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Performance sweet gourd grown in association with Akashmoni saplings

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Abstract: An experiment was conducted at the Char Kalibari which is situated at the opposite side of Brahmaputra river adjacent to the Bangladesh Agricultural University, Mymensingh, during the period from October 2011 to January 2012 with the aim of evaluating the growth performance of winter crop viz. sweet gourd grown under two years old Akashmoni tree saplings using four different distances for crop cultivation viz. 2, 4 and 6 feet distance from tree sapling bases and in open field condition referred as control . The experimental design was laid out in a Randomized Complete Block Design with three replications. Sweet gourd was cultivated surrounding the two years old sapling of *Acacia auricuhformis.* Different stages of growth and yield data were taken from Sweet gourd. The result showed that yields of sweet gourd were highest in the open field. The second highest yields of sweet gourd 29.8 t/ha were obtained under 6 feet distance and the lowest yields 15.3 t/ha were recorded less than 2 feet distance from sapling base. Morphological parameters of sweet gourd were affected significantly by different distances from sapling base Different morphological characteristics of sweet gourd such as- vine; length, fruit length, no. of fruit, and fruit diameter etc. were increased consistently with the increase of distance from the sapling base. The growth characteristics of Akashmoni *(Acacia aurimliformis)* significantly influenced the growth parameters and yields of the crop.
Key word: Sweet gourd, tree sapling, Char kalibari, *Acacia auriculiformis*.

Introduction

Agroforestry is an old concept but the term is new. Though agroforestry is an age old practice in Bangladesh, further development may be brought for harvesting maximum benefit by identification of appropriate tree-crop combination. Sound environment is needed to maintain the environmental equilibrium and rate of socio-economic development at least 25% area of a country should be covered with forest.

In Bangladesh, the total forest area covers about 17.08% of the total land area (BBS, 2011). But the actual tree covered area is estimated at around 5.4%, which is decreasing at an alarming rate (Hossain and Bari, 1996).

As a result of continuous transformation of forest land to agricultural land, aquaculture, homestead and other purposes about 8000 ha of forest land is decreasing per year (FAO, 2007). It causes harm to the environment. 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.

Population of Bangladesh is increasing at an alarming rate. Therefore, demand of food crops is increasing rapidly due to ever increasing population. The population has doubled in the last 30 years and 964 persons are living per square kilometer at present. The country has only a land area of 14.39 million hectares, but to the ever-growing population per capita land area is decreasing at an alarming rate of 0.005 ha/capita/year since 1989 (Hossain and Bari, 1996) About 31.60% of the gross domestic product of Bangladesh is contributed from agriculture.

Of the total agricultural product about 22.80% conies from various crops, 3.2% from livestock, 3.27 from fishes and 2.32% from forests (BBS, 2006), However, recently, some techniques have already been advocated to overcome the future challenges, agroforestry is one of them. Agroforestry, the integration of the tree, crop and vegetable on the same area of land is a promising production system for maximizing yield (Nair, 1990) and maintaining friendly environment. Growing of crops/ vegetables in association with trees is becoming popular day by day for their higher productivity, versatile/multipurpose use and environmental consciousness among the peoples.

Akashmo*ni (Acacia auriculiformis)* used for fuelwood plantations as an ornamental and shade tree, quite tolerant of heat, the Australian species is widely planted in ocean and Southeast Asia. The wood is also employed for making farm tools and furniture (NAS, 1983). Recent Australian tests suggest that 10-year old trees can be pulped readily by the sulfate process, giving high pulp yields, with good strength properties

Our limited cultivable and natural resources are the main constraint for increasing vegetable production. On the other hand to meet up 'farmer's timber and fuelwood demand they plant large number of saplings of timber species in their cropland, homestead, and other fallow lands at block plantations, row plantation, woodlot plantation, and scattered plantations (Haqu'e, 1996). Initially the saplings are small and it requires wider spacing and it takes many years to generate income. Farmers do not get immediate return from the monoculture area of *Acacia auriculiformis*. But it does not do so harm to agricultural crops and vegetables. During this early period of tree establishment farmers can produce annual crops (like vegetables) at the area and surrounding area of the saplings.

