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EFFECT OF PLANTING SYSTEM OF POTATO AND PLANT DENSITY OF MAIZE ON PRODUCTIVITY OF POTATO- HYBRID MAIZE INTERCROPPING SYSTEM

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Abstract

The experiment was conducted at Agronomy Research Field, Bangladesh Agricultural Research Institute, Gazipur during 2010-11 to find out the appropriate planting system of potato and plant density of maize in potato-hybrid maize intercropping system for maximum yield and economic return. Ten treatments were evaluated viz., T_1= Potato whole tuber single row (75 cm × 20 cm) + 125% hybrid maize (75 cm × 20 cm), T_2=Potato whole tuber single row (75 cm × 20 cm) + 100% hybrid maize (75cm × 25 cm), T_3= Potato whole tuber single row (75 cm × 20 cm) + 83% hybrid maize (75 cm × 30 cm), T_4= Potato half tuber paired row (20 cm/ 55 cm × 20 cm) + 125% hybrid maize (75 cm × 20 cm), T_5= Potato half tuber paired row (20 cm/ 55 cm × 20 cm) +100% hybrid maize (75 cm × 25 cm), T_6= Potato half tuber paired row (20 cm/ 55 cm × 20 cm) + 83% hybrid maize (75 cm × 30 cm), T_7= Sole potato whole tuber single row planting system (60 cm × 25 cm), T_8 = Sole potato half tuber paired row (20 cm/ 55 cm × 20 cm), T_9= Sole hybrid maize in normal spacing 75 cm × 25 cm (sole HM1) and T_{10}= Sole hybrid maize (75 cm × 25 cm) sown 30 days after potato planting (sole HM2). The results revealed that sole planting of both potato and maize produced the maximum yields. In case of sole potato, potato half tuber paired row planting system was better than potato whole tuber single row planting system. On the other hand, the performance of sole HM1 was better than sole HM2 in relation to growth, yield and economic performance. Over all T_1 treatment (potato whole tuber single row planting system with 125 % hybrid maize population) was the best intercropping system for getting higher yield and economic return as well as less relative crowding coefficient with better crop performance ratio.

Keywords: Planting system, Plant density, PAR interception, Dry matter, RCC, CPR, Relative yield, Equivalent yield, Potato, Maize.

Introduction

Intercropping system is one of the important approaches of cropping systems by which production can be increased. Intercropping system becomes productive and economical only when it is done properly by selecting compatible crops

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(Santalla *et al.*, 2001), shifting the period of peak demand for growth resources through changing the time of sowing of the component crops (Santalla *et al.*, 1999) and when their component crops differ in photosynthetic pathway, growth habit, growth duration, alteration of planting arrangement and demand for growth resources (Fukai and Trenbath, 1993).

Maize is a unique crop for its versatile use and low cost unit^{-1} production. Its cultivation and uses are spreading very fast due to development of both poultry industry and increase in human consumption. So, there is ample scope for farther expansion of maize in Bangladesh (Islam, 2007). However, there is problem in increasing the cropping area of maize in the country as it has to compete with a number of crops particularly in the dry season. The production of maize can be increased if it can be included as an intercrop in the cropping system. Maize is a widely spaced crop and there is ample scope to grow short duration intercrops in the interspaces and maize is the most compatible crop with potato for their contrasting phenology, highest maize equivalent yield (179q ha^{-1}) and 163% yield advantage (Jha *et al.*, 2000). Potato (*Solanum tuberosum* L.) is leading vegetable crop in the world and it is the third largest food crop in Bangladesh. The production of potato has been increased to almost 10 million tons in Bangladesh.

