STUDY ON MIXED CROPPING MUNGBEAN WITH SESAME AT DIFFERENT SEEDING RATES

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ABSTRACT

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A field experiment was conducted at PRC, Ishurdi, Pabna during Kharif-I season of 2007 to evaluate the technological feasibility and economic validity of mixed cropping mungbean with sesame by the different seeding rates. There were 7 seeding rates *viz*. mungbean (sole), sesame (sole), 90% mungbean seeds with 10% sesame, 80% mungbean seeds with 20% sesame, 70% mungbean seeds with 30% sesame, 60% mungbean seeds with 40% sesame, 50% mungbean seeds with 50% sesame. The seed yields of mungbean and sesame when mixed cropped under variable seeding rates were less than their sole crop yields but combined yields or equivalent yields of mungbean and sesame from mixed cropping were more than the sole crop yield of either mungbean or sesame. Significantly, the highest equivalent yield of mungbean (1476.00 kg/ha) was obtained by 70% mungbean with 30% sesame seeding ratio which was statistically identical to 90% mungbean with 10% sesame and 80% mungbean with 20% sesame but the lowest seed yield (949.00 kg/ha) was found in sole sesame. Land equivalent ratios (LER) from mixed cropping were increased by 12 to 27 over sole crop yields. The highest LER (1.27) was obtained by 70% mungbean with 30% sesame. The highest net return (Tk 31,560.00 /ha) and BCR (2.57) were found in 70% mungbean with 30% sesame and the lowest net return (Tk 16,715.00 /ha) and BCR (2.01) were found in sole sesame.

Key words: Mixed cropping, seeding rates, grain yield,

INTRODUCTION

Mungbean (*Vigna radiata* Lin.) is one of the most important pulse crop and its' ranks third position regarding area and production among other pulses in Bangladesh (BBS, 2006). It is one of the most important sources of protein for both food and feed. It also produces more stable yield and can be grown with minimum care. Mungbean is generally grown as sole crop but it can also be grown as mixed or intercrop with sugarcane, sesame or in mango orchards or in vacant spaces between perennial fruit trees. On the other hand, sesame (*Sesamum indicum* Lin.) is an important oil crop which ranks second position among the oil crops in Bangladesh (BBS, 2006). It contains 42-45% oil and 20% protein. It is quality edible oil. It supplies 11% of the country's total oilseed production. In Bangladesh, sesame is mainly grown in early Kharif season (March-May) under rainfed condition (Anonymous, 2003).

Generally, sesame is grown as a sole crop. Whereas, a few farmers are cultivating mungbean as mixed crop with other crops. In this system, mungbean is grown as a main crop and the other crops like sesame or other ones are grown as intercrops. From the survey of multiple cropping practiced in farmers' field, it is observed that farmers of the south-western and north-western areas of Bangladesh especially some parts of Natore, Greater Kushtia, Jessore, Rajshahi and Pabna have been practicing inter-mixed cropping of sesame and mungbean using broadcast method. But they do not follow proper ratio of component crops e.g. the optimum seeding ratio for a successful mixed cropping or intercropping system which has great effect on yield and productivity of component crops.An ideal intercropping or mixed cropping system should aim to i) produce higher yields per unit area through better use of natural resources, minimizing the incidence of insect pests, diseases weeds and improving the nitrogen economy in legume associations, ii) Offer greater stability and crop insurance in production under aberrant weather condition, iii) Meet the domestic need of farmers and animal iv) provide an equitable distribution of farm resources (Ali, 1990). Several function or parameter, e.g. monetary advantage (Willey, 1981), aggressiveness (McGilchrist and Trenbath, 1971) cash return (Chowdhury, 1981), land equivalent ratio (LER) (Willey and Rao, 1980) and equivalent yield have been used to assess the efficiency of intercrops or mixed crops. However, LER is considered as the most appropriate in combination with the absolute yields of the component crops.

Now a days, poverty alleviation of resource poor farmers is an important slogan in Bangladesh and multiple cropping system can be helpful to reduce poverty through the achievement of above benefits. Generally, resource poor farmers practice multiple cropping (Intercropping/Mixed cropping/Relay cropping) to utilize their land intensively, to engage their unemployed family labour and to get more profit than sole cropping. Framers also practice their own multiple innovations. In practicing their own created systems they face different problems like planting geometry and relative sowing, time of companion crops, fertilizer management etc. for obtaining maximum benefit. (Anonymous, 2005). So, this program was planned to evaluate the technological feasibility and economic validity of mixed cropping mungbean with sesame by the different seeding rates.

