Plant Archives Vol. 25, Supplement 2, 2025 pp. 1598-1605 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-2.200

EFFECT OF DIFFERENT ORGANIC MULCHING MATERIALS ON VEGETATIVE PARAMETERS OF STRAWBERRY CV. WINTER DAWN

Mamta Nishad[1], Anshuman Singh[1] and Neeraj Singh[2*]

[1]Department of Horticulture, Faculty of Agriculture, Kamla Nehru Institute of Physical & Social Sciences, Sultanpur (U.P.) 228118, India

[2]Department of Agricultural Statistics & Computer Application, Faculty of Agriculture, Kamla Nehru Institute of Physical & Social Sciences, Sultanpur (U.P.) 228118, India

*Corresponding author E-mail: neeraj.agristat@gmail.com

(Date of Receiving : 03-05-2025; Date of Acceptance : 08-07-2025)

ABSTRACT

The present investigation was carried out to evaluate the effect of different organic mulching materials on the vegetative growth of strawberry (*Fragaria* × *ananassa* Duch.) cv. Winter Dawn under open field conditions at Horticultural Farm, Department of Horticulture, Faridipur, Sultanpur (U.P.). The experiment was laid out in a Randomized Completely Block Design (RCBD) with eight treatments and three replications. The treatments included T_1 (Control), T_2 (Wheat straw), T_3 (Paddy straw), T_4 (Coconut husk), T_5 (Paddy husk), T_6 (Saw dust), T_7 (Cut grass), and T_8 (Compost). Observations were recorded at 30, 60, 90, and 120 Days After Transplanting (DAT) for various vegetative parameters including plant height, number of leaves, plant spread, and number of runners per plant.

The results revealed that all mulching treatments significantly improved vegetative growth compared to the control, with T_8 (Compost) consistently recording the highest values across all parameters. At 90 DAT, T_8 achieved the maximum plant height (16.66 cm), number of leaves (39.00), plant spread (34.33 cm), and number of runners per plant (9.00), which further increased to 12.33 runners at 120 DAT. T_4 (Coconut husk) and T_5 (Paddy husk) also performed well. The improved performance under mulch treatments was attributed to enhanced soil moisture retention, moderated root zone temperature, and increased microbial activity.

The study concludes that compost mulch (T_8) is the most effective organic mulching material for promoting vegetative growth and runner production in strawberries. It is recommended for adoption in commercial cultivation and nursery propagation to improve productivity in a sustainable and eco-friendly manner. Further field trials across diverse agro-climatic regions are suggested to validate these findings.

Keywords **:** RCBD, Strawberries, mulching and vegetative parameters**.**

Introduction

Strawberry (*Fragaria* × *ananassa* Duch.) is a highly valued temperate fruit, known for its appealing shape, distinctive aroma, and refreshing flavor (Ali and Gaur, 2007). Despite being primarily grown in temperate regions, it can also be cultivated with ease in tropical and subtropical climates. Mulching plays a critical role in strawberry farming, not only conserving soil moisture but also promoting plant growth and enhancing fruit quality (Hassan *et al.,* 2000). Both organic and inorganic mulches are commonly used in strawberry cultivation to enhance growth and productivity. Organic mulches, which are sourced from plant and animal materials, include straw, hay, peanut hulls, leaf mold compost, wood-based products like sawdust, wood chips, and shavings, as well as animal manures. Among the organic mulches, combinations such as straw-vetch offer several environmental benefits, including increased nitrogen levels, nutrient

recycling, suppression of weed growth, reduced soil erosion, addition of organic matter, and a cooling effect during hot summer months, while also acting as a slow-release fertilizer (Abdul-Baki and Teasdale, 1993). Straw is an excellent mulching material due to its ease of application, stability, and ability to reflect sunlight. It is widely used for winter protection as well as a summer mulch in vegetable fields. These mulches offer excellent insulation, water absorption, and weed control. One of the key advantages is that straw itself doesn't contain weed seeds. However, straw mulches are generally avoided in high-traffic areas due to their highly flammable nature. The typical thickness of straw mulch is around 6 to 8 inches.

