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Performance of tomato under multistoried agrforestry system

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Abstract: A field experiment was conducted at the Bangladesh Agricultural University germplasm center, fruit tree improvement project (FTIP), Department of Horticulture, Bangladesh Agricultural University, Mymensingh, during July to November, 2008 to find out the performances of tomato under different multistoried agroforestry production system and open field condition. Different multistoried agroforestry system such as Amloki + Guava based agrofrestry system (T_1), Horitaki + Lemon based agroforestry system (T_2) and Bohera + lemon based agroforestry system (T_3) were investigated in the study. Tomato was grown following the RCBD design with three replications. The study showed that except plant height all others morphological characters viz. Number of branches per plant, number of leaves per plant, number of fruits per plant, fruit length, fruit diameter and single fruit weight were highest in open field condition among the different agroforestry systems (Multistoried vegetation), highest yield was obtained in Horitaki + lemon + tomato based agroforestry system, which was 16.67% lower than open field condition.
Key words: Tomato, multistoried agroforestry system, performance.

Introduction

Bangladesh is one of the most densely populated country of the world struggling hard to feed her more than 150 million peoples. Population had doubled in the last 30 years and population density is now 926 persons per square kilometer (BBS 2008). About 30 percent of the total population live in rural areas and are directly dependent on agriculture for then livelihood. The capacity of our land is decreasing day by day due to intensive cropping and use of high input technologies. Recently, some techniques have already been advocated to over come 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. Traditionally farmer grow different types of trees and vegetables in association in their homesteads, where productivity of vegetables is low due to lack of appropriate combinations. Besides the homesteads and adjacent land, one eighth of the land surface area of Bangladesh consists of hills and valley that also offer potentials for year round vegetables production under agroforestry system. Growing of crops in layer by layer is called multilayered/ multistoried cropping system. It is an important cropping system in Bangladesh as well as in the world. It way be two, three or four layers and may be consist of forest tree, fruit trees, horticultural or agronomical crops as well as species in same land. Basically, multistoried garden is various kinds of tree, Shurbs and herb combination with diversity which is 3-4 layer of horizontal canopy with cropping intensity. In this garden system, the optimum use of land is ensured. In the country like Bangladesh were is always shortage of land, this system can be recognized in a time winning recognition. The cultivated horizontal plants under this system can get sunlight from different layers. Hence the present study was undertaken with the broad objective to evaluate the performance of tomato in association with medicinal tree under different multistoried agroforestry system, where as the specific objectives of the study were: To find out the appropriate orientations of amloki tree for the cultivation of behavior of vegetable. To characterize the morphological behaviour of vegetable grown under medicinal trees; and To utilize natural resources properly.

Materials and Methods

A field experiment was conducted at the Bangladesh Agricultural University germplasm center, fruit tree improvement project (FTIP), Department of Horticulture, Bangladesh Agricultural University, Mymensingh, during July to November, 2008 to find out the performances of tomato under different multistoried agroforestry production system and open field condition. The treatments of the experiment were four different light levels. The tomato was grown following the Randomized Complete Block Design (RCBD). Each treatment was replicated three times. Tomato seedlings were collected from BARI farm Joydebpur. Tomato maintaining the spacing of 60cm×40cm. Tomato plot sizes was 2m×1m. Necessary cultural operations were done when required. Tomato was harvested at 90 days after transplanting of seedlings. Plant height, number of branches per plant, number of leaves per plant, number of fruit, fruit length, fruit diameter, single fruit weight, fruit yield per plant and fruit yield per plot were measured in the experiment. The data on various growth and yield contributing characters were statistically analysis of variance for each of the studied character was done by F (Variance ratio) test following Randomized Complete Block Design. The treatment means were compared by LSD test at 5% level of significance.

Results and Discussion

The results of each parameter have been adequately discussed and possible interpretations where ever necessary have been elaborated in this chapter.

Plant height: Tomato plant cultivated under shade grew more vigorously than those grew in the open field. With the increase of shade levels plant height increased significantly. The shortest plant (80.00cm) was found in open field condition and the tallest plant (85.00) was recorded under the heaviest shade condition of T_3 (Table 1) due to auxin and higher apical dominance(Hillman, 1994). Significantly tallest plant height under heavy shade condition of T_3 (Table1) tallest plant height under heavy shade in okra was reported by Ali (1999).

Number of branches per plant: Number of branches per plant was influenced by reduced light condition. Number of branches per plant was also decreased gradually with

the increase of shade levels (Table 1). The maximum number of branches (6.00) obtained under full sunlight was statistically identical to treatment T_2 (4.00). Significantly the minimum number of branches (3.50) was recorded under treatment T_3.

