

PERFORMANCES OF OKRA AND BOTTLE GOURD IN ASSOCIATION WITH FOUR YEARS OLD *Xylia dolabriformis* TREE

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ABSTRACT

A field experiment was conducted at the Najirpur farm near Pabna town of during the period from 05 February 2015 to 25 May 2015 to observe the performance (growth and yield) of okra, bottle gourd grown at different distances from the *Xylia dolabriformis*. Different treatments of the experiment were T₁ (3 feet distance from tree), T₂ (6 feet distance from tree), T₃ (9 feet distance from tree), T₄ (open field referred as control). The experiment was laid out in RCBD for all crops with 3 replications. The result of the experiment revealed that the yield of the crops increased gradually with the increase of planting distance from the tree. In Okra the highest value of yield (12.50 tha⁻¹) was found in T₃ which was statistically similar to treatment T₄ (open field referred as control). In case of Bottle gourd, it was also found that treatment T₃ (9 feet distance from tree) produced highest yields (70 tha⁻¹) which were statistically similar to treatment T₄ (open field referred as control). In cases of lowest yield was found in T₁ (3 feet distance from the tree).

Key words: Performance, agroforestry, bottle gourd.

Introduction

In Bangladesh, a large number of vegetable are grown throughout the year including summer season. About 30 per cent of vegetable are produced in summer and rainy seasons. The average consumption of vegetable in Bangladesh is only 70 g per head per day including potato and sweet potato. To supply the minimum daily requirement of 200g vegetable head day⁻¹, national production of vegetable should be over 10 million ton in addition. The effective area of forest in Bangladesh is neither in a position to fulfill the requirements of the people's fuel and timber nor to stabilize the climatic condition. So, conflict for land use between agriculture and forestry are prevalent in Bangladesh. Under these circumstances it is necessary to find out a suitable alternative to overcome this situation. Since there is no scope for expanding forest area and sole grain crops area. Recently, some techniques have already been advocated to overcome future food challenges, vegetable agroforestry is one of them (Basak *et al.*, 2009). Unfortunately Bangladesh is endowed with only 17.5% of unevenly distributed forests. In Bangladesh, different crops are cultivated in summer season. Among the different summer vegetables okra and bottle gourd are the important summer vegetables in Bangladesh (Khatun *et al.*, 2009). These are well known and very popular vegetables grown successfully during summer season in Bangladesh. For identifying the compatible tree-crop combination, particularly under storey species i.e. different crops should be screened out in terms of their adaptability and yield in association with the early stage of tree. Therefore, it would be wise to conduct experiments under different tree crop or vegetable combination at different spacing for screening of different crops in terms of their growth and yield performance. The specific objectives of the study were to observe the performance of okra, and bottle gourd in association with *Xylia dolabriformis* tree and to observe interaction effect of *Xylia dolabriformis* tree on okra, bottle gourd.

Materials and Methods

The study was made to evaluate the performance of vegetables in association with four years old lohakat tree. The soil of the experimental area was a medium high land. The texture of the soil was silty loam

having pH 6.7 (Amir and Bhuiya, 1994). The topography of the field was medium high land above flood.

Tree and plant materials: In this study the four years old previously established *Xylia dolabriformis* tree were used as tree components. The seeds of bottle gourd variety BARI lau-4 were collected from International Seed Fair in Bangladesh Agricultural University campus, Mymensingh used as plant materials in this study.

Experimental design and treatment combination: The study for okra and bottle gourd was laid out following the Randomized Complete Block Design with single factorial arrangement and three replications. Individual plot size was 9 ft x 2 ft. Four treatments were used in this study which is as follows: T₁= 3 feet distance from the tree base, T₂=6 feet distance from the tree base, T₃=9 feet distance from the tree base and T₄=Open field referred to as control

Land preparation: The experimental land was first opened on 05 February 2015 and the operation was done by spade. Then the land was fallow for few days. All crop residues and weeds were removed from the field and finally the land was properly leveled.