Materials and Methods

The experiment was conducted in open field condition at Horticultural Farm, Department of Horticulture in Faridipur, Sultanpur District, U.P. with Strawberry variety Winter Dawn. Strawberry planting was undertaken in the month of October. The area is situated on the north of Prayagraj on the right bank of Gomti river at Rewa Road at about 5 km from Sultanpur city. It is situated at 26° 15' N Latitude and 85° 05'E Longitude. This region has sub-tropical climate with extreme of summer and winter the temperature down to as low as 10 - 12°C during winter season especially in the month of December and January. During the summer season, temperatures rise to 40–43°C. The average rainfall in this area is around 800-1200mm annually. The experiment was laid out in a Randomized Completely Block Design (RCBD) with 08 treatments and 03 replications. The treatments were T_1 (Control, without mulching), T_2 (Wheat straw (5t/ha)), T_3 (Paddy straw (5t/ha)), T_4 (Coconut husk (5t/ha)), T_5 (Paddy husk (5t/ha)), T_6 (Saw dust (5t/ha)), T_7 (Cut grass (5t/ha)) and T_8 (Compost (8-10t/ha)).

Results and Discussion

Among the various treatments studied on vegetative parameters like plant height, number of leaves, plant spread, days taken to first flowering and number of flowers per plant. At 30 DAT maximum plant height 04.66 cm, 09.66 cm at 60 DAT and 16.66 cm at 90 DAT were noted in T_8 (Compost) followed by 05.33 cm at 30 DAT 09.00 at 60 DAT and 16.33 cm in at 90 DAT in T_4 (Coconut Husk) while the minimum plant height 04.66 cm in at 30 DAT, 07.66 cm at 60 DAT and 12.66 cm at 90 DAT was recorded in T_1 (Control, Without mulching). Mulching treatment enhanced the plant height of strawberry, possibly because the soil beneath the mulch remained loose and well-aerated, promoting root activity and thus significantly improving plant growth. Similar findings were reported by Kher *et al.* (2012) and Bakshi *et al.* (2015) in strawberries. Highest number of leaves 12.00 at 30 DAT, 22.00 at 60 DAT and 39.00 at 90 DAT were observed in T_8 (Compost), which is at par with 10.33 at 30 DAT, 19.00 at 60 DAT and 37.33 at 90 DAT in T_4 (Coconut Husk). The minimum number of leaves 07.00 at 30 DAT, 14.33 at 60 DAT and 27.00 was noted in T_1 (Control, Without mulching). This might be because the prolonged retention and availability of moisture led to increased nutrient uptake, supporting proper plant growth and development. As a result, plants exhibited greater growth compared to the control." Similar finding was obtained by Deanban *et al.,* (2004), Ansary and Roy (2005) in watermelon. Effect of different organic mulching materials on plant spread. Maximum plant spread 14.33 cm, 17.33 cm and 34.33 cm were observed in T_8 (Compost) at 30, 60 and 90 DAT which is at par with 14.05 cm at 30 DAT, 17.00 cm at 60 DAT and 33.00 cm at 90 DAT in T_4 (Coconut Husk). Minimum plant spread 11.00 cm at 30 DAT, 13.33 cm at 60 DAT and 17.00 cm at 90 DAT was found in T_1 (Control, Without mulching). The data pertaining on number of runners at 90 DAT and 120 DAT was affected by different organic mulching materials. Maximum number of runners 09.00 at 90 DAT and 12.33 at 120 DAT was collected in T_8 (Compost) which is at par with 06.66 at 90 DAT and 09.00 at 120 DAT in T_4 (Coconut Husk). The minimum number of runners 02.00 at 90 DAT and 06.66 at 120 DAT was observed in T_1 (Control, Without mulching). Among the various mulching treatments, black polythene mulch proved significantly more effective in reducing weed populations compared to the other treatments. This effectiveness may be attributed to its smothering effect and the physical barrier it creates, which inhibits photosynthetic activity. The data clearly indicate that strawberry plants mulched with black polythene produced the highest number of runners (Ali and Gaur, 2013).

