YIELD AND YIELD COMPONENTS OF BRINJAL (*SOLANUM MELONGENA* L.) AS AFFECTED BY GROUNDNUT (*ARACHIS HYPOGAEA* L.) INTERCROPPING

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ABSTRACT

A study was conducted at the Crop Farm, Eastern University, Sri Lanka during *maha,* 2007 to assess the effect of groundnut intercropping on brinjal yield and yield components. Experiment was designed in RCBD with a plot size of 3.0m x 1.5m. Brinjal variety Paluhamam Purple and groundnut variety Indi were used for this study. Five treatments were included viz. brinjal as a sole crop (90 cm × 60 cm) (T_1), groundnut as a sole crop (45 cm × 30 cm) (T_2), brinjal (90 cm × 60 cm) with groundnut (90 cm × 30 cm) in alternative rows (T_3), 60/150 cm paired row planting of brinjal with two rows of groundnut (T_4) and 75/120 cm paired row planting of brinjal with single row of groundnut (T_5). Results showed that reduced interrow spacing did not change the brinjal yield. It was slightly higher (8.89 kg/plot) in T_4 followed by T_3 (7.84 kg/plot). Minimum brinjal yield was obtained in T_1 (6.52 kg/plot) compared with other treatments. In case of intercropped groundnut, yield and yield components did not significantly differ among the treatments. However, 60/150 cm paired row of brinjal with two rows of groundnut (T_4) would be the suitable planting geometry to obtain higher yield of brinjal in intercropping.

Key words: ***Solanum melongena; Arachis hypogaea;*** **intercropping; agronomic characters; Sri Lanka.**

INTRODUCTION

Rapidly increasing world population and the declining soil fertility coupled with poverty call for urgent remedial measures to ensure food security especially in developing countries. That is why role of agriculture in increasing food supplies and poverty alleviation carries extreme importance through reducing the unit cost of production and technological advancements.

Intercropping system is an important feature of tropical agriculture. One of the advantages of this system is that it gives an assurance against crop failure which is common in developing countries. Another advantage of mixing of crop is the yield and quality improvement compared with sole

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cropping. The biological advantage of intercropping comes from complimentary use of growth resources. In addition, competition from weeds may be reduced by a combination of crop species occupying two or more niches in the field (1). The value of intercropping system has been gaining recognition because of its ability to reduce damage caused by pest and diseases, ensure greater yield stability by producing some yield even though some of the component crops failed (4).

In Sri Lanka, brinjal (*Solanum melongena* L.) and groundnut (*Arachis hypogaea* L.) are the important vegetable and pulse crops, respectively. Brinjal, belonging to family Solanaceae, is the most common and popular vegetable crop in Sri Lanka for local and export market. It is a hardy plant compared to other vegetables grown in Sri Lanka. Due to this character, it can be successfully grown in very dry areas under rainfed conditions or with minimum irrigation facilities. It is highly productive and usually finds its place as a poor man's crop. Fruit is the important part of brinjal and has economical, nutritional and medicinal properties. One hundred gram edible portion has 1.4 g protein, 4 g carbohydrates, and considerable amount of copper, potassium, sulphur, chlorine, calcium, magnesium, phosphorus, iron and vitamins (2,3). Groundnut a leguminous crop, is grown for seeds, oil, meal and vegetable residues. It is a commercial oilseed crop and described as ‘King of oilseed’ in Indian agriculture. It has high content of protein and oil. One hundred gram raw groundnuts contain about 47.5 g oil and 26 g protein. One hundred gram roasted nuts have composition of 48.7 g oil and 26 g protein and also rich in P, vitamins, riboflavin and niacin (2,3). Theoretically, growth resources used by the component crops over time and space may be different, and when appropriate combinations of crops are adopted together, efficiency of resource use is greater than that of mono-cropping.

Due to local adaptability and high nutritive value of both brinjal and groundnut, this study was aimed to select the suitable brinjal and groundnut intercropping system in sandy regosol.

MATERIALS AND METHODS

This study was conducted during the year 2007 at the Crop Farm, Eastern University, Sri Lanka located in low country dry zone. Annual rainfall ranges from 1600 mm-2300 mm and temperature from 25ºC - 39ºC. The soil at experimental site is sandy regosol. There were five treatments replicated thrice. Experiment was designed in a RCBD with plot size of 3.0 m x 1.5 m. Five treatments viz. brinjal as a sole crop (90 cm × 60 cm) (T_1), groundnut as a sole crop (45 cm × 30 cm) (T_2), brinjal (90 cm × 60 cm) with groundnut (90

cm × 30 cm) in alternative rows (T_3), 60/150 cm paired row planting of brinjal with two rows of groundnut (T_4) and 75/120 cm paired row planting of brinjal with single row of groundnut (T_5) were included.

