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Intercropping grasspea with chilli at varying plant population

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ABSTRACT

An intercropping experiment was conducted to find out the suitable intercropping pattern for higher return from the same land. The intercropping combinations includes T1 = sole grasspea, T2 = sole chilli (50 cm x 40 cm), T3 = grasspea (100%) + 100% chilli (50 cm x 40 cm), T4 = grasspea (100%) + 60% chilli (50 cm x 60 cm), T5 = grasspea (100%) + 50% chilli (50 cm x 80 cm), and T6 = grasspea (100%) + 40% chilli (50 cm x 100 cm). The highest grasspea seed yield (1.82 t ha-1) was obtained from T5 which was statistically similar to that of T1 treatment and significantly higher than those of T3 and T6. The highest pod yield (2.2 t ha-1) was recorded in T5 which was significantly different from other intercrops combinations. Among intercropping combinations studied, the highest gross return and net return was recorded in T5 [grasspea (100%) + 50% chilli (50 cm x 80 cm)]. Cost of production was also highest in this intercropping due to involvement of more labour and seed cost. The lowest benefit cost ratio (BCR) among intercropping combinations was obtained from T6 [grasspea (100%) + 40% chilli (50 cm x 100 cm)]. This study suggest that grasspea (100%) + 50% chilli (50 cm x 80 cm) ratio might be the suitable intercropping pattern for getting higher economic return. It also might be concluded that intercropping would help for higher economic profit from the same land.

Introduction

Intercropping offers a possible solution to raise productivity through temporal intensification in a country like Bangladesh where the possibility of bringing more land under cultivation is limited. Yield advantages through intercropping have been reported by many workers (Willey, 1979). The advantages is often attributed to the fact that different crops complement each other and make better use of resources when grown together rather than separately. Besides, intercropping also acts as insurance for resource poor farmers if one crop fails, they get some yield of another crop.

A change in the cropping pattern or vegetation diversity could change the vector abundance and distribution while reducing virus transmission and spread (Hussein, 2008). It is also reflected that importance of intercropping to increase the productivity per unit area. Further, it also offers insurance against crop failure (Suresha et al. 2007).

Suitable crop rotations in the multiple cropping help in reducing the weed population and intercropping of forage crops have been investigate profitable than mixture (Talukder et al. 2016). Cultivation of Napier dwarf early along with *Khesari* in the *Bathan* land is the existing feeding system (Rahman et al. 2015). Cultivation of garden pea with onion would be more profitable than sole cropping of onion (Rahman et al. 2015).

Rice straw is important crop residue fed to ruminants in Bangladesh, contributing >90% of the feed energy available (Saadullah, 2002). The literature pertinent to intercropping with grasspea is meager (Biswas et al. 2008). Grasspea and chilli are very important edible crops which usually grown as sole and in some cases as intercrops in farmers field in various part of Bangladesh. But Farmers do not follow proper ratio in components crops. Moreover suitable planting geometry of components crops is meager. Hence this experiment was conducted to find out the optimum plant population of grasspea for intercropping with chilli for higher productivity and return.

Materials and Methods

Experimental site

The experiment was conducted at the at the Farming System Research Division site, Kadamshohor, Godagari, On farm Research Division of Bangladesh Agricultural Research Institute, Lakshipur, Rajshahi, during *rabi* season of 2012-2013.

Planting materials

BARI developed two crop varieties such as Grasspea (*Lathyrus sativus* L. var. BARI Khesari 2) and chilli (*Capsicum frutescens* L. var. BARI chilli 1) ware used as experimental material in this study.

Experimental treatments

Six intercropping combinations were studied following a randomized complete block design with three replications. These were: T_1 = sole grasspea, T_2 = sole chilli (50 cm x 40 cm), T_3 = grasspea (100%) + 100% chilli (50 cm x 40 cm), T_4 = grasspea (100%) + 60% chilli (50 cm x 60 cm), T_5 = grasspea (100%) + 50% chilli (50 cm x 80 cm) and T_6 = grasspea (100%) + 40% chilli (50 cm x 100 cm).

Cultivation procedures

The unit plot size was 4 m x 4 m. Grasspea and chilli seeds were sown on 15 November, 2010. Grasspea was planted with broadcast method and chilli was planted in line sowing method. Sole chilli were grown with 120-80-120-20-4-0.5 kg ha^{-1} of NPKSZnB in the form of urea, triple super phosphate, muriate of potash, gypsum, zinc sulphate and boric acid, respectively. In sole chilli, half of N and full amount of other fertilizer were applied as basal.

In intercropping systems, the full amount of PKSZnB and 1/2 N were applied as basal. The remaining N was top dressed at 25, 50, 70 days after sowing (DAS) in three equal splits. A light irrigation was given after sowing for proper emergence. Intercultural operations were done as and when required. Yield components of grasspea and chilli were taken from randomly selected 5 plants from each plot. Yields of both the crops were taken from whole plot. Equivalent yields were computed using the formula of Bandyopadhaya (1984).

Data recording and statistical analysis

Data on yield and yield components of both the crops were analyzed statistically and the means were adjudged using LSD. Cost benefit analysis was also done.