The Table 1 presents the effect of different organic mulching materials (T_1 to T_8) on vegetative growth parameters of strawberry at various stages after transplanting (30, 60, 90, and 120 DAT). Treatment T8 consistently recorded the highest plant height, number of leaves, plant spread, and number of runners, indicating its superiority. Significant differences were observed among treatments for most parameters, suggesting that mulching has a notable impact on vegetative growth in strawberry.

Table 1 : Effect of Organic Mulches on Plant Height, Leaf Number, Plant Spread, and Runners in Strawberry

Treatments	Plant Height (cm)			Number of Leaves			Plant Spread (cm)			Number of Runners per Plant	
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	90 DAT	120 DAT
T_1	04.66	07.64	12.66	07.33	14.33	27.00	11.00	13.33	17.00	02.00	03.66
T_2	05.00	08.94	14.66	08.33	15.33	30.00	12.00	15.00	24.66	04.33	08.00
T_3	04.67	08.33	16.33	10.00	15.66	35.00	12.66	14.00	26.66	05.00	07.00
T_4	05.33	09.00	16.45	10.33	19.00	37.33	14.05	17.00	33.00	06.66	09.00
T_5	05.00	08.66	15.00	09.66	18.66	36.00	14.02	13.33	23.33	05.33	08.64
T_6	05.32	08.66	15.66	07.66	18.33	37.00	13.33	15.00	28.66	05.66	07.00
T_7	05.31	07.66	13.00	08.00	16.33	36.00	13.00	14.00	31.00	05.66	08.33
T_8	06.00	09.66	16.66	12.00	22.00	39.00	14.33	17.33	34.33	09.00	12.33
SE(d)	01.05	00.63	00.63	01.22	01.50	05.38	01.24	01.73	01.96	00.95	01.16
C.D.	2.25	1.35	1.35	2.62	3.22	11.54	2.66	3.71	4.20	2.04	2.44

Fig. 1: Effect of different Organic Mulching materials on Plant Height of Strawberry