Brinjal seeds (cv. Paluhamam Purple) were sown in nursery and transplanted to field at three weeks after sowing. Groundnut seeds (cv. Indi) were sown directly in field one week after brinjal planting. As basal dose urea (75 kg/ha), triple super phosphate (335 kg/ha) and muriate of potash (85 kg/ha) were applied to brinjal. At 4th, 8th and 12th week after transplanting (WAT) urea @ 75 kg, urea @ 75 kg with 85 kg muriate of potash and urea @ 75 kg per hectare were applied as top dressing, respectively. For groundnut, urea, triple super phosphate and muriate of potash were applied as basal dose @ 35, 140 and 75 kg per hectare, respectively and at time of flowering urea @ 30 kg was applied as top dressing. Different traits such as 50 percent flowering, number of flowers, fruit length and girth, number of fruits per plant and fruit yield per plot were measured in brinjal. In groundnut, number of pods per plant, number of seeds per pod, dry weight of 100 seeds and shelling percentage were recorded. Data were analyzed by using SAS version. The means were compared using Duncan's multiple range test at 5 percent significant level.

RESULTS AND DISCUSSION

Brinjal

50% flowering: Brinjal plant reached 50 percent flowering between 6th and 8th WAT. It attained 50 percent flowering in 6 and 7 weeks in T_1 and T_3, respectively whereas in T_4 and T_5 it reached this stage in 8 weeks (Table 1). Theoretically nitrogen leads to increase vegetative period and delay reproductive phase, while groundnut has ability to fix atmospheric nitrogen. In this study, in intercropping treatments, delayed flowering of brinjal may be the reason of nitrogen. Large amount of nitrogen produces excessive vegetative growth and delays the reproductive growth considerably (13). Light is an essential for photosynthesis and affects flowering in plants as well as reproduction. In this study, number of weeks to 50 percent flowering was not remarkably changed by any of the treatments which suggests that 50 percent flowering in brinjal was not affected by intercropping with groundnut.

Table 1. Number of weeks to reach 50% flowering in brinjal.

Treatments	Weeks to reach 50% flowering
T_1	6+0.33
T_3	7+0.33
T_4	8+0.6
T_5	8+0.58
F. test	NS

Number of flowers: T_1 (brinjal as sole crop) significantly differed from other treatments at 4th WAT. Thereafter, difference in number of flowers in brinjal was non-significant (Table 2). In this experiment, competition for resources seemed to be lower which led to give non-significant results in treatments. Unfavorable conditions, cultivation practices, low soil fertility and low light enhance the flower drop (8, 10).

Table 2. Number of flowers per plant at two weeks interval.

Treatments	At 4th week after transplanting	At 8th week after transplanting	At 12th week after transplanting
T_1	2 ± 0.33 a	1 ± 0.33	1 ± 0.00
T_3	0 ± 0.00 b	1 ± 0.33	1 ± 0.00
T_4	1 ± 0.33 b	1 ± 0.33	1 ± 0.33
T_5	1 ± 0.33 b	1 ± 0.00	1 ± 0.67
F test	*	NS	NS

Value represents mean ± standard error of three replicates, F test::-*Significant (P < 0.05); NS: Non-significant. Means followed by the same letter did not significantly differ according to Duncan's multiple range test at 5% level.

Length and girth of fruit: The fruit length was not influenced by any of the treatments (Table 3). T_1 gave higher value at 8th WAT fruit (15 cm length and 11.3 cm girth). From 10th week onwards fruit length was high in intercropping treatments (14.3 and 13.0 cm) compared to sole cropping (8.2 and 10.8 cm). The girth of fruit also was not influenced by any of the treatments at 8th and 12th WAT but significantly differed (P < 0.05) at 10th week (Table 3).

Table 3. Length and girth of fruit (cm) at two week intervals.

Treatments	At 8th week		At 10th week		At 12th week	
	Length	Girth	Length	Girth	Length	Girth
T_1	15 ± 7.93	11.3 ± 5.69	13.2 ± 6.62	10.0 ± 5.00 ab	08.2 ± 5.25	05.2 ± 5.17
T_3	13 ± 6.76	09.6 ± 4.84	23.0 ± 0.92	18.8 ± 0.44 a	10.8 ± 5.41	11.0 ± 5.34
T_4	07 ± 6.66	05.6 ± 5.66	22.8 ± 0.44	17.6 ± 0.55 ab	14.3 ± 7.17	10.2 ± 5.13
T_5	06 ± 6.33	04.6 ± 4.67	16.6 ± 6.66	15.5 ± 5.50 b	13.0 ± 6.50	10.7 ± 5.34
F test	NS	NS	NS	*	NS	NS

Value represents mean ± standard error of three replicates, F test:-*Significant (P < 0.05; NS: Not significant. Means followed by the same letter did not significantly differ according to Duncan's multiple, range test at 5% level.

