Internat. J. agric. Sci. Vol.2 No.2 July 2006 : (478-479)

Effect of intercropping of pigeonpea, sorghum and cotton on productivity and yield advantages of soybean (*Glycine max.*L.) under rainfed condition

Pramod M. Chaudhari*, Arun B. Kambale, Pankaj U Raundal and Sanjay S. Chitodkar
Mahatma Phule Krishi Vidyapeeth, College of Agriculture, DHULE (M.S.) INDIA

ABSTRACT
The field experiment was conducted for four rainy seasons of 2001, 2002, 2003 and 2004 at National Agricultural Research Project, Farm for scarcity zone of M.S.,College of Agriculture, Dhule to study the effect of intercropping of pigeonpea, sorghum and cotton on productivity and advantages of soybean(*Glycine max.L.*) under rainfed Condition. The intercropping of soybean (JS – 335) + pigeonpea (BSMR-736) with 3:1 row proportion produced highest soybean equivalent yield (24.06 q ha^{-1}), gross monetary returns (Rs. 30322 ha^{-1}), net monetary returns (Rs. 20010 ha^{-1}), LER (1.38) and B: C ratio (2.92) . Hence it is advisable to grow intercropping of soybean (JS – 335) with pigeonpea (BSMR-736) under rainfed conditions of Maharashtra for higher productivity and stability of yield.

Key words : Intercropping, Rainfed conditions, Productivity, Monetary advantages, Soybean equivalent yield.

INTRODUCTION

A soybean, pigeonpea, sorghum and cotton production can be increased by adopting the intercropping and sequential cropping system (Reddy *et al.* 1985) under rainfed situation in medium black soil areas. Intercropping may be a feasible and viable agronomic practice for stepping up the production of pulses, oil seeds and cereals from a unit of land during a cropping period. Plant population, spatial arrangement and selection of suitable genotypes in intercropping have important effects on the balance of competition between component crops and their productivity. Now a day intercroppig is receiving greater emphasis in Indian agriculture because of yield advantage, especially under adverse weather conditions and substantially increases economic returns. An intercropping of pigeonpea, sorghum and cotton in soybean having different growth habits, canopy adoption and rooting patterns can easily be accommodated with least competition. Taking this into consideration, the present study was conducted to study the effect of pigeonpea, sorghum and cotton as an intercrop on yield of soybean under rainfed conditions.

MATERIALS AND METHODS

The field experiment was conducted for four rainy seasons of 2001, 2002, 2003 and 2004 at National Agricultural Research Project, Farm for scarcity zone of M.S.,College of Agriculture, Dhule The experiment was conducted on a clay 1oam soil having organic carbon content 0.48 percent, available nitrogen 234 kg ha^{-1}, available phosphorus (P)12 kg ha^{-1} , available potash 328 kg ha^{-1}, pH 8.0, EC ds/m 0.32, bulk density 1.52 mg/m^3 and moisture content 19 percent at 0.33 Mpa. The experiment was laid out in randomized block design with three replications. The gross and net plot size were 5.00 X 4.80 m^2 and 4.60 X 3.6 m^2 , respectively. The crops were sown on 12/7/2001, 11/7/2002, 28/6/2003 and 6/7/2004 after receipt of sufficient rains. The cultivars JS –335 and MACS – 124 of soybean, BSMR – 736 of pigeonpea, Y – 1 of cotton and CSH – 14 of hybrid sorghum were used in the experiment. The crops were sown at 30 X 10 (soybean), 65 X 20 (pigeonpea), 45 X 15 (sorghum) and 45 X 22.5cm (cotton) with 3:1 row proportions in soybean intercropping. Soybean was fertilized with recommended fertilizer dose of 50: 75 kg N and P_2O_5 ha^{-1}, pigeonpea 25:50 N, P_2O_5 Kg ha^{-1} as a basal dose and for hybrid sorghum 120:60:60 N, P_2O_5 and K_2O kg ha $^{-1}$ for cotton 80:40:40 N, P_2O_5 and K_2O kg ha^{-1}.Out of which half dose of nitrogen and full dose of phosphorus and potash were applied as a basal dose at the time of sowing and remaining half dose of nitrogen was top dressed thirty days after sowing. All the recommended practices were adopted to raise the crops.