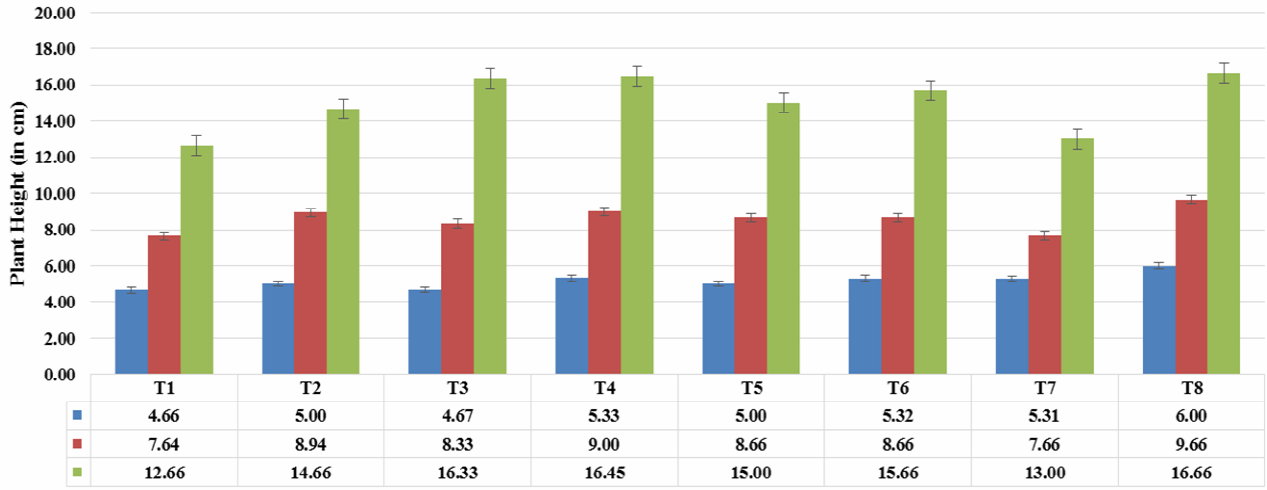


Table 2: Effect of Different Treatments on Plant Height at 30, 60, and 90 Days After Transplanting (DAT)

Plant Height (cm)	30 DAT	4.66 T_1	4.67 T_3	5.00 T_2	5.00 T_5	5.31 T_7	5.32 T_6	5.33 T_4	6.00 T_8	SE(d): 1.05 C.D.: 2.25 (NS)
	60 DAT	7.64 T_1	7.66 T_7	8.33 T_3	8.66 T_5	8.66 T_6	8.94 T_2	9.00 T_4	9.66 T_8	SE(d): 0.63 C.D.: 1.35
	90 DAT	12.66 T_1	13.00 T_7	14.66 T_2	15.00 T_5	15.66 T_6	16.33 T_3	16.45 T_4	16.66 T_8	SE(d): 0.63 C.D.: 1.35

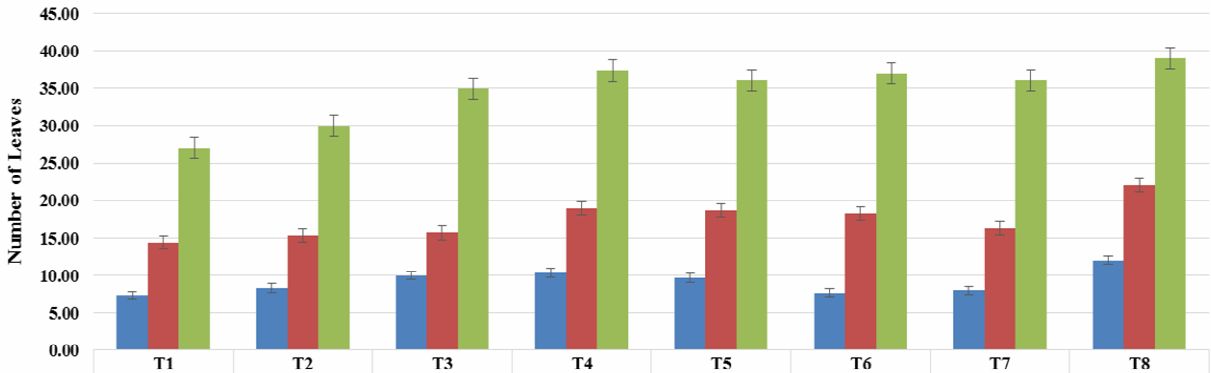
Graph 1 and **Table 2** collectively depict the effect of various organic mulching treatments (T_1 to T_8) on the plant height of strawberry at 30, 60, and 90 Days After Transplanting (DAT).

The data indicate a progressive increase in plant height across all treatments as the crop matured. Among all the treatments:

- **T_8 consistently recorded the highest plant height** at all three growth stages (6.00 cm at 30 DAT, 9.66 cm at 60 DAT, and 16.66 cm at 90 DAT), suggesting that the organic mulch used in T8 was most effective in promoting vegetative growth.

- Other high-performing treatments included T_4 and T_3, which also showed significantly greater plant heights compared to the control (T_1).
- T_1 (Control) showed the lowest plant height throughout the study period (4.66 cm, 7.64 cm, and 12.66 cm at 30, 60, and 90 DAT, respectively), indicating the positive influence of mulching over no mulch.
- At 30 DAT, the Critical Difference (C.D.) value was 2.25, and the variation among treatments was not significant (NS).
- At 60 DAT and 90 DAT, the C.D. was 1.35, indicating statistically significant differences among treatments at these stages.

