An Observation of Different Types of Soil for Growth of *Stevia rebaudiana* in Different Areas of Jabalpur (Madhya Pradesh)

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Abstract

Soil is the most important requirement for plant. It has all the essential elements for plants. In order to identify the best soil-type for the growth, plants of these species were grown in round-shaped poly-pots with different types of soil of Jabalpur to find out the suitable soil for its growth. Four types of soil, namely sandy-loam, loamy sand, lateritic and silt clay were used in this experiment. Different types of soils significantly influenced the morphological parameters of Stevia. In this experiment it was observed that the highest range of plant height, number of branches, number of leaves, fresh and dry weight per plant were recorded in sandy loam soil. However, after mixing of FYM in equal ratio, silt clay showed the best performance. It can be concluded that cultivators may be adviced to grow Stevia either in sandy loam soil sat or FYM mixed silt clay in Jabalpur district.

Keywords- *Plant growth, soil types, Stevia rebaudiana*

Introduction

Stevia rebaudiana is, the sweetest gift of nature, belongs to the sunflower family Asteraceae (Rashid *et al.*, 2013). *Stevia* is an amazing herb from the rain forests of Amazan in South America. *Stevia* is also known by various names such as sweet leaf, sweet herb, sugar leaf and honey leaf etc. There are around270-300 species in the genus *Stevia* in whole world, but only *Stevia rebaudiana* contains steviol-glycoside, which makes it the sweetest herb in the world (Soejarto *et al*., 1982, 1983). *Stevia rebaudiana* has gained so much popularity in little time among different types of sweetener users for its synthesized product, steviol-glycoside as a substitute of sugar. Stevioside is 250-300 times sweeter than cane-sugar and non-caloric and normally used by humans without any side effect. It is a safe sweetener for children also. Due to imbalanced life style and eating habits Indians are as increased are as the highest risk of many diseases, like obesity, heart disease, kidney disease and diabetic mellitus conditions in whole world. Nearly 77 millions of people between 25 to 70 years of age have been suffering from diabetes mellitus in India. A large number of children between 10 to 20 years' age have also been suffering from diabetes in the world (Hasan, 2008).

India is an agriculture-based country. Few experiment shave been conducted both in the field as well as pot in condition to its study the growth of *Stevia* (Khanom, 2007; Nasrin,

2008 and Hasan, 2008).Some experiments were also conducted to study different agronomic aspects like stem cutting, tissue culture, pruning, date of planting, etc on the growth of *Stevia* (Khan, 2014).Soils are of different types and the soil type greatly affects crop production. Soil provides physical support and supplies of water and other essential nutrients for morphological and physiological development. *Stevia rebaudiana* is a high concentrate sweetener plant. *Stevia* plant requires well drained soil. In any type of soil, the moisture for too long period of time is unsuitable for the cultivation of *Stevia*. Black cotton soils with very heavy clay should be avoided. The plant prefers a normal textured soil with added organic matter. Sandy loam and red soil with a pH of 5.5 to 7.5 is the best for the *Stevia* cultivation. Saline soils with 8 pH value must be avoided for *Stevia* plant cultivation.

Materials and Methods

The experiment was conducted in the net house of the nursery at Madhya-Pradesh State Forest Research Institute, Polipathar, Jabalpur, (M.P.) during July to September 2019. Four types of soils, namely sandy loam, loamy sand, laterite and silt clay were collected from different location of Jabalpur. Sandy loam soil was collected from the bank of Narmada river. Loamy sand was collected from Lalpur area. Laterite was collected from Indrana in Sehora tehsil and silt clay soil was collected from Dumna Nature Reserve area respectively. For the experiment, approximately 50 kg of soil was collected from each location from 1-20cm depth. All the samples were made free from plant residues and other waste materials. Then, these were dried and fine sieved through a 3mm sieve. Then, each soil was divided into two parts. One part was kept as such and the second part was mixed with the same quantity of farm yard manure (FYM). Approx 1kg sieved soil from each area was preserved in a plastic bag and analyzed for its physical and chemical properties following standard procedures (Page *et al.* 1982). Experiment was laid out with three replications. Total number of pots was 24. There were 12 pots filled with normal soil (Each type of soil X 3 pots) and the remaining 12 pots were filled with soil and farm-yard manure (FYM) in 1:1 ratio. *Stevia* plant cuttings were planted in the pots. Pots were immediately irrigated after planting of *Stevia* cuttings. The size of cuttings of *Stevia* plant was 2cm. Irrigation, hand weeding and removal of flower bud were done, when required. After three months of sowing, plants were uprooted and growth parameters and fresh weight were recorded. Then the uprooted plants were sundried and dry weights were recorded.

