorbic acid (178.78 mg 100 g⁻¹) in the wider spacing of 6 m x 6 m and Gad El - Moula *et al.* (2018) found higher ascorbic acid (26.64 mg 100 g⁻¹) under silver black mulch in tomato compared to paddy straw (25.30 mg 100 g⁻¹) and no mulch treatments (24.28 mg 100 g⁻¹).

In the present study, no significant effect of spacing on fruit pH was found. The increase in pH could be related to a possible decrease in the respiratory metabolic activity or increase in ascorbic acid content as expressed by Da Silva *et al.* (2013). Higher fruit pH (3.93) under silver black mulch could be due to changes in quality and quantity of light energy re-radiated into plant canopy from mulch that might have influenced fruit pH. Yogaraj (2016) got higher juice pH (3.57) in pomegranate plants mulched with black polythene.

Effect of spacing on fruit moisture content was non significant, whereas in red mulch treatment, minimum fruit moisture content (91.04 %) was recorded that could be due to better conversion of starch into sugars. Hence, lower relative water content in fruits with increase in ripeness level in agreement with views of Frenkel and Hartman (2012).

From the study and data it can be concluded that wider spacing of 40 cm x 40 cm with silver black mulch influenced quality of fruits in strawberry.

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