STUDY ON BLACK GRAM (*Vigna mungo*)/ VEGETABLE AMARANTHUS (*Amaranthus tricolor* L.) INTERCROPPING IN SANDY REGOSOL

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ABSTRACT

Intercropping is the practice of growing more than one crop in the same field simultaneously and considered for increasing and stability of yield per unit. In this regard, a field experiment was conducted at Crop farm, Eastern University, Sri Lanka during yala 2014 to study the effect of black gram/vegetable amaranthus intercropping system in sandy regosol. The experiment was laid out in Randomized Complete Block Design with four replicates and five treatments; monocropping black gram (T1), monocropping vegetable amaranthus (T2), black gram intercropped with one row of vegetable amaranthus (T3), black gram intercropped with two rows of vegetable amaranthus (T4) and black gram intercropped with three rows of vegetable amaranthus (T5). All the agronomic practices for cultivation were done according to the department of agriculture, Sri Lanka recommendation. The measurements were recorded at the harvesting stage of vegetable amaranthus and harvesting stage of black gram at thirty and sixty days after sowing of crops, respectively. The results showed that black gram/vegetable amaranthus intercropping system had significant ($p<0.05$) influenced on tested parameters of vegetable amaranthus such as fresh leaf weight, fresh stem weight along with marketable yield. In which highest marketable yield was recorded in monocropping amaranthus followed by T3 and T4 and lowest in T5. In the meantime there were significant differences on tested parameters including plant height and total plant fresh weight of black gram compare to monocropping while yield per hectare of black gram did not change significantly by intercropped vegetable amaranthus ($p<0.05$). Therefore it can be concluded that vegetable amaranthus and black gram are compatible crops and can be recommended for intercropping in sandy regosol.

Keywords: Black gram, Intercropping, Marketable yield, Sandy regosol, Vegetable amaranthus,

INTRODUCTION

Intercropping is the practice of growing more than one crop in the same field simultaneously. It is one of the many farming systems that hold great potential to solve future food and economic problems in developing countries (Tsubo *et al*., 2001). Intercropping between legumes and other suitable crops is an alternative system for small-scale farmers to improve income and food production per unit area, and lessen the risks of total crop failure due to environmental limitations (Prasad and Brook, 2005). Black gram is one of the important grain legumes in the rain fed farming system in dry and intermediate zones of Sri Lanka. It can be grown under low moisture and fertility conditions. It has high nutritive value and consist high content of proteins, vitamins and minerals (DOA, 2015). It is an important protein source for people in the cereal-based society. Legumes adapt well to various cropping systems owing to their ability to fix atmospheric nitrogen (N_2) in symbiosis with soil bacteria of Rhizobium spp. In intercropping system, component crops should be able to complement each other and obtain better overall use of resources than grown separately. Nitrogen is critical for amaranth cultivation. Amaranth is one of the most nutritious plants in the world (Anon, 2015). Botanists and nutritionists have studied this plant and found out that it has great

nutritional value, especially high in protein, calcium, folic acid and vitamin C (Anon, 2015). Therefore, this experiment was planned to study the Black Gram/Vegetable Amaranth intercropping in sandy regosol.

MATERIALS AND METHODS

Experimental Site and Experimental Design

The experiment was conducted at the Crop Farm, Faculty of Agriculture, Eastern University of Sri Lanka during yala 2014. It is belongs to the agro ecological region of low country dry zone (DL_2) in Sri Lanka. The mean annual rainfall ranges from 1400 mm to 1680 mm and temperature varies from 30 ^{0}C to 32 ^{0}C. The soil type is sandy regosol. Experiment was laid out in a Randomized Complete Block Design (RCBD) with four replications. Experiment consisted of five treatments;

T1- Monocropping black gram
T2- Monocropping vegetable amaranthus
T3- Black gram + one row of vegetable amaranthus
T4- Black gram + two rows of vegetable amaranthus
T5- Black gram + three rows of vegetable amaranthus

Land Preparation and Planting

Initially, land was ploughed by using two -wheel tractor and harrowed well by using mammoty followed by application of cow dung at the rate of 10 ton/ha to each plot and incorporated into the soil. Then, Urea-35 kg/ ha, TSP- 100 kg/ha and MOP- 75 kg/ha were applied as basal fertilizer. There were 20 plots of 1.5 m × 1 m and these were separated by 0.5 m and the blocks were separated with the space of 1 m. Two days after basal application, the seeds of component crops were sown where 30 cm × 10 cm used for mono cropping black gram and 10 cm × 5 cm used for mono cropping vegetable amaranthus. When vegetable amaranthus intercropped with black gram, the spacing between plants were kept as 5 cm in the meantime the spacing between rows was determined based on the treatments such as 15 cm (T3), 10 cm (T4), and 7.5 cm (T5) respectively. The recommendations of the Department of Agriculture, Sri Lanka were used for other crop management practices including irrigation, fertilizer application and crop protection measures.

