International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(5): 1316-1322

Received: 04-07-2019
Accepted: 08-08-2019

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Growth and development dynamics of Guava cv. L – 49 plants under consortium of vermicompost and phosphorus solubilizing bacteria

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Abstract
A field experiment entitled ''Effect of Vermicompost and Phosphorus Solubilizing Bacteria (PSB) on Growth and Development of Guava cv. L - 49'' was conducted during the year 2018-19, at the Fruit Instructional Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalawar. The experiment consisted of different treatments of vermicompost and PSB and was laid out in Randomized Block Design. Amongst different treatments application, treatment T_{17} (7.5 kg vermicompost + 50 g PSB per plant application was found significantly superior over other treatments in terms of growth and development parameters such as per cent increase in plant height, rootstock girth, scion girth, number of shoots/plant, number of nodes/plant. T_{17} treatment has also exhibited better results in enhancing the organic carbon percentage, available N, P and K content of soil status and was found significantly superior over other treatments. Like-wise, soil pH and electrical conductivity also reduced significantly under T_{17} treatment as compared traits to other treatments. Overall, T_{17} treatment exhibited better plant growth and development combinations and improvement in soil health of guava cv. L - 49 plants as compared to other treatment of vermicompost and PSB.

Keywords: Guava, vermicompost, PSB, growth and development

Introduction
Guava (*Psidium guajava* L.) is one of the most important top-rated tropical fruit rich in high profile nutrients and commercially cultivated fruit crop belonging to the family Myrtaceae. It is one of the commonest available fruits liked by the all section of society as a table fruit and is known as "apple of the tropics". Guava is believed to have originated in tropical America and it was introduced in India by the Portuguese during 17th century. It is the fifth most widely grown fruit crop of India. It is one of the hardiest fruit trees, adaptable to a wide range of soil and climate conditions. It is one of the hardiest among all the fruits in productivity, adaptability under diverse agro-climatic conditions, well known for its plethora of nutritional quality and hence aptly known as "Poor man's apple". Guava is classified taxonomically under genus *Psidium*, which consists of 150 species but only *Psidium guajava* has been exploited worldwide commercially. Guava is cultivated in tropical and subtropical parts of several countries including India, China, Thailand, Mexico and Brazil etc. Guava fruit is a powerhouse of nutraceuticals. The guava is shallow rooted shrub or small tree of spreading nature. It grows 3-10 meter in height. It produces sylleptic branches near to ground and often produces suckers from roots near base of trunk. It is long lived and hardy tree. The bark is smooth, greyish or reddish brown, peeling off in the flakes. Leaves are simple, opposite in pairs, elliptical to oblong. The upper surface of leaves is glabrous and finely pubescent beneath. Fruit bearing occurs in the leafaxils of current season shoots. Flowers are axillary, solitary and occur in 2-3 flowered cymes. Fruit is a berry, globose, ovoid or pyriform. The skin colour at maturity stage is pale green to yellow, mesocarp fleshy of varying thickness, white yellow, pink or red seeds are usually embedded in cavity of pulp as per identified colour of variety. Each fruit contains numerous tiny, Semi – hard edible seeds concentrated especially at its center within the core position. Guava fruit has pleasantly sweet and refreshingly acidic in flavor and emits sweet aroma. Guava fruit helps in reduction of high blood pressure, constipation, respiratory, disorders, and hyper cholesterolemia. The humble fruit is an excellent source of ascorbic acid three times higher than citrus fruits,

but has low energy (66 cal/100g), protein (1%) and has 17% dry matter and 83% moisture. The fruit is also rich in minerals like phosphorous (24 - 37 mg/100 g), calcium (14 - 30 mg/100 g) and iron (0.6 - 1.4 mg/100g). Guava contains nutrients that promote wellness to cure illnesses and facilitates better bowel movement cancer and diabetes. Its vitamin A content is five times more than that of orange. Integration of organic manures with mineral fertilizers can have positive effect on the physical, microbiological and chemical properties of soil in order to develop strong framework *i.e.* root shoot ratio during gestation period which is indirectly responsible for supporting growth and development of plants. (Adak *et al*., 2012) [1].

