***Schinus molle* Leaves Compost Improves the Growth, Quality and Productivity of Strawberry (*Fragaria* × *Ananassa* Duch) in Potting Culture**

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Abstract: *Schinus molle* leaves, compost (SLC) incorporated with soil at different volume rates contrasted with control (soil alone), intending to improve and stimulating strawberry growth. Anecdotal accounts of SLC for these purposes the experiment has examined the impacts of SLC on strawberry growth and production responses. This research assessed the impacts of a six volume% (v: v) rates of SLC combined with soil at 0, 20, 40, 60, 80 and 100 of growing medium (field soil). The pots RCBD experiment included four replicates designed at the faculty of agriculture, Sana'a University. Plants cultivated in 20% SLC was significantly ($p < 0.05$) greater than control (field soil) in leaf area, yield, fruit weight and crown DM% by about 12.8% 25.8%, 20.4% and 101.6% subsequently. Meanwhile, transplants grown in 80 and 100% SLC developed the highest quantity of crowns and longer of peduncle. Transplants grown in 60% SLC was the poorest of flower number per plant measured with other treatments. Plants in 100% SLC showed the significantly downer of a DM% in the roots and crown parts 65.3% and 82.7% lower than control, respectively, nevertheless, composed the significantly greater 50.4% of fruit TSS than the control treatment. The variation between the SLC rates on the root characters showed that the 100% SLC increased the roots network volume cm³, root length cm² root surface area cm², specific root length cm. This study illustrates the benefit of that application SLC.

1 Introduction

Cultivated Strawberry, *Fragaria* × *ananassa* Duch, is a member of the Rosaceae family. It is grown all over the world in about half world countries covering sub-tropical, temperate and high tropical regions [11-12]. According to [11], global strawberry production has increased over the last 50 years. The total estimated global production in 2017 is 9,223,815 tonnes with an area of cultivation of about 395,844 hectares. The economic importance of strawberries lies in the fruit portion. Occupies a special place in the list of food preferences, and widely consumed in the human diet because of its distinctive taste and flavour. It has also attracted much attention because of its ability to provide the benefits of human health. It contains a large amount of nutrients, vitamins, and sugars. Strawberry fruit is consumed either as fresh fruit or packaged as a jam or juice for drinks. Moreover, strawberry fruit is one of the most important fruits in the food industry. It is a component of cakes, yoghurt, and ice cream.

There is a diverse system of growing strawberry, which be groped in a mine-drag system, a matted row and a soil less culture. Potting culture or contender is a mine system in urban culture, which the medium plays an important role in the growth and productivity of strawberry. In addition, compost can have beneficial effects on strawberry production and these benefits can be based on the type of

fertilizer used [14]. Its effect on the quality of fruits such as flavonoids, anthocyanins, soluble solids contain (SSC), antacid acid (TA), fructose, glucose, sucrose, malic acid, citric acid. In addition, it is effect on yield, production curves and absorption of mineral elements, soil salinity, plant formation, soil nitrate, soil microbial activity, and soil pH [14], [22], [13], [17], [21].

In general, different medium habits such as peat, coarse cork, coconut fiber, municipal solid waste, cow manure, spent mushrooms, yard residues, and ferment compost had studied. Moreover, significant impacts on yield were probable to occur when environmental conditions and management practices were less than ideal or organic compost not routinely added [14].

Meanwhile, the dropped leaf of *Schinus molle* tree is widely appearing in the Yemen and neutrally composting under the tree. In it, maybe promote as local cheap organic growing medium. Therefore, the aim of this study was to evaluate the different percentage of *Schinus molle* leaves, compost on growth and yield of strawberry.

2 Materials and Methods

2.1 Composting Procedure and Maturation Time

Fallen dry leaves of *Schinus molle* decomposed, and maturation naturally under the tree for over two years, collected and cleaned from any plankton. The decomposed leave washed with water, then placed in black plastic bags and closed with one third of the bag left air. The compost was flipped tree time. After two weeks, the compost distributed for solar sterilization. The compost applied after a month.