Results and Discussion

Effect intercropping on the growth and yield of Grasspea

Plant height (cm), number of seed $plant^{-1}$, and seed yield (t ha^{-1}) of grasspea were significantly influenced by intercropping systems practiced (Table 1). Number of plants m^{-2} was identical in T_4 and T_6 intercropping which was higher than those in T_3 and T_1. The difference in plants m^{-2} in different intercrop combinations was mainly attributed due to planting system. The highest seed yield (1.82 t ha^{-1}) was obtained from T_5 which was statistically similar to that of T_1 and significantly higher than those of T_3 and T_6. The variation in seed yield might be due to different plant populations. The result is similarity as in study carried out by Islam (2002) and Biswas et al. (2008).

Effect intercropping on the growth and yield of Chilli

Yield attributes and yield of chilli was significantly affected by grasspea-chilli intercropping system (Table 2). The highest plant height (44.2 cm) was found in T_2 followed by T_3 (33.1 cm). This may be due to the sole chilli plants and insufficient nutrient up take through competition in this intercropping system. The highest length of pod was found in T4 intercrop, where there were not any significant difference ware found. The highest pod yield (2.2 t ha^{-1}) was recorded in T_5 which was significantly different from other intercropping systems. The lowest pod yield was found in T_6 intercrop combination. It may be due the plant density of grass pea and chilli and increased competition of nutrient uptake.

Table 1. Effect of intercropping system on the yield attributes and yield of grasspea

Intercrop combinations	Plant height (cm)	Number of plant m^{-2}	Number of seed $plant^{-1}$	Seed yield (t ha^{-1})
T_1	56.2	35.0	18.3	1.62
T_3	55.3	31.7	19.7	1.31
T_4	63.5	32.7	20.7	1.20
T_5	61.9	31.5	18.7	1.82
T6	57.2	33.0	21.7	1.13
$LSD_{(0.05)}$	4.41	NS	3.65	0.52
CV%	5.56	25.99	13.71	11.95

T_1 = sole grasspea, T_2 = sole chilli (50 cm x 40 cm), T_3 = grasspea (100%) + 100% chilli (50 cm x 40 cm), T_4 = grasspea (100%) + 60% chilli (50 cm x 60 cm), T_5 = grasspea (100%) + 50% chilli (50 cm x 80 cm) and T_6 = grasspea (100%) + 40% chilli (50 cm x 100 cm).

Table 2. Effect of intercropping system on the yield attributes and yield of chilli

Intercrop combinations	Plant height (cm)	Length of pod (cm)	Yield (t ha^{-1})
T_2	44.1	4.4	1.7
T_3	33.6	4.2	2.0
T_4	26.1	4.7	1.9
T_5	28.5	4.6	2.2
T_6	29.6	4.2	1.4
LSD ($_{0.05}$)	6.49	NS	0.72
CV%	14.85	11.46	28.65

T_1 = sole grasspea, T_2 = sole chilli (50 cm x 40 cm), T_3 = grasspea (100%) + 100% chilli (50 cm x 40 cm), T_4 = grasspea (100%) + 60% chilli (50 cm x 60 cm), T_5 = grasspea (100%) + 50% chilli (50 cm x 80 cm) and T_6 = grasspea (100%) + 40% chilli (50 cm x 100 cm).

Table 3. Grasspea equivalent yield and economics of grasspea chilli intercropping systems

Intercrop combinations	Grasspea equivalent yield (t ha^{-1})	Gross return (Tk ha^{-1})	Cost of production (Tk ha^{-1})	Net return (Tk ha^{-1})	BCR
Sole Grasspea (T_1)	1.62	97200	14800	16200	1.09
Sole chilli (T_2)	1.14	68400	15020	16380	1.06
T_3	2.64	158600	71500	87100	1.21
T_4	2.46	147600	79100	68500	0.86
T_5	3.28	197200	73700	113500	1.53
T_6	2.06	123800	83600	49000	0.58

Price (Tk kg^{-1}): In Rajshahi region; Grasspea: 60.00, Chilli: 40.00
T_1 = sole grasspea, T_2 = sole chilli (50 cm x 40 cm), T_3 = grasspea (100%) + 100% chilli (50 cm x 40 cm), T_4 = grasspea (100%) + 60% chilli (50 cm x 60 cm), T_5 = grasspea (100%) + 50% chilli (50 cm x 80 cm) and T_6 = grasspea (100%) + 40% chilli (50 cm x 100 cm).

Productivity and cost benefit analysis

The highest grasspea equivalent yield was recorded in T_5 [grasspea (100%) + 50% chilli (50 cm x 80 cm)] (Table 3). The higher gross return, net return and BCR was obtained from sole cropping system. Among intercropping combinations, the highest gross return and net return was recorded in T_5. Cost of production was also highest in this intercropping system due to involvement of more labour and seed cost. The lowest BCR among intercropping treatments was obtained from T_6 [grasspea (100%) + 40% chilli (50 cm x 100 cm)]. The similar results were obtained in intercropping studies by Ahmed et al. (2015).

Conclusion

The intercropping system studies revealed that chilli is compatible with grasspea as combination of grasspea (100%) + 50% chilli (50 cm x 80 cm) ratio and can give higher economic return.

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