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Management practices to improve the growth of polybag seedlings in sugarcane (Saccharum *officinarum L.*)

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ABSTRACT

Two different experiments were conducted at Annamalai University, Annamalainagar (Tamil Nadu) to raise sugarcane nursery with setts by using different mediums and soaking techniques. The experiments were conducted in randomized block design with eight treatments and three replications. Among the different mediums tried in the first experiment, soil + sand + vermicompost + neemcake @ 5 g/ bag resulted in maximum values of plant height (19.6 cm), leaf area (27.1 cm^2), number of leaves/plant (3.63), collar girth (0.98), fresh shoot (2.93g) and root weight (1.33g). Soil + sand medium resulted in least values of all growth parameters. In the second experiment, soaking of setts in humic acid solution improved the germination percentage (88), plant height (26.6 cm), leaf area (28.4 cm^2), collar girth (1.16) , fresh shoot (3.67 cm) and root weight (2.75). Soaking of setts in hot water and tea leaf waste slurry were found to be better than cold water and coffee powder waste slurry soaking respectively.Least values of the various parameters were noticed in soaking of setts in cold water.

Keywords: Management practices, growth, polybag, sugarcane seedlings

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) occupies 2.8 % of gross cropped area in India, holds an enviable position among the commercial crops,contributes significantly to national exchequer, provides livelihood for farmers and employment to millions of people. Sugarcane is an important cash crop in many tropical and sub-tropical countries and accounts for over 70 % of world sugar production. It is grown between the latitudes of 35° North and 35° South latitudes.In India, sugarcane is cultivated in an area of 5.03 M ha and the average yield is 70 t /ha. The average sugar recovery is 9.71 %. Tamil Nadu state accounts for 10 % of the sugarcane production in India. In Tamil Nadu sugarcane is cultivated in an area of 3.54 lakh ha with a production of 38.07 lakh tones and the average yield is 108.9 t / ha. Out of total area under sugarcane, 63 % is planted and 37 % is under ratoon crop.It is known that the seed cost in sugarcane cultivation occupies 21 % of the total cost of cultivation. However, quality seed cane for planting is not considered by the farmers. Mostly, seed cane crop is not raised separately for planting. Farmers tend to use setts from the commercial plot, which indeed harbours pest and diseases. Raising seed crop separately for commercial crop reduces the risk of pest and diseases such as redrot, wilt, smut, ratoon stunting and grassy shoot. This is one of the factors that is lacking with the farmers which is causing the production decline in India with increasing cost of production. The main reason for lesser yield in sugarcane was due to poor germination percentage which results in low plant population (Saini *et al.*, 2012). Transplanting of 30 to 40 days old poly bag seedlings resulted in highest tiller production, millable cane and cane yield (Marimuthu*et al.*, 2002). Transplanting of pre germinated cane settlings of 35 days ensured optimum plant population and gave higher net return and B:C ratio (Meharchand *et al.*, 2011). Soaking of setts in NAA @150 ppm or in water for six hours increased the intake of water by setts, retention of water by setts,leaching out germination inhibitors and improved the germination percentage (Sujatha *et al.*, 2018). In order to produce healthy settlings for planting and gap filling polybag method nursery research programmes were carried out.

MATERIALS AND METHODS

Two polybag experiments were conducted at the experimental farm, Annamalai University, Annamalainagar (Tamilnadu).The farm is situated at 11°24 N latitude and 79°44 E

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longitude and at an elevation of 5.79 m above mean sea level. The first poly bag experiment was conducted during January to March with CoC (SC-22) variety in a randomized block design with eight treatments and three replications. The treatments were T_1 - soil + sand (Control), T_2- soil + sand + FYM ,T_3-soil + sand + pressmud, T_4 - soil + sand + vermicompost, T_5 - soil + sand + neemcake @ 5 g bag^{-1}, T_6- soil + sand + FYM + neemcake @ 5 g bag^{-1} ,T_7- soil + sand + press mud + neemcake @ 5 g $bag^{-1,}$ T_8 - soil + sand + vermicompost + neem cake @ 5 g $bag^{-1.}$. The second polybag experiment was conducted during July to August with CoSi - 7 variety in a randomized block design with eight treatments and three replications. The treatments were: T_1-soaking of setts in cold water,T_2- soaking of setts in hot water ,T_3- soaking of setts in cow dung slurry(50 g cow dung in one litre water),T_4- soaking of setts in vermicompost slurry (50 g vermicompost in one litre water),T_5- soaking of setts in humic acid solution (5 ml in one litre water),T_6- soaking of setts in coffee powder waste slurry (50 g coffee powder waste in one litre water),T_7- soaking of setts in tea leaf waste slurry (50 g tea leaf waste in one litre water),T_8 - control. Polythene bags with a dimension of 15x10 cm, having two holes at the bottom, were used for the experiments.Ten polythene bags were considered as one treatment. In each experiment 240 polythene bags were used to accommodate eight treatments and three replications. In second experiment, soil + sand + vermicompost + neem cake was used as a medium. The setts were soaked in the respective treatment solution for half an hour and then planted. The biometric observations like plant height, leaf number, leaf area, collar girth, fresh shoot and root weight were recorded from three tagged plants for each treatment at 15 and 30 DAP. The data recorded were statistically analysed and conclusions were drawn at 5% significant level as per the method suggested by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Effect of medium