2.2 Experimental layout

The RCBD experimental pots were six treatments and four replicates for a total 24 experimental units, Twelve seedlings in every unit experiment, which forty-eight seedlings for every treatment. The experiment carried out April 2016 to July 2017 on faculty of Agriculture – Sana'a University, Yemen, latitude 4°28'6.75"N and longitude 101°23'6.83"E at an altitude of 2,700 m. The maximum daily temperatures at the site vary from 26 to 32 °C, while the minimum daily temperatures range from 15 to 20 °C. Fortuna strawberry cultivar acquired from Egypt, frigo plantlets were growing in the field on July 2016 and some plant lets manufactured runner. At the end of November 2016, the rooted plantlets runner cuttings obtained from the adult plants with about 3.5 leaf stags were using in this examine, (BBCH-identification keys of strawberry: '13 or 14' 3rd or 4rd leaf unfolded) [10]. Plant grown in plastic pots (15cm diameter × 11cm depth) containing mixed growing medium according to the treatments. Growing medium contain different volume rate% (v:v) of *Schinus molle* leaf compost (SLC): field soil. Control treatments (T0) = 100% field soil. T1=20% compost + 80% field soil. T2= 40 % compost + 60 % field soil. T3= 60 % compost + 40% field soil. T4= 80 % compost + 20% field soil. T6= 100% compost. Potted plants grown under protected plastic-house covered with a polyethylene plastic sheet and pillared with white net. Irrigation was every 2 days, and the weekly fertilized. Growing media properties are in the Table 1

Table 1 Growing media properties

Compost % (v : v)	0	20	40	60	80	100
EC (ds/m)	0.6	1.0	1.7	1.8	3.7	4.0
TDC (mg/L)	384	627	1,088	1,152	2,336	2,560
TSS(mmol/L)	6	10	17	18	37	40

Electrical conductivity (EC) measured by using an EC-meter. pH measured by using a portable pH-meter, Total dissolved solids ((TDC (mg/L)) = (EC* 640). Total soluble salt ((TSS(mmol/L)) = (EC*10).

2.3 Relative Growth and Yield Parameters

Number of leave and flowers recorded weekly. Number and weight of fruit recorded every two days. Petiole length recorded after five months of experiment begin. The number and length of the peduncle and crown diameter recorded at the end of the experiment. The fruit TSS % was recorded using a hand Refractometer.

The absolute growth rate in number (AGRN) of leaf and flowers per plant per day calculated according to the following equation:

$$\text{AGRN} = (N_2 - N_1) / (t_2 - t_1),$$

Where;

N = number of leaf or flower at the first day (N1) and second day (N2),

t = the time (day), day1 (t1), day2 (t2).

2.4 Chlorophyll Content mg/g

Chlorophyll was recorded by using SPAD 502 chlorophyll meters. The chlorophyll was determined by using those equations according to [24], chlorophyll A = $-0.27 + 0.05x$, chlorophyll B = $0.04 + 0.013x$, and Total chlorophyll = $0.24 + 0.062x$.

After a five months of experiment occur, two plant samples chosen carelessly from the pots of each unit experiment (replicate for every treatment). Those samples operated to measure leaf area index ($\text{cm}^2\text{-leaf}$), Dry Matter and Root Characteristics.

2.5 Root Characteristics

After fresh weight, the washed roots immersed and spread out in a 50×35 cm square white plastic sheet. The whole plant organism photographed with a mobile digital camera (Samsung Not II) (Figure 1a). JPEG format photographs were transferred to the laptop, then cropped, scaled (Figure 2b), and blacked background by Photoshop software (Figure 1c). Images processed with GiARoots software (Georgia Tech Research Corporation and Duke University, USA) to acquire a Gray and threshold images (Figure 1d and 1e) for measuring the root characteristics (network volume cm^3 , length cm^2 , surface area cm^2 , specific root length cm^2 and network depth cm).

Figure 1. From The Left (a) Original Image (b) Cropped Image, (c) Enhancement Image via Photoshop Software, (d) Gray Images and (e) Thresholding Global Image.

2.6 Dry Matter Parameters

After photographed, the plants divided into the leaf blade, petiole, crown and roots organs. Each part of the plant was freshly weighted, then, the leaf blade and petiole used to measure the leaf area and petiole length. Samples dried under room temperature to reach the stable weight. Dry matter calculated using the following formula:

$$\text{Dry matter (DM)\%} = (\text{dry weight}) / (\text{fresh weight}) \times 100 \quad (\text{Al-madhagi } et al., 2011)$$