Result and Discussion

Various types of soil significantly affected the morphological, physiological and growth parameters of *Stevia* plant. Maximum plant height, number of leaves, fresh& dry weights were recorded from sandy loam soil and minimum values of these parameter were recorded from lateritic soil (Table-1). However, when mixed FYM silt clay soil showed the highest plant height, number of leaves and fresh and dry weights and loamy soil showed the lowest values of all these parameter (Table-2).

Table-3 shows the improvement in growth performance of *Stevia* plants where grown in FYM mixed soils over that when grown in soils without FYM. It can be seen that the plant

height growth improves by 1.08 times in sandy loam to 1.21 times in silt-clay. Number of branches improves by 1.2 times in sandy loam to 2.0 times in lateritic soils. The number of leave is improved by 1.3 times in sandy loam is 2.61 times in lateritic soils. Similarly, the fresh and dry plant weight also exhibited proportionate increase. The most significant improvement in all the growth parameters was noticed in lateritic soil whereas the sandy loam soil was found to be the least affected.

Stevia rebaudiana is a subtropical semi-humid plant grown easily like crop of any vegetable. Sandy loam soil with FYM and neutral pH and well drainage is important for cultivation of *Stevia*. *Stevia* can also be grown on relatively poor soil. Various soil types influence production of crop according to capability as a supplier of nutrient based on requirement of plant.

Conclusion

In this study, it has been concluded that the growth performance of *Stevia* plants grown indifferent types of collected from different locations in Jabalpur district is affected by the type of the soil. Soil types affected the growth, leaf number, number of branches, fresh and dry weights of *Stevia* plants. The maximum plant height, number of branches, highest number of leaves and weight of fresh and dry plant were recorded from the plant grown in sandy loam soil. On the other hand, the highest values of height of plant, highest number of branch, highest number of leaves and weight of fresh and dry plant were recorded from the plant grown in FYM mixed silt clay. Hence, soil and FYM in equal ratio is recommended as best growing medium for successful production of *Stevia* on large scale.

Table-1 Growth parameters of *Stevia rebaudiana* plants grown in different soil types of Jabalpur district.

S. No.	Type of soil (Without FYM)	Average plant height (cm)	Average number of branches per plant	Average number of leaves per plant	Average fresh weight per plant (g)	Average dry weight per plant (g)
1	Sandy loam	70.4	5	217	95.8	30.7
2	Loamy sand	63.8	3	138	76.7	14.7
3	Laterite	58.3	2	102	70.5	12.8
4	Silt clay	65.5	4	175	80.3	16.7

Table-2 Growth parameters of *Stevia rebaudiana* plants grown in different types of soils of Jabalpur district mixed with FYM in 1:1 ratio.

S. No.	Type of soil (With FYM)	Average plant height (cm.)	Average number of branches	Average number of leaves per plant	Average fresh weight per plant (g)	Average dry weight per plant (g)
1	Sandy loam	76.3	6	284	136.5	39.6
2	Loamy sand	69.8	4	247	112.7	36.2
3	Laterite	73.6	4	267	120.4	37.7
4	Silt clay	79.9	7	308	140.8	48.8

Table-3 Growth performance ratio compared between Table- 1 and Table- 2

S. No.	Type of soil	Average plant height (cm.)	Average number of branches	Average number of leaves per plant	Average fresh weight per plant (g)	Average dry weight per plant (g)
1	Sandy loam	1.08times	1.2times	1.30times	1.42times	1.29times
2	Loamy sand	1.09times	1.3times	1.78times	1.46times	2.46times
3	Laterite	1.26times	2.0 times	2.61times	1.70times	2.94times
4	Silt clay	1.21times	1.75times	1.76times	1.75times	2.92times

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