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STUDY OF VARIOUS COMBINATIONS OF SOIL ON STEVIA CUTTINGS FOR HERBAGE YIELD AND ROOT PARAMETERS

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ABSTRACT

The experiment was carried out to study the best combination of soil with different growing media for herbage yield (fresh weight and dry weight), number of roots/plant and root length of *Stevia rebaudiana* cuttings atissue culture laboratory, Main Sugarcane Research Station, Navsari Agriculture University, Navsari, Gujarat, India. From the observations of experimental data, Treatment T6 (soil+sand+coco peat+ vermin compost 1:1:1:1) was found best in terms of highest fresh weight of plant (10.40 g), dry weight (2.0 g) and root length (12.20 cm). Poor herbage yield, fresh weight (2.60g) and dry weight (0.46 g) was found in treatment T_1 (soil+sand 1:1). Finally, it was concluded that proper roots also helped plant to survive and increase the survival rate with context to increase in fresh weight and dry weight of the plant. Results from this experiment suggests that one can use combination of soil + sand + cocopeat + vermicompost in equal proportion for good herbage yield and growth performance of this vital plant in South Gujarat.

KEYWORDS: Sand, cocopeat, cuttings, herbage yield, root parameters.

INTRODUCTION

Stevia rebaudiana Bertoni, native to Paraguay, is an herbaceous perennial (2n=22) shrub of the *Asteraceae* family. This shrub contains tremendous application to sweeten soft drinks, soy sauce, yoghurt and other foods in Japan, Korea and Brazil (Taylor, 2005; Tadhani, *et al*., 2007). The leaves of stevia are a source of diterpene glycosides, which are 300 times sweeter

than cane and beet sugar (Uddin, *et al*., 2006). Stevia is a short day plant and will flower when the days become shorter than 13 hours long (Metivier and Viana, 1979; Valio, 1977; Zaidan, *et al*., 1980).

Traditional Indian foods have very high concentration of sugar and there is evidence of attempts to replace whole or a part of sugar with sugar substitutes (Chetana, *et al*., 2006, Arora, *et al*., 2008). In India, this plant also got approval by FDA in 2015 to be used in proper proportion in beverages. Recently, cultivation of *Stevia rebaudiana* in India has been increased due to its zero-caloric and medicinal properties. Scientific cultivation and careful selection of planting material can yield better returns in shorter times as compared to traditional crops according to Indian Stevia Cultivators. Cultivation of stevia also opens up new regards for crop diversification and appears as viable alternative to crops with extensive usage of chemical fertilizers and pesticides (Aci Agro Solution, 2015).

The main objective of present study is to establish proper soil amendments on herbage yield and root parameters with respect to large scale production of stevia in South Gujarat conditions.

MATERIAL AND METHODS

This experiment was conducted out at Tissue Culture Laboratory Main Sugarcane Research Centre, NAU, Navsari, during June-September 2017. Navsari comes under West Coastal region of Gujarat, India. Weather remains hot during summer and cold during winter with average humidity of 56%. Soil material plays an important role on survival percentage and growth parameters of stevia. The experiment was conducted to evaluate suitability of different rooting mixtures on growth. Experimental treatments composed of following combinations of different growing media.T0- control (regular soil), T_1- soil + sand (1:1), T_2- soil + FYM (1:1), T_3- soil + sand + FYM (1:1:1), T_4- soil + sand + Cocopeat(1:1:1), T5- soil + sand + FYM + cocopeat (1:1:1:1), T6- soil + sand +cocopeat + vermicompost (1:1:1:1).

Transplanting of cutting was done on 2nd week of June 2017 in different media prepared in blocks. The blocks were immediately irrigated after transplanting of cuttings. Soil moisture was maintained by facilitating proper subsurface drainage system. Irrigation schedule was prepared as per the soil water holding capacity of each block. All the treatments were implemented in triplicate with three replications analysed in RBD. Each treatment was composed of 30 plants. All the observation on survival of cuttings was recorded and

randomly selected five plants for growth parameters.Selected plants were subjected to study fresh weight of plants (g) at the time of end of vegetative phase and dry weight of plant (g) at maturity stag. Selected plants were uprooted and number of roots and root length were recorded.

Table 1: Effects of different Treatments of rooting mixture on fresh weight, dry weight, number of roots and root length.

Treatment	Fresh weight of plants (gm)	Dry weight of plant (gm)	No. of roots/plant	Root length (cm)
T_0	3.40	1.14	6.2	6.50
T_1	2.60	0.46	12.40	7.30
T_2	4.10	0.78	4.80	12.00
T_3	7.70	0.94	10.80	11.60
T_4	5.30	1.27	15.60	8.40
T_5	8.70	1.12	12.80	10.50
T_6	10.40	2.00	14.20	12.20
SEM ±	0.268	0.04	0.48	0.312
CD at 5%	0.82	0.14	1.48	0.96
CV	7.69	7.33	7.59	5.53

Note: T_0- Control; T_1- Soil + sand (1:1), T_2- Soil + FYM (1:1), T_3 - Soil + sand + FYM (1:1:1), T_4- Soil + sand + cocopeat (1:1:1), T_5 - Soil + sand + cocopeat + FYM (1:1:1:1), T_6 - Soil + sand + cocopeat + vermicompost (1:1:1:1).