Fig. 2: Effect of different Organic Mulching materials on Number of Leaves of Strawberry



	T1	T2	T3	T4	T5	T6	T7	T8
30 DAT	7.33	8.33	10.00	10.33	9.66	7.66	8.00	12.00
60 DAT	14.33	15.33	15.66	19.00	18.66	18.33	16.33	22.00
90 DAT	27.00	30.00	35.00	37.33	36.00	37.00	36.00	39.00

Table 3: Effect of Different Treatments on Number of Leaves at 30, 60, and 90 Days After Transplanting (DAT)

Number of Leaves	**30 DAT**	7.33 **T_1** 7.66 **T_6** 8.00 **T_7** 8.33 **T_2** 9.66 **T_5** 10.00 **T_3** 10.33 **T_4** 12.00 **T_8**	SE(d): 1.22 C.D.: 2.62
	60 DAT	14.33 **T_1** 15.33 **T_2** 15.66 **T_3** 16.33 **T_7** 18.33 **T_6** 18.66 **T_5** 19.00 **T_4** 20.00 **T_8**	SE(d): 1.50 C.D.: 3.22
	90 DAT	27.00 **T_1** 30.00 **T_2** 35.00 **T_3** 36.00 **T_5** 36.00 **T_7** 37.00 **T_6** 37.33 **T_4** 39.00 **T_8**	SE(d): 5.38 C.D.: 11.54

Graph 2 and Table 3 illustrate the influence of various organic mulching treatments (T_1 to T_8) on the number of leaves per strawberry plant at 30, 60, and 90 Days After Transplanting (DAT).

Key Observations:

- There was a progressive increase in the number of leaves from 30 to 90 DAT across all treatments.
- The highest number of leaves was consistently recorded under **T_8**, with:
  - 12.00 leaves at 30 DAT,
  - 22.00 leaves at 60 DAT, and
  - 39.00 leaves at 90 DAT.
- Treatments T_4, T_6, T_5, and T_3 also showed comparatively better performance in increasing leaf number.
- The control treatment (T_1) recorded the lowest leaf numbers at all stages:
  - 7.33 at 30 DAT,
  - 14.33 at 60 DAT,
  - 27.00 at 90 DAT.

These trends clearly show the positive effect of organic mulching on vegetative growth, especially in enhancing the development of foliage.

- The critical difference (C.D.) values indicate statistically significant differences among treatments at all three stages, confirming that organic mulching had a substantial impact on leaf development.
- The results reveal that organic mulching materials significantly enhance the number of leaves in strawberry plants, particularly as the crop matures. This may be attributed to improved soil moisture conservation, better root zone temperature, and enhanced microbial activity in mulched plots.
- T8 proved to be the most effective treatment, followed closely by T_4, T_6, and T_5.
- The increased leaf number under these treatments could potentially lead to greater photosynthetic activity and higher yield.

Fig.- 3: Effect of different Organic Mulching materials on Plant Spread of Strawberry