Crop establishment and management: Seeds of okra, bottle gourd were directly sown in the experimental plot on 15 February 2015. Seeds of okra were sown following the spacing 30 cm x 35 cm. Seeds of bottle gourd were sown following the spacing 40 cm x 45 cm. Only recommended dose of well decomposed cowdung were applied for the all crop species. No chemical fertilizer was applied considering the suitable fertility status of the soil. Full amount of well decomposed cowdung was incorporated during the final land preparation. The plots were irrigated seven times by using water cane to supply sufficient soil moisture for the vegetable. Finally, okra was harvested in several pickings; first harvesting was done 70 days after the seed sowing. Bottle gourd was harvested by cutting the twigs as vegetables as they were not grown for fruit cultivation.

Sampling procedure and data collection: Ten plants of okra were selected from each plot for data collection. The parameter such as plant height, number of flowers, number of fruits, average length of fruits and total weight of fruits were considered for data collection. Plant samples of bottle gourd were also collected randomly from all rows of the respective plots. Three plants of bottle gourd were selected and harvested from each plot by cutting the twigs (branch) for data collection; number of branch twigs⁻¹, length of branch, number of leaves, stem weight of branch, leaf weight of the branch, total weight was recorded at the final harvesting period.

Statistical analysis: The data were collected from the experiment at different stages of various growths and then analyzed statistically by using PC- MASTAT software package to find out the statistical significance of the experimental results. The means for all the treatments and analysis of variance of yields of the summer vegetables were calculated by Duncan's Multiple Range Test (DMRT).

Results and Discussion

Performance of Okra in association with lohakat tree (Xylia dolabriformis)

Plant height: The growth of okra was more vigorous in the open field than those grew close distance to the tree. The highest average plant height of okra was 145 cm, found in T₄ (Open field referred as control) and lowest average plant height of okra was 94 cm, found in T₁ (3 feet distance from the tree). Other than the T₄ (Open field referred as control) highest average plant height of okra was 127 cm, found in T₃ (9 feet distance from the tree).

Number of flowers plant⁻¹: Good foliage indicates higher growth, development and productivity of plant. The result of the experiment showed that the number of flowers per plant gradually increased with time being highest at 65 DAS. The highest number of flower plant⁻¹ was 06 when plants were grown under treatment T₄ (Open field referred as control). The lowest number of flower plant⁻¹ (02) was found under treatment T₁ (3 feet distance from the tree), (Table 1). Number of flower plant⁻¹ showed significant variation due to different distance of Okra plant from the tree.

Number of fruits plant⁻¹: Number of fruits plant is the most important yield contributing character, which was also significantly influenced by different distance of growing okra plant from the tree. The maximum number of fruits per plant was found in the open field (06). The lower number of fruits plant⁻¹ (01) was found under close contact of the tree condition and it was probably due to poor photosynthetic capacity and nutrients competition between tree and crops. Basak *et al.* (2009) also showed that the yield contributing characters of the vegetables increased gradually with the increase of planting distance from the tree. Khatun *et al.* (2009) also showed the similar results as like of this present study.

Average length of fruits: Average length of fruits plant is one of the important yields contributing character, which was also significantly influenced by different distance of growing Okra plant from the tree. The maximum average length of fruits per plant was found in the open field (16 cm). The lower number of fruits plant⁻¹ (09 cm) was found under close contact of the tree condition and it was probably due to poor photosynthetic capacity and nutrients competition between tree and crops.

Weight of fruits plant⁻¹: Weight of the fruits of okra plant⁻¹ was also significantly influenced by different planting distance from the tree. The trend of weight of fruit plant⁻¹ was almost similar to that of number of fruits plant⁻¹. The highest yield plant⁻¹ (75 g) was recorded in T₄ (Open field referred as control). Due to high competition between tree and crop the lowest yield plant⁻¹ (16 g) was found in T₁.