Considering the aforementioned facts and potentiality, a study was undertaken with the broad objective to examine the competitive performance of winter vegetables sweet gourd grown in association with saplings of timber trees for tree-crop agroforestry system.

Regarding the broad objectives, the specific objectives of the study were, to evaluate the morphological characteristics and yield of mustard and sweet gourd grown along with *Acacia auriculiformis* sapling, to observe the interaction effect of mustard and sweet gourd with *Acacia auriculiformis* sapling; and to identify the optimum distance from the tree base for optimum growth and yield of mustard and sweet gourd.

Materials and Methods

Location of the study area: The experiment was carried out at char Kalibari belongs to the Mymensingh sadar upazila during the period from October 2011 to January

2012. The district Mymensingh is located between 24°38'3" North and 90°164" East Latitude. Total area of this district is 4363.48 km^2 and situated on the west bank of Brahmaputra River. The geographical position of char Kalibari located between 2°45 - 24°45'40" North and 90°244"90°24'44" East Latitude.

Soil characteristics: The experimental site belongs to the agro ecological region of Old Brahmaputra Flood Plain having Non- calcareous Black Grey Flood Plain Soil. The soil of this area is mainly formed with recent and sub-recent alluvial sediments of low parts of the Old Brahmaputra Flood plain. Most of the soil has silty to clay texture and low contents of organic matter having pH ranged from 6.3 to 7.2.

Climate and weather: The climate at the locality is sub-tropical in nature. It is characterized by high temperature and heavy rainfall during kharif season (April to September) and a scanty rainfall during rabi season (October to March).

Tree and plant materials: In this study the two years old previously established Akashmoni *(Acacia auriculiformis)* trees were used as tree components and one crop is used as plant materials. This is: Sweet gourd *(Cucurbita moschata)* -vegetable crop

Experimental design: The Experimental design was done in a Randomized Complete Block Design with three replications. Three plots each of 13.2m x 35.80m were laid around the tree. The layout of all the experiments is shown in the Fig. 1. Different treatments of this study were; To = Open field referred to as control, T_i = 2 feet distance from the tree, T2 = 4 feet distance from the tree, T3 =- 6 feet distance from the tree.

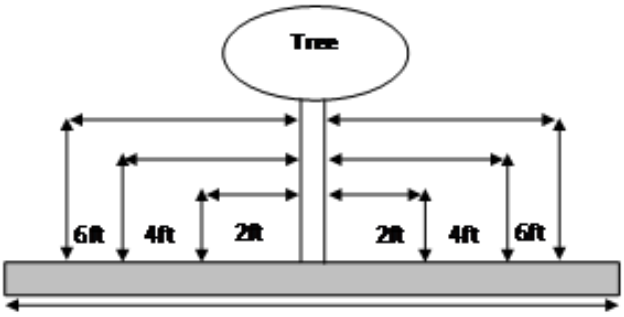

Fig. 1. Layout of the experiment

Data collection: Plant samples of sweet gourd were collected randomly from all the respective pots. Five plants of sweet gourd were selected from each plot for data collection. Data were collected at 30, 60 and 90 days after sowing at 30 days intervals. The following plant characters of sweet gourd were recorded such as vein length, no of leaf, length of leaf, breadth of leaf, no of flower, no of branch, length of branch, fruit length, no. of fruit, fruit diameter.

Data analysis: Data were analyzed statistically by ANOVA to examine whether treatment effects were significant (Gomez and Gomez, 1984). Mean value were compared by DMRT (Duncan's Multiple Range Test). The software package, MSTATC was followed for statistical analysis.