Measurements

Plant height, leaf area, main root length, leaf fresh weight, stem fresh weight, root fresh weight and marketable yield were recorded from vegetable amaranthus while plant height, leaf area, fresh weight of total plant, leaf fresh weight, stem fresh weight, root fresh weight and yield were recorded from black gram at thirty and sixty days after sowing (DAS) of crops, respectively.

RESULTS AND DISCUSSIONS

Effect of black gram/vegetable amaranthus intercropping on performances of amaranthus

Table 1: Effect of black gram/ vegetable amaranthus intercropping in sandy regosol at thirty days after sowing on vegetable amaranthus

Treatments	Fresh leaf weight (g)	Fresh stem weight (g)	Marketable yield (tons/ha)
T2	10.52 a	11.02 a	21.25 a
T3	10.35 a	07.31 b	20.35 a
T4	06.38 b	05.97 b	18.61 ab
T5	04.57 b	06.82 b	14.82 b
F-test	*	*	*

Value represents mean of four replicates. * Represents significant at 5% level of probability and ns represents not significant. Mean values in a column having dissimilar letter/letters indicate significant differences at 5% level by DMRT.

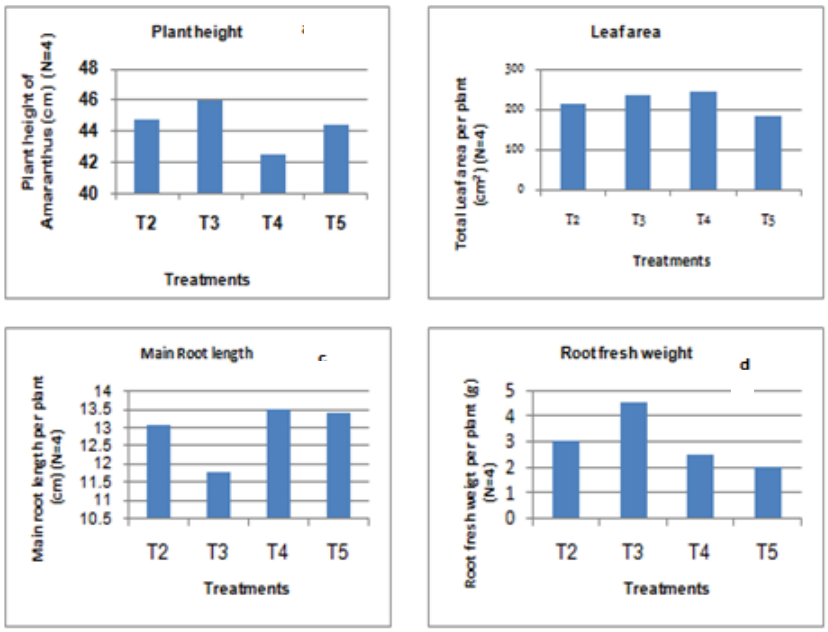

Figure 1: Effect of back gram/ vegetable amaranthus intercropping in sandy regosol on growth of vegetable amaranthus at thirty days after sowing

As can be seen from table 1 the effect of black gram/ vegetable amaranthus intercropping had significant ($p<0.05$) effect on tested parameters such as fresh weight of leaf and fresh weight of stem and marketable yield of vegetable amaranthus while there were no significant differences on plant height, leaf area, main root length and fresh weight of root. The maximum marketable yield was achieved in mono cropping of vegetable amaranthus. However, black gram with one row of amaranthus provided comparable marketable yield with mono cropping amaranthus at 5% of significant level.

Present findings were coinciding with the studies of Adigbo (2009) who reported that amaranthus is a compatible crop for intercropping system.

Effect of black gram/ vegetable amaranthus intercropping on performances of black gram

Growth parameters such as plant height and total fresh weight of plant were significantly differed among the treatments at 5% significant level (Table 2) while, there was no significant differences observed among tested parameters such as root length, leaf area, fresh weight of leaf, fresh weight of root, fresh weight of stem and yield per hectare when black gram was intercropped with amaranthus at 5% of significant level (Fig.2).

Table 2. Effect of black gram/ vegetable amaranthus intercropping in sandy regosol at sixty days after sowing on black gram.

Treatment	Plant height (cm)	Total plant fresh weight(g)	Yield (tons/ha)
T1	22.35 b	27.35a	2.21
T3	42.69 ab	21.08b	2.16
T4	37.50 ab	18.95c	2.13
T5	52.19 a	19.38bc	2.09
F-test	*	*	ns

Value represents mean of four replicates. * Represents significant at 5% level of probability and ns represents not significant. Mean values in a column having dissimilar letter/letters indicate significant differences at 5% level by DMRT.

