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Effect of Different Growing Media and Growing Condition on Dry Matter Accumulation in Guava (*Psidium guajava* L.) Seedlings

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ABSTRACT

The study was carried out to see the effect of different growing media and growing condition on dry matter accumulation in guava (*Psidium guajava* L.) seedlings at CCS Haryana Agricultural University, Hisar during 2021-2022. The experiment had 10 treatments of various combinations of growing media viz. T_1: Garden soil, T_2: Garden soil + FYM (1:1), T_3: Garden soil + Vermicompost (1:1), T_4: Garden soil + Cocopeat (1:1), T_5: Garden soil + Vermiculite (1:1), T_6: Garden soil + Sawdust (1:1), T_7: Garden soil + FYM + Vermicompost (2:1:1), T_8: Garden soil + FYM + Cocopeat (2:1:1), T_9: Garden soil + FYM + Vermiculite (2:1:1), T_{10}: Garden soil + FYM + Sawdust (2:1:1) under two environmental conditions (open field and polyhouse). Among different treatment combinations, treatment of T_7 - garden soil+ FYM+ vermicompost (2:1:1) had maximum fresh and dry weight of shoot as well as root at 60, 90, and 120 DAS, respectively. All the parameters were better in poly house compared to open field conditions.

Keywords: Growing media, seed, seedlings, guava, leaves

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INTRODUCTION

Guava (*Psidium guajava* L.) is an evergreen plant and a member of the Myrtaceae family. The wide adaptability nature of the guava tree helped it to sustain a wide range of environmental conditions, soils, pH (4.5 to 8.2), drought and salinity. It is quite a hardy, prolific bearer and considered to be one of the most delicate nutritionally valuable and remunerative crops of the tropics (Sharma *et al*., 2020). Since in Haryana guava is a remunerative crop, the area under guava cultivation is increasing day by day. The farmers also adopt new techniques such as high-density planting and meadow orcharding for better production and productivity. Because of this, there is an increase in demand for budded and grafted plants, but this demand is not fulfilled because of the deficiency of superior seedling rootstock due to poor seed germination and seedling growth. These factors adversely affect the production and productivity levels in guava cultivation.

Growing media plays an important role in seed germination and vegetative growth of seedling (Singh *et al.* 2023), it also provides nutrients for plant growth. A good potting medium is characterized by light weight friability, good water holding capacity, drainage, porosity, low bulk density, free from fungal spores and insect and low inherent fertility etc. For enhancing, the seed germination and growth of seedlings, the use growing media like soil, FYM, vermicompost and cocopeat are most effective (Abirami *et al.* 2010). It is possible to produce good seedlings throughout the year by taking the advantage of optimum temperature available in net house conditions (Parasana *et al.* 2013). Farm Yard Manure contains 0.5%N, 0.2% P, 0.5% K and 30-40% moisture when it is decomposed. It improves the water holding capacity of the soil, which is responsible for the increase in plant growth and yield (Bhardwaj, 2014). Vermicompost is an eco-friendly natural fertilizer and also rich in macro and micronutrients (Kaur, 2017).

Therefore, keeping all these points in view, the present study was undertaken to find out effect of growing media and growing condition on dry matter accumulation in guava seedling.

MATERIALS AND METHODS

The experiment was carried out under both poly house and in open field conditions at nursery and Precision Farming Development Centre, Department of Horticulture, CCS Haryana Agricultural University, Hisar, in the year 2021-2022. The experiment was laid out in randomized block design with three replications. There were 10 media treatment combinations under both conditions. The following treatments were under both growing conditions: T_1: Garden soil, T_2: Garden soil + FYM (1:1), T_3: Garden soil + Vermicompost (1:1), T_4: Garden soil + Cocopeat (1:1), T_5: Garden soil + Vermiculite (1:1), T_6: Garden soil + Sawdust (1:1), T_7: Garden soil + FYM + Vermicompost (2:1:1), T_8: Garden soil + FYM + Cocopeat (2:1:1), T_9: Garden soil + FYM + Vermiculite (2:1:1), T_{10}: Garden soil + FYM + Sawdust (2:1:1).

Fully matured fruits of guava *cv.* L-49 were procured from Experimental Orchard of the Department of Horticulture, washed and cleaned thoroughly. After this, the fruits were

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mashed and mixed with water to extract the seeds by removing the pulp. The extracted seeds were dried under shade for one day and were ready for sowing. In each polybag, two seeds were sown during the 2nd week of September 2021. Polybags were irrigated after seed sowing and after that, moisture was maintained regularly. Weeding was done manually at regular interval.