Materials and Methods

The experimental entitled ‘‘Effect of Vermicompost and Phosphorus Solubilizing Bacteria (PSB) on Growth and Development of Guava cv. L - 49’’ was conducted during the year 2017-18, at the Fruit Instructional Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalawar. The application of vermicompost and PSB treatments were applied during second fortnight week of June, 2018 with the help of spade after thorough mixing in the active root zone of two year old plants. The treatments combinations were:

T_0 Control (RDF)
T_1 Vermicompost 2.5 kg
T_2 Vermicompost 5 kg
T_3 Vermicompost 7.5 kg
T_4 PSB 25 g
T_5 PSB 50 g
T_6 PSB 75 g
T_7 PSB 100 g
T_8 Vermicompost 2. 5 kg + PSB 25 g
T_9 Vermicompost 2. 5 kg + PSB 50 g
T_{10} Vermicompost 2. 5 + PSB 75 g
T_{11} Vermicompost 2. 5 kg + PSB 100
T_{12} Vermicompost 5 kg + PSB 25 g
T_{13} Vermicompost 5 kg + PSB 50 g
T_{14} Vermicompost 5 kg + PSB 75 g
T_{15} Vermicompost 5 kg + PSB 100 g
T_{16} Vermicompost 7. 5 kg + PSB 25 g
T_{17} Vermicompost 7. 5 kg + PSB 50 g
T_{18} Vermicompost 7. 5 kg + PSB 75 g
T_{19} Vermicompost 7. 5 kg + PSB 100 g

The experiment was laid down in randomized block design with three replications. Soil physico - chemical parameters including soil pH, electrical conductivity (dSm^{-1}), organic carbon (%) and available NPK (kg ha^{-1}) were recorded at initiation of experiment and after completion of experiment. Soil pH was determined by using glass electrode pH meter (Jackson, 1973 (5) [10], electrical conductivity of soil by using standard precision conductivity bridge (Jackson, 1973 (5) [10], organic carbon content by Walkley and Black, 1934 (15) [26] wet digestion method, available Nitrogen (kg/ha) by using alkaline Potassium Permanganate method (Subbiah and Asija, 1956) [24], available soil Phosphorus (kg/ha) by Olsen *et al.*, 1954 (9) [15], available Potassium (kg/ha) by Flame Photometer (Metson, 1956) [14]. The data obtained during the experiment were subjected to statistical analysis using Fisher’s analysis of variance technique.

The present investigations were undertaken at Fruit Instructional Farm, College of Horticulture and Forestry, Jhalawar on two year old plants of guava cv. L - 49 planted at spacing of 6 X 6 meter under square system of planting. The total number of plants included in the experiment was 100. All the selected guava plants were selected on the basis of desired uniformity in growth and vigour. All the treatments were applied in second fortnight week of June, 2018. In T_0 treatment RDF (Recommended Dose of Fertilizers) was applied and in other treatments (T_1 to T_{19} treatment) dosages were given in canopy area to individual guava plants per replication. The best quality vermicompost and phosphorus solubilizing bacteria (PSB) selected and procured from Krishi Vigyan Kendra, Jhalawar and Mehin Total Chemical Private Limited, Mansa (Punjab), respectively for the purpose of research experiment. Observations on growth and development parameters such as per cent increase in plant height, rootstock girth, scion girth, number of shoots per plant and number of nodes per shoot in guava cv. L - 49 plants were recorded at monthly intervals from July 2018 to December 2018. The plant growth data observations were recorded at the end of every month (July - December).

Results and Discussion

The phenomenal plant growth attributes including plant height rootstock and scion girth, number of shoots per plant, number of nodes per plant, and their cumulative percentage increase as growth progression are elucidated and discussed under suitable sub headings. Plant growth: The observations pertaining to cumulative growth progression in plant height are given in Table 1. The results obtained under present investigations are presented and discussed under in suitable sub headings.

1. Plant height (%)

The data on percentage increment in guava cv. L - 49 plants under different vermicompost and PSB treatments application during study period are given in Table 1.The maximal percentage increase (8.93 %) of plant height during December, 2018 was found in T_{17} treatment (Vermicompost 7.5 kg + PSB 50 g) and was found significantly high as compared to other treatments. It may be attributed to the fact that Vermicompost and PSB consortium have their role in improving the physical conditions of the soil with concomitant increase in organic matter as well as chemical properties of the soil such as increase in the available N, P, K content. It may also be due to proliferation in beneficial microbial community which might improved soil fertility through acceleration of various soil processes viz. decomposition, mineralization and storage as well as release of nutrients. The fortification of PSB @ 50g/plant perhaps enhanced availability of P to plants by making available beneficial microorganisms which helped in mineralizing organic P in soil and thereby solubilizing precipitated phosphates (Chen *et al.*, 2006) [4]. The results of present findings are in accordance with those of Kumar *et al.*, 2017 [12] in guava cv. Lalit, Singh *et al.*, 2011 [22] in guava cv. Allahabad Safeda, Shukla et *al.*, 2014 [21] in guava, Bhatnagar and Singh, 2015 [3] in custard apple cv. Arka Sahan and Dwivedi et *al.*, 2018 [16] in guava cv. Allahabad Safeda.