MATERIALS AND METHODS

The experiment was conducted at Pulses Research Centre (PRC), Ishurdi, Pabna during Kharif-I season of 2007. There were seven seeding rates *viz.* mungbean (sole), sesame (sole), 90% mungbean with 10% sesame, 80% mungbean with 20% sesame, 70% mungbean with 30% sesame, 60% mungbean with 40% sesame, 50% mungbean with 50% sesame. The experiment was laid out in RCB design with 3 replications. The unit plot size was 4m x 5m.

The soil of the experimental plot was silty loam having pH 7.5. Seed sowing date was 20 March, 2007. Sole sesame and all other plots were fertilized through NPK @ 35-55-20 kg/ha and 20-40-20 kg/ha, respectively. The variety BARImung-6 and BARItil-3 were used and seed rates were 25 kg/ha and 7.00 kg/ha respectively (Anonymous, 2005) for sole cropping and combination of seed rates incase of mixed cropping were sequentially divided as per treatments. Weeding and other intercultural operations were done as and when required. First and second pod harvesting of mungbean were done at 18 May, 2007 and 3 June, 2007, respectively. Sesame was harvested at 11 June, 2007. Data on yield contributing characters were recorded from 10 randomly selected plants from each plot and grain yield (kg/ha) was recorded from whole plot at harvest. The treatments were evaluated in terms of land equivalent ratio (LER) using the following formula of Willey (1981).

$$LER = \frac{\text{Yield of intercrop (mungbean)}}{\text{Yield of monocrop (mungbean)}} + \frac{\text{Yield of intercrop (sesame)}}{\text{Yield of monocrop (sesame)}}$$

Also, sesame yields were converted into mungbean equivalent yield as per Anjeneyula *et al.* (1982). Mungbean yield equivalent Y= (Ym x Pm)/ Ps, where Ym = Yield of mungbean, Pm and Ps = Market prices of mungbean and sesame, respectively.

The recorded data were statistically analyzed and mean values were separated by Duncan's Multiple Range Test (DMRT) following Gomez and Gomez (1984). All types of variable production cost are recorded to find out the benefit cost ratio (BCR). Economic analysis with respect to net return was carried out to evaluate the profitability of different treatments.

RESULTS AND DISCUSSION

Plant population, grain yield of mungbean and sesame, equivalent yield of mungbean and land equivalent ratio (LER) are presented in Table 1. The results showed that plant population, grain yield of mungbean, sesame and equivalent yield of mungbean were significantly affected by the varying seeding ratios. The highest plant population of mungbean (38.67 /m^2) was observed in sole mungbean and the lowest (17.33 /m^2) was found in 50% mungbean with 50% sesame. Again, the highest plant population of sesame (58.00 /m^2) was observed in sole sesame plot where the lowest (9.67 /m^2) was found in 90% mungbean with 10% sesame.

The highest grain yield of mungbean (1304.00 kg/ha) was obtained by sole mungbean which was statistically identical to 90% mungbean with 10% sesame. The highest mungbean yield was obtained from sole crop only for maximum plant populations per square meter. But the lowest grain yield of mungbean (660.10 kg/ha) was found in 50% mungbean with 50% sesame which was identical to 60% mungbean with 40% sesame (764.00 Kg/ha).

On the other hand, the highest grain yield of sesame (1279.00 kg/ha) was obtained by sole sesame. The highest sesame yield was obtained from the sole crop only for maximum plant populations per square meter. But the lowest grain yield of sesame (328.70 kg/ha) was found in 90% mungbean with 10% sesame which was statistically identical to 80% mungbean with 20% sesame (481.00 kg/ha).

The highest equivalent yield of mungbean (1476.00 kg/ha) was obtained by 70% mungbean with 30% sesame which was statistically identical to 90% mungbean with 10% sesame and 80% mungbean with 20% sesame but the lowest (949.00 kg/ha) was found in sole sesame.