Table 1. Morphological characteristics of okra in association with *Xylia dolabriformis* tree

Treatment	Average plant height (cm)	No. of flowers plant ⁻¹	No. of fruits plant ⁻¹	Average length of fruit (cm)	Total weight of fruits (g)
T ₁	94c	2c	1c	9c	16c
T ₂	103b	3b	3b	13b	65b
T ₃	127a	5a	5a	14a	69a
T ₄	145a	6a	6a	16a	75a
CV	1.72	0.39	0.56	1.21	0.89
Level of significance	**	**	**	**	**

**= Significant at 1% level of probability

Where, T₁= 3 feet distance from the tree, T₂= 6 feet distance from the tree, T₃ = 9 feet distance from the tree, T₄ = Open field referred as control

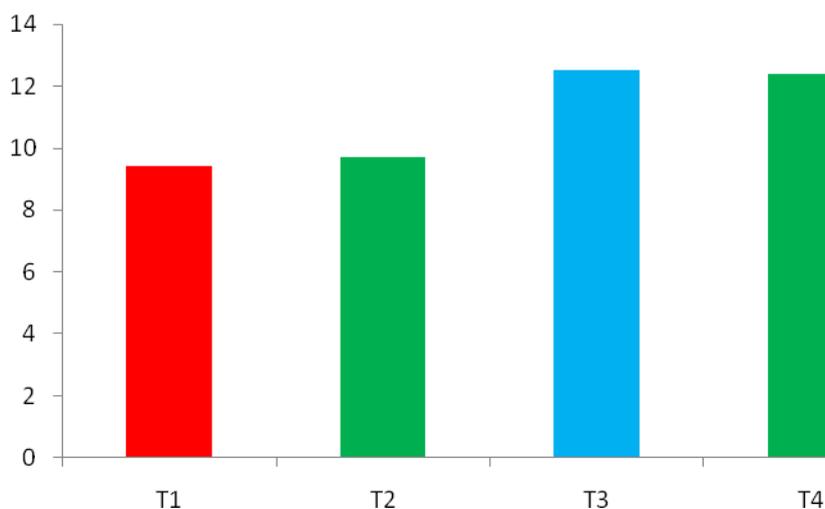


Fig. 1. Yields of okra in association with *Xylia dolabriformis* tree

Yield (tha⁻¹): The variation in yield of Okra ton per hectare due to different treatments was found significant. As evident from results, the highest yield of okra (12.50 t/ha) was obtained from treatment T₃ (9 feet distance from the tree). (Fig.1). On the other hand, the lowest yield of okra (9.40 t/ha) was found from treatment T₁ (3 feet distance from the tree). The second highest yield of okra (12.40 t/ha) was obtained from T₄ (Open field referred as control).

Performance of Bottle gourd in association with Lohakat tree (*Xylia dolabriformis*)

Number of branches⁻¹: Bottle gourd was cultivated under different distance from the tree. It grew more vigorously in the open field than those grew close distance to the tree. The first harvesting was done at 55 days after seed sowing by cutting the main branch and the number of branch was increased later. Branching and growth were more vigorous in the open field than those grew close distance to the tree. The highest average number of branching was 5, found in T₄ (Open field referred as control) and lowest average number of branching was 2, found in T₁ (3 feet distance from the tree). Other than the T₄ (Open field referred as control) highest average number of branching was 4, found in T₃ (9 feet distance from the tree).

Average length of branch: Branching and growth of Bottle gourd were more vigorous in the open field than those grew close distance to the tree. The highest average length of branch was 125 cm, found in T₄ (Open field referred as control) and lowest average length of branch was 61 cm, found in T₁ (3 feet distance from the tree). Other than the T₄ (Open field referred as control) highest average length of branch was 117 cm, found in T₃ (9 feet distance from the tree).

Number of leaves plant⁻¹ at harvest period: Good foliage indicates higher growth, development and productivity of plant. The result of the experiment showed that the number of leaves per plant gradually increased with time being highest at 55 DAS. The highest number of leaves plant⁻¹ was 29 when plants were grown under treatment T₄ (Open field referred as control). The lowest number of leaves plant⁻¹ (11) was found under treatment T₁ (3 feet distance from the tree), (Table 2). Number of leaves per plant showed significant variation due to different distance of Bottle gourd plant from the tree.