2. Rootstock girth and scion girth (%)

The data on percentage increment in rootstock girth and scion girth in guava cv. L - 49 plants under different vermicompost and PSB treatments application during study period are presented in Table 2 and 3, respectively. The maximum overall percentage increase in rootstock girth (7.67 %) and scion girth (7.88 %) during December 2018 was found in T_{17}

treatment (Vermicompost 7.5 kg + PSB 50 g) in L – 49 cultivar. This might be contributed to better nitrogen fixation in soil, ability of vermicompost to work as a slow release fertilizer, production of phytohormone substances and increased uptake of nutrients particularly nitrogen and phosphorus as a result of bioorganic fertilizer application comprising Vermicompost and PSB under the rhizosphere of guava plants. The better scion girth might also be attributed to high rate of nitrogen mineralization with increase in the number of roots thereby stimulating the plant ability to scavenge enhanced nutrients from Vermicompost and PSB incorporation in the soil for growth and development. The present results are in consonance to finding of increase in rootstock girth and scion girth as reported by Baksh et *al.*, 2008 in guava cv. Sardar, Jain et *al.*, 2012 [11] in Nagpur Mandarin, Godage et *al.*, 2013 [18] in guava cv. Allahabad Safeda, Bhatnagar and Singh, 2015 [3] in custard apple cv. Arka Sahan.

3. Number of shoots per plant (%)

The data on percentage increment in number of shoots per plant in guava cv. L - 49 under different vermicompost and PSB treatments application during study period are presented in Table 4. The highest per cent increase in number of shoots (69.23 %) per plant of guava cv. L - 49 was recorded in T_{17} treatment. It might be due to enhanced uptake of nutrients under combined application of 7.5 kg Vermicompost + 50 g PSB per plant which might augmented the available N, P, K status of the soil. The consortium of Vermicompost + PSB in T_{17} treatment probably enriched the soil by biological nitrogen fixation and perhaps acted as a source of energy (carbon) for its growth and development and might contributed to enhanced auxin synthesis particularly IAA in actively dividing meristematic region in juvenile in guava plants. The present results are in accordance to finding of increase in number of shoots per plant as reported by Tripathi *et al.*, 2015 in strawberry cv. Chandler, Sharma *et al.*, 2015 [19] in custard apple cv. Balanagar, Sharma *et al.*, 2016 [10] in custard apple cv. Raidurg, Pareek *et al.*, 2017 [16], in Kinnow mandarin, Manjare *et al.*, 2018 in sapota cv. Kalipatti, Poonia *et al.*, 2018 [17] in mango cv. Kesar and Poonia *et al.*, 2018 [18] in mango cv. Dashehari.

4. Number of nodes per plant (%)

The data on percentage increment in number of nodes per plant in guava cv. L - 49 under different Vermicompost and PSB treatments application during study period are exhibited in Table 5. The maximum per cent increase in number of nodes (52.90 %) per plant of guava cv. L - 49 was recorded in T_{17} treatment (7.5 kg Vermicompost + 50 g PSB). It might be attributed to applied Vermicompost and PSB as well as gene environment interaction. Vermicompost improves beneficial microbial distribution and moisture retention capacity in soil both on volume and weight basis that results in greater enzymatic (phosphatase and urease) activities which might improve the growth parameters. The present results are in accordance to finding by Poonia *et al.*, 2018 [18] in mango cv. Dashehari and Poonia *et al.*, 2018 [18] in mango cv. Kesar.