Results and Discussion

Effect of *Acacia auriculiformis* on morphological characteristics and yield of Sweet gourd were as:

Vine length (m): It was perceived that the vine length (m) of sweet gourd was affected by Akashmoni (*Acacia auriculiformis)* tree saplings (Table 1). The best vine length (4.033m) was verified in without saplings treatment (Table 1). The vine length was recorded under 2, 4 and 6 feet distance from saplings (Table 1). The second highest vine length (4.007m) was produced under 6 feet distance from saplings and the lowest vein length (3.670m) was observed under 2 feet distance from saplings. It was noted that vine length of sweet gourd was significantly increased with the increase of distance from seedlings.

No. of leaves plant^{-1}: It was observed that no. of leaves plant^{-1} of sweet gourd was suggestively augmented with the growth of distance from saplings. It was noticed that the total of leaves plant^{-1} of sweet gourd was exaggerated by saplings (Table 1). The top no. of leaves plant^{-1} (32.55) was recorded in without sapling treatment (Table 1). The no. of leaves plant^{-1} was logged under 2, 4 and 6 feet distance from saplings (Table 1). The another uppermost no. of leaves plant^{-1} (32.63) was produced under 6 feet distance from saplings and the lowest no. of leaves plant^{-1} (30.06) was observed under 2 feet distance from saplings.

Length of leaves plant^{-1}: The paramount length of leaves plant^{-1} (33.00cm) of sweet gourd was recorded in without saplings treatment (Table 1). It was perceived that the length of leaves plant^{-1} was affected by saplings. The length of leaves plant^{-1} was listed fewer than 2, 4 and 6 feet distance from saplings. The next highest length of leaves plant^{-1} (32.03cm) was created under 6 feet distance from saplings and the lowest length of leaves plant^{-1} (28.33cm) was observed less than 2 feet distance from saplings. It was noticed that length of leaves plant^{-1} of sweet gourd was significantly increased with the increase of distance from saplings.

Breadth of leaves plant^{-1}: Breadth of leaves plant^{-1} of sweet gourd was expressively improved with the increase of distance from saplings. The breadth of leaves plant^{-1} was documented fewer than 2, 4 and 6 Feet distance from saplings (Table 1). The breadth of leaves plant^{-1} of sweet gourd was exaggerated by saplings. The top breadth of leaves plant^{-1} (36.67cm) was recorded in without saplings treatment. The second highest extent of leaves plant^{-1} (32.33cm) was produced less than 6 feet distance from saplings and the lowest breadth of leaves plant^{-1} (27.50cm) was observed less than 2 feet distance from saplings.

Number of flowers plant^{-1}: The number of flowers plant^{-1} was verified fewer than 2, 4 and 6 feet distance from saplings (Table 1). The total no. of flowers plant^{-1} of sweet gourd was affected by Akashmoni tree saplings. The top number of flowers plant^{-1} (11.10) was verified in without saplings treatment. The following highest number of flowers plant^{-1} (10.70) was created under 6 feet distance from saplings and the lowest number of flowers plant^{-1} (7.670) was observed less than 2 feet distance from sapling. Number of flowers plant^{-1} of sweet gourd was pointedly enlarged with the rise of distance from saplings.

Number of branches plant^{-1}: The total of branches plant^{-1} of sweet gourd was affected by Akashmoni tree saplings

(Table 1). The best total of branches plant^{-1} (10.89) was noted in without saplings treatment (Table 1). The number of branches plant^{-1} was detailed under 2, 4 and 6 feet distance from saplings (Table 1). The second highest total of branches plant^{-1} (9.950) was produced under 6 feet distance from saplings and the lowest number of branches plant^{-1} (7.110) was observed under 2 feet distance from saplings. The number of branches plant^{-1} of sweet gourd was significantly increased with the increase of distance from saplings.