Row arrangement or planting system of component crops is an important agronomic approach in intercropping systems. The intercrop productivity may be increased through minimizing of interspecific competition and maximizing complementary use of growth resources (Midmore, 1993). In potato- maize intercropping, maize being tall statured C_4 crop has higher competitive ability for light than underneath C_3 potato crop. Competition for light may be minimized by changing planting pattern of maize without affecting its yield (Waghmare *et al.*, 1982). Density of component crops plays a vital role in increasing productivity and profitability of intercropping systems. Competitive ability of a component crop in intercropping system is largely influenced by population density. For maximum productivity it is also important to determine maximum population density of the companion crops to be accommodated in the system. The experiment was, therefore, undertaken to find out planting arrangement/system of potato and plant density/spacing of maize in potato maize intercropping system for getting higher yield and economic return.

Materials and Method

The experiment was conducted at the Agronomy research field of BARI, Joydebpur during the *rabi* season of 2010-11. Ten treatments were evaluated in the experiment viz., T_1= Potato whole tuber single row (75 cm × 20 cm) + 125% hybrid maize (75 cm × 20 cm), T_2=Potato whole tuber single row (75 cm × 20 cm) + 100% hybrid maize (75cm × 25 cm), T_3= Potato whole tuber single row (75 cm × 20 cm) + 83% hybrid maize (75 cm × 30 cm), T_4= Potato half tuber paired row (20 cm/ 55 cm × 20 cm) + 125% hybrid maize (75 cm × 20 cm), T_5=

Potato half tuber paired row (20 cm/ 55 cm × 20 cm) +100% hybrid maize (75 cm × 25 cm), T_6= Potato half tuber paired row (20 cm/ 55 cm × 20 cm) + 83% hybrid maize (75 cm × 30 cm), T_7= Sole potato whole tuber single row planting system (60 cm × 25 cm), T_8 = Sole potato half tuber paired row (20 cm/ 55 cm × 20 cm), T_9= Sole hybrid maize in normal spacing 75 cm × 25 cm (sole HM1) and T_{10}= Sole hybrid maize (75 cm × 25 cm) sown 30 days after potato planting (sole HM2). The experiment was laid out in randomized complete block design with three replications. The unit plot size was 6.0 m × 5.0 m. The potato var. BARI Alu 8 (Cardinal) and maize var. BARI Hybrid maize 7 were used in the experiment. Sole potato, intercropped potato and sole HM1 (T_9) were planted on 22 November, 2010. Sole HM2 (T_{10}) and intercropped maize were planted on 22 December, 2010. Fertilizers were applied @ $N_{180}P_{40}K_{180}S_{20}Zn_6B_{1.2}$ kg/ha and $N_{260}P_{72}K_{148}S_{48}Zn_4B_2$ kg/ha for sole potato and sole hybrid maize, respectively (FRG, 2005). For intercrop fertilizers were applied @ $N_{320}P_{73}K_{170}S_{50}Zn_6B_2$ kg/ha. The source of N, P, K, S, Zn and B was urea, triple super phosphate (TSP), muriate of potash (MoP), gypsum, zinc sulphate and boric acid, respectively. In case of sole potato, half amount of urea and MoP and the whole amount of TSP, gypsum, zinc sulphate and boric acid were applied at the time of final land preparation. Remaining half amount of urea and MoP were applied at 30 days after planting (DAP). For sole maize, one-third of urea and whole amount of other fertilizers were applied at the time of final land preparation. Remaining amount of urea was applied in two equal splits as side dressing at 30 and 55 days after sowing (DAS). In case of intercrop, 1/3 urea as basal, 1/3 at 30 DAP & 1/3 after potato harvest followed by irrigation and all other fertilizers were applied as basal. Irrigation and other intercultural operations were done as and when required. Fungicide (Dithane M 45) was sprayed at every 10-day intervals beginning from 25 DAP to 70 DAP for preventing potato disease. Photosynthetically active radiation (PAR) was measured by PAR Ceptometer (Model – LP-80, Accu PAR, Decagon, USA). PAR (µmole s^{-1} m^{-2}) was measured at 10-day intervals from 30 to 90 day after emergence (DAE) of potato at around 11:30 am to 13:00 pm. Potato was harvested at 95 DAP on 24 February, 2011 and hybrid maize were harvested on 6 May, 2011 (135 DAS) except sole HM1 (T_9) which was harvested on 15 April, 2011 (144 DAS). Collected data of both the crops were analyzed statistically and the means were adjudged using DMRT at 5% level of probability. Economic analysis was also done considering local market price of harvested crops.