The germination percentage recorded due to various treatments ranged from 46.3 to 100 (Table1). The highest germination percentage (100) was noticed in soil + sand + vermicompost + neem cake medium which was 53.7 % higher than the control. The beneficial effect of vermicompost might be due to its NPK content, micronutrients, hormones and enzymes present in it. Similar result was reported by Loganandhan *et al.* (2013). Application of neem cake along with organic manures favoured the germination percentage over organic manures application alone. The tallest plant (19.6 cm) was observed in soil + sand + vermicompost + neem cake medium. Addition of neem cake to FYM or pressmud increased the plant height upto 1.96 and 2.0 cm over their individual application along with soil and sand, respectively. Similar result was reported by Patil *et al.* (2013). The shortest plant (12.8 cm) was observed in control, which may be attributed to poor soil fertility.

Table 1: Effect of various mediums on growth of sugarcane polybag seedlings

Treatments	Germination percentage 15 DAP	Plant height (cm)15 DAP	Leaf area (cm^2) 30 DAP	No. ofleaves /plant 30 DAP	Collar girth (cm) 30 DAP	Fresh shoot weight/plant (g) 30 DAP	Fresh root weight /plant (g)30 DAP
T_1	46.3	12.8	12.5	2.33	0.48	2.14	0.70
T_2	66.7	15.2	20.4	3.16	0.71	2.30	0.95
T_3	66.7	16.2	22.3	3.16	0.73	2.39	0.99
T_4	66.7	17.0	23.1	3.16	0.73	2.43	1.18
T_5	54.3	13.8	14.1	2.56	0.51	2.25	0.81
T_6	77.8	17.1	25.2	3.33	0.82	2.85	1.25
T_7	77.8	18.2	26.3	3.33	0.82	2.90	1.30
T_8	100	19.6	27.1	3.63	0.98	2.93	1.33
CD (p=0.05)		1.05	1.35	0.28	NS	0.21	0.02

T_1 - soil + sand (Control), T_2- soil + sand + FYM ,T_3 - soil + sand + pressmud, T_4 - soil + sand + vermicompost, T_5 - soil + sand + neemcake @ 5 g bag^{-1}, T_6- soil + sand + FYM + neemcake @ 5 g $bag^{-1,}$ T_7- soil + sand + press mud + neemcake @ 5 g $bag^{-1,}$ T_8 - soil + sand + vermicompost + neemcake @ 5 g bag^{-1}

Number of leaves ranged from 2.33 to 3.63 and highest leaf number / plant (3.63) wasobserved in soil + sand + vermicompost + neem cake medium. Application of FYM or pressmudor vermicompost along with soil and sand resulted in the production of identical (3.16) leaf number per plant This might be due to the presence of nutrients in these substances. The least leaf number (2.33) was observed in soil + sand medium. Among the various mediums tried, the highest leaf area was recorded in soil + sand + vermicompost + neem cake medium which resulted in an increase of 14.64 cm^2 over soil and sand medium. The least leaf area of 12.5 cm^2 was recorded in soil + sand medium.The collar girth did not differ significantly due to various treatments. The collar girths recorded due to various treatments were ranged from 0.48 to 0.98 cm. Within the treatments, the highest fresh weight of 2.93 g was noticed in soil + sand + vermicompost + neem cake medium. This might be due to the presence of nutrients, hormones, vitamins, enzymes, antibiotics and beneficial organisms. Addition of neem cake to FYM or pressmud or vermicompost along with sand + soil + FYM increased the fresh shoot weight of the plant to the tune of 0.55, 0.6 and 0.63 g over application of organic manures along with soil and sand medium, respectively. The treatment soil + sand + vermicompost + neem cake medium ranked first with a fresh root weight of 1.33 g. Planting of setts either alone in FYM or pressmudor vermicompost medium or along with neem cake increased the fresh root weight to the tune of 0.25, 0.29, 0.48 and 0.55, 0.6 and 0.63 g over soil and sand medium respectively.