2.7 Leaf area index (cm²/leaf)

After fresh weight, the leaves running to measure the leaf area index (cm²-leaf) by recorded the height and width of its individual leaflets of all leaves of each plant. The leaves parted into its individual leaflets and order in a labeled square white plastic sheet 50 × 35 cm. Leaves photographed with a mobile digital camera (Samsung Not II) (Figure 1a) and Jpeg format photographs transferred to the laptop for future processing. Images processed first with Photoshop software to blacked background and saved at 200 resolutions after corrected the size according to calibration ruler (Figure 2b). The images analysed for leaflets area (cm²), height, and width (cm) employing the Tomato Analyser 3.0 program (Figure 1c) (http://oardc.osu.edu/vanderknaap/tomato_analyzer.htm). The individual leaf area determined from summation the area of its leaflets. The liner regression equation for leaflet calculated using excel office software $Y = 0.283x + 5.101$ ($R^2 = 0.955$), where Y: leaf area and x = leaflets Length

Figure 2. Original Image (a) Enhanced Image via Photoshop Software (b) and image measured by Tomato Analyzer 3.0 program (c)

2.8 Data Statistical Analysis

The data was statistically analysed as a randomized completely block design with four replicates in one-way ANOVA (Analysis of Variance). The least significant difference (LSD $_{0.05}$) used to determine the significant difference between the means, by using the PC GenStat.12.1 software. Pearson correlation made (2-tailed) between the parameters using the IBM SPSS 21 program.

2.9 Results

There is a deviation between the treatments in Table 2, 3 and 4. Plants that flourish on growing medium have 20% of SLC had an important higher ($p < 0.05$) than control (field soil only) in the leaf

area, yield, fruit weight and DM% on the crown part by 12.8% 25.8%, 20.4% and 101.6%, respectively. Plants that grow on medium contain 80% and 100% SLC produces the greatest number of crowns, with 99% as measured to those plants grown in control treatment. It recorded longer peduncle from plants grow in 100% SLC, where they differ significant only with those plants growing in the medium containing 80% (Table 3). It observed largest number of the flower from the plant grown in the medium at 20, 80 and 100% of SLC compost. There was no meaningful difference found between the treatments on petiole length.

Addition of compost on the medium showed a significant variation in growth rate, the number of final leaves (Figure 3), and absolute weekly growth curve (Figure 2). The biggest controversy was from the sixth week (Figure 4), and no considerable difference calculated in the earlier of 6-weeks. Medium with mature compost (100%) has a vital rise in the quantity of leaves contrasted with control (Table 2).

The number of flower^{-plants-week} appeared to step up sharply during flowers stage (Figure 5). Meanwhile, the absolute weekly growth rate curve in flower^{-plant-day} occurred to increase in first 50 days from beginning of flowering stage and then decreased to up rise again in 119 days (Figure 6). The absolute curve of the flower^{-plant-day}, was ranges from 0.2 to 0.6 flower^{-plant-day} (Figure 6). Total number of flower per plant was gauge lower in plants grown in 40% and 60% of SLC compost, with a decrease of 42.33% and 41.2% compared to control treatment, respectively (Table 3).

The effect of compost on fruit quality is in Table 3. At medium with mature compost (100%), plants produced much greater 50.4% TSS than that fruits got from control treatment. Fruit TSS significant associated with the leaf number ($r^2 = 0.652$, $P < 0.05$) (Figure 7f). Compared with control, all treatments significant increased the level of fruit pH except in the fruit harvested from plants grown in 60% and 80% of SLC compost. Compared with control, too, each SLC compost treatments significant increased the level of EC on fruits except the fruit harvested of plants grown in medium containing 20% SLC. All SLC treatments significant increased the leaves chlorophyll (Total, A and B) except leaves of 100% SLC compost (Table 2).

The diversity among the level of compost on the dry matter (DM%) is showing in Table 4. Among all treatments, the highest accumulative DM% on the roots and crowns were obtained when SLC added to the medium at 60%. but, at 100% of SLC compost created significant lower DM% than control, with a diminishing of 65.3% on the root and 82.7% in crown parts, but fashioned the highest DM% in the peduncle part. Where, it recorded the lowest peduncle DM% from plants grew at 40% SLC. There were no significant differences between all treatments and control on the DM % of petiole and lamina parts.

The effect of SCL composts on strawberry root characters grown in a pot experiment showed that the medium with 100% SLC compost significantly give the highest value of the network volume cm³ 675.75 %, network length cm² 309.76% longer specified cm² 203.2% and Network Surface Area cm² root compared with control treatment. At the same time, the highest network depth cm was obtained from plants grown in 60% SLC, which was 174.27% higher than that obtained with control-treated compost (Table 5).