Table 1. Morphological performance and yield contributing characters of sweet gourd in association with Akashmoni (*Acaci auriculiformis*) tree saplings

Treatment	Vine length (m)	No. of leaves per plant	Length of leaves (cm)	Breadth of leaves (cm)	No. of flowers	No. of branch	Length of branch (cm)	No. of fruits	Fruit diameter (cm)	Fruit length (cm)	Yield/plant (kg)
T_0	4.033 a	32.55 a	33.00 a	36.67 a	11.10 a	10.89 a	40.87 a	3.250 a	46.44 a	25.22 a	12.13 a
T_1	3.670 b	30.06 b	28.33 c	27.50 c	7.670 b	7.110 d	36.77 d	2.570 b	44.73 b	22.47 b	9.560 b
T_2	3.850 a	31.44 a	30.31 b	29.35 c	8.050 b	8.680 c	38.23 c	2.670 b	45.69 ab	23.18 b	9.877 b
T_3	4.007 a	32.36 a	32.03 a	32.33 b	10.70 a	9.950 b	39.88 b	2.890 ab	45.96 a	24.88 a	11.64 a
$LSD_{0.05}$	0.178	1.17	1.46	2.47	0.981	0.695	0.924	0.451	0.968	1.1	1.05
Level of significance	**	**	**	**	**	**	**	*	**	**	**
CV%	2.27	1.86	2.37	3.93	5.23	3.79	1.19	7.97	1.06	2.3	4.91

* = Significant at 5% level of probability, ** = Significant at 1% level of probability, NS = Not significant; T_0 = Control, T_1 = 2 feed distance from the tree, T_2 = 4 feed distance from the tree, T_3 = 6 feed distance from the tree.

Length of branches plant^{-1} (cm): Length of branches plant^{-1} of sweet gourd was suggestively increased with the increase of distance from saplings. The best length of branches plant^{-1} (40.87cm) was logged in deprived of saplings treatment (Table 1). The length of branches plant^{-1} of sweet gourd was exaggerated by saplings. The length of branches plant^{-1} was noted under 2, 4 and 6 feet distance from saplings. The second uppermost length of branches plant^{-1} (39.88cm) was created under 6 feet distance from saplings and the lowest length of branches plant^{-1} (36.77cm) was observed under 2 feet distance from saplings.

Number of fruits plant^{-1}: The amount of fruits plant^{-1} of sweet gourd was affected by Akashmoni tree saplings (Table 1). The best amount of fruits plant^{-1} (3.250) was recorded in without saplings treatment. The amount of fruits plant^{-1} was noted under 2, 4 and 6 feet distance from saplings. The second highest amount of fruits plant^{-1} (2.890) was produced under 6 feet distance from saplings and the lowest amount of fruits plant^{-1} (2.570) was observed under 2 feet distance from saplings. It was noticed that amount of fruits plant^{-1} of sweet gourd was pointedly amplified with the growth of distance from saplings.

Fruit diameter plant^{-1}: The supreme fruit diameter plant^{-1} (46.44cm) was recorded in without saplings treatment (Table 1). It was noted that the fruit diameter plant^{-1} of sweet gourd was affected by saplings. The fruit diameter plant^{-1} was logged under 2, 4 and 6 feet distance from saplings. The additional highest fruit diameter plant^{-1} (45.96) was produced under 6 feet distance from saplings and the lowest fruit width plant^{-1} (44.73) was observed under 2 feet distance from saplings. It was noticed that fruit diameter plant^{-1} of sweet gourd was significantly increased with the increase of distance from saplings.

Fruit length plant^{-1}: The fruit length plant^{-1} of sweet gourd was expressively enlarged with the growth of distance from saplings. The fruit length plant^{-1} was recorded under 2, 4 and 6 feet distance from saplings (Table 1). It was perceived that the fruit length plant^{-1} of sweet gourd was affected by saplings. The finest fruit length plant^{-1} (25.22cm) was recorded in without saplings treatment. The second highest fruit length plant^{-1} (24.88cm) was produced under 6 feet space from sapling and the last fruit length plant^{-1} (22.47cm) was observed under 2 feet distance from saplings.