At this stage girth of fruit in T_3 was higher than other treatments. Groundnut has ability to fix nitrogen and nitrogen may be high in intercropped treatments compared to sole cropping, which may increase length and girth of fruit in intercropped treatments. Som and Maity (11) also found that length, diameter and volume of brinjal fruit responded positively to increased nitrogen.

Number of fruits per plant and brinjal yield: There was no significant effect on number of fruits due to planting patterns (Table 4). Number of fruits per plant was high in T_1 (8) and T_3 (7) compared to T_4 and T_5 (6 each). However, there was no significant difference among treatments. The results suggest that number of fruits was not affected by planting pattern.

Table 4. Number of fruit per plant and pod yield (kg/plot).

Treatments	Number of fruits/plant	Fruits yield (kg/plot)
T_1	8 ± 1.55	6.52
T_3	7 ± 1.55	7.84
T_4	6 ± 0.58	8.89
T_5	6 ± 1.22	7.72
F test	NS	NS

Value represents mean ± standard error of three replicates.
F test: NS: Non-significant.

Fruit yield was high in T_4 (8.89 kg/plot) while T_1 (sole brinjal) produced the lowest (6.52 kg) (Table 3)**.** It may be due to fixation of nitrogen by groundnut intercropping compared with that of mono-cropping. The beneficial effects of nitrogen in increasing the production of brinjal have also been reported by Verma and Choudhury (12). Non-significant differences ($P > 0.05$) in yield may be due to constant fruit number of brinjal in each treatment. Sivaraman and Palaniappan (10) also report similar findings.

Groundnut

Number of pods: Number of pods per plant in groundnut was not affected by any of the treatments (Table 5). Positive correlation between number of pods and pod yield has earlier been reported (8). Efficiency of absorption of nutrients is high in pegs than roots. At peg there is no translocation and it directly converts into pods. In this experiment, there is no significant difference in pod number. It suggests that number of pods per plant was not affected by brinjal intercropping. Low light intensity at pegging reduces peg and pod number in groundnut (8).

Number of seeds per pod: There was no significant differences (P > 0.05) among treatments also in number of seeds per pod (Table 5). It ranged from

Table 5. Yield components of groundnut

Treatments	Pod number/ plant	Number of seeds/pod	100 seed dry weight (g)	Shelling percentage
T_2	26 ± 2.40	2.15 ± 0.08	58.37 ± 03.44	77.67 ± 1.49
T_3	24 ± 3.18	2.12 ± 0.35	54.80 ± 16.74	77.48 ± 0.37
T_4	18 ± 6.17	2.28 ± 0.83	57.90 ± 36.80	75.64 ± 0.14
T_5	25 ± 4.91	2.24 ± 0.48	61.01 ± 21.37	77.36 ± 0.96
F test	NS	NS	NS	NS

Value represents mean ± standard error of three replicates.
NS = Non-significant.

2.12 (T_3) to 2.28 (T_4). Reddy (8) reported that number of groundnut seeds per pod varies from two to six. Theoretically kernel number is controlled by genetic factors and also influenced by internal competition. Yield components are more sensitive to environmental stress during kernel growth stage (8). In this experiment, competition for resources may be lower which led to give non-significant results in treatments. Plant population of groundnut did not influence the number of kernels per pod (6).

100-seed dry weight: This trait also did not significantly differ among the treatments (Table 5). Among intercropping treatments, it was higher in T_5 (61.01 g) and lower in T_3 (54.80 g). Gopalaswamy *et al.* (5) found that decreasing plant population increased weight of 100 seeds.

Shelling percentage: Shelling percentage was also not influenced by the treatments (Table 5**).** It ranged from 75.64 (T_4) to 77.67 percent (T_2). Gopalaswamy *et al*. (5) reported that plant density did not affect shelling percentage.

CONCLUSION

The results conclude that reduced inter-row spacing did not significantly (P > 0.05) change brinjal yield. The yield of brinjal was slightly high (8.89 kg/plot) in T_4 followed by T_3 (7.84 kg/plot) against minimum in T_1 (6.52 kg/plot). It may be due to high water evaporation in soil due to absence of intercrop cover. T_4 had optimal number of plants in proper planting geometry and yield of base crop (brinjal) was high (8.89 kg/plot). In case of intercropped groundnut, parameters did not significantly differ among the treatments. Treatment of 60/150 cm paired row of brinjal with two rows of groundnut (T_4) proved as suitable planting geometry to obtain higher yield in intercropping.

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