***Author for correspondence**

RESULTS AND DISCUSSION

The total precipitation received during 2001, 2002, 2003 and 2004 was 570.90 mm, 494.00 mm, 856.40 mm and 783.60 mm in 32, 30, 38 and 40 rainy days respectively.

Effect of soybean equivalent yield

The soybean equivalent yield (Table 1) was found to be significantly influenced by different intercropping system during all the years and when the data were pooled over the seasons. The pooled data showed that soybean (JS – 335) + pigeonpea registered significantly higher soybean grain equivalent yield (24.06 q ha^{-1}) than soybean (MACS – 124) + pigeonpea. However, it was on par with soybean (JS – 335) sole (21.72 q ha^{-1}) soybean (JS – 335) + cotton (21.29 q ha^{-1}) and soybean (JS - 335) + Sorghum (19.99 q ha^{-1}). This might be due to the higher yield of pigeonpea as an intercrop due to long duration, which could capitalize on the resources after harvest of soybean. Similar results were also reported by Dunawale *et al.*(1996), Dudhade *et al.* (2002) and Gare *et al.* (2004). It is observed that yield stability was greater with intercropping than sole cropping. The reduction in soybean yield might be due to greater competition between the component crops. These findings are in confirmity with results of Willey (1979), Tomar *et al.* (1987) and Nimje (1995).

Gross monetary returns

The gross monetary returns were found to be influenced significantly due to the different intercropping systems. The intercropping of soybean (JS – 335) + pigeonpea with 3:1 row proportion recorded significantly higher gross monetary returns (Rs. 30322 ha^{-1}) than rest of the intercropping and sole cropping system except intercropping of soybean (JS – 335) + sorghum (Rs. 27527 ha^{-1}), sole cropping of soybean (JS – 335) (Rs. 27398 ha^{-1}), soybean (MACS – 124) + sorghum (Rs. 23443 ha^{-1}) and sole crop of sorghum. Gare et al (2004) also reported increase in GMR in intercropping systems.

Net monetary returns

The net monetary returns were differed significantly due to different intercropping systems under study. The intercropping of soybean (JS – 335) + pigeonpea (BSMR 736)(Rs. 20010 ha^{-1}) recorded significantly higher net monetary returns as compared to rest of the intercropping and sole cropping systems. However, it was on par with soybean (JS – 335) (Rs. 17143) sole cropping, soybean (JS – 335) + sorghum (Rs. 17155 ha^{-1}) soybean (MACS – 124) + sorghum (Rs. 12872 ha^{-1}) and soybean (MACS – 124) + sorghum (CSH-14) (Rs. 12872 ha^{1}). The higher economic returns due to pigeonpea intercropping might be due to its higher yield as an intercrop as compared to sole soybean.

Table1 : Grain and straw yield, soybean equivalent yield, gross and net monetary returns, LER, B:C ratio as influenced treatme (Pooled mean 2001 to 2004)

Treatment	Grain yield ($q\ ha^{-1}$)	Straw/ Fodder yield ($q\ ha^{-1}$)	Soybean equivalent yield ($q\ ha^{-1}$)	Gross monetary returns ($Rs\ ha^{-1}$)	Net monetary returns ($Rs\ ha^{-1}$)	LER	B:C Ratio
Sole soybean (JS – 335)	21.71	28.79	21.72	27398	17143	1.00	2.64
Sole soybean (MACS – 124)	13.50	20.72	13.51	17257	6988	1.00	1.64
Sole cotton Y-1	7.05	39.72	12.95	17046	1927	1.00	1.10
Sole sorghum (CSH-14)	42.06	79.70	15.28	22597	11926	1.00	2.09
Sole pigeonpea (BSMR-736)	10.83	43.36	12.34	17229	6785	1.00	1.60
Soybean + cotton (JS – 335 + Y-1)	15.63 3.02	20.76 19.55	21.29	27182	15725	1.12	2.33
Soybean + cotton (MACS – 124 + Y-1)	11.01 2.86	15.92 20.07	18.48	20389	8933	1.19	1.72
Soybean + sorghum (JS – 335 +CSH-14)	9.54 29.07	14.16 55.09	19.99	27527	17155	1.13	2.64
Soybean + Sorghum (MACS – 124 +CSH-14)	6.45 28.08	12.97 56.47	16.43	23243	12872	1.20	2.24
Soybean + pigeonpea(JS – 335 +BSMR 736)	16.38 6.27	22.13 20.03	24.06	30322	20010	1.38	2.92
Soybean + Pigeonpea (MACS – 124 + BSMR 736)	9.78 7.54	17.37 20.01	16.86	22197	11885	1.27	2.10
S.E ±			2.08	2773	2754	0.06	0.25
C.D. at5%			6.01	7999	7945	0.19	0.73