5. Soil parameters

The prime role of Vermicompost as a soil conditions and PSB application is to improve the soil quality as well as promoting the plant growth and development while sustaining natural resources. The plant growth is most obvious characteristic for evaluation the effect of PSB. The results showed the positive influence of combination of Vermicompost and PSB in plant growth attributes as well as available N, and K content of rhizosphere soil. The data on soil physico-chemical properties in guava cv. L - 49 orchard soils are presented in Table 6. The data pertaining to the effect of Vermicompost + PSB treatments on soil physicochemical properties revealed that pH, electrical conductivity (EC) decrease and organic carbon (%), available N, P, K status was increased significantly under T_{17} treatment (Vermicompost 7.5 kg + PSB 50 g). PSB in consonance which Vermicompost improved the absorption and use of P by guava plants and contributes plant growth by producing hormones and cytokinins. Vermicompost has very high porosity, aeration, drainage and water holding capacity and strong retention of nutrients. The results of present findings are in accordance with those of Dutta and Kundu 2012 [5] in mango cv. Himsagar, Singha *et al.*, 2014 [23] in mango, Hadole *et al.*, 2015 [9] in Nagpur Mandarin, Dutta *et al.*, 2016 [6] in mango cv. Himsagar, Poonia *et al.*, 2018 [18] in mango cv. Dashehari and Poonia *et al.*, 2018 [17] in mango cv. Kesar.

Conclusion

The plant growth parameters study of guava cv. L - 49 under application of different vermicompost and PSB treatments revealed that application of T_{17} treatment (Vermicompost 7.5 kg + Phosphorus Solubilizing Bacteria (PSB) 50 g per plant got better results in terms of increment in plant growth parameters particularly plant height, rootstock girth, scion girth, number of shoots/plant, number of nodes/plant and improvement in soil health particularly reduction in soil pH, EC and enhancement of soil organic carbon and available N, P, K status of guava rhizosphere soil as compared to other treatments.

Table 1: Effect of Vermicompost and PSB on per cent increase in plant height (cm) of guava cv. L - 49 during growth period (July 2018 to December, 2018).

Treat.	July (%)	Aug. (%)	Sept. (%)	Oct. (%)	Nov. (%)	Dec. (%)
T_0	102.80 (1.14)	103.75 (2.08)	104.50 (2.81)	105.00 (3.31)	105.50 (3.80)	105.80 (4.09)
T_1	108.80 (1.78)	109.35 (2.29)	110.50 (3.37)	111.50 (4.30)	111.80 (4.58)	112.53 (5.27)
T_2	110.20 (1.89)	110.75 (2.29)	111.90 (3.46)	113.00 (4.47)	113.25 (4.71)	113.95 (5.35)
T_3	111.10 (1.98)	111.68 (2.52)	112.75 (3.50)	113.90 (4.55)	114.30 (4.92)	114.84 (5.42)
T_4	108.90 (1.17)	109.90 (2.10)	110.90 (3.03)	112.00 (4.05)	112.20 (4.24)	113.10 (5.07)
T_5	104.35 (1.21)	105.30 (2.13)	106.40 (3.20)	107.32 (4.09)	107.50 (4.27)	108.40 (5.14)
T_6	103.40 (1.25)	104.35 (2.18)	105.42 (3.23)	106.35 (4.14)	106.60 (4.39)	107.40 (5.17)
T_7	105.60 (1.34)	106.50 (2.21)	107.63 (3.29)	108.60 (4.22)	108.90 (4.51)	109.65 (5.23)
T_8	113.35 (2.09)	114.47 (3.10)	115.50 (4.03)	116.70 (5.11)	117.80 (6.10)	118.90 (7.09)
T_9	108.40 (2.17)	109.50 (3.20)	110.48 (4.13)	111.70 (5.28)	112.65 (6.17)	113.80 (7.26)
T_{10}	120.00 (2.21)	121.20 (3.24)	122.35 (4.22)	123.65 (5.32)	124.75 (6.26)	125.98 (7.31)
T_{11}	112.60 (2.36)	113.65 (3.32)	114.80 (4.36)	115.90 (5.36)	117.10 (6.36)	118.12 (7.38)
T_{12}	112.50 (2.46)	113.50 (3.37)	114.63 (4.40)	115.80 (5.46)	116.90 (6.47)	118.00 (7.47)