Yield: It was perceived that yield of sweet gourd was exaggerated by saplings (Fig. 2). The best harvest of sweet gourd per plant (12.13kg) was recorded in without Akashmoni tree saplings. Because it uptakes appropriate amount of nutrient, water, raw materials and it does not cope with in any tree crop interaction. The harvest of sweet gourd per plant was verified under 2, 4 and 6 feet space from saplings (Fig. 2). The second maximum number of yield per plant (11.64kg) was produced under 6 feet space from saplings and the lowest number of yield per plant (9.560kg) was observed under 2 feet distance from saplings. When distances were diminishing, yield of sweet gourd was decreased. Because in tree-crop interaction, crop does not acceptance proper amount of sunlight, air, nutrient, and water etc. It was noted that yield of sweet gourd per plant was expressively increased with the increase of distance from sapling.

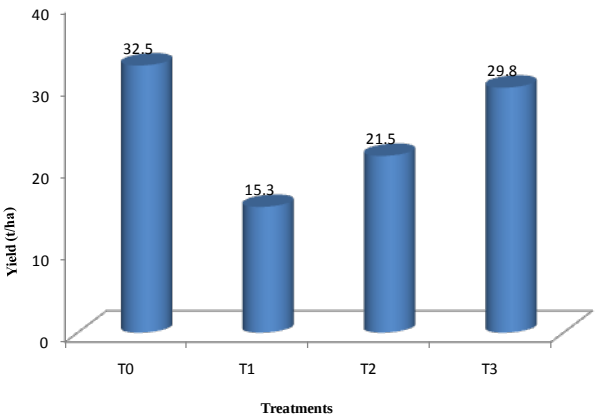

Fig.2. Yield of sweet gourd along with Akashmoni tree

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References

BBS (Bangladesh Bureau of Statistics). 2011. Statistical Year Book of Bangladesh, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.

BBS. 2006. Statistical Yearbook of Bangladesh. Bangladesh Bur. Stat. (BBS), Divn.,Minist. Plan. Govt. People's Repub. Bangladesh, Dhaka. p.51.

FAO. 2007. Tropical forestry resources assessment project (GEMD): Tropical Africa, Tropical Asia, Tropical America (4Vols), FAO/UNDP, Rome.

Francis. 2001. Forestry Master Plan-Forest Production. Ministry of Environment and Forest, Government of Bangladesh (UNDP/ FAO/ BGD 88/025): 2-48.

Gomez, K.A. and Gomez, A.A. 1984: Statistical Procedures for Agricultural Research, John Wiley and Sons Inc., N.Y.

Haque, M.A. 1996. Social forestry in Bangladesh: Concept and present status, In. Bangladesh Swiss Development Corporation, Dhaka and Bangladesh Agricultural University, Mymensingh. P 30.

Hossain, S.M.A. and Bari, M.N. 1996. Agroforestry farming system. In: (Hoque, M.A. Ed.). Agroforestry in Bangladesh Village and Farm Forestry Project. SIDC. Dhaka and Bangladesh Agric. Univ., Mymensingh. pp. 21-29.

Leuscher, W.A. and Khaleque, K. 1987. Homestead agroforestry in Bangladesh. Agroforestry System, 5:139-151.

Lundgren, B.O. and Raintree, J.B. 1982. Sustained agroforestry. In: Agricultural research for development: potentials and challenges in Asia, Nestle, B. ed. ISNAR. pp. 37-39.

Nair, P.K.R. 1990. An introduction to agroforestry. Kluwer Academic publishers, ICRAF.

NAS. 1980. Firewood crops, shrub and tree species for energy production. National Academy of Sciences, Washington, DC.

NAS. 1983. Producer gas: another fuel for motor transport. National Academy Press, Washington DC.

Rahim, M.A. 1997. Fruit Tree Management: Frame working of fruit tree training, pruning and bearing habits of fruit trees. Swiss Development Cooperation (SDC) Publication, Dhaka, Bangladesh.p.128.

TAC (Technical Advisory Committee of the Consultative Group on International Agricultural Research), 1989. Sustainable agricultural publication: Implications for international agricultural research. FAO, Rome, Italy. 18(3): 109-123.