



Mulching and Spacing Affects Growth, Yield and Fruit Quality of Strawberry (*Fragaria x Ananassa* Duch.) under Terai Zone of West Bengal

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ABSTRACT

The experiment was conducted at KVK Jalpaiguri, Ramshai, West Bengal during 2018-19, to study the effect of different mulching and spacing on growth, yield and fruit quality of Strawberry cv. Nabila under Terai condition of West Bengal. The experiment was laid out in a Randomized Block Design (RBD) with three treatments: FP (Farmer's practice): Paddy straw mulch with spacing 45x45cm, TO (Technology Option) 1: Black polythene mulch with spacing 45x30 cm, TO (Technology Option) 2: Black polythene mulch with spacing 45x45 cm) and eight replications. The results revealed that different mulches and spacing significantly increased the soil moisture percent, number of flowers, fruit retention, physico-chemical qualities of fruits and it improved the plant growth too. Among different mulches and spacing it was found that TO 2: Black polythene mulch with spacing 45x45 cm showed the highest growth, yield and fruit quality of strawberry cv. Nabila with the highest B:C ratio of 1.73. The average yield obtained under TO (Technology Option) 2 was 11.00 t/ha which was 17.27% higher than yield obtained from farmers' practice (9.10 t/ha).

Key Words: Mulching, Spacing, Growth, Quality, Yield, Strawberry

INTRODUCTION

The cultivated strawberry (*Fragaria x ananassa* Duchesne.) is a natural hybrid being grown in cooler regions worldwide for delicious fruits with rich source of vitamins, minerals and various other bioactive compounds (Oszmianski and Wojdylo, 2009). In recent years, several agro-techniques have been standardised for day-neutral varieties and standardization of plasti-cultural techniques have resulted in phenomenal increase in its area and production (Sharma and Sharma, 2004; Paramanick *et al*, 2013). Strawberry is amongst the ten fruit crops, which give quicker and very high returns per unit area on the capital interests, as a crop gets ready for harvesting within six months of planting. However, presently farmers grow strawberry without maintaining proper planting space and proper mulching. Consequently, high

percentage of under sized, unmarketable fruit and incidence of pest and diseases have been noticed which is a bottle neck for obtaining good returns. Higher plant population per unit area has generally tended to increase the fruit yield up to 27 per cent in straw berry (Sonkar *et al*, 2012). Mulching plays an important role in soil moisture conservation, weed control, regulation of soil-hydrothermal regime, besides keeping the delicate fruit neat and clean. In strawberry, mulching has been found to improve plant growth, berry weight, fruit yield and quality. Ngente *et al* (2021) reported that different kinds of mulches were useful in altering the hydrothermal regime of the soil and provide favorable soil environment for plant growth. However, black polythene mulch was more pronounced for altering soil environment than all the other mulching materials. It significantly enhanced plant height,

Table 1. Effect of different mulching and spacing on yield attributes of strawberry cv. Nabila.

Treatment	Plant height (cm)	No. of leaves per plant	No. of fruit per plant	Fruit weight (g)	Fruit length (mm)	Fruit width (mm)	Fruit yield t/ha
Farmers' practice: Paddy straw mulch with spacing 45x45cm	24.71	9.88	14.94	16.81	35.40	24.77	9.10
TO 1: Black polythene mulch with spacing 45x30 cm	27.28	11.2	16.97	19.22	38.09	27.91	10.62
TO 2: Black polythene mulch with spacing 45x45 cm	28.84	11.76	18.06	20.05	40.04	29.07	11.26
CD (0.05)	1.44	0.40	1.50	0.57	0.89	0.83	0.56

plant spread, number of leaves, number of fruits and increased yield per plant in strawberry.

Considering these facts, the systematic studies were conducted in strawberry cv. 'Nabila' which is a newly *emerging day* neutral cultivar in the Indian climate to standardize the appropriate mulch material and an ideal spacing for its cultivation.

