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Performance of sweet gourd in association with eucalyptus saplings

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Abstract: The experiment was conducted at the Char Kalibari which is situated at the side of Brahmaputra River adjacent to the Bangladesh Agricultural University, Mymensingh to study the growth and yield of Sweet gourd grown in association with Eucalyptus saplings. The experiment was conducted during October 2011 to March 2012 in a Randomized Complete Block Design (RCBD) with three replications. The different treatments were- T_1(2 feet distance from the tree), T_2 (4 feet distance from the tree), T_3 (6 feet distance from the tree from tree bases). The treatment T_0 referred as control. From the results, it was observed that the growth and yield of Sweet gourd increased rapidly as distance increased from the tree base. All the parameters i.e. plant height, diameter, leaf length, leaf breadth, number of fruits plant$^{-1,}$ weight of fruits plant^{-1}, yield etc. increased gradually with increasing distance from tree bases. The treatment control i.e. without tree gave the highest results in all the studied parameters of Sweet gourd than those treatments with Eucalyptus association. Among the distance treatments, the highest (6.5kg/plant) yield of Sweet gourd was obtained in T_3 treatment and lowest (5.0 kg/plant) in T_1 treatment in Eucalyptus association. It was observe that sweet gourd compete highly with Eucalyptus sapling as because Eucalyptus has attained highest height growth, vigorous stem, spreaded root with lateral root system; shading and lighting effect. In case of large distance treatments (e.g. 6 feet distance), no competitions were visible and the short distance showed less production for more competition among nutrient and other growth factors in this agroforestry practices.
Key words: Eucalyptus, sweet gourd, agroforestry, tree-crop association.

Introduction

Agroforestry combines agriculture and forestry technologies to create more integrated, diverse, productive, profitable, healthy and sustainable land-use systems. Small-scale agriculture plays an important role in Bangladesh economy. It provides nearly 50% of cash flow to the rural poor (Leuscher and Khaleque, 1987; Alam *et al*., 1996). Due to increasing population, land holdings are being fragment and area devoted to small-scale agriculture is decreasing. It is important that small-scale agriculture be maintain so that sustainable local vegetable production is continued in Bangladesh. The goal of sustainable agriculture is to maintain production in order to meet the increasing needs and aspirations of an expanding world population without degrading the environment (TAC, 1989). Agroforestry can provide a sound ecological basis for increasing crop and animal productivity, more dependable economic returns, and greater diversity in social benefits on a sustained basis (Rahim, 1997). Agroforestry can help to overcome shortcomings of traditional agriculture that are often characterized by low output, relatively high investment and a deterioration of the environment. In agroforestry systems, several multipurpose trees are introduced throughout the south Asia. Of them, Eucalyptus is very popular and profitable too .Eucalyptus tree was introduced in India from Australia about 200 years ago. During 18th century, a few trees were planted in the Nilgiris hills of Tamilnadu. Around 1956, a hybrid Eucalyptus, known as "Mysore gum" became more popular in Mysore. Eucalyptus is a fast growing tree and has about 625 species and sub-species with several varieties and hybrids. It can be plant on agricultural lands both as monoculture and as a component of agro-forestry programs. One of the principal factors for its widespread introduction is the ease of cultivation. Besides this, easily obtainable seed supplies, good germination and its adaptability to varying soil and climatic conditions are the other important characteristics of Eucalyptus. In Bangladesh a large number of vegetables are grown of which most of them are grown in winter season. Financial returns from vegetables showed that winter vegetables production is more profitable than the production of most field crops (BBS, 1998). Among the different winter vegetables, Sweet gourd is the important winter vegetables in Bangladesh. Sweet gourd is important for its quick growing nature and high yielding potential. It is easily cultivated as a companion crop or inter crop. Sweet gourd is a well known and a very popular vegetable grown successfully throughout Bangladesh. Even these vegetable can successfully growing in association with Agroforestry trees. In the view of proper utilization of homesteads, hilly areas or other shaded places and to increase the production of winter vegetables, the present study has been under taken with the broad objective to evaluate the performance of Sweetgourd as lower layer crops under Eucalyptus (*Eucalyptus camaldulensis*). Present study investigate the performance of sweet gourd in association with Eucalyptus saplings