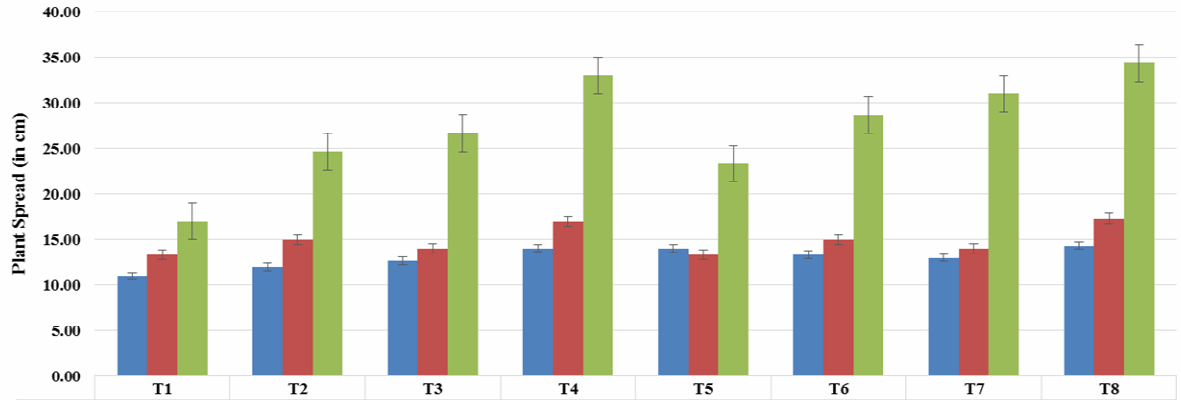


Table 4: Effect of Different Treatments on Plant Spread (in cm) at 30, 60, and 90 Days After Transplanting (DAT)

Plant Spread (in cm)	**30 DAT**	11.00 T_1	12.00 T_2	12.66 T_3	13.00 T_7	13.33 T_6	14.02 T_5	14.05 T_4	14.33 T_8	SE(d): 1.24 C.D.: 2.66
	60 DAT	13.33 T_1	13.33 T_5	14.00 T_3	14.00 T_7	15.00 T_2	15.00 T_6	17.00 T_4	17.33 T_8	SE(d): 1.73 C.D.: 3.71
	90 DAT	17.00 T_1	23.33 T_5	24.66 T_2	26.66 T_3	28.66 T_6	31.00 T_7	33.00 T_4	34.33 T_8	SE(d): 1.96 C.D.: 4.20

Graph 3 and Table 4 depict the influence of various organic mulching treatments (T_1 to T_8) on the plant spread (in cm) of strawberry plants at 30, 60, and 90 Days After Transplanting (DAT).

Key Observations:

- The data demonstrate a consistent increase in plant spread with time under all treatments, indicating continuous vegetative growth.
- T8 recorded the maximum plant spread at all stages:
  - 14.33 cm at 30 DAT,
  - 17.33 cm at 60 DAT,
  - 34.33 cm at 90 DAT.
- This was followed closely by T_4 (33.00 cm) and T_7 (31.00 cm) at 90 DAT, showing that these treatments also positively influenced horizontal plant growth.

- The lowest plant spread was observed in T_1 (Control) with only:
  - 11.00 cm (30 DAT),
  - 13.33 cm (60 DAT),
  - 17.00 cm (90 DAT), signifying the least growth without organic mulch application.

The critical difference (C.D.) values confirm statistically significant differences between treatments at each growth stage.

The results clearly indicate that organic mulching significantly enhances plant spread in strawberry, with T_8 proving to be the most effective treatment. The likely reasons include improved soil temperature, better moisture retention, and increased microbial activity under mulched conditions, which promote better root and shoot development.

- Treatments T_4, T_6, and T_7 also contributed substantially to increased plant spread compared to the control.
- This wider canopy coverage under mulch-treated plants can lead to improved photosynthesis, better resource use, and potentially higher yields.

Fig. 4: Effect of different Organic Mulching materials on Number of Runners per Plant