Shoots and roots of selected seedlings from each replication were separated and weighed with the help of electronic balance. The shoots and roots which were used to measure fresh weight were dried in oven at 60^0 C for 48 hours. After drying, dry weight of both were measured by electronic balance. Fresh and dry weight of shoots and roots were recorded at 60, 90 and 120 days after sowing. Average data were calculated for each replication.

Final data were analysed using online statistical analysis package OPSTAT (Sheoran, 2010) and treatments means were compared by C.D. at 5% level of significance.

RESULTS AND DISCUSSION

Effect of growing media and growing condition on fresh weight of shoot

The data on the fresh weight of shoot in different growing media under open field and poly house conditions is presented in Table 1. The fresh weight of shoot after 60, 90, and 120 DAS as influenced by different growing media varied significantly among the treatments ranged from 30.03 to 57.67, 40.30 to 84.92 and 172.67 to 301.45mg respectively.

Among different treatments maximum fresh weight of shoot (57.67, 84.92 and 301.45mg) was observed in T_7- garden soil + FYM+ vermicompost (2:1:1) at 60, 90, and 120 DAS respectively. Treatment T_7 had significantly higher fresh weight of shoot compared to other treatments. The lowest fresh weight of shoot (30.03, 40.43 and 172.67mg) was noticed in T_1- garden soil (control) at 60, 90, and 120 DAS respectively.

Between two growing conditions, poly house condition recorded the maximum fresh weight of shoot (43.34, 64.24 and 265.87mg) compared to open field condition (46.60, 57.81 and 219.58mg) at 60, 90, and 120 DAS. Higher shoot weight is due to a higher concentration of growth-promoting nutrients, proper aeration and more moisture supplying capacity of FYM. Rapid elongation and division of the cells modifying the physiological process supports the faster root growth in terms of number, length and weight (Sejal *et al*, 2022) in khirni and (Chiranjeevi *et al*, 2018) in aonla.

Effect of growing media and growing condition on dry weight of shoot

The results presented in Table 2 revealed that different growing media had a significant effect on dry weight of the shoot under both growing conditions (open field and poly house). Dry weight of shoot varied between 8.40 to 15.15, 15.38 to 28.02 and 30.49 to 55.09 mg at 60, 90, and 120 DAS respectively.

Among different treatments, T_7- garden soil + FYM+ vermicompost (2:1:1) was recorded the highest dry weight of shoot significantly i.e., 15.15mg, 28.02mg and 55.09mg at 60, 90, and 120 DAS respectively. Minimum dry weight was recorded in T_1- garden soil (control) i.e., 8.40, 15.38 and 30.49mg at 60, 90, and 120 DAS respectively.

Between two growing conditions, significantly higher dry weight of shoot i.e.,12.56, 23.86 and 46.06 mg were observed in poly house condition compared to field condition (10.01, 18.69 and 37.47mg) at 60, 90, and 120 DAS. Similar findings were reported by Rafeeq *et al.* (2020) in mulberry. Addition of vermicompost in soil increased biomass in various plants (Wang *et al*. 2010).

Table 1: Effect of growing media and growing condition on fresh weight of guava shoots

Treatments (T)	Fresh weight of shoot (mg)								
	60 DAS			90 DAS			120 DAS		
	In Field	In Poly house	Mean	In Field	In Poly house	Mean	In Field	In Poly house	Mean
GS	29.00	31.07	30.03	38.47	42.12	40.30	162.00	183.33	172.67
GS+FYM	35.43	39.00	37.22	49.20	65.00	57.10	218.43	247.55	232.99
GS+VC	45.62	49.24	47.43	65.17	71.17	68.17	310.55	310.53	310.54
GS+CoP	34.07	36.80	35.43	48.03	58.70	53.37	202.67	244.67	223.67
GS+Verm	33.33	35.07	34.20	45.53	56.23	50.88	177.33	201.33	189.33
GS+SawD	30.10	31.50	30.80	41.25	48.32	44.79	164.00	190.59	177.29
GS+FYM+VC	56.00	59.33	57.67	87.50	82.34	84.92	264.67	338.23	301.45
GS+FYM+CoP	53.45	55.21	54.33	80.00	78.25	79.13	242.56	321.54	282.05
GS+FYM+Verm	49.52	51.53	50.53	72.10	74.65	73.38	230.32	316.62	273.47
GS+ FYM +SawD	39.47	44.62	42.04	50.80	65.67	58.23	223.31	304.33	263.82
Mean	40.60	43.34		57.81	64.24		219.58	265.87	
C.D. (at 5%)	C=1.05, T=2.35, C×T=NS			C=1.69, T=3.78, C×T=NS			C=3.32, T=5.43, C×T=NS		