Materials and Methods

The experiment was carried out at Kalirchar, which is situated by the side of Brahmaputra River adjacent to the Bangladesh Agricultural University, Mymensingh during the period from 15 October 2011 to 15 January 2012. The study area is geographically located at about 24°75" North latitude and 90°50' East longitude (Khan, 1997). The experiment was laid out in a low land belonging to the AEZ(Agro-ecological Zone)of Old Himalayan Flood Plain area (FAO, 1981). The soil texture was sandy loam with a pH 6.6. The structure of the soil was fine and the organic matter content was 1.80%. This characteristic of the soil was previously tested in the Soil Science Department, BAU, Mymensingh). The seed was collect from BRAC seed centre, Mymensingh. The association with Eucalyptus tree saplings maintaining standard spacing grew Sweet gourd. Experiment was laid out following the Randomized Complete Block Design (RCBD) with three replication and single factorial arrangement of multistoried production system. Following four treatments were used in association with Eucalyptus saplings experiment: T_0=Open field referred to as control, T_1=2 feet distance from the tree, T_2=4 feet distance from the tree, T_3=6 feet distance from the tree

The land used for the experiments was first opened one week before laying out the experimental plots. The land was well prepared with the tractor followed by harrowing and laddering up to a good tilth. All weeds and stubbles were removed accordingly. The Sweet gourd was directly sown in the experimental plot on

10 October 2011. Those seedlings were collected from BRAC seed Centre, Mymensingh. The spacing was taken 20 x 20 cm for Sweet gourd planting. After emergence, Sweet gourd was thinned out by maintaining 15, 25 and 30 days, respectively. Only cow dung was applied as manure. The full amount of cow dung was applied at the time of final land preparation. The experimental plots were kept weed free by weeding frequently. The land were irrigated wherever needed by using hose pipe and watering cane to supply sufficient soil moisture for the vegetables. Emergence of Sweet gourd seedling was started after 15 days from the date of sowing. Seedlings were thinned out for three times. First thinning was done after 15 days of sowing. The second and third thinning was done after 25 and 30 days of sowing respectively. No pesticide and fungicide were used in the field for tree-vegetable association. Sweet gourd was harvested at 90 days after seed sowing. It was harvested at several picking. Three and four plants were randomly selected for data collection. The parameters under study were as follows: No. of leaves, Length of leaves, Breadth of leaves, Vein length, No. of branch, Length of branch, No. of flowers, No. of fruits, Length of fruits, Diameter of fruits, and Yield. The analysis of variance for each of the studied character was done by F (variance ratio) test following Randomized Complete Block Design. The mean differences were evaluated finally by Duncan Multiple Range Test (DMRT) at 5% level of significance.

Results and Discussion

This chapter represents the results of the performance of Sweet gourd in association with Eucalyptus (*Eucalyptus camaldulensis*) saplings.

Morphological characters and yield contributing parameter: These parameters are presented in Table 1, (Vine length, No. of leaves, Length of leaves, Breadth of leaves, No. of Branch, Length of leaves per plant was significantly affected by different distance condition, where the largest leaf length plant^{-1} (28.87 cm) was obtained under T_0(19.33 cm) was recorded under treatment T_1 (Table 1). Different treatments had significant effect on length of leaf breadth of Sweet gourd. The maximum breadth of leaves plant $^{-1}$ (30.67 cm) was recorded from the plant grown under treatment T_0 (which is considered as control). The minimum breadth of leaves plant^{-1} of Sweet gourd (20.67 cm) was obtained from the plant grown under treatment T_1 (2ft distance from the tree). All the values are statistically different. However, the breadth of leaves of Sweet gourd was increased with increasing the distance from the tree (Table 1).

Table 1. Morphologicalperformance of Sweet gourd in association with Eucalyptus (*Eucalyptus camaldulensis*) saplings

Treatment	Vine Length (m)	No. of Leaf	Length of leaf (cm)	Breadth of leaf (cm)	No. of flower	No. of branch	Length of branch (cm)
Control(T_0)	3.500 a	45.67 a	28.67 a	30.67 a	11.33 a	5.333 a	78.67 a
2ft away from Eucalyptus(T_1)	2.900 c	36.67 c	19.33 c	20.67 c	6.333 c	2.667 c	60.33 d
4ft away from Eucalyptus (T_2)	3.000 c	38.67 bc	23.00 b	23.67 bc	8.000 b	3.333 bc	66.20 c
6ft away from Eucalyptus (T_3)	3.267 b	40.67 b	23.67 b	26.33 b	8.400 b	4.000 b	71.67 b
LSD_{005}	0.227	2.64	3.54	3.05	0.625	1.14	4.80
Level of significance	**	**	**	**	**	**	**
CV%	3.65	3.27	7.49	6.03	3.67	14.95	3.47