MATERIALS AND METHODS

At Krishi Vigyan Kendra Jalpaiguri, Ramshai, West Bengal during the period from November 2018 to April 2019, the experiment was conducted in Strawberry cv. Nabila in randomized block design consisting of three treatments and eight replications conducted in ten farmers' field. The treatment details were as follows: FP (Farmers' Practice): Paddy straw mulch with spacing 45x45cm, TO (Technology Option) 1: Black polythene mulch with spacing 45x30 cm and TO (Technology Option) 2: Black polythene mulch with spacing 45x45 cm) with eight replications. Four plots each measuring 1m X 1m under each treatment were considered as single replication. Ten plants were planted in each plot at scheduled spacing for each treatment and five plants were selected randomly for collecting data. Black polyethylene sheet were used and

spread over the beds of Treatment- Technology Option 1 and 2. Corresponding to the position of plant, incisions were given on mulch and the plant stems were taken out through the slits to keep the foliage uncovered. Paddy straw, were spread over the plots of Treatment- FP (Farmers Practice) evenly to maintain a mulch thickness of about 10 cm. Observations were recorded on the height of plant (cm), number of leaves (cm), number of fruit per plant, fruit weight (g), fruit length (mm), fruit breadth (mm), and yield (tonne/ha) were noted. The disease and pest incidence percentage and the economic analysis of the different treatment were also recorded.

RESULTS AND DISCUSSION

It was found that the vegetative growth, yield attributes and quality parameters were significantly affected by mulching and spacings, respectively in different treatments. Data clearly revealed that the different vegetative growth attributes *viz.*, plant height and number of leaves per plant and yield parameters namely number of fruit per plant, fruit weight, fruit length, fruit breadth and yield were significantly varied in Technology option 2: Black polythene mulch with spacing 45x45 cm) followed

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Table 2. Economics of the effect of different mulching and spacing on strawberry cv. Nabila

Treatment	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio
Farmers' practice: Paddy straw mulch with spacing 45x45cm	7,10,200	11,05,000	3,94,800	1.55
TO 1: Black polythene mulch with spacing 45x30 cm	7,87,100	13,18,400	5,31,300	1.67
TO 2: Black polythene mulch with spacing 45x45 cm	7,50,250	13,02,200	5,51,950	1.73

by Technology option 1: Black polythene mulch with spacing 45x30 cm) and farmers' practice: Paddy straw mulch with spacing 45x45cm. Data presented in Table 1 clearly indicated that significant variation in the influence of various treatments on strawberry and reflected that the maximum plant height 28.84 cm being observed in TO 2 followed by 27.28 cm in TO1 while the least 24.71 cm was noticed from farmers' practice. The number of leaves per plant was significantly varied and found maximum 11.76 in TO 2 followed by 11.2 in TO 1 while the minimum leaf number 9.88 was found in FP. Similarly, the number of fruits per plant at harvest was found to be statistically significant with the highest number 18.06 obtained from TO 2, which was at par with 16.97 in TO 1 while the lowest number 14.94 was found from farmers' practice.

Strawberry plant is shallow rooted and surface feeder therefore moisture and temperature conditions of the upper layer of soil significantly influence the growth and fruiting of the plant (Sharma *et al*, 2013). Polythene mulches play a vital role in strawberry cultivation as it helps in conserving moisture, controlling weeds, regulating hydrothermal regimes and protecting the delicate fruits from direct contact with the soil (Sharma, 2009). Indication of highest plant height under black polythene mulched plots with wider spacing may be due to thick, matted surface covering capacity of polythene mulch helps to better water retention and nutrient availability to the plant with less competition among each other. Production of highest number of leaves per plant

and fruit per plant under black polythene and wider spacing may be due to the soil cover which perhaps led to better conservation of moisture, soil heat including the light penetration and better biological function of soil. The results were in agreement with the result of Kour and Singh (2009).