3 Discussion

Compost used in production because it improves the nature and structure of the soil, and increases useful living organisms [5]. These organic sources have a significant impact on yield and quality [7]. In organic farming, and organic fertilisers extracts used to improve soil fertility and control of pests and diseases. In the current study, used 20% of SLC compost was the greatest in almost parameter. Where, taken comparable direction with the previous suggestion for different composts with varies plants like studied from [16], [9], [20]. [18] recommended content of 10-20% compost in potting mixtures.

Soil in Yemen is high in PH value, which averages about 8.2. Meanwhile, soil pH of 6.0 to 6.5 has recommended for strawberry [6]. Organic compost changes pH values, electrical conductivity, and total water retention capacity. With enhanced nutrient uptake of plants [15], [1]. The difference in compost ratios in the parameters may be because of the levels available from the nutrition and air level: H₂O capacity in the growing medium. In which effect on the vegetative and roots growth and productivity of strawberry. Iron deficiency reflected and corrected in plants grow on medium containing 80% and 100% compost.

Electrical conductivity levels increased with compost additions, where take same direction with [14-15].

Results showed that adding compost to soil was better than used soil or organic compost alone in almost parameters as yield, chlorophyll, average fruit weight and fruit quality. The greatest different observed on fruit pH and fruit EC. This because the soil provided a metal element, the compost reinforced soil structure, and its effect on absorption of mineral elements. The yield increase may be because of an increase in leaf area with a positive correlation about $r^2 = 0.517$ at $p < 0.01$ (Figure 7c). Relative to that, Tomato seedling was much better growth of leaves and chlorophyll content in the 50%compost mixture of plant leave, straw and chicken manure than Soil field + 10% sand [8].

Medium at 100% of compost increased TSS fruit. This was because of an increased number of leaves, with a positive correlation of about $r^2 = 0.652$ at $P < 0.05$ (Fig. 7f). In it, the leaf function produces carbohydrates during photosynthesis. [13] discovered that solid organic waste effect mineral elements absorption and quality of strawberry fruit. Composts provided counterpart amounts of plant essential nutrients without increasing concentrate of trace elements in soils and tissues [23]. The supplement compost regardless of the type or method of adding improves the fruit quality. earlier studies support these findings are the study by [17] where reported that there was a significant different between open and closed systems in cork and coconut fibre for TSS, SS and SS/TA ratio compared with those of traditional cultivation. In addition, [22]disclosed that fruit from plants grown in compost socks had higher in soluble solids contain and titratable acidity (TA) than fruit produced in the black plastic mulch or matted row systems. [19] found that the using Azotobacter at 7 kg/ha + vermin-compost at 30 ton/ha increased vegetative, flowering, yield of strawberry. That could explain the reason of compost enhanced the growth and development of strawberry

Medium with 60% compost provided the highest level of DM% and the lowest value of fruit weight. At 100% compost, plants produced the relatively lower of DM% on root and crown parts, and provided the significantly higher of fruit TSS. Imposing DM% and carbohydrate growth through vegetative growth, flowering and fruiting stages is a proper effect on growrh, development, yield and quality of strawberry [2].

Relative to that, the DM% crown is significantly and positively ($P<0.01$) correlated with root DM% ($r^2= 0.559$) (Figure 7e). The level of DM% at petiole gave a positive correlation ($P<0.05$) of 0.604 and 0.593 with Fruit TSS and EC respectively (Figure 7 a and b). Besides, [2], noticed that, in Camarosa cv, the level of sucrose at petiole negatively correlated ($r^2 = -0.442$, $P<0.05$) with the dry matter in the root part. That may explain the effect of compost on fruit quality, by virtue of the affected of dry matter.

The Effect of medium on DM% is due to its lowest water capacity, causing a water stress on plants. [9] settled that the grape marc compost with a rate higher than 50% the mixture with soil encourage the reduction of the quantity, length, width and weight of lettuce leaves, increased dry matter and total soluble solids content. The plant biomass of tomato seedlings found to have decreased with the increase in the compost rate of mixed waste processing of rose oil, discrete dairy residues, poultry manure and straw [16].

A new crowns number and roots character was steeper with a ratio greater than 60% of SLC. In fact, the soil structure, air capability, total ability to retain water and nitrogen level are factors affects the vegetative and roots growth of strawberry, which effect in quality and quantity of fruit. Root growth reported to be associated with the increasing ratio of grape marc compost [9]. Vigorous and rooted of Chandler and Camarosa cultivars was vaster in peat-grown and plug more than that cultivated in perlite alone or in mixing with peat or sand in the rooting unit [16].