Land equivalent ratio (LER)

The LER values for intercropping system indicated that intercropping of soybean (JS – 335) + pigeonpea (BSMR 736) in 3:1 row proportion recorded maximum LER as compared to the other cropping systems followed by intercropping of soybean (MACS – 124) + pigeonpea (BSMR 736) (1:27) and soybean (MACS – 124) + sorghum (CSH-14) (1:20). This clearly indicate that the productivity and advantages was greater with the intercropping of soybean + pigeonpea ((JS-335 + BSMR 736) when compared with other intercropping systems under study. The results collaborate with the findings of Gare et al (2004)

Benefit cost ratio

The maximum B:C ratio of 2.92 was recorded in soybean (JS – 335) + pigeonpea(BSMR 736) with 3:1 row ratio intercropping system followed by soybean (JS – 335) + sorghum(CSH-14), sole soybean (JS – 335) and soybean (JS – 335) + cotton (Y-1).

Non of the interaction effects were found to be nonsignificant.

Considering trends of soybean equivalent yield (24.06 $q\ ha^{-1}$), gross monetary returns (Rs. 30322 ha^{-1}), net monetary returns (Rs. 20010 ha^{-1}), LER (1.38) and B: C ratio (2.92) showed that the soybean (JS – 335) + pigeonpea (BSMR-736) with 3:1 row ratio found to be the most productive, remunerative, profitable and viable intercropping system under rainfed conditions of Maharashtra.

REFERENCES

Danawale, N.J., S.H.Shinde and P.S.Pol (1996). Crop row ratio in pigeaonpea soybean intercropping systems. *Journal of Maharashtra Agriculture Universities* **21(3):** 479-480.

Dudhade, D.D., S.R.Dhonde and L.N.Tagad (2002). Studies on intercropping of tur and soybean. *Journal of Maharashtra Agriculture Universities* **27 (2):** 228-299.

Gare, B.N., S.M.More., M.G.Jadhav and A.V.Burli (2004). Effect of pigeaonpea sorghum intercrop on yield of soybean under rainfed condition in sub-montane zone of Maharashtra. *Journal of Maharashtra Agriculture Universities* **29 (2) :** 170-172.

Nimje, P.M. (1995). Effect of spatial arrangement and phosphorus fertilization in pigeaonpea (*Cajanus Cajan* L.), soybean (*Glycinemax* L.) intercropping system. *Indian Journal of Agron*. **40 (3):** 380-385.

Reddy, M.S., M.Natrajan, M.R.Rao, R.W.Willey and C.K.Ong (1985). Cropping system for rainfed situations with particular reference to ICRISAT an experience paper presented at Nat.symp.on cropping system, held at Kernal on April 3-5, p.p-13.

Tomar, R.W., M.S.Upadhya and R.A.Sharma (1987). Effect of planting pattern in pigeaonpea + soybean intercropping system. *Indian Journal Agron.* **32 (4):** 322-325.

Willey, R.W. (1979). Intercropping its importance and research needs part – I competition and yield advantage. *Field Crop Abstract* **32 (1):** 1-13.

Received : August, 2005; Accepted : March, 2006