[C=Growing conditions, T =Growing media, C×T= Growing conditions x Growing media]

Table 2: Effect of growing media and growing condition on dry weight of guava shoots

Treatments (T)	Dry weight of shoot(mg)								
	60 DAS			90 DAS			120 DAS		
	In Field	In Poly house	Mean	In Field	In Poly house	Mean	In Field	In Poly house	Mean
GS	7.57	9.23	8.40	13.53	17.23	15.38	27.27	33.71	30.49
GS+FYM	9.39	11.94	10.67	18.35	23.16	20.76	35.13	43.51	39.32
GS+VC	10.97	13.05	12.01	20.45	25.80	23.13	40.31	50.08	45.20
GS+CoP	8.95	11.23	10.09	16.92	21.94	19.43	33.50	40.78	37.14
GS+Verm	8.37	10.62	9.50	15.57	20.03	17.80	30.37	38.88	34.62
GS+SawD	7.93	10.09	9.01	14.45	18.65	16.55	29.37	35.13	32.25
GS+FYM+VC	13.33	16.97	15.15	24.07	31.97	28.02	50.37	59.81	55.09
GS+FYM+CoP	12.10	15.73	13.92	22.87	28.10	25.48	46.00	56.88	51.44
GS+FYM+Verm	11.52	14.46	12.99	21.04	27.40	24.22	44.12	54.49	49.30
GS+ FYM +SawD	10.00	12.30	11.15	19.63	24.27	21.95	38.25	47.34	42.80
Mean	10.01	12.56		18.69	23.86		37.47	46.06	
C.D. (at 5%)	C=0.64, T=1.43, C×T=NS			C=0.63, T=1.40, C×T=NS			C=0.50, T=1.13, C×T=1.59		

[C=Growing conditions, T =Growing media, C×T= Growing conditions x Growing media]

Effect of growing media and growing condition on fresh weight of root

The data related to fresh weight of root under both the growing conditions (open field and polyhouse) is illustrated in table 3, which clearly indicated that fresh weight of root was significantly influenced by different growing media under both growing conditions. It varied between 20.63 to 38.25mg, 27.54 to 54.76mg and 56.78 to 104.87mg at 60, 90, and 120 DAS respectively.

Among different growing media significantly higher fresh weight of root (38.25mg, 54.76mg and 104.87mg) was found in T_7- garden soil + FYM+ vermicompost (2:1:1) at 60, 90, and 120

Table 3: Effect of growing media and growing condition on fresh weight of guava root

Treatments (T)	Fresh weight of root(mg)								
	60 DAS			90 DAS			120 DAS		
	In Field	In Poly house	Mean	In Field	In Poly house	Mean	In Field	In Poly house	Mean
GS	17.62	23.64	20.63	26.73	28.35	27.54	54.23	59.32	56.78
GS+FYM	22.33	26.39	24.36	34.67	42.40	38.53	68.17	78.70	73.43
GS+VC	25.63	33.11	29.37	37.23	50.34	43.79	71.71	94.80	83.26
GS+CoP	20.67	25.01	22.84	32.67	38.41	35.54	56.47	75.97	66.22
GS+Verm	20.00	24.05	22.03	24.00	36.88	30.44	49.21	62.63	55.92
GS+SawD	19.33	23.29	21.31	22.00	27.07	24.53	51.53	61.03	56.28
GS+FYM+VC	32.17	44.33	38.25	49.28	60.23	54.76	97.50	112.23	104.87
GS+FYM+CoP	30.10	41.62	35.86	44.34	57.73	51.04	91.33	110.17	100.75
GS+FYM+Verm	27.45	38.78	33.12	41.45	54.36	47.91	88.67	105.03	96.85
GS+ FYM +SawD	22.67	27.00	24.83	35.27	42.87	39.07	70.67	91.33	81.00
Mean	23.80	30.72		34.76	43.86		69.95	85.12	
C.D. (at 5%)	C=1.31, T=2.92, C×T=NS			C=2.93, T=3.55, C×T=NS			C=1.44, T=3.23, C×T=NS		

