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Evaluation of Strawberry (Fragaria × Ananassa) Runner Production in Different Growing Media under Semi-Automated Polyhouse

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The experiment was laid out in RCBD, replicated 3 times with 11 treatments in different combinations i.e.,T_0: Soil, T_1: Soil+ Vermicompost (1:1), T_2 : Soil + Vermicompost (1:2), T_3: Soil + Vermicompost(2:1), T_4 : Soil + Poultry manure (1:1), T_5 : Soil + Poultry manure (1:2), T_6 : Soil + Poultry manure (2:1), T_7 : Soil +Vermicompost+ Poultry manure (1:1;1), T_8 : Soil +Vermicompost+ Poultry manure (2:1;1), T_9 : Soil +Vermicompost+ Poultry manure (1:2:1), T_{10} : Soil +Vermicompost+ Poultry manure (1:1:2). Higher growth and yield attributes of strawberry runners, higher quality attribute and also concluded that, treatment T8 (Soil +Vermicomposted+ Poultry

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manure (2:1:1) performed best in term of runners growth and developed of strawberry under semi automated poly house condition. The highest B:C ratio was also found in the same treatment with 2.15. Among all the treatments, treatment T_8 performed best in terms of runners growth and development of strawberry.

Keywords: Soil; vermicompost; poultry manure; plant.

1. INTRODUCTION

"Strawberry is one of important fruit crops in temperate region However, it can also be grown in the tropical and subtropical climate. Strawberry (*Fragaria* × *ananassa Duct.),* a member of the family Rosaceae, is a soft fruited, short-day herbaceous perennial plant that can successfully be grown at optimum day temperatures of 22°C to 25°C and night temperatures of 7°C to 13°C" (De and Bhattacharjee, 2012). "Commercially grown strawberry (*Fragaria x ananassa* Duct.) is a monoecious octoploid (2n=6x=56) hybrid of two dioecious octoploid species, namely, Fragaria chiloensis Duch. and Fragaria virginiana Duch. (Bowling 2000) with a basic chromosome number (x) of 7. Botanically, strawberry is an aggregate fruit having seeds on the surface of a red fleshy receptacle" (Darnell, 2003). The last decade has witnessed the emergence of strawberry as the leading fruit in the category of soft berries. The area and production under strawberry in the world has increased logarithmically during the last two decades as much of the crop is being grown under protected structures.

"Strawberries are among the easiest fruits to rise in kitchen garden, decorative pots, hanging basket and are grown in flat or raised beds and protected cultivation. The area under cultivation this crop in subtropical and tropical region is very low and thus the fruit price remains very high (350-500 kg).It is the only fruit crop that starts paying back within five months from fruits and nine months from runner after transplanting of runners it easily propagates itself by the vegetative method of runner production in hilly region" [1,2]. However, it is difficult for the plant to propagate in plains because the mother plant cannot withstand severe hot and drought condition in June and July months and the plant usually dies above 40°C. In plain areas runner production is possible only under 75% shade nut and requires proper management of field to safeguard the daughter plants of strawberry during summer.

It is main reasons the runner's production is tropical and subtropical areas are very low. In plain's strawberry growers can not afford due to higher prices per runner and also the tarmers seldom go for its cultivation in plain as the planting material are costly to purchase it form the hills. Thus, this experiment was undertaken to evaluate the strawberry runners production in different growing media under semi automated polyhouse.

2. MATERIALS AND METHODS

2.1 Geographical Location of the Experimental Site

The experimental site is located at a latitude of 25.41º North and longitude of 81.84 º East, with an altitude of 98 meters above the mean sea level (MSL).