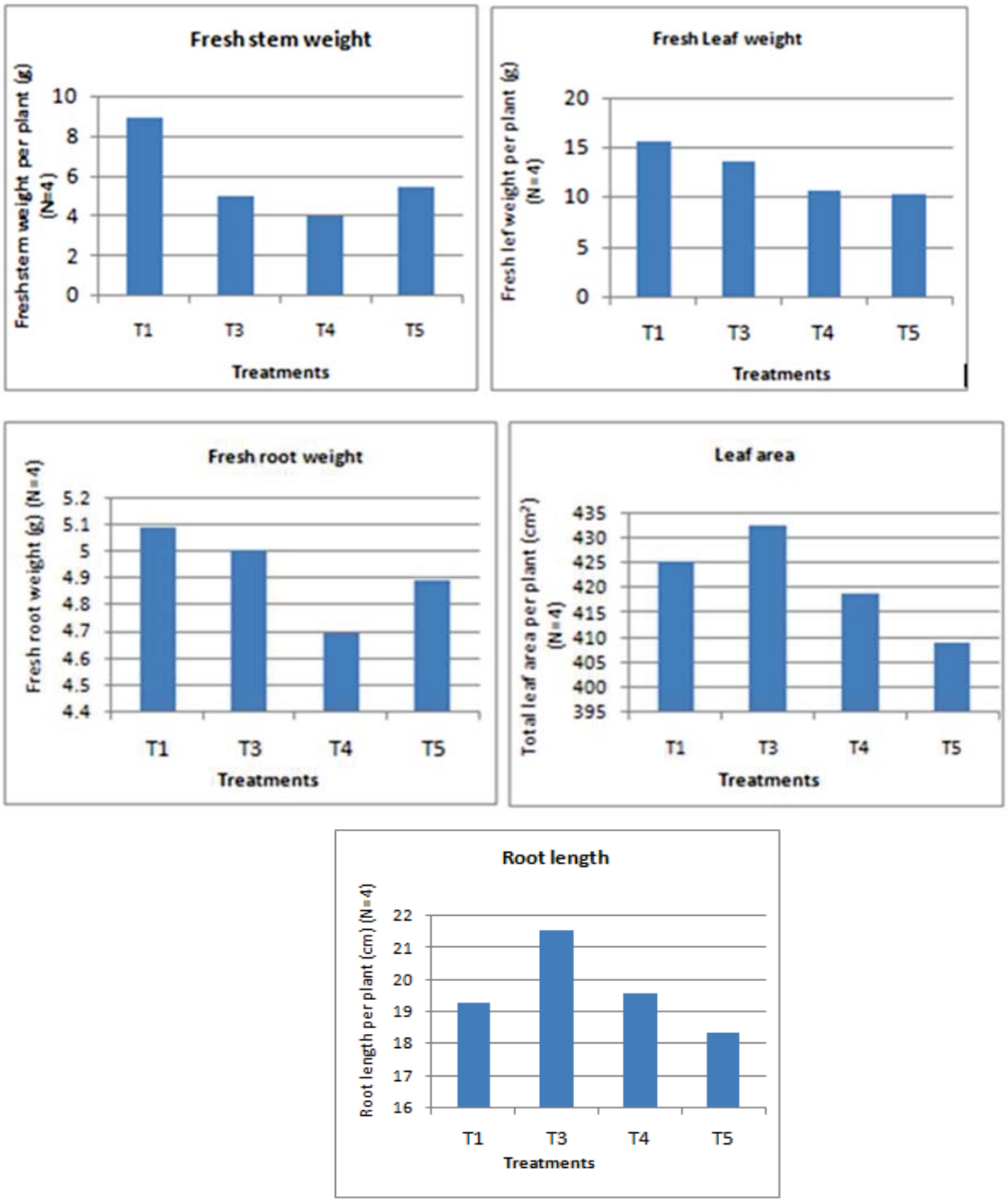

Figure 2. Effect of back gram/ vegetable amaranthus intercropping in sandy regosol on growth of black gram at sixty days after sowing.

In this experiment where the vegetable amaranthus was sown at one row, no significant difference in yield was found while vegetable amaranthus was sown more than one row, the yield from black gram was slightly lower by the end of the growing season due to competitive exclusion by the amaranthus plant. These results were supported by Hauggaard-Nielsen *et al*. (2004) who stated that high plant density can drastically reduce yield due to competitive exclusion of component crops.

CONCLUSIONS

Findings of the experiment showed that black gram yield did not change significantly by intercropping with vegetable amaranthus. Further, marketable yield of vegetable amaranthus from black gram with intercropping of one row of amaranthus and mono cropping amaranthus were comparable. Therefore it can be concluded that black gram and vegetable amaranthus are compatible crops and can be recommended for intercropping in sandy regosol.

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