Table 1: Effect of seeding rates on plant population, yield of mungbean and sesame and their equivalent yield and LER

Seeding rates	Plant Population /m^2		Grain yield (kg/ha)		Equivalent yield of mungbean (kg/ha)	Land Equivalent Ratio (LER)
	mungbean	sesame	mungbean	sesame		
Mungbean(sole)	38.67 a	-	1304.00 a	-	1304.00 b	1.00
Sesame (sole)	-	58.00 a	-	1279.00 a	949.00 c	1.00
90% mungbean + 10% sesame	31.33 b	9.67 f	1160.00 ab	328.70 d	1403.90 ab	1.15
80% mungbean + 20% sesame	26.33 c	15.67e	1067.00 bc	481.00 cd	1424.00 ab	1.20
70% mungbean + 30% sesame	24.00 c	21.00 d	999.20 c	643.20 bc	1476.00 a	1.27
60% mungbean + 40% sesame	20.00 d	24.67 c	764.00 d	735.10 b	1309.44 b	1.16
50% mungbean + 50% sesame	17.33 d	29.00 b	660.10 d	784.70 b	1243.00 b	1.12
CV (%)	6.82	7.43	11.02	14.43	9.83	-

(Values followed by the same letter(s) in a column are statistically similar at 5% level of significance according to Duncan's Multiple Range Test)

In general intercropping sesame with mungbean caused slight reduction in yield of sesame that obtained in a sole crop of sesame. Results showed that sesame is quite compatible to cultivate with mungbean. The sowing pattern and spatial arrangement considerably influence competition among the component crops (Chowdhury and Bhargava, 1986). It is therefore imperative to adopt an appropriate sowing combination, which minimizes competition and at the same time enhances total productivity. Seeding combination of mungbean and sesame @ 70% mungbean with 30% sesame is advantageous in that sense that on that combination the equivalent yield is profitable to a greater limit than the other ones keeping the plant population densities for mungbean and sesame as standard. On the other hand, other combinations also shows profit in case of equivalent yield but as the ratio of sesame seeding increased the equivalent yield become lessened. Because the market price of sesame has marked effect in case of calculating equivalent yield of mungbean as the price of sesame is less than mungbean (Price of Table 2).

Land equivalent ratios (LER) of mixed cropping by mungbean and sesame ranged from 1.12 to 1.27 which indicates that the mixed cropping system were 12 to 27 per cent efficient over sole crop yield of mungbean in terms of land utilization. The highest LER (1.27) was obtained by 70% mungbean with 30% sesame. The results indicated that 27 per cent additional advantage of mixed cropping mungbean with sesame keeping the plant population densities for mungbean and sesame for the same as for pure crops.

From the Table-2, it is found that the highest net return (Tk 31,560.00 /ha) and the highest BCR (2.57) were found in 70% mungbean with 30% sesame. On the other hand, the lowest net return (Tk 16,715.00 /ha) and the lowest BCR (2.01) were found in sole sesame. Sarker and Rahman (1992) reported that the highest net income and BCR were obtained when cowpea was intercropped with kaon.

From the above study, it is revealed that seeding combination of mungbean and sesame @ 70% mungbean with 30% sesame is profitable for this mungbean-sesame mixed cropping system, giving the highest equivalent yield, monetary advantage and benefit cost ratio (BCR).

Table 2: Agro-economic performance of mixed cropping system of sesame with mungbean

Seeding Rates	Equivalent yield of mungbean (kg/ha)	Total variable cost (Tk/ha.)	Gross return (Tk/ha)	Net return (Tk/ha)	Benefit cost ratio (BCR)
Mungbean (Sole)	1304.00	19675.00	45640.00	25965.00	2.32
Sesame (Sole)	949.00	16500.00	33215.00	16715.00	2.01
90% mungbean + 10% sesame	1403.90	19800.00	49136.50	29136.50	2.48
80% mungbean + 20% sesame	1424.00	19950.00	49840.00	29890.00	2.50
70% mungbean + 30% sesame	1476.00	20100.00	51660.00	31560.00	2.57
70% mungbean + 30% sesame	1309.44	20150.00	45830.40	25680.40	2.27
50% mungbean + 50% sesame	1243.00	20100.00	43505.00	23405.00	2.16

Price

Urea= Tk 6.00 /kg, TSP= Tk 20.00 /kg, MP= Tk 15.00 /kg, Plough= Tk 750.00 /plough/ha, Labour = Tk 100.00 / 8 hour/head, Sesame= Tk 25.00 / kg, Mung = Tk. 35.00 /kg (non seed) & Tk. 60.00 /kg (seed).

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