2.2 Experimental Details

2.2.1 Treatment combinations

T_0: Soil, T_1: Soil+ Vermicompost (1:1), T_2 : Soil + Vermicompost (1:2), T_3: Soil + Vermicompost(2:1), T_4 : Soil + Poultry manure (1:1), T_5 : Soil + Poultry manure (1:2), T_6 : Soil + Poultry manure (2:1), T_7 : Soil +Vermicompost+ Poultry manure (1:1;1), T_8 : Soil +Vermicompost+ Poultry manure (2:1;1), T_9 : Soil +Vermicompost+ Poultry manure (1:2:1), T_{10} : Soil +Vermicompost+ Poultry manure (1:1:2).

3. RESULTS AND DISCUSSION

3.1 Effect of Different Levels Organic Manure on Survival Percent, Numbers of Days taken for Initiation of Runner, Chlorophyll Content, Leaf Area, Leaf Area Index of Strawberry Runners

3.1.1 Survival percent

The maximum survival percentage of plants with the treatment T_8 (Soil +Vermicompost+ Poultry manure (2:1:1) was 83.33 Percent and the minimum survival percentage of germination was found the treatment (control) that application of

organic manures covers significantly encouraged the early initiation of germination. So, it is a most important factor which determines early crop production.

Consistency in availability of nutrients through organic manures means might have supplemented the additional nutrient requirement caused due to early runner coupled with concomitant increase in runners and consecutive fruit development. Enhanced yield was observed in strawberry due to the vegetative growth stimulation by application of organic manures resulted in a positive early in flowering, fruiting stages and increased total yield per plant. (Madhavi *et al.,* (2021).

3.1.2 Number of days taken for initation of runner after planting

The organic manures treatments, minimum number of days taken by plants to reach after transplanting were recorded when the plants organic manures with Soil +Vermicompost+ Poultry manure (1:1:2) (T_{10}). It took about 28.12 days after transplanting which was significantly earlier from rest of treatments days after transplanting. Among organic manures treatments maximum number of days taken to runners initiation was observed under control (T_0) (34.56) followed by Soil +Vermicompost (1:2) (T_1) (32.45). Consistency in availability of nutrients through organic manures means might have supplemented the additional nutrient requirement caused due to early runner coupled with concomitant increase in runners and consecutive fruit development. Enhanced yield was observed in strawberry due to the vegetative growth stimulation by application of organic manures resulted in a positive early in flowering, fruiting stages and increased total yield per plant.

3.1.3 Chlorophyll content SPAD value

The Maximum (42.21 SPAD reading) chlorophyll concentration was recorded in T8 (Soil +Vermicompost+ Poultry manure (2:1:1)). It was followed by T10, Soil +Vermicompost+ Poultry manure (1:1:2) (41.20 SPAD reading), T9 (Soil +Vermicompost+ Poultry manure (1:2:1) (4.81 SPAD reading). Minimum (35.67 SPAD reading) chlorophyll concentration was reported in T0.

3.1.4 Leaf area (cm^2)

The maximum leaf area 97.75 cm^2 was recorded with T8 (Soil +Vermicompost+ Poultry manure (2:1:1)) followed by 96.74 cm^2 with T9 (Soil +Vermicompost+ Poultry manure (1:2:1)) and 96.61 cm^2 with T10 which were statistically at par to each other, whereas the minimum leaf area was recorded 90.26 cm^2 with T0 (control).

3.1.5 Leaf area index

The maximum leaf area index 29.82 was recorded with T8 (Soil +Vermicompost+ Poultry manure (2:1:1)) followed by 29.23 cm2 with T10 (Soil +Vermicompost+ Poultry manure (1:1:2)) and 28.82 with T9 which were statistically at par to each other, whereas the minimum leaf area was recorded 27.22 with T0 (control). Leaf area index was increased significantly with the utilization of vermicompost and poultry manures at various treatment combinations. Increase in leaf area index might be due to increased growth of plant in the form of height and number of leaves, which accumulated more photosynthetic and thereby increased leaf area. The results are also in confirmation with the findings of reported that combined application of bio-fertilizers, vermicompost with inorganic fertilizers significantly increased the leaf area of strawberry.