Table1. Morphological characters of tomato under different multistoried agroforestry system

Treatment combination	Plant height (cm)	No. of branches/ plant	No. of leaves/ plant	No. of fruits/ plant	Fruit length (cm)	Fruit diameter (cm)	Single fruit wt. (gm)	Fruit yield/ plant (gm)	Fruit yield/ plot (kg)
T_0	80.00c	6.00a	35.00a	40.00a	6.50a	5.40a	85.00a	2400a	28.80
T_1	84.00ab	3.80b	22.00bc	26.00b	5.50c	4.80bc	76.00bc	1800b	21.60
T_2	82.00bc	4.00b	26.00b	30.00b	6.00b	5.00b	80.00ab	2000b	24.00
T_3	85.00a	3.50b	20.00c	20.00c	5.00d	4.50c	72.00c	1400c	16.80
LSD (0.05)	2.053	0.9392	4.721	5.767	0.4894	0.3402	5.966	349.6	-

Means in row followed by the same letter are significantly different by DMRT at $P \leq 0.05$

Number of leaves per plant: Number of leaves per plant was significantly influenced by reduced light levels. The highest number leaves per plant (35.00) was recorded in open field condition (Table 1). Significantly the second highest number of leaves per plants (26.00) was observed under treatments T_2. The lowest number of leaves per plants (20.00) was observed under treatment T_3. The lowest number of leaves per plants at the reduced light condition may be due to lower production of photosynthates under low light condition for a longer period (Miah *et al*. 1999).

Number of fruits per plant: Number of fruits per plant is the most important yield contributing character which was also significantly influenced by different light levels. The maximum number of fruits per plant (40.00) was found under open condition of treatment T_0 (Table 1)**.** Significantly the minimum number of fruits per plant (20.00) was recorded under treatment T_3.

Fruit length: Fruit length of tomato grown under different light levels followed almost a similar pattern of variation like number of branches per plant. The highest fruit length (6.5cm) was recorded under treatment T_0 (Table 1). Significantly the lowest fruit length (5.00cm) was recorded under treatment T_3. Shading recorded average fruit size and also reduced the proportion of fruit in the larger size grades. Heavy shade also reduced the incidence of uneven ripening in summer (Cockshull *et al*. 1992).

Diameter of fruit: Fruit diameter of tomato grown under different light levels followed almost a similar pattern of variation like number of clusters per plant. The highest fruit diameter (5.40cm) was found under open condition. Significantly the lowest fruit diameter (4.50cm) was recorded under treatment T_3 (Table 1).

Single fruit weight: Individually fruit weight also decreased at the light levels decreased. The fruit weight varied in significantly up to partial shade condition. The maximum fruit weight (85.00gm) was observed under 100% PAR level (Table1) which was followed by treatment T_2 (80.00gm) and T_1 (76.00gm) was medium. Where as treatment T_3 produced significantly the lowest fruit weight T_3 (72.00gm). Similar findings were also reported by Miah (2000).

Yield per plant: The trend of yield perplant was almost similar to that of fresh weight of fruits. Among the four treatments the highest yield per plant (2400gm) was recorded under full sunlight which was followed by treatment T_2 (2000gm) and T_1 (1800cm). Significantly the lowest yield per plant (1400gm) was found under treatment T_3.

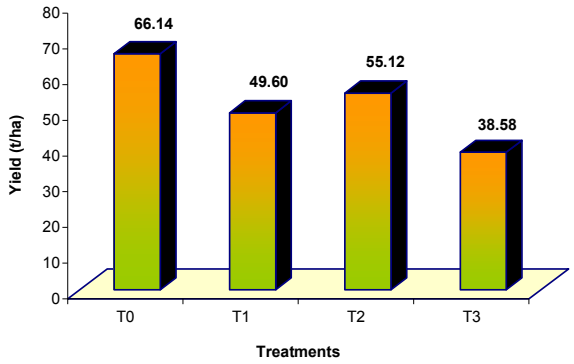

Fig 1. Yield of tomato of different treatment (T_0 = Full sunlight condition, T_1 = Amloki + Guava + Tomato based agroforestry production system, T_2 = Horitaki + Lemon + Tomato based agroforestry production system, T_3 = Bohera + Lemon + Tomato based agroforestry production system)

Yield (t/ha): The highest yield (66.14 t/ha) was recorded under open field condition in full sunlight (Fig.1). In agroforestry system the highest yield was recorded in the treatment T_2 (55.12 t/ha) because the system was thin canopy compared by the treatment T_1 & T_3, The second highest yield was recorded in the treatment T_1 (49.60 t/ha). Significantly the lowest yield (38.58 t/ha) was recorded in the treatment T_3 because of its dense canopy. Yield under

open field condition was 25, 16.67 and 41.6 % higher than T1, T2 and T3 treatment i. e., Amloki + Guava + Tomato, Horitaki + Lemon + Tomato and Bohera + Lemon + Tomato based agroforestry production system. The similar trend of yield was observed by Taleb (2003)..

Tomato are suitable for multistoried agroforestry production system. The result showed that "Horitaki, lemon and tomato" based multistoried agroforestry production is more profitable than "Amloki, guava and tomato" and "Bohera, lemon and tomato".

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