[C=Growing conditions, T =Growing media, C×T= Growing conditions x Growing media]

Table 4: Effect of growing media and growing condition on dry weight of guava root

Treatments (T)	Dry weight of root (mg)								
	60 DAS			90 DAS			120 DAS		
	In Field	In Poly house	Mean	In Field	In Poly house	Mean	In Field	In Poly house	Mean
GS	5.85	6.82	6.34	7.37	9.29	8.33	14.82	19.77	17.30
GS+FYM	7.70	8.60	8.15	9.10	11.63	10.36	18.34	24.90	21.62
GS+VC	8.61	9.65	9.13	10.40	13.06	11.73	21.03	27.93	24.48
GS+CoP	7.13	8.02	7.58	8.63	10.95	9.79	17.68	23.19	20.44
GS+Verm	6.90	7.79	7.34	8.29	10.14	9.22	16.51	21.60	19.06
GS+SawD	6.67	7.28	6.97	8.03	9.33	8.68	15.70	21.05	18.38
GS+FYM+VC	10.20	11.76	10.98	12.70	16.48	14.59	26.73	35.22	30.98
GS+FYM+CoP	9.10	10.45	9.78	11.50	14.73	13.12	24.37	32.69	28.53
GS+FYM+Verm	8.95	10.01	9.48	10.97	13.92	12.45	22.51	29.49	26.00
GS+ FYM +SawD	8.13	9.15	8.64	9.76	12.34	11.05	19.45	26.13	22.79
Mean	7.92	8.95		9.68	12.19		19.71	26.20	
C.D. (at 5%)	C=0.03, T=0.07 C×T=0.09			C=0.10, T=0.15, C×T=0.23			C=0.13, T=0.28, C×T=0.40		

[C=Growing conditions, T =Growing media, C×T= Growing conditions x Growing media]

DAS respectively over the other treatments. The lowest fresh weight of root (20.63, 27.54 and 56.78mg) was noticed in T_1- garden soil (control) at 60, 90, and 120 DAS respectively.

Maximum fresh weight of root was observed in poly house condition (30.72mg, 43.86mg and 85.12mg) compared to field condition (23.80, 34.76 and 69.95mg) at 60, 90, and 120 DAS. Interaction between growing media and growing conditions was found non-significant. Vermicompost contains bioactive components that are favourable to root growth, resulting in better root development, increased biomass, and improved growth and development (Dash, 2019) and also a balanced composition of nutrients (Wang *et al*. 2010).

Effect of growing media and growing condition on dry weight of root

It is delineated from the data presented in Table 4 that the dry weight of root was significantly affected by different growing media under both growing conditions i.e., open field and polyhouse. Dry weight of root ranged from 6.34 to 10.98mg, 8.33 to 14.59mg and 17.29 to 30.98mg at 60, 90, and 120 DAS respectively.

Among different treatments, maximum dry weight of root (10.98, 14.59 and 30.98mg) was observed in T_7- garden soil + FYM+ vermicompost (2:1:1) at 60, 90, and 120 DAS respectively. Minimum dry weight of root was recorded in T_1- garden soil (control) i.e., 6.34, 8.33 and 17.29mg at 60, 90, and 120 DAS respectively.

Between growing conditions, the highest dry weight of root recorded in poly house condition (8.95, 12.19 and 26.20mg) compared to field condition (7.92, 9.68 and 19.71mg) at 60, 90, and 120 DAS respectively. Organic matter may also improve nutrient availability and improve phosphorus absorption. All of these conditions are favourable for better root development. The results are in confirmation with Singh *et al.,* (2022) in ber and Singh *et al.,* (2015) in stevia.

CONCLUSION

Among the different treatments on growing media, seeds sown in media combination of T_7- garden soil + FYM + vermicompost (2:1:1) had maximum fresh and dry weight of shoot as well as root at 60, 90, and 120 DAS, respectively. This combination provides the better nutrient utilization, aerations and water availability resulting better dry matter accumulation. Further, two growing conditions poly house conditions were found best for all parameters compared to open field condition.

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