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Effect of planting pattern on soybean and pigeonpea intercropping system

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ABSTRACT

The field experiment was carried out on clayey soil at Agriculture College Farm, Latur (M.S.) during 2006-2007 to find out the suitable soybean genotype for intercropping and to identify the suitable planting pattern for getting higher productivity in system. The result of field trial indicated that planting pattern 4:2 and intercropping system of soybean (JS-335) with pigeonpea were more profitable than other planting patterns and intercropping systems under study. Similarly highest values of grain equivalent, net monetary return and land equivalent ratio were recorded in intercropping system soybean (JS -335) + pigeonpea (BSMR – 736) and planting pattern 4:2.

Key words : Grain equivalent, Planting pattern, Intercropping, Soybean, Land equivalent ratio

INTRODUCTION

It is well known that the crop production is unstable and at times uneconomic due to vagaries of mansoon in dry land areas of scarcity zone of Maharashtra. Appropriate intercropping systems besides meeting the varied requirements of farmer, provide stability in rainfed agriculture and improve the total productivity through better resource use. Utilization of natural resource like soil, space, moisture and light through intercropping of short duration pulses and oilseed in between the rows of pigeonpea is the promising way to boost the total productivity of pulses. Oilseeds and pulses are receiving more attention owning to higher demand and prices. Besides many agro-economic advantages, intercropping is also consider advantageous in the context of increasing demand of household and better and regular employment opportunity to family labour. Amongst the evolved agricultural practices, an intercropping has been proved as a boon to the Indian farmers. It is a mean to stabilize the crop productivity in dry land areas and to increase it in rainfed area under existing inadequate land and rainfall situations. Under the climatic conditions of Marathwada region, soybean and pigeonpea crops are recently being considered to be valuable crops as *Kharif* legumes like green gram and blackgram.

MATERIALS AND METHODS

An agronomic investigation was carried out at Agriculture College Farm, Latur on clayey soil during 2006-2007. A Factorial Randomized Block Design replicated three times was used. The treatments comprised of three planting patterns *viz.*, 6:3, 3:3 and 4:2 with five intercropping systems sole soybean (JS-335), sole pigeonpea (BSMR-736), soybean (MAUS-71) + pigeonpea (BSMR-736), soybean (MAUS-81) + pigeonpea (BSMR-736) and soybean (JS-335) + pigeonpea (BSMR-736) were included in the investigation. The gross plot size was 6.0 x 5.4 m^2 and net plot sizes were varied according to planting patterns. The recommended fertilizer doses 30:60:30 kg NPK ha^{-1} for soybean and 25:50:00 kg NPK ha^{-1} for pigeonpea were applied to all the plots. The crops were sown by dibbling method. Soybean was sown at 45 x 5 cm^2 and pigeonpea at 45 x 20 cm^2 spacing.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads:

Grain yield :

The planting pattern 4:2 produced maximum grain yield of soybean and pigeonpea which was significantly superior over planting patterns 6:3 and 3:3. The growth characters *i.e.* number of functional leaves, leaf area, mean dry matter accumulation and yield contributing characters *i.e.* weight of pods, number of pods, weight of grains and test weight were highest in planting pattern 4:2 which contributed for more grain yield per unit area. Similarly, corresponding growth and yield contributing characters of soybean and pigeonpea were also highest in intercropping system soybean (JS-335) + pigeonpea (BSMR-736). The maximum grain yield was recorded in sole soybean (JS-335) and sole pigeonpea (BSMR-736) due to maximum plant population per unit area. Similar results were obtained by Rafey and Varma (1988) and Holkar *et al.*(1991).

Grain yield of soybean and pigeonpea was influenced by interaction of planting pattern and intercropping

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system. The maximum yield was found in interaction of planting pattern 4:2 and intercropping system soybean (JS-335) + pigeonpea (BSMR-736). This may be because of initial growth of pigeonpea (BSMR-736) was slow which resulted in more space for soybean development. The results are in conformity with Danawale and Shinde (1996).

Soybean grain equivalent :

The highest value of soybean grain equivalent was found in planting pattern 4:2 followed by planting pattern 3:3 and lowest value was found in planting pattern 6:3. Where as, intercropping system soybean (JS-335) + pigeonpea (BSMR-736) recorded the highest value of soybean grain equivalent. This was due to higher yield of soybean as well as pigeonpea genotypes. Similar results were reported by Patil and Joshi (2003).