Results and Discussion

Photosynthetically active radiation

The photosynthetically active radiation (PAR) was measured at 60, 68, 76, 84 and 92 DAP of potato or 30, 38, 46, 54 and 62 DAS of maize. PAR interception was significantly influenced at all time intervals by intercropping system. PAR interception was the highest in all the treatments at 60 DAP (Fig. 1). The efficiency of PAR interception depends on the leaf area and the plant population as well as leaf shape and inclination into the canopy. Over the growing period, the higher PAR interception was observed in intercrop situation than sole crop. Higher PAR was observed in all the treatments at 60 DAP, and then declined up to potato harvest (92 DAP) except sole maize. It might be due to leaf area of potato reached its maximum growth at 60 DAP and then leaf senescence occurred sharply up to harvest. On the other hand, PAR interception was less in maize due to its incomplete canopy coverage at its early growth stage and then increased up to its maximum growth stage (after potato harvest). The results revealed that over the growing period, PAR interception was higher in intercrop than sole crop at all the time intervals. Similar result was observed by Islam (2007) who reported that PAR interception was higher in intercrop situation than sole crop in potato + maize intercropping system. Treatment comprises, potato half tuber double row planting system, attained its full canopy coverage with more vigorous within 30 DAP than that of whole tuber single row planting system. Moreover, it was found that the growth of half tuber was faster than that of whole tuber. So, emergence of intercropped hybrid maize was affected with heavy shading by potato canopy of half tuber paired row planting system. As a result, maize population decreased drastically in potato half tuber double row planting system. Though there was no significant difference in PAR interception with different maize population.

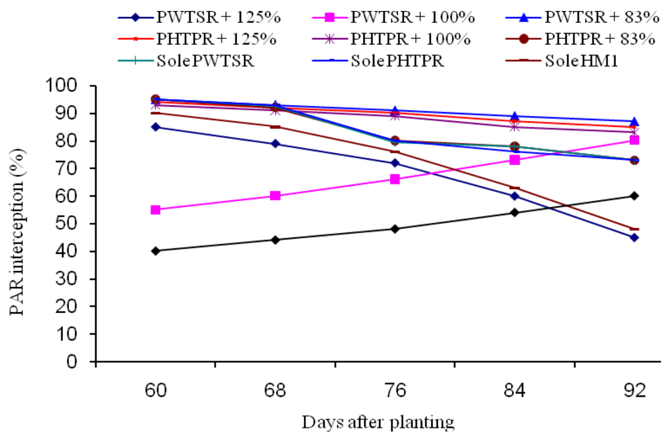

Fig. 1. PAR (%) intercepted in potato-hybrid maize intercropping system.

Note: PWTSR= Potato whole tuber single row, PHTPR = potato half tuber paired row, HM1= hybrid maize sown at the time of potato planting and HM2= hybrid maize sown 30 days after potato planting.

Total dry matter of potato and maize

Planting system and population density caused significant variation in dry matter accumulation of potato and hybrid maize (Fig. 2). Total dry matter (TDM) of potato and hybrid maize increased with the advancement of plant age irrespective of different treatments. The differences in TDM production were slow at the initial stage of crop development and with the advancement of time. Sole potato (half tuber double row) and respective intercrops produced higher TDM than sole potato (whole tuber single row) and respective intercrops due to higher population density. On the other hand, both sole of hybrid maize gave higher TDM than that of intercropping maize. It might be due to no intercrop competition for light, nutrients, moisture and space in sole crop. This corroborates with the findings of Islam (2007) and Alom (2007).