Author Contributions

The both author's contributions in this research, the first author: ISAM AL-MADHAGI was contributions on methodology: design the experiment, supervision, root characters, leaf area, dry matter, and software analysis. The second author contributed under guidance of first author on calculate the data of the flower, the number of leaf and fruit harvest. Fruit quality worked out by the both authors. Data organized, analysed and writing done by first author ISAM AL-MADHAGI.

Conflicts of Interest

“The authors declare no conflict of interest.”

Table 2. The Effect of *Schinus molle* Leaf Compost (SLC) on Strawberry Vegetative Growth and Chlorophyll contains

Compost % (v:v)	Leaf area Index (cm ²)	N. Crown	Petiole length (cm)	Crown Diameter	Chlorophyll A	Chlorophyll B	Total Chlorophyll
0	26.39±2.12 ^{bc}	0.16±0.08 ^b	6.43±0.5	1.15±0.26 ^b	2.13±0.05 ^b	0.67±0.01 ^b	3.22±0.07 ^b
20	30.25± 1.07 ^a	0.6±0.25 ^b	6.77±0.27	2.32±0.36 ^a	2.40±0.02 ^a	0.73±0.006 ^a	3.55±0.03 ^a
40	29.18±1.9 ^{ab}	0.7±0.49 ^b	6.27±0.6	1.12±0.05 ^b	2.42±0.02 ^a	0.74±0.005 ^a	3.58±0.02 ^a
60	25.25±0.6 ^c	0.7±0.25 ^b	6.13±0.7	1.64±0.53 ^b	2.41±0.03 ^a	0.74±0.009 ^a	3.56±0.04 ^a
80	26.39±0.5 ^{bc}	1.66±0.16 ^a	6.6±0.4	1.56±0.28 ^b	2.43±0.4 ^a	0.74±0.1 ^a	3.57±0.6 ^a
100	27.48±0.8 ^{abc}	1.68±0.28 ^a	6.92±0.16	1.25±0.05 ^b	2.2±0.3 ^b	0.68±0.09 ^b	3.30±0.4 ^b
LSD ^{0.05}	3.329	1.043	no	0.6638	0.088	0.023	0.1108

The means with Standard error of mean (SEM) from four replicate. Different letters in the same column indicate significant differences ($P<0.05$) (Fisher's least significant difference test).

Table 3. The Effect of *Schinus Molle* Leaf Compost (SLC) on Strawberry Flowering and Fruiting Growth

Compost % (v:v)	Flower Number	Length of peduncle	Peduncle Number	Marketable Yield (g/plant)	Fruit weight (g/fruit)	Fruit pH	Fruit TSS	Fruit EC
0	39.45 ± 3.6 ^a	8.84 ± 0.9 ^{ab}	3.53 ± 0.28 ^b	75.97 ± 9.4 ^b	8.75 ± 0.5 ^b	2.98 ± 0.02 ^d	6.2 ± 0.1 ^b	84.3 ± 0.6 ^d
20	35.6 ± 0.8 ^a	9.5 ± 1.04 ^{ab}	8.99 ± 0.86 ^a	102.39 ± 5.6 ^a	11.0 ± 0.6 ^a	4.37 ± 0.02 ^a	7.15 ± 0.5 ^b	97.8 ± 9.5 ^{cd}
40	23.2 ± 3.7 ^b	9.35 ± 0.2 ^{ab}	3.03 ± 0.88 ^b	58.65 ± 16.9 ^{bc}	8.07 ± 0.3 ^b	3.46 ± 0.06 ^b	7.08 ± 0.5 ^b	115 ± 2.3 ^b
60	22.75 ± 5.1 ^b	6.02 ± 1.59 ^b	2.83 ± 0.28 ^b	53.7 ± 7.2 ^c	8.10 ± 0.8 ^b	3.13 ± 0.03 ^{cd}	6.99 ± 0.2 ^b	133.8 ± 0.5 ^a
80	35.55 ± 5.7 ^a	7.6 ± 1.3 ^b	7.06 ± 1.08 ^a	73.8 ± 8.2 ^{bc}	7.71 ± 0.4 ^b	2.83 ± 0.06 ^e	7.06 ± 0.5 ^b	103.3 ± 1.9 ^{bc}
100	30.95 ± 2.13 ^{ab}	12.45 ± 0.9 ^a	7.94 ± 1.5 ^a	54.64 ± 11.1 ^c	7.58 ± 0.5 ^b	3.25 ± 0.08 ^{bc}	12.29 ± 0.2 ^a	144.2 ± 0.7 ^a
LSD ^{0.05}	10.979	3.65	3.076	21.011	1.721	0.232	1.652	15.991

The means with Standard error of mean (SEM) from four replicate. Different letters in the same column indicate significant differences ($P < 0.05$) (Fisher's least significant difference test).