Pigeonpea grain equivalent :

The highest value of pigeonpea grain equivalent was found in planting pattern 4:2 followed by planting pattern 3:3 and lowest value was found in planting pattern 6:3. Where as, intercropping system soybean (JS-335) + pigeonpea (BSMR-736) recorded the highest value of pigeonpea grain equivalent. This was due to higher yield of soybean as well as pigeonpea genotypes. The results are in conformity with Vyas *et al*. (1995).

Land equivalent ratio :

Significantly higher value of LER was found in planting pattern 4:2 followed by planting pattern 3:3 and 6:3. However, in intercropping system soybean (JS-335) + pigeonpea (BSMR-736) recorded the highest value of LER. This was due to better growth of soybean as well as pigeonpea which resulted in higher yield of both the crops in said row proportions. Rafey and Verma (1988) reported similar results.

Net monetary return :

The highest value of net monetary return (Rs.30797/ ha) was obtained in planting pattern 4:2 followed by planting pattern 3:3 (Rs.30251/ha) and the lowest value in planting pattern 6:3(Rs.28682/ha). Among the intercropping system, soybean (JS-335) + pigeonpea (BSMR-736) recorded the highest value (Rs.36754/ha) of net monetary return. The lowest value of net monetary return (Rs.8600/ha) was found in sole soybean. This was due to higher yield of both the crops. The results are in confirmation with findings of Jagtap and Holkar (1995).

Table 1: Soybean grain yield, Mean soybean grain equivalent, land equivalent ratio (LER) and Net monetary return

Treatment	Soybean grain yield (q ha^{-1})	Pigeonpea grain yield (q ha^{-1})	Soybean grain equivalent (kg ha^{-1})	Pigeonpea grain equivalent (kg ha^{-1})	LER	Net monetary return	Cost : Benefit ratio
Planting pattern							
P_1 – 6 : 3	9.56	17.40	3692	2086	1.38	28682	1:2.18
P_2 – 3 : 3	10.02	17.56	3813	2155	1.44	30251	1:2.33
P_3 – 4 : 2	10.54	17.90	3922	2216	1.53	30797	1:2.34
S.E. $\pm$	0.003	0.005	--	--	--	151.33	0.07
C.D. (P=0.05)	0.008	0.016	--	--	--	453.99	0.22
Intercropping system							
C_1 – Sole soybean	12.92	--	--	--	--	8600	1:1.15
C_2 – Sole pigeon pea	--	21.60	--	--	--	35196	1:2.42
C_3 – Soybean (MAUS-71) + Pigeon pea (BSMR-736)	8.74	15.99	3717	2101	1.41	33906	1:2.38
C_4 – Soybean (MAUS-81) + Pigeon pea (BSMR-736)	9.18	16.30	3790	2142	1.46	35096	1:2.47
C5 – Soybean (JS-335) + pigeonpea (BSMR-736)	9.32	16.62	3918	2214	1.48	36754	1:2.59
S.E. $\pm$	0.005	0.005	--	--	--	272.30	0.09
C.D. at 5.0%	0.015	0.015	--	--	--	816.90	0.28
Interaction (P x C)							
S.E. $\pm$	0.008	0.91	--	--	--	168.40	0.17
C.D. (P=0.05)	0.026	2.70	--	--	--	NS	NS
General mean	10.04	17.62	3809	2152	1.45	29910	1:2.28

NS = Non significant

Benefit : cost ratio :

The planting pattern 4:2 recorded the highest value of B:C ratio followed by planting pattern 3:3 and lowest value was found in planting pattern 6:3. Among the intercropping system, the highest value of B:C ratio was found in soybean (JS-335) + pigeonpea (BSMR-736) followed by intrcropping system soybean (MAUS-81) + pigeonpea (BSMR-736). The lowest value was recorded by sole soybean. Similar results were recorded by Tomar *et al*.(1987).

From the above study, it can be inferred that soybean (JS-335) performed better when intercropped with pigeonpea (BSMR-736) with 4:2 planting pattern.

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