T_{13}	120.25 (2.60)	121.25 (3.46)	122.45 (4.48)	123.70 (5.55)	124.92 (6.59)	126.11 (7.60)
T_{14}	116.45 (2.69)	117.35 (3.48)	118.53 (4.52)	119.75 (5.60)	120.95 (6.66)	122.15 (7.72)
T_{15}	115.24 (2.71)	116.18 (3.55)	118.55 (4.59)	118.53 (5.64)	119.72 (6.70)	121.05 (7.89)
T_{16}	120.85 (2.76)	121.58 (3.38)	123.10 (4.68)	124.29 (5.69)	125.62 (6.82)	127.12 (8.10)
T_{17}	125.59 (2.94)	126.60 (3.77)	128.00 (4.92)	129.35 (6.02)	131.00 (7.38)	132.90 (8.93)
T_{18}	125.00 (2.80)	125.78 (3.44)	127.32 (4.70)	128.60 (5.76)	129.95 (6.87)	131.51 (8.15)
T_{19}	123.65 (2.87)	124.40 (3.49)	125.90 (4.74)	127.20 (5.82)	128.56 (6.96)	130.21 (8.33)
SEm (±)	1.70	1.75	1.76	1.67	1.65	1.69
CD (5%)	4.78	4.92	4.96	4.69	4.63	4.77

Table 2: Effect of Vermicompost and PSB on per cent increase in root stock girth (mm) of guava cv. L - 49 during growth period (July 2018 to Dec. 2018)

Treat.	July (%)	Aug. (%)	Sept. (%)	Oct. (%)	Nov. (%)	Dec. (%)
T_0	8.84 (1.03)	8.86 (1.26)	8.90 (1.71)	8.93 (2.06)	8.95 (2.29)	9.08 (3.77)
T_1	10.05 (1.52)	10.08 (1.82)	10.11 (2.12)	10.23 (3.33)	10.26 (3.64)	10.38 (4.85)
T_2	10.10 (1.61)	10.13 (1.91)	10.16 (2.21)	10.28 (3.42)	10.31 (3.72)	10.43 (4.93)
T_3	10.15 (1.70)	10.18 (2.00)	10.21 (2.30)	10.33 (3.51)	10.36 (3.81)	10.48 (5.01)
T_4	9.12 (1.11)	9.14 (1.33)	9.18 (1.77)	9.29 (2.99)	9.32 (3.33)	9.39 (4.10)
T_5	9.19 (1.21)	9.21 (1.43)	9.25 (1.87)	9.36 (3.08)	9.39 (3.41)	9.46 (4.19)
T_6	9.34 (1.30)	9.36 (1.52)	9.40 (1.95)	9.51 (3.15)	9.54 (3.47)	9.65 (4.66)
T_7	9.36 (1.41)	9.39 (1.73)	9.42 (2.06)	9.53 (3.25)	9.56 (3.58)	9.67 (4.77)
T_8	10.23 (1.69)	10.27 (2.09)	10.30 (2.39)	10.42 (3.58)	10.50 (4.37)	10.60 (5.37)
T_9	10.37 (1.87)	10.40 (2.16)	10.44 (2.55)	10.55 (3.63)	10.63 (4.42)	10.73 (5.40)
T_{10}	11.11 (1.93)	11.14 (2.20)	11.20 (2.75)	11.30 (3.67)	11.39 (4.50)	11.50 (5.50)
T_{11}	12.01 (1.95)	12.06 (2.38)	12.11 (2.80)	12.22 (3.74)	12.31 (4.50)	12.43 (5.52)
T_{12}	10.40 (1.97)	12.46 (2.47)	12.51 (2.88)	12.62 (3.78)	12.72 (4.61)	12.85 (5.67)
T_{13}	11.43 (2.05)	11.48 (2.50)	11.53 (2.95)	11.63 (3.84)	11.73 (4.73)	11.84 (5.71)
T_{14}	10.99 (2.14)	11.04 (2.60)	11.08 (2.97)	11.18 (3.90)	11.28 (4.83)	11.40 (5.95)
T_{15}	12.80 (2.24)	12.85 (2.64)	12.90 (3.04)	13.02 (3.99)	13.13 (4.87)	13.30 (6.23)
T_{16}	12.90 (2.38)	12.94 (2.70)	12.99 (3.10)	13.11 (4.05)	13.22 (4.92)	13.40 (6.35)
T_{17}	15.43 (2.87)	15.45 (3.00)	15.54 (3.60)	15.64 (4.27)	15.82 (5.47)	16.15 (7.67)
T_{18}	14.70 (2.44)	14.74 (2.72)	14.80 (3.14)	14.94 (4.11)	15.10 (5.23)	15.29 (6.55)
T_{19}	14.72 (2.51)	14.76 (2.79)	14.82 (3.20)	14.96 (4.18)	15.12 (5.29)	15.31 (6.62)
SEm (±)	0.84	0.84	0.85	0.84	0.85	0.82
CD (5%)	2.36	2.36	2.40	2.37	2.38	2.31

Table 3: Effect of Vermicompost and Phosphorus Solubilizing Bacteria (PSB) on per cent increase in scion girth (mm) of guava cv. L - 49 during growth period (Jul 2018 to December 2018).