Effect of soaking setts

The highest germination percentage (88) was noticed in soaking the setts in humic acid solution (Table2). The next best treatment was soaking the setts in vermicompost. Soaking the setts in tea leaf waste and coffee powder waste resulted in similar effect and increased the germination percentage upto 11 over control, respectively. The control resulted in the least (55) germination percentage.The plant height was influenced by all the treatments significantly over control. The various treatments increased the plant height from 1.83 to 10.34 cm over control. The tallest plant (26.6 cm) was noticed in soaking the setts in humic acid solution. The increased growth attributes might be due to hormone like activity of humic acid. This result is in agreement with the findings of Atiyah *et al.*(2002). Comparable effect was observed with hot water, cowdung, coffee powder waste and tea leaf waste treatments in influencing the plant height. The control resulted in the least (16.3 cm) plant height. Soaking of setts in humicacid solution excelled all other treatments with a seedling vigour index of 2346.9. This was followed by vermicompost soaking. A comparable effect was observed among hot water, cowdung, coffee power waste and tea leaf waste treatments and all of them were superior than control. The least (898.1) seedling vigour index was observed in control.

Table 2: Effect of various setts soaking treatments on germination and growth of sugarcanepolybag seedlings at 30 DAP

Treatments	Germination (%)	Plant height (cm)	Seeding Vigour index	Leaf area (cm^2)	Leaves /plant	Collar girth (cm^2)	Fresh shoot weight /plant (g)	Fresh root weight /plant (g)
T_1	66	19.3	1275.7	17.6	3.0	1.05	2.00	2.0
T_2	66	19.8	1309.4	18.0	3.16	1.08	2.33	2.16
T_3	66	20.1	1336.6	25.4	3.33	1.16	2.15	2.33
T_4	77	23.1	1783.3	26.7	3.33	1.16	3.50	2.67
T_5	88	26.6	2346.9	28.4	3.33	1.16	3.67	2.75
T_6	66	19.3	1275.7	20.6	3.16	1.10	2.00	2.16
T_7	66	18.1	1198.5	22.4	3.0	1.08	2.00	2.10
T_8	55	16.3	898.1	16.2	2.84	0.75	2.00	1.67
CD (p=0.05)		1.99	138.4	3.1	NS	0.07	0.09	0.09

The number of leaves per plant did not differ significantly due to various treatments. The numbers of leaves recorded due to various treatments ranged from 2.84 to 3.3.Data

pertaining to leaf area differed conspicuously due to various treatments. Among the treatments, the highest leaf area (28.4) was observed in humic acid soaking. The next best treatment was vermicompost. Soaking of setts in tea leaf waste was found to be numerically better than coffee powder waste. Presence of nitrogen, potassium and other substances present in the coffee powder waste and tea leaf waste might have stimulated the growth characters. Soaking of setts in cold or hot water increased the leaf area upto 1.4 and 1.8over control, respectively. Hot and cold water soaking protected the buds from desiccation and helps to convert sucrose in to glucose for better and quick germination. The highest collar girth of 1.16 cm was recorded with humic acid treatment and its value is identical with vermicompost and cowdung soaking treatments. Soaking the setts in hot water or tea leaf waste resulted in identical collar (1.08cm) girth. The control resulted in least (0.75 cm) collar girth.Soaking of setts in humic acid increased the fresh shoot weight upto 1.67 g per plant over control and ranked first. Similar result of increased growth parameters due to soaking of setts in humic acid was reported by Amer *et al.*(2018). The next in order was vermicompost treatment. An identical fresh shoot weight of (2.0 g) was observed in soaking of setts in cold water, coffee powder waste, tea leaf waste and control treatments. Soaking of setts inhumic acid resulted in highest fresh root weight (2.75 g) which was found to be on par with the second best treatment vermicompost. Soaking of setts in cold water or hot water or cowdung or coffee power waste or tea leaf waste significantly increased the fresh root weight to the tune of 0.33, 0.49, 0.66, 0.49 and 0.43 g over control respectively.

From the results, it may be concluded that soil + sand + vermicompost + neemcake @ 5 g/ bag was found to be the best medium for polybag nursery and: soaking of setts inhumic acid solution improved the growth parameters of sugarcane seedlings.

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