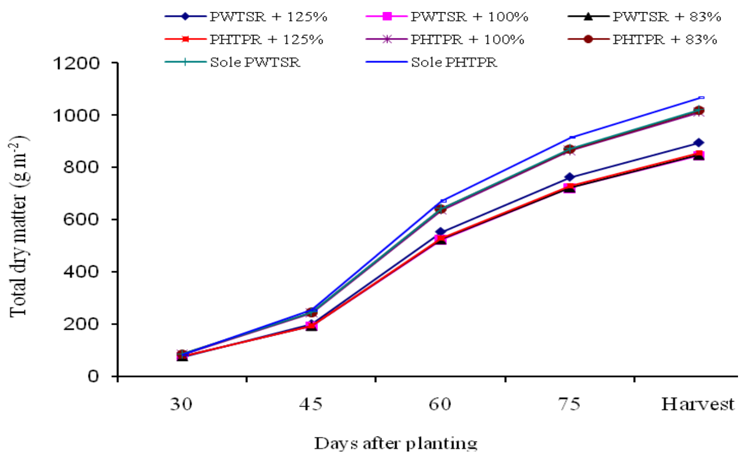

Fig. 2. Total dry matter of potato in potato-hybrid maize intercropping.

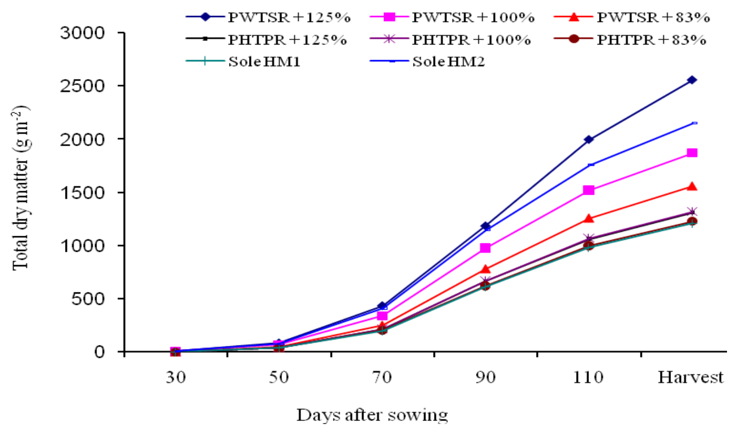

Fig. 3. Total dry matter of hybrid maize in potato-hybrid maize intercropping system.

Note: PWTSR= Potato whole tuber single row, PHTPR = potato half tuber paired row, HM1= hybrid maize sown at the time of potato planting and HM2= hybrid maize sown 30 days after potato planting

Early sown sole hybrid maize produced more TDM than delayed sown sole maize. It might be due to shortening of growth period of maize with the increased of temperature at later stage. Similar result was observed by Islam (2002). The results also revealed that TDM of hybrid maize in potato single row based intercropping were higher than that of potato double row based intercropping.

Assessment of competition in intercropping system

Crop competition quantified by relative crowding coefficient (Hall, 1974), crop performance ratio (Ali *et al.*, 1990) and relative yield and relative yield total (Jokinen, 1991). Relative crowding coefficient (RCC) provides a measure of aggressiveness of each species grown in association. In this study, RCC of potato was higher than that of hybrid maize in all intercropping systems. The results indicated that potato was more competitive than maize (Table 1). The RCC of each potato and maize (when intercropped with potato whole tuber single row system) was greater than unity indicated better utilization of growth resources in intercropping. The highest K value (20.45) was observed in potato whole tuber single row in association with 125% hybrid maize population indicating the higher compatibility in intercropping.