Table 4. The Effect of *Schinus Molle* Leaf Compost (SLC) on Percentage of Dry Matter

Compost % (v : v)	Root DM%	Crown DM%	Petiole DM%	Leaf blade DM%	Peduncle DM%
0	36.4 ± 4.7 ^a	31.89 ± 1.8 ^{ab}	17.35 ± 0.17	27.33 ± 0.69	19.63 ± 4.17 ^{ab}
20	41.88 ± 2.2 ^a	29.42 ± 1.3 ^{abc}	14.27 ± 1.38	26.65 ± 0.83	15.28 ± 2.05 ^{bc}
40	35.65 ± 3.6 ^a	30.82 ± 1.5 ^{ab}	17.57 ± 4.56	28.85 ± 4.35	12.93 ± 8.74 ^c
60	38.23 ± 2.9 ^a	33.28 ± 0.72 ^a	15.26 ± 0.76	27.19 ± 0.94	20.54 ± 1.474 ^a
80	31.54 ± 4.1 ^{ab}	28.78 ± 1.8 ^{bc}	17.43 ± 3.26	32.07 ± 2.45	15.08 ± 1.63 ^{bc}
100	23.78 ± 1.8 ^b	26.38 ± 0.3 ^c	15.51 ± 1.63	26.66 ± 1.81	20.23 ± 2.26 ^a
LSD ^{0.05}	10.801	4.23	no	no	4.797

The means with Standard error of mean (SEM) from four replicate. Any two means within a column not followed by the same letter are significantly different at $P > 0.05$ using analysis of variance standard and least significantly different (LSD 0.05).

Table 5. The Effect of *Schinus Molle* Leaf Compost (SLC) on Strawberry Root Characters

Compost % (v : v)	Network Volume cm ³	Network Length cm ²	Network Surface Area cm ²	Specific Root Length cm ²	Network Depth cm
0	17.61 ± 7.42 ^c	89.1 ± 26.09 ^b	82.9 ± 21.36 ^d	8.70 ± 0.69 ^b	8.63 ± 0.91 ^c
20	17.73 ± 0.07 ^c	243.2 ± 30.84 ^a	159.7 ± 47.34 ^{cd}	17.62 ± 2.62 ^a	13.81 ± 0.61 ^{ab}
40	33.38 ± 8.49 ^{bc}	226.3 ± 6.80 ^a	136.7 ± 21.23 ^d	10.86 ± 0.41 ^b	9.61 ± 1.32 ^{bc}
60	43.99 ± 0.75 ^{bc}	300.3 ± 4.48 ^a	245.2 ± 1.35 ^{bc}	8.15 ± 0.63 ^b	15.04 ± 2.15 ^a
80	80.79 ± 14.81 ^{ab}	252.4 ± 18.43 ^a	345.4 ± 28.76 ^a	10.92 ± 0.13 ^b	13.88 ± 2.09 ^{ab}
100	119.98 ± 41.13 ^a	276.4 ± 42.11 ^a	314.8 ± 10.50 ^{ab}	17.68 ± 0.23 ^a	9.68 ± 0.29 ^{bc}
LSD ^{0.05}	56.214	90.845	91.602	2.820	4.543

The means with Standard error of mean (SEM) from four replicate. Different letters in the same column indicate significant differences ($P < 0.05$) (Fisher's least significant difference test).

Figure 3. Logistic weakly growth curve fitted in leaves number per plant of strawberry growing in media content different level of *Schinus molle* leaf compost (SLC)

Figure 4. Instantaneous Absolute weakly growth rate curve in leaves number per plant per day of strawberry growing in the media content different level of *Schinus molle* leaf compost(SLC)

*Leaf number (calculated as all numbers of dead and survive leaves)

Figure 5. Logistic weekly growth curve fitted in flower number per plant of strawberry growing in media content different level of *Schinus molle* leaf compost (SLC)
*flower number (calculated as fully flower opening)

Figure 6. Instantaneous absolute weekly growth rate curve in flower number per plant of strawberry growing in the media content different level of *Schinus molle* leaf compost (SLC)

Figure 7. Correlation between parameters of strawberry. Means from the four replicates. One star (*) = Correlation is significant at the $p=0.05$ level (2-tailed t test). Two stars (**) = Correlation is significant at the 0.01 level (2-tailed)

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