The yield and yield attributes appeared to be greatly influenced and significantly varied among the various treatments. The highest fruit weight of 20.05 g was seen in TO 2 followed by 19.22 g in TO 1 while the lowest 16.81 g was observed in FP. Similar trend was followed in case of fruit length and fruit width with the highest of 40.04 mm and 29.07 mm obtained in TO 2 followed by 38.09 mm and 27.91 mm in TO 1 while the lowest value of 35.40 mm and 24.77 mm was found in FP. The yield in terms of tonne per ha was found to be highest with 11.01 t/ha in TO 1 due to closer spacing which was at par with 11.0 t/ha in TO 2 while the least yield 9.1t/ha was found in farmers practice (Table 1). The treatments also showed varied level of disease and pest incidence. With the minimal percentage of incidence was observed in TO 2 treatment followed by TO 1 while highest percentage of disease pest was observed in FP. Use of plastic mulches in agriculture helped to increase the production per unit area for all types of crops reduces the incidence of diseases and pest. The soil under plastic mulch remains loose and friable and roots access to adequate oxygen in not compromised, and microbial activity is enhanced (Parmar *et al*, 2013). Wider (45 x 45 cm) plant to

plant spacing provided better space for the root distribution. It also indicated a shift in the most favourable environment in root growth consists of optimal moisture availability. This leads to increased root activities which might have been resulted in better nutrient uptake, subsequently better dry matter formation and gas exchange. These results were also supported by Ahmad (2009).

Results (Table 2) revealed that the cost of cultivation Rs.7,87,100/ha was highest in TO 1 (Technology Option) followed by Rs.7,50,250/ha in TO 2. The high cost of cultivation in TO 1 might be due to the closer spacing and inter culture operations while the lowest cost of cultivation Rs.7,10,200 /ha was obtained from FP (Farmers' practice). The gross return and net return from the different treatments was also calculated and found that technology option 2 was superior giving a gross return of Rs.13,02,200/ha and net return of Rs 5,51,950/ha followed by TO 1 giving gross return of Rs/13,18,400/ha and net return of Rs 5,31,300/ha while the lowest gross return Rs.11,05,000/ha and net return Rs.3,94,800/ha was obtained from Farmers' practice. TO 2 gave the highest B:C ratio 1.73 followed by TO 1 1.67 and the least 1.55 B:C ratio was found in FP. This may be attributed to better manifestation of yield and yield attributes on account of maintaining proper spacing and application of black polythene resulting in better growth indices due to efficient utilization of nutrients by Strawberry.

CONCLUSION

Different mulches used along with different spacing revealed that use of black polythene mulching along with wider spacing of 45 x 45 cm resulted in better growth, yield and fruit quality of strawberry fruit and it was economical also. Thus the technology can be disseminated to the farmers of Terai zone of West Bengal for promotion of cultivation of strawberry cv. Nabila as a potential crop for better economic upliftment and improvement of socio economic status.

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REFERENCES

- Ahmad M F (2009). Effect of planting density on growth and yield of straw berry. *Indian J Hort* **66**(1): 132-134.
- Kour R and Singh S (2009). Impact of mulching on growth, fruit yield and quality of strawberry (*Fragaria x ananassa* Duch.). *Asian J Hort* **4**(1): 63-64.
- Ngente Vanlalhmua, Chhungpuii Khawhring and Vanlalngurzauva T (2021). Utilization of different mulch materials on strawberry (*Fragaria x Ananassa* Dutch.) cultivation under open condition in Mizoram. *J Krishi Vigyan* **9** (2) : 245-250.
- Oszmianski J and Wojdylo A (2009). Comparative study of phenolic content and antioxidant activity of strawberry puree, clear, and cloudy juices. *European Food Res Tech* **228**: 623-631.
- Parmar H N, Polara N D and Viradiya R R (2013). Effect of mulching material on growth, yield and quality of watermelon (*Citrullus lanatus* Thunb.) cv. Kiran. *Universal J Agric Res* **1**(2): 30-37.
- Pramanick K K, Kishore D K, Sharma S K, Das B K and Murthy B N S (2013). Strawberry cultivation under diverse agro-climatic conditions of India. *Int J Fruit Sci* **13**(1): 36-51.
- Sharma N C, Sharma S D and Spehia R S (2013). Effect of plastic mulch colour on growth, fruiting and fruit quality of strawberry under polyhouse cultivation. *Int J Bio-resource Stress Manage* **4**(2) : 314-316.
- Sharma V K (2009). Effect of mulching and row spacing on growth and yield of strawberry. *Indian J Hort* **66**(2): 271-273.
- Sonkar P, Ram R B and Meena M L (2012). Effect of various mulch materials and spacing on growth, yield and quality of strawberry. *Hort Flora Res Spectrum* **1**(4): 323-327.

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