The crop performance ratio (CPR) is used to assess the performance of individual crop as well as total intercropping. Partial CPR of potato was greater than unity (1.83-1.91) in all intercrop combinations, which showed 83 to 91% yield advantage over its sole crop and maize also contributed 4-40 % yield advantage in different intercropping systems (Table 1). This yield improvement of component crops might be the resultant of complementary use of growth resources. Islam (2002) also reported that maize in maize + bush bean intercropping system produced 27- 99% yield advantage over sole crop. But CPR of maize was less than unity (0.67- 0.71) when maize was intercropped with potato half tuber double row system and it was found that maize had heavy shading by large potato canopy at early growth stage of maize in intercropping system. However, CPR values in different intercropping systems varied from 1.51 to 1.72 indicating 51 to 72% yield advantage over monoculture (Table 1). The highest CPR (1.72) was found in T_1 and the lowest CPR (1.51) in T_4.

The relative yields of intercropped potato varied from 0.92 to 0.96 depending upon the planting systems and population density of potato and maize (Table 1). The results indicated that intercropped potato showed poor competitiveness in accordance to different planting systems and population densities. Similarly, relative yields of intercropped maize varied from 0.34 to 0.70 in response to different planting systems and population density of component crops. The results revealed that potato had more competitive ability than maize in intercropping systems. Relative yield totals (RYT) in all intercrop combinations were greater than unity indicated yield advantage of intercropping systems over mono cropping (Table 1). The highest RYT (1.64) was found when 125% maize population grown in potato whole tuber single row planting system.

Table 1. Relative crowding coefficient (RCC), crop performance ratio (CPR) and relative yield total of potato and hybrid maize intercropping under different planting arrangement and plant density

Treatment	RCC		Product (K)	Partial CPR		CPR	Relative Yield		Relative yield total
	Potato	Maize		Potato	Maize		Potato	Maize	
T_1	18.58	1.87	20.45	1.87	1.40	1.72	0.94	0.70	1.64
T_2	14.86	1.56	16.42	1.87	1.22	1.66	0.94	0.61	1.55
T_3	18.26	1.31	19.57	1.91	1.04	1.62	0.96	0.52	1.48
T_4	13.58	0.44	14.02	1.83	0.71	1.51	0.92	0.35	1.27
T_5	14.86	0.59	15.45	1.87	0.70	1.54	0.94	0.35	1.29
T_6	13.84	0.61	14.45	1.89	0.67	1.54	0.94	0.34	1.28
T_7	1.00	-	1.00	1.00	-	1.00	1.00	-	1.00
T_8	1.00	-	1.00	1.00	-	1.00	1.00	-	1.00
T_9	-	1.00	1.00	-	1.00	1.00	-	1.00	1.00
T_{10}	-	1.00	1.00	-	1.00	1.00	-	1.00	1.00

Note: T_1= Potato whole tuber single row (75 cm × 20 cm) +125% hybrid maize (75 cm × 20 cm), T_2= Potato whole tuber single row (75 cm × 20 cm) +100% hybrid maize (75cm × 25 cm), T_3 = Potato whole tuber single row (75 cm × 20 cm) +83% hybrid maize (75 cm × 30 cm), T_4= Potato half tuber paired row (20/55 cm × 20 cm) + 125% hybrid maize (75 cm × 20 cm), T_5 = Potato half tuber paired row (20/55 cm × 20 cm) + 100% hybrid maize (75 cm × 25 cm) and T_6= Potato half tuber paired row (20/55 cm × 20 cm) +83% hybrid maize (75 cm × 30 cm), T_7= Sole potato whole tuber single row (75 cm × 20 cm) and T_8= Sole potato half tuber paired row (20/55 cm × 20 cm), T_9= Sole HM1 and T_{10}= Sole HM2.