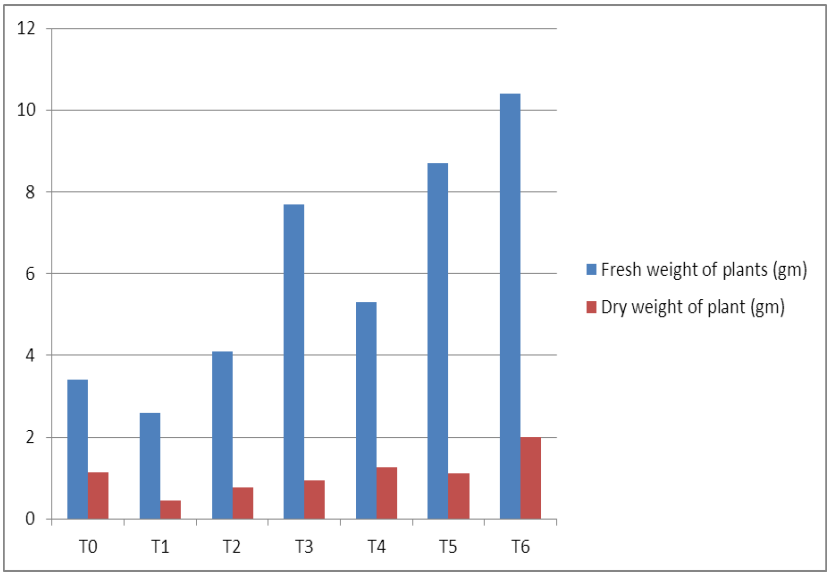

Fig.1: Variation in fresh weight and dry weight of plants on different treatments.

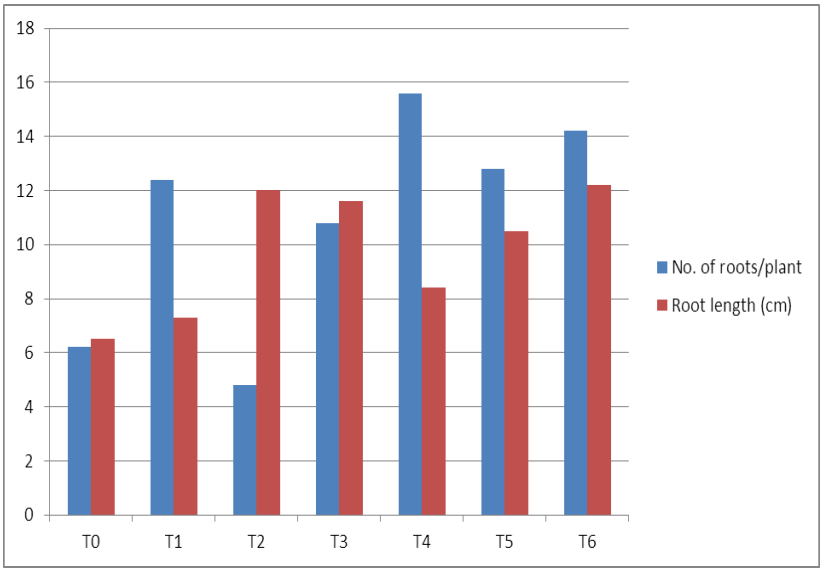

Fig. 2: Variation in number of roots and root length of plants on different treatment.

RESULTS AND DISCUSSION

The experimental results analysed and presented in table 1. Among all the treatments T6 was found to be the best followed by T5. Highest fresh weight of plant and dry weight of plant was observed in T6 (soil+sand+ cocopeat +vermicompost 1:1:1:1) was 10.40 gm and 2.0 gm respectively. Best performance might be due to good nutrient supply through vermicompost and good water holding capacity by cocopeat + vermicompost and particle porosity due to combination of sand and coco peat resulted maximum root length 12.20 cm. Due to available nutrient supply at vegetative phase enhance hormonal balance (ABA) for and biological yield that i.e. fresh weight and dry weight of plant. Combination of cocopeat, sand and vermicompost may develop soil aggregates to loosely adhere leading to granulation. Loose soil aggregates may lead to permeability of water and airflow in the beds. Soil temperature was regulated by vermicompost incorporated as active ingredients to the rooting mixture. By considering the different growth phases of stevia particularly at vegetative phase availability of organic matter at root zone enhance the root growth and number of roots. The improvement of soil porosity, water holding capacity, drainage, soil permeability and water availability with decreasing soil and water availability with decreasing soil density is due to presence of vermicompost and cocopeat in growing media has provided support for fast growth of cuttings due to availability of better nutrition, optimum moisture and air in rhizosphere. Therefore good physical and biological condition at root zone enhances growth and yield.

Significant differences were also observed among different treatments with regards to growth parameters such as maximum No. of roots/plant(15.60 cm) was observed in treatment T_4 followed by treatment T6 (14.20 cm). This treatment is at par with the highly positive significant best treatment (T6), for fresh weight of plant and dry weight of plant. Similar results were also reported by Sing and Sing, 2015. In the case of biological yield (fresh weigh of plant) and other attributing characters, treatment (T6) was found superior to others and control. Similar results were reported by Supriyant, *et al*., 1990. The results are in agreement with the synergetic and combinational effect of both factors in improving the physical condition of media and nutrient status. The medium with vermicompost and cocopeat is more suitable because of the better physical properties and enhanced nutrient level. Fresh weight and dry weight of all the treatments were in positive correlation with no. of roots and root length.

CONCLUSION

Growth media plays significant role for successful establishment of cuttings, root parameters and herbage yield. Among all the treatment combinations treatment T6 (soil +sand+cocopeat+vermicompost 1:1:1:1) was found to be best for growth and developmental characters. Hence, soil, sand, cocopeat, vermicompost in equal proportion is recommended as good growing media for successful stevia production on large scale.

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