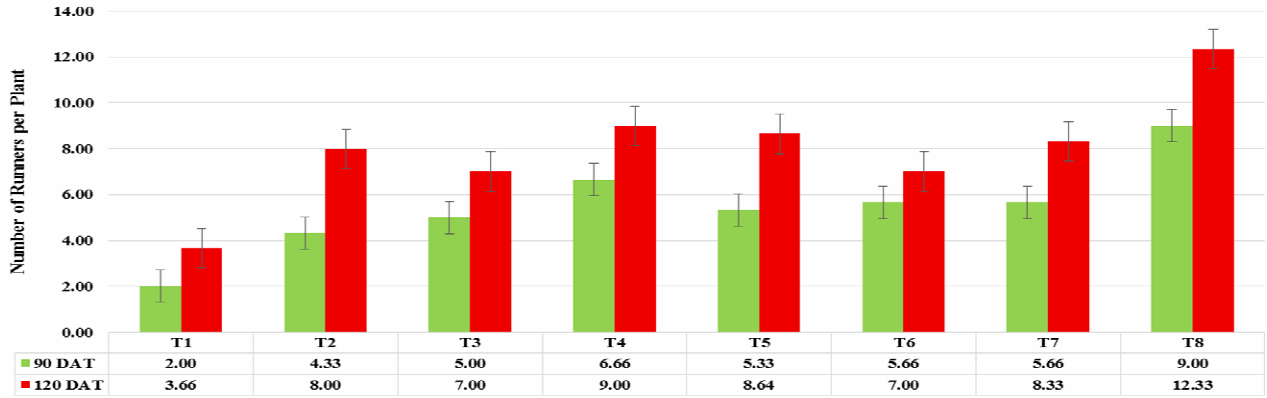


Table 5: Effect of Different Treatments on Number of Runners per Plant at 30, 60, and 90 Days After Transplanting (DAT)

Number of Runners per Plant	**90 DAT**	2.00 **T_1**	4.33 **T_2**	5.00 **T_3**	5.33 **T_5**	5.66 **T_6**	5.66 **T_7**	6.66 **T_4**	9.00 **T_8**	SE(d): 0.95 C.D.: 2.04
	120 DAT	3.66 **T_1**	7.00 **T_3**	7.00 **T_6**	8.00 **T_2**	8.33 **T_7**	8.64 **T_5**	9.00 **T_4**	12.33 **T_8**	SE(d): 1.16 C.D.: 2.44

Graph 4 and Table 5 collectively depict the influence of various organic mulching treatments (T_1 to T_8) on the number of runners per plant in strawberry crop at 90 and 120 Days After Transplanting (DAT).

At 90 DAT

- There was a gradual increase in the number of runners across treatments, ranging from 2.00 (T_1) to 9.00 (T_8) runners per plant.
- The highest number of runners was observed in T_8 (9.00), followed by T_4 (6.66) and T_7 (5.66).
- The lowest was in T_1 (2.00), indicating minimal vegetative propagation under this treatment.
- The standard error of difference [SE(d)] was 0.95, and the critical difference (C.D.) at 5% was 2.04, suggesting statistically significant differences between treatments.

At 120 DAT

- A marked increase in the number of runners was observed across all treatments compared to 90 DAT.
- T_8 again recorded the highest number of runners (12.33), showing a consistent positive effect of that mulching treatment over time.
- T_4 (9.00) and T_5 (8.64) also showed significantly higher values, indicating strong performance.

- T_1 remained the lowest (3.66), reaffirming its limited effectiveness.
- The SE(d) was 1.16, and C.D. at 5% was 2.44, highlighting significant treatment effects.

Overall Trends and Implications:

- The number of runners increased with time (from 90 to 120 DAT) for all treatments, suggesting the progressive impact of mulching on vegetative growth.
- T8 consistently showed superior performance, likely due to better moisture retention, temperature moderation, and nutrient enhancement offered by the mulching material used in that treatment.
- Treatments T_4, T_5, and T_7 also performed well, while T_1 consistently showed the least effectiveness in promoting runner production.

The results clearly indicate that organic mulching significantly influences the runner production in strawberry plants, with T_8 being the most effective treatment followed by T_4 and T_5. These findings emphasize the potential of using specific organic mulches to enhance vegetative propagation and overall crop productivity.