Tuber yield & yield components of potato

Tuber yield and yield components like number of stems m^{-2}, number of tubers $hill^{-1}$ and tuber weight $hill^{-1}$ varied significantly by planting systems of potato and maize (Table 2). Results revealed that potato half tuber paired row planting system and respective intercropping treatments showed significantly better performance in all parameters than those of potato whole tuber single row planting system and respective intercropping treatments. The maximum number of stems m^{-2} (49.33), tubers $hill^{-1}$ (12.0) and tuber weight $hill^{-1}$ (600.00 g) were observed in T_8 which was statistically similar with respective intercropping treatments while lower number of stems m^{-2} (30.00), tubers $hill^{-1}$ (7.70) and tuber weight $hill^{-1}$ (495.30 g) were observed in T_1 which were statistically similar with respective intercrop treatments. The germination percentage was higher in half tuber paired row system due to fungicide treatment. As a result population as well as number of stems m^{-2} became higher in paired row planting system than that of whole tuber single row system. But there was no significantly different in the number of stems m^{-2} between the sole potato and respective intercropping due to different population of maize. The results also revealed that in both planting systems, higher number of tubers $hill^{-1}$ was obtained in monoculture compared to respective intercropping treatments. It might be due to the plants having more growth resources resulting the plants had luxurious growth which produced higher number of tubers $hill^{-1}$ than other respective intercropping treatments. The results are agreement with Islam (2007) in hybrid maize + potato intercropping system. Among the treatments, both the sole crop gave the higher tuber weight $hill^{-1}$ than respective intercropping treatments. It might be due to the plants having more space, light and nutrients resulting the plants grew luxuriously and able to produce higher tuber weight $hill^{-1}$ in monoculture than respective intercropping treatments. The results are in agreement with Islam (2007) in hybrid maize + potato intercropping. The highest tuber yield (26.33 t ha^{-1}) was observed in T_8 followed by respective intercropping treatments and the lowest yield (21.55 t ha^{-1}) was found in T_1 which was statistically similar with T_2, T_3 & T_7. Higher yield of potato was observed in monoculture compared to respective intercropping might be due to no intercrop competition for growth resources like light, nutrients, moisture and space in sole cropping. This corroborates with the findings of Karim *et al*. (1989) and Islam (2007).

Table 2. Yield and yield components of potato in potato- hybrid maize intercropping as affected by planting arrangement and plant density

Treatment	Stems m^{-2} (no.)	Tubers $hill^{-1}$ (no.)	Tuber wt. $hill^{-1}$ (g)	Tuber yield (t ha^{-1})
T_1	30.00b	7.70d	495.30b	21.55d
T_2	30.00b	7.70d	495.30b	21.55d
T_3	31.33b	7.72d	500.70b	22.00cd
T_4	46.67a	10.80b	540.70ab	24.11abc
T_5	46.67a	11.00ab	545.00ab	24.67ab
T_6	47.33a	11.20ab	550.70ab	24.84ab
T_7	34.67b	9.00c	540.70ab	23.00bcd
T_8	49.33a	12.0a	600.00a	26.33a
CV (%)	6.00	5.10	5.44	4.06

In a column figures having common letter (s) do not differ significantly whereas the figures with dissimilar letter differ significantly as per DMRT at 5% probability level.

T_1= Potato whole tuber single row (75 cm × 20 cm) +125% HM (75 cm × 20 cm), T_2= Potato whole tuber single row (75 cm × 20 cm) +100% HM (75cm × 25 cm), T_3 = Potato whole tuber single row (75 cm × 20 cm) +83% HM (75 cm × 30 cm), T_4= Potato half tuber paired row (20/55 cm × 20 cm) + 125% HM (75 cm × 20 cm), T_5 = Potato half tuber paired row (20/55 cm × 20 cm) + 100% HM (75 cm × 25 cm), T_6= Potato half tuber paired row (20/55 cm × 20 cm) +83% HM (75 cm × 30 cm), T_7= Sole potato whole tuber single row (75 cm × 20 cm) and T_8= Sole potato half tuber paired row (20/55 cm × 20 cm).