** = Significant at 1% level of probability, * = Significant at 5% level of probability

Table 2. Yield contributing characters of Sweet gourd in association with Eucalyptus (*Eucalyptus camaldulensis*) saplings

Treatment	No. of fruit	Fruit diameter (cm)	Fruit length (cm)	Yield (kg plant $^{-1}$)
Control(T_0)	6.333 a	57.00 a	27.00 a	9.500 a
2ft away from Eucalyptus(T_1)	3.333 b	47.00 c	22.00 b	5.000 b
4ft away from Eucalyptus (T_2)	3.667 b	51.67 b	24.00 ab	5.500 b
6ft away from Eucalyptus (T_3)	4.333 b	53.33 b	25.00 ab	6.500 b
LSD_{005}	0.998	3.14	3.05	1.49
Level of significance	**	**	*	**
CV%	11.32	3.01	6.23	11.32

** = Significant at 1% level of probability, * = Significant at 5% level of probability

It was found that the number of branch of Sweet gourd was affected significantly at 1% level of significance (Table1). The result found that the highest number of branchplant^{-1}of Sweet gourd (5.33) was produced by T_0 (which is considered as control). The second highest number of primary branch plant^{-1}(4.00) was produced under T_3 and the lowest (2.67) was produced inT_1 (Table 1).

Different treatments had significant effect on length of branch of Sweet gourd. The maximum length of branchplant^{-1} (78.67 cm) was recorded from the plant grown under treatment T_0. The minimum length of branch plant^{-1}of Sweet gourd (60.33 cm) was obtained from the plant grown under treatment T_1. All these means are statistically different. However the length of branch of Sweet gourd was increased with increased the distance from the treeT_1 (Table 1).

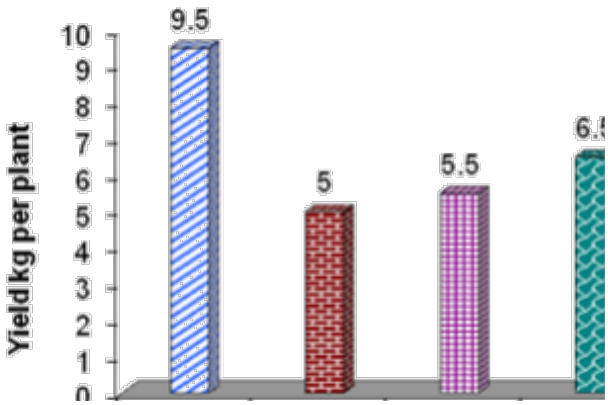

Fig. 1. Yield of Sweet gourd at different distances from Eucalyptus tree base.

The highest number of flowers per plant (11.33) was recorded in T_0 and the minimum number of flowers per plant (6.33) was obtained under T_1 treatment. The second highest number of flowers per plant (8.40) was observed under T_3. Number of flowers per plant of Sweet gourd at control was better than any other treatments due to less competition with the tree.

A significant difference was showing in number of fruits per plant at 1% level of probability. The maximum number of fruits per plant (6.33) were recorded in treatment T_0 and the minimum in T_1 (3.33) due to various competition.

It was observed that the length of fruits of Sweet gourd was affected significantly at 1% level of significance (Table 2). The result revealed that the highest length of fruits plant^{-1} (27 cm) was produced by T_0.The second highest length of fruits plant^{-1}(25 cm) was produced under T_3 and the lowest (22 cm) was observed inT_1. The result found that the highest fruit diameter of Sweet gourdplant^{-1} (57 cm) was produced in T_0treatment and the lowest (47 cm) was observed in T_1 (Table 2).

The yield of Sweet gourd was affected significantly at 1% level of probability (Table 2). The result showed that the highest yield (9.50kg plant^{-1}) was obtained under treatment T_0 and the second highest yield of Sweet gourd plant^{-1} (6.50kg plant^{-1}) was recorded at T_3. The yield of Sweet gourdplant^{-1} produced under treatment T_1 (5.0kgplant^{-1}) was significantly lower than other treatments (Table 2 and Fig. 1).

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