Table 2. Morphological characteristics of bottle gourd in association with *Xylia dolabriformis* tree

Treatment	No. of branches ⁻¹	Average length of the branch (cm)	No. of leaves ⁻¹	Stem weight of branches ⁻¹ (g)	Leaf weight of branches plant ⁻¹ (g)
T ₁	2c	61c	11d	41c	79c
T ₂	3b	109b	18c	238a	238a
T ₃	4a	117a	23b	104b	209b
T ₄	5a	125a	29a	112b	218b
CV	0.67	2,89	1.12	4.11	2,45
Level of significance	**	**	**	**	**

**= Significant at 1% level of probability

Where, T₁= 3 feet distance from the tree, T₂= 6 feet distance from the tree, T₃ = 9 feet distance from the tree, T₄ = Open field referred as control

Stem weight plant⁻¹, Leaf weight plant⁻¹ and Total weight plant⁻¹: Distance of Bottle gourd plant from the tree had significant effect on weight at final harvest. The highest stem weight plant⁻¹, leaf weight plant⁻¹ and total weight plant⁻¹ were 112 g, 218 g and 330 g respectively, found in T₄ (Open field referred as control) and the lowest stem weight plant⁻¹, leaf weight plant⁻¹ and total weight plant⁻¹ were 41 g, 79 g and 120 g respectively, found in T₁ (3 feet distance from the tree) (Table 2). The second highest stem weight plant⁻¹, leaf weight plant⁻¹ and total weight plant⁻¹ were 104 g, 209 g and 313 g respectively, found in T₃ (9 feet distance from the tree). The stem weight plant⁻¹, leaf weight plant⁻¹ and total weight plant⁻¹ showed significant variation due to different distance of bottle gourd plant from the tree.

Yield (tha⁻¹): The variation in yield of bottle gourd ton per hectare due to different treatments was found significant. As evident from results, the highest yield of Bottle gourd (43.70 tha⁻¹) was obtained from treatment T₃ (9 feet distance from the tree) (Figure 2). On the other hand, the lowest yield of bottle gourd (20.50 tha⁻¹) was found from treatment T₁ (3 feet distance from the tree). The second highest yield of Bottle gourd (42.50 tha⁻¹) was obtained from T₄ (Open field referred as control).

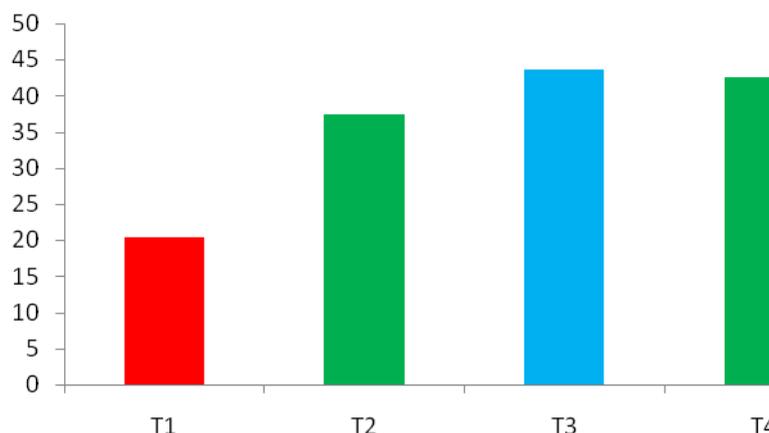


Fig. 2. Yield of Bottle gourd in association with *Xylia dolabriformis* tree

Conclusion

Tree crop interaction is one of the most important factors in this study. The yield components of okra, bottle gourd growth characteristics of *Xylia dolabriformis* tree are highly interacted with each other. The result of the experiment revealed that the yield of the crops increased gradually with the increase of planting distance from the tree. For okra the highest value of yield (12.50 t ha⁻¹) was found in T₃ which was statistically similar to treatment T₄ (open field referred as control). In case of Bottle gourd, it was also found that treatment T₃ (9 feet distance from tree) produced highest yields (39.20 t ha⁻¹ and 43.70 t ha⁻¹ respectively) which were statistically similar to treatment T₄ (open field referred as control). In both cases, the lowest yield was found in T₁ (3 feet distance from the tree). The growth characters (tree height, number of leaves and stem girth) of *Xylia dolabriformis* tree are not satisfactory in association with all crops like okra and bottle gourd at 9 feet distance from *Xylia dolabriformis* tree.

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