Grain yield & yield component of maize

Grain yield and yield component of hybrid maize was significantly affected by planting system and population density (Table 4). Number of cobs m^{-2} was observed higher in intercropping treatments involving potato whole tuber planting. Lower number of cobs m^{-2} was observed in intercropping treatments based on potato half tuber paired row planting system. At early growth stage, vigorous potato canopy under potato half tuber paired row planting system affected germination of maize. As a result, lower plant stand and number of cobs m^{-2} in maize under potato half tuber paired row planting system. However, the highest number of cobs m^{-2} was obtained in potato whole tuber single row + 125% hybrid maize treatment due to higher maize population while lowest number of cobs m^{-2} from potato half tuber paired row + 83% maize population due to lower maize population. Similar result was found by Dehdashti and Riahinia (2008) and Ahmed *et al*. (2010). They reported that higher plant population increased number of cobs per unit area. Both sole maize gave significantly higher number of grains cob^{-1} than their intercrop treatments and there was no significant difference among the intercrop treatments. Highest number of grains cob^{-1} was observed in sole maize presumably due to plants having more space, light and nutrients where plants grew luxuriously. The findings are in accordance to those of Quayyum *et al*. (1985) and Nag *et al*. (1996). Sole maize (both) and potato whole tuber single row based intercropping treatments gave higher 1000-grain weight. It might be due to more availability of growth resources in sole maize than in intercropping treatments. On the other hand, maize in intercropping treatments (potato half tuber paired row planting system) gave lower grain weight probably due to the fact that maize had poor growth caused by heavy shading at early growth stage. Grain yield of maize followed almost similar pattern to its yield contributing characters at the different intercropping systems (Table 3). However, sole maize (both) gave the higher grain yield which might be due to low competition occurrence for growth resources. The result also revealed that sole HM2 gave lower yield than sole HM1. It might be due to shortening of growth period of maize under late sown condition due to rise of temperature, especially at the later growth stage. On the other hand, potato half tuber paired row based intercropping treatments showed lower yield due to lower number of cobs m^{-2}. Besides this, other yield contributing characters were also lower in potato half tuber paired row based intercropping treatments.

Table 3. Yield and yield components of hybrid maize in potato- hybrid maize intercropping as affected by planting arrangement and plant density

Treatment	Cobs m^{-2} (no.)	Grains cob^{-1} (no.)	1000-grain wt. (g)	Grain yield (t ha^{-1})
T_1	6.67a	459.3bc	320.18b	8.05c
T_2	5.34b	459.4bc	327.20ab	7.00d
T_3	4.45c	460.2bc	330.50ab	6.00d
T_4	3.50d	445.0c	300.20b	3.67e
T_5	3.50d	445.1c	310.80b	3.64e
T_6	3.20d	445.0c	320.20b	3.50e
T_9	5.50b	510.1a	375.90a	11.50a
T_{10}	5.40b	500.0ab	349.00ab	10.40b
CV (%)	5.88	5.17	6.74	6.23

In a column figures having common letter (s) do not differ significantly whereas the figures with dissimilar letter differ significantly as per DMRT at 5% probability level.

T_1= Potato whole tuber single row (75 cm × 20 cm) +125% HM (75 cm × 20 cm), T_2= Potato whole tuber single row (75 cm × 20 cm) +100% HM (75cm × 25 cm), T_3 = Potato whole tuber single row (75 cm × 20 cm) +83% HM (75 cm × 30 cm), T_4= Potato half tuber paired row (20/55 cm × 20 cm) + 125% HM (75 cm × 20 cm), T_5 = Potato half tuber paired row (20/55 cm × 20 cm) + 100% HM (75 cm × 25 cm), T_6= Potato half tuber paired row (20/55 cm × 20 cm) +83% HM (75 cm × 30 cm), T_9= Sole HM1 and T_{10}= Sole HM2.