Treat.	July (%)	Aug. (%)	Sept. (%)	Oct. (%)	Nov. (%)	Dec. (%)
T_0	11.58 (1.22)	11.65 (1.84)	11.70 (2.27)	11.79 (3.06)	11.81 (3.23)	11.83 (3.41)
T_1	13.38 (1.52)	13.47 (2.20)	13.58 (3.03)	13.64 (3.49)	13.74 (4.25)	13.89 (5.39)
T_2	13.74 (1.55)	13.83 (2.22)	13.95 (3.10)	14.01 (3.55)	14.11 (4.29)	14.27 (5.47)
T_3	13.78 (1.62)	13.87 (2.29)	13.99 (3.17)	14.05 (3.61)	14.15 (4.35)	14.31 (5.53)
T_4	12.47 (1.30)	12.54 (1.87)	12.65 (2.76)	12.69 (3.09)	12.81 (4.06)	12.93 (5.04)
T_5	12.70 (1.36)	12.77 (1.92)	12.88 (2.79)	12.92 (3.11)	13.05 (4.15)	13.18 (5.19)
T_6	12.84 (1.42)	12.92 (2.05)	13.03 (2.92)	13.07 (3.24)	13.19 (4.19)	13.32 (5.21)
T_7	13.91 (1.46)	14.00 (2.12)	14.12 (2.99)	14.18 (3.43)	14.29 (4.23)	14.43 (5.25)
T_8	14.55 (1.68)	14.64 (2.31)	14.76 (3.14)	14.89 (4.05)	15.04 (5.10)	15.19 (5.15)
T_9	14.61 (1.74)	14.70 (2.37)	14.82 (3.20)	14.95 (4.11)	15.10 (5.15)	15.25 (6.20)
T_{10}	14.71 (1.97)	14.79 (2.49)	14.90 (3.26)	15.03 (4.16)	15.19 (5.27)	15.34 (6.31)
T_{11}	14.86 (1.99)	14.94 (2.54)	15.05 (3.29)	15.18 (4.19)	15.35 (5.35)	15.51 (6.45)
T_{12}	14.93 (2.05)	15.02 (2.67)	15.12 (3.35)	15.27 (4.37)	15.43 (5.47)	15.58 (6.49)
T_{13}	15.00 (2.25)	15.07 (2.73)	15.17 (3.41)	15.32 (4.43)	15.48 (5.52)	15.63 (6.54)
T_{14}	15.05 (2.31)	15.12 (2.79)	15.23 (3.54)	15.37 (4.49)	15.53 (5.27)	15.69 (6.66)
T_{15}	15.17 (2.36)	15.25 (2.90)	15.35 (3.58)	15.50 (4.59)	15.66 (5.67)	15.82 (6.75)
T_{16}	15.25 (2.49)	15.32 (2.96)	15.42 (3.63)	15.57 (4.64)	15.73 (5.71)	15.91 (6.92)
T_{17}	16.71 (2.83)	16.89 (3.94)	17.03 (4.80)	17.17 (5.66)	17.35 (6.77)	17.53 (7.88)
T_{18}	15.68 (2.62)	15.75 (3.08)	15.90 (4.06)	16.12 (5.50)	16.22 (6.15)	16.39 (7.26)
T_{19}	15.87 (2.65)	15.94 (3.10)	16.10 (4.14)	16.32 (5.56)	16.42 (6.21)	16.60 (7.37)
SEm (±)	0.41	0.43	0.42	0.40	0.41	0.43
CD (5%)	1.14	1.21	1.17	1.12	1.16	1.22

Table 4: Effect of Vermicompost and PSB on per cent increase in number of shoot per plant of guava cv. L - 49 during growth period (July 2018 to Dec. 2018).