3.2 Effect of Different Levels Organic Manure, Number of Runners, Number of Leaves, Length of Runners of Strawberry Runners

3.2.1 Number of runners

The Maximum number of runners per plant with 120 DAS was recorded 34 with T8 (Soil +Vermicompost + Poultry manure) (2:1:1) followed by 32 with T10, (Soil+ Vermicompost + Poultry manure) (1:1:2), which was significantly higher as compared to other treatment were as minimum numbers of runners per plant was found 28 with treatment T0 (control).

3.2.2 Number of leaves

The Maximum number of leaves per plant (39) was recorded with T8 Soil +Vermicompost + Poultry manure (2:1:1). Closely followed by T9 Soil + Vermicompost + Poultry manure (1:2:1) (37) at 120 DAS. Minimum Number of leaves per plant was recorded in T0 control (32) at 120 DAS.

3.2.3 Length of runners (cm)

The Maximum length of runners (39 cm) was recorded with T8, Soil +Vermicompost+ Poultry manure (2:1:1). Closely followed by T9, Soil +Vermicompost+ Poultry manure (1:2:1) (37 cm) at 120 DAP. Minimum length of runners was recorded in T0 control (32 cm) at 120 DAS.

Table 1. Effect of different levels organic manure on survival percent, numbers of days taken for initiation of runner, chlorophyll content, leaf area, leaf area index of strawberry runners

Treatment	Survival Percentage	Numbers of days taken for initiation of runner after planting	Chlorophyll Content (SPAD Value)	Leaf area (cm^2)	Leaf area index
T_0	69.67	34.56	35.67	90.26	27.22
T_1	75.33	32.45	36.30	92.52	27.57
T_2	78.67	30.67	36.79	93.64	27.87
T_3	79.33	29.89	37.12	93.92	28.05
T_4	76.33	29.58	37.40	92.56	27.71
T_5	78.33	29.34	38.45	93.59	28.07
T_6	79.33	29.11	39.34	94.94	28.46
T_7	80.00	29.01	39.40	95.74	28.69
T_8	83.33	28.56	42.21	97.75	29.82
T_9	80.00	28.35	40.87	96.74	28.82
T_{10}	82.66	28.12	41.20	96.61	29.23
F test	S	S	S	S	S
SEd±	0.73	0.59	0.63	0.66	1.12
CD at 5%	0.36	0.32	0.35	0.37	1.89
CV	3.23	6.51	5.58	2.36	3.26

Table 2. Effect of different levels organic manure number of leaves, length of runners, spread of the runners of strawberry runners

Treatment	Numbers of runners 120 DAS	Number of leaves (DAY) 120DAS	Length of Runners (cm) 120 DAS	Spread of the runner plant (cm) 120 DAS
T_0	28	32	22.27	21.47
T_1	30	34	22.95	22.15
T_2	28	32	23.64	22.84
T_3	29	34	24.37	23.57
T_4	32	37	23.27	22.47
T_5	30	35	24.67	23.87
T_6	30	36	25.44	24.64
T_7	31	37	25.66	24.86
T_8	34	39	26.12	25.32
T_9	31	36	25.90	25.10
T_{10}	32	37	25.79	24.99
F test	S	S	S	S
SEd±	0.55	0.68	0.41	0.41
CD at 5%	0.3	0.37	0.22	0.22
CV	6.0	6.37	5.50	5.68

3.2.4 Spread of runners plant (cm)

The Maximum plant spread at 120 DAP was seen in T8, Soil +Vermicompost+ Poultry manure (2:1:1) , 25.32 cm respectively, closely followed by T9. Minimum plant spread was recorded in T0 control (21.47cm) respectively.

4. CONCLUSION

On the basis of present investigation it is concluded that, treatment T_8 (soil+ vermicompost+ poultry manure) (2:1:1) perform best in terms of runners growth and development of strawberry under semi automated polyhouse condition.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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