Suggestions and Recommendations

Based on the present investigation on the effect of different organic mulching materials on the vegetative growth of strawberry, the following suggestions and recommendations are proposed:

1. Selection of Effective Mulching Material

- Among all treatments, T_8 consistently outperformed other treatments across all vegetative growth parameters, including plant height, number of leaves, plant spread, and number of runners.
- Therefore, the organic mulching material used in T_8 should be recommended as the most effective option for enhancing vegetative growth and propagation in strawberry cultivation.

2. Promotion of Organic Mulching Practices

- Organic mulching significantly improved plant growth compared to the control (T_1), which lacked mulch. This underscores the vital role of mulching in strawberry production.
- Adoption of organic mulching practices should be encouraged among farmers, particularly those practicing sustainable or organic farming, due to its positive impact on soil health, moisture retention, and plant vigor.

3. Time-Specific Application Benefits

- The study clearly demonstrated that vegetative growth parameters improved progressively with time (from 30 to 120 DAT) under mulch treatments.
- Hence, it is recommended to apply organic mulch soon after transplanting and maintain it throughout the critical vegetative growth period for optimal results.

4. Consideration for Commercial Cultivation

- Since treatments like T_8, T_4, and T_5 not only enhanced plant growth but also promoted higher runner production (which is essential for propagation), these treatments can be strategically used in nurseries or commercial farms aiming for both fruit yield and propagation material.
- Use of such effective mulching strategies may lead to reduced input costs, better water-use efficiency, and enhanced productivity.

5. Further Research and Field Trials

- While the results are promising, on-farm trials across different agro-climatic zones are recommended to validate the effectiveness of T_8 mulching material under varied soil and climatic conditions.
- Long-term studies may also be carried out to evaluate the effect of mulching on fruit yield, quality, and soil microbial health in addition to vegetative parameters.

Conclusion

- Organic mulching has proven to be a highly beneficial agronomic practice for improving vegetative growth in strawberry. The treatment T_8 emerged as the most effective, suggesting its potential for large-scale adoption. These findings can serve as a valuable guide for farmers, extension workers, and policymakers aiming to boost sustainable strawberry production through eco-friendly practices.

References

Ali, A., Gaur, G.S. (2007). Effect of mulching on growth, fruit yield and quality of strawberry (Fragaria x ananassa Duch.). *Asian J Hort*., 2(11):149-151.

Abdul-Baki, A.A., Teasdale, J.R. (1993). A no tillage tomato production system using hairy vetch and subterranean clover mulches. *Hort Sci*. **28**:106-108

Ansary, S.H., Roy, D.C. (2005). Effect of irrigation and mulching on growth, yield and quality of watermelon (*Citrullus lonatus* Thumb.) *Environment and Ecology*. **23**(spl-1): 141-143.

Bakshi, P., Bhat, D.J., Wali, V.K., Sharma, A., Iqbal, M. (2014). Growth, yield and quality of strawberry (Fragaria x ananassa Duch.) cv. Chandler as influenced by various mulching materials. *African Journal of Agricultural Research*. **13;9**(7):701-706.

Dobbelaere, S., Croonenborghs, A., Thys, A., Ptacek, D., Vanderleyden, J., Dutto, P. *et al*. (2001). Responses of agronomically important crops to inoculation with Azospirillum. *Functional Plant Biology*. **28**(9): 871-9.

Dean, B., Zanic, K., Dumicic, G., Culjak, T.G., Ban, S.G. (2004). The type of polythene mulch impact on vegetable growth, yield and aphid population in watermelon production. *J. food Agri. and Envi*., **7**(3-4):543-550.

Hassan *et al*. (2018). Corollary use of mulches and pgr's on physicochemical properties of strawberry (Fragaria × ananassa) cv. Camarosa in polytunnel. *Plant Archives*, **18**(2):1745-1750.

Kher, R., Baba, J.A., Bakshi, P., Wali, V.K. (2010). Effect of planting time and mulching material on quality of strawberry. *J. Res.*, **9**(1):54-62.