Treat.	July (%)	Aug. (%)	Sept. (%)	Oct. (%)	Nov. (%)	Dec. (%)
T_0	2.43 (21.50)	2.48 (24.00)	2.52 (26.00)	2.58 (29.00)	2.64 (32.00)	2.70 (35.00)
T_1	3.29 (31.60)	3.36 (34.40)	3.42 (36.80)	3.45 (38.00)	3.55 (42.00)	3.61 (44.40)
T_2	3.45 (32.69)	3.53 (35.77)	3.60 (38.46)	3.63 (39.62)	3.75 (44.23)	3.78 (45.38)
T_3	3.55 (33.96)	3.62 (36.60.)	3.70 (39.62)	3.75 (41.51)	3.85 (45.28)	3.86 (45.66)
T_4	2.65 (26.19)	2.70 (28.77)	2.73 (30.00)	2.80 (33.33)	2.85 (35.71)	2.90 (38.10)
T_5	2.78 (26.36)	2.85 (29.55)	2.93 (33.18)	2.95 (34.09)	3.05 (38.64)	3.10 (40.91)
T_6	2.92 (26.96)	3.00 (30.43)	3.10 (34.78)	3.14 (36.52)	3.20 (39.13)	3.25 (41.30)
T_7	3.09 (28.75)	3.15 (31.25)	3.25 (35.42)	3.30 (37.50)	3.40 (41.67)	3.44 (43.33)
T_8	3.63 (34.44)	3.70 (37.04)	3.79 (40.37)	3.85 (42.59)	3.86 (42.96)	3.94 (45.93)
T_9	3.79 (35.36)	3.85 (37.50)	3.95 (41.07)	4.00 (42.86)	4.01 (43.21)	4.12 (47.14)
T_{10}	3.97 (36.90)	4.00 (37.93)	4.10 (71.38)	4.18 (44.41)	4.23 (45.86)	4.32 (48.97)
T_{11}	4.17 (39.00)	4.19 (39.67)	4.25 (41.67)	4.33 (44.33)	4.38 (46.00)	4.48 (49.33)
T_{12}	4.26 (41.53)	4.28 (42.19)	4.29 (42.52)	4.37 (45.18)	4.43 (47.18)	4.58 (52.16)
T_{13}	4.38 (43.61)	4.39 (43.93)	4.41 (44.59)	4.46 (46.23)	4.51 (47.87)	4.67 (53.11)
T_{14}	4.40 (43.79)	4.41 (44.12)	4.46 (45.75)	4.48 (46.41)	4.53 (48.04)	4.75 (55.23)
T_{15}	4.40 (43.32)	4.45 (44.95)	4.48 (45.93)	4.55 (48.21)	4.58 (49.19)	4.78 (55.70)
T_{16}	4.45 (43.55)	4.47 (44.19)	4.53 (46.13)	4.61 (48.71)	4.64 (49.68)	4.83 (55.81)
T_{17}	4.68 (50.00)	4.79 (53.53)	4.92 (57.69)	5.02 (60.90)	5.05 (61.86)	5.28 (69.23)
T_{18}	4.50 (43.77)	4.55 (45.37)	4.58 (46.33)	4.68 (49.52)	4.70 (50.16)	4.97 (58.79)
T_{19}	4.54 (44.59)	4.58 (45.86)	4.61 (46.82)	4.70 (49.68)	4.75 (51.27)	5.01 (59.55)
SEm (±)	0.07	0.11	0.13	0.14	0.15	0.16
CD (5%)	0.21	0.30	0.36	0.39	0.41	0.44

Table 5: Effect of Vermicompost and PSB on per cent increase in number of nodes per plant of guava cv. L - 49 during growth period (July 2018 to Dec. 2018).