Intercrop efficiency

Potato-hybrid maize intercrop productivity was evaluated on the basis of equivalent yield (Bandyophadhyay, 1984). The result showed that all the intercropping systems gave higher potato and maize equivalent yield than that of corresponding sole crop yield (Table 4). The highest potato equivalent yield was recorded in the treatment of potato whole tuber single row + 125% maize population which showed yield advantages of 32% whereas maize equivalent yield advantages of 169% over the respective sole crops. Jha *et al.* (2000) reported the highest maize equivalent yield (179 q ha^{-1}) and yield advantage (163 %) in potato + hybrid maize intercropping. Land equivalent ratio (LER) values in the intercrops ranged from 1.27 to 1.64 which indicated 27 to 64% yield advantage due to intercropping (Table 4). The highest LER value (1.64) was obtained from the treatment of potato whole tuber single row + 125% maize population, which might be due to maximum complementary use of different growth resources in potato this treatment.

Economic performance

Economic analysis is an important tool to evaluate the economic feasibility of intercropping systems and monetary advantage was evaluated according to Shah *et al*. (1991). Data pertaining to monetary return of intercropping system indicated that higher gross return and gross margin was observed in all intercropped treatments than in monoculture of potato or maize (Table 4). Potato whole tuber single row + 125% hybrid maize gave the highest gross return (Tk. 363240 ha^{-1}) 32% and 155% more than sole cropping of potato and hybrid maize, respectively. The data showed that potato whole tuber single row + 125% hybrid maize gave the highest BCR of 2.66 (Table 4). Islam (2007) reported that BCR and gross margin was higher in intercropped situation than sole crop. The findings are also in agreement with those of Jha *et al*. (2002) and Sharma *et al*. (2000) and they reported that highest productivity and profitability in terms of equivalent yield and monetary return from intercropping system.

Table 4. Equivalent yield and economic performance of potato- hybrid maize intercropping under different planting arrangement and plant density

Treatment	PEY (t ha^{-1})	MEY (t ha^{-1})	LER	Gross return (Tk. ha^{-1})	Total cost of cultivation (Tk. ha^{-1})	Gross margin (Tk. ha^{-1})	BCR
T_1	30.27	27.94	1.64	363240	136467	226773	2.66
T_2	29.13	26.89	1.55	349560	135867	213693	2.57
T_3	28.50	26.31	1.48	342000	135467	206533	2.52
T_4	28.09	25.93	1.27	337080	137917	199163	2.44
T_5	28.61	26.41	1.29	343320	137317	206003	2.50
T_6	28.63	26.43	1.28	343560	136917	206643	2.51
T_7	23.00	21.23	1.00	276000	119086	156914	2.32
T_8	26.33	24.30	1.00	315960	120536	195424	2.62
T_9	12.46	11.50	1.00	142500	83065	59435	1.80
T_{10}	11.27	10.40	1.00	135200	83065	52135	1.63

Market price: Potato Tk. 12 kg^{-1}; Maize Tk. 13 kg^{-1}.

PEY= Potato equivalent yield, MEY=Maize equivalent yield, LER= Land equivalent ratio.

T_1= Potato whole tuber single row (75 cm × 20 cm) +125% HM (75 cm × 20 cm), T_2= Potato whole tuber single row (75 cm × 20 cm) +100% HM (75cm × 25 cm), T_3 = Potato whole tuber single row (75 cm × 20 cm) +83% HM (75 cm × 30 cm), T_4= Potato half tuber paired row (20/55 cm × 20 cm) + 125% HM (75 cm × 20 cm), T_5 = Potato half tuber paired row (20/55 cm × 20 cm) + 100% HM (75 cm × 25 cm), T_6= Potato half tuber paired row (20/55 cm × 20 cm) +83% HM (75 cm × 30 cm), T_9= Sole HM1 and T_{10}= Sole HM2.

Conclusion

The result revealed that the intercropping system of potato whole tuber single row planting system (75cm × 20cm) + 125% hybrid maize (75cm × 20cm) was the most productive and profitable combination than all other intercropping systems as well as than sole cropping of potato and maize.

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