Treat.	July (%)	Aug. (%)	Sept. (%)	Oct. (%)	Nov. (%)	Dec. (%)
T_0	13.90 (10.32)	14.30 (13.49)	14.65 (16.27)	15.00 (19.05)	16.00 (26.98)	16.20 (28.57)
T_1	14.35 (11.33)	14.75 (14.43)	15.11 (17.22)	15.47 (20.02)	16.50 (28.01)	17.16 (33.13)
T_2	14.40 (11.46)	14.90 (15.33)	15.20 (17.65)	15.55 (20.36)	16.55 (28.10)	17.21 (33.20)
T_3	14.45 (11.58)	14.95 (15.44)	15.28 (17.99)	15.65 (20.85)	16.65 (28.57)	17.30 (33.59)
T_4	14.02 (10.39)	14.45 (13.78)	14.78 (16.38)	15.15 (19.29)	16.15 (27.17)	16.50 (29.92)
T_5	14.18 (10.78)	14.58 (13.91)	14.90 (16.41)	15.30 (19.53)	16.30 (27.34)	16.70 (30.47)
T_6	14.25 (11.15)	14.62 (14.04)	14.95 (16.61)	15.35 (19.73)	16.35 (27.54)	16.80 (31.05)
T_7	14.30 (11.28)	14.70 (14.40)	15.00 (16.73)	15.42 (20.00)	16.42 (27.78)	17.08 (32.92)
T_8	14.40 (11.63)	14.90 (15.50)	15.30 (18.60)	15.70 (21.71)	16.65 (29.07)	17.25 (33.72)
T_9	14.51 (12.05)	15.00 (15.83)	15.40 (18.92)	15.85 (22.39)	16.75 (29.34)	17.35 (33.98)
T_{10}	14.65 (12.69)	15.10 (16.15)	15.50 (19.23)	15.95 (22.69)	16.85 (29.62)	18.00 (38.46)
T_{11}	14.70 (12.64)	15.20 (16.48)	15.60 (19.54)	16.05 (22.99)	16.95 (29.89)	18.08 (38.54)
T_{12}	14.80 (12.98)	15.28 (16.64)	15.70 (19.85)	16.15 (23.28)	17.05 (30.15)	18.25 (39.31)
T_{13}	14.92 (13.03)	15.43 (16.89)	15.85 (20.08)	16.30 (23.48)	17.10 (29.55)	19.02 (44.09)
T_{14}	15.02 (13.36)	15.53 (17.21)	15.92 (20.15)	16.45 (24.15)	17.25 (30.19)	19.11 (44.23)
T_{15}	15.10 (13.53)	15.61 (17.37)	16.00 (20.30)	16.55 (24.44)	17.35 (30.45)	19.20 (44.36)
T_{16}	15.23 (13.66)	15.84 (18.21)	16.20 (20.90)	17.00 (26.87)	17.50 (30.60)	19.44 (45.07)
T_{17}	16.12 (16.81)	16.80 (21.74)	17.50 (26.81)	18.01 (30.51)	18.60 (34.78)	21.10 (52.90)
T_{18}	15.80 (15.33)	16.30 (18.98)	17.00 (24.09)	17.39 (26.93)	18.00 (31.39)	20.20 (47.45)
T_{19}	15.75 (15.38)	16.35 (19.78)	17.02 (24.69)	17.41 (27.55)	18.01 (31.94)	20.15 (47.62)
SEm (±)	0.34	0.35	0.50	0.51	0.43	0.62
CD (5%)	0.96	0.97	1.40	1.44	1.21	1.75

Table 6: Effect of Vermicompost and PSB on soil physico - chemical parameters of guava cv. L - 49 at the end of experiment (December 2018).

Treatments	Soil parameters					
	pH	EC (dSm^{-1})	OC (%)	N ($kgha^{-1}$)	P ($kgha^{-1}$)	K ($kgha^{-1}$)
Initial values	7.80	0.63	0.40	321.25	32.10	301.20
T_0	7.60	0.60	0.42	322.10	32.99	302.60
T_1	7.58	0.58	0.44	322.80	33.46	303.70
T_2	7.52	0.57	0.43	322.84	33.61	303.80
T_3	7.53	0.56	0.45	322.91	33.71	303.85
T4	7.48	0.57	0.47	322.97	33.76	304.00
T_5	7.52	0.55	0.45	323.01	34.06	304.80
T_6	7.50	0.52	0.46	323.07	34.16	305.10
T_7	7.49	0.51	0.48	323.12	34.36	305.15
T_8	7.47	0.53	0.47	323.17	34.46	305.25
T_9	7.45	0.50	0.52	323.25	34.66	305.30
T_{10}	7.46	0.48	0.51	323.33	34.82	305.60

T_{11}	7.43	0.52	0.53	323.60	34.87	305.70
T_{12}	7.44	0.47	0.55	324.02	35.36	305.95
T_{13}	7.44	0.45	0.53	324.75	35.46	306.01
T_{14}	7.43	0.46	0.54	324.79	35.56	306.70
T_{15}	7.45	0.44	0.56	325.02	35.67	307.00
T16	7.43	0.42	0.57	325.06	35.72	307.24
T17	7.31	0.38	0.64	327.52	37.07	310.72
T18	7.32	0.39	0.62	326.36	36.64	310.12
T19	7.34	0.40	0.63	326.03	36.46	309.82
SEm (±)	0.04	0.01	0.01	0.64	0.27	0.35
CD (5%)	0.11	0.03	0.02	1.81	0.75	0.99

*Initial values of soil health parameters were recorded at the time of initiation of experiment (July 2018).

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