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Productivity of newly evolved sorghum (*Sorghum bicolor*) genotypes-based intercropping systems

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ABSTRACT

A field experiment was conducted during the rainy seasons (*kharif*) of 1989–91 at Sorghum Research Unit, Akola, on Vertisols. Treatments included 3 newly evolved sorghum [*Sorghum bicolor* (L.) Moench] genotypes ('SPV 669', 'SPH 388) and 'SPH 468' as a main crop. Each genotype was intercropped with 3 leguminous crops, viz. pigeonpea [*Cajanus cajan* (L.) Millsp.], greengram (*Phaseolus radiatus* L.) and soybean [*Glycine max* (L.) Merr.], in 3 : 3 row proportion. Sole crop of 3 sorghum genotypes and 3 intercrops were taken for comparison with intercropping systems. Sorghum genotype 'SPH 468' intercropped with greengram recorded the highest mean land-equivalent ratio (1.28) and net monetary returns (Rs 11,465/ha) compared with other intercropping treatments. Increase was 3.2% in `SPV 669' + soybean intercropping over sole crop of `SPV 669', 0.53 and 6.2 and 8.8% in `SPV 468' + pigeonpea, `SPV 468' + greengram and `SPV 468 + soybean intercroppings, respectively over sole crop of `SPH 469'; and 7.3 and 2.2% in 'SPV 388' + greengram and `SPV 389' + soybean respectively over sole crop of `SPH 388'.

Farmers expect of full yield of sorghum [*Sorghum bicolor* (L.) Moench] from intercropping and consider pigeonpea [*Cajanus cajan* (L.) Millsp.] as a bonus or extra crop. Early-maturing crop like greengram (*Phaseolus radiatus* L.) is also a beneficial intercrop, which results in 31% advantage (Rao and Willey, 1979). De and Singh (1981) also reported the advantage of 36% and Singh (1977) that of 43% of soybean [*Glycine max* (L.) Merr.] intercropping. Attempts are being made to assess compatibility of newly evolved sorghum genotypes with leguminous intercrop for the most productive, stable and profitable intercropping system under rainfed conditions of Vidarbha region, with special reference to Akola location.

MATERIALS AND METHODS

A field experiment was conducted during the rainy seasons (*kharif*) of 1989–91 on Vertisols at Akola. The soil was low in nitrogen (188 kg/ha) and phosphorus (14.10 kg/ha), moderately high in potassium (281 kg/ha) and moderately alkaline (pH 8.2). Treatments were arranged in randomized block design with 3 replications with net plot size of 7.0 m x 5.4 m. Newly evolved 3 sorghum genotypes ('SPV 669', 'SPH 468' and 'SPH 388') were taken as main crop. Each sorghum genotype was intercropped with 3 leguminous crops, viz. pigeonpea ('C 11'), greengram ('TAP 7') and soybean ('Monetta') in 3 : 3 row proportion. Sole crops of 3 sorghum genotypes and 3 leguminous crops were taken for comparison with intercropping. Recommended dose of fertil-

izer N @ 80 kg/ha and P_2O_5 @ 40 kg/ha was applied to sole sorghum crop and intercrop treatment. However, sole crop of greengram, pigeonpea and soybean received 20 and 40 kg/ha, 25 and 50 kg/ha and 30 and 60 kg/ha of N and P_2O_5/ha respectively.

Sowing was done on 30 June 1989, 25 June 1990 and 7 July 1991 in the respective years. Data on mean of 3 years for sorghum grain and fodder yields, intercrop yield, total grain productivity, sorghum equivalent and land-equivalent ratio (LER) and year-wise data for net monetary return (Rs/ha) were recorded. Monetary returns were calculated considering prevailing market prices in respective years. The pooled analysis was done for net monetary returns (Rs/ha) only.

Table 1. Grain yield, fodder yield, total grain productivity, sorghum equivalent (q/ha) and net monetary return (Rs/ha) as influenced by different intercropping treatments (mean data of 3 years)

Treatment	Grain yield (q/ha)	Fodder yield (q/ha)	Total grain productivity (q/ha)	Sorghum-equivalent (q/ha)	Net monetary return (Rs/ha)	Increase over sole crop (%)	Land-equivalent ratio
Intercropping							
'SPV 669' + pigeonpea	22.93 (2.04)	69.94(11.46)	24.95	30.86	9,414		0.98
'SPV 699' + greengram	26.18 (2.60)	74.12 (7.52)	28.78	34.16	10,169		1.18
'SPV 699' + soybean	26.24 (4.60)	77.33	30.74	39.42	10,571	3.2	1.17
'SPH 468' + pigeonpea	24.73 (3.04)	58.99(16.14)	27.78	36.36	10,025	0.53	1.06
SPH468 + greengram	27.79 (3.79)	58.62(10.30)	31.57	40.04	10,600	6.2	1.28
'SPH 468' + soybean	26.40 (6.02)	57.69	32.44	44.49	10,857	8.8	1.18
'SPH 388' + pigeonpea	27.98 (2.14)	72.52(11.10)	30.14	36.28	10,595		1.06
'SPH 388' + greengram	30.56 (2.82)	73.97 (8.72)	33.38	39.55	11,469	7.3	1.24
'SPH 388' + soybean	26.79 (5.40)	70.27	32.19	42.12	10,917	2.2	1.16
Sole cropping							
'SPV 669'	31.50	89.10	31.90	31.90	10,246		1.0
'SPH 468'	35.43	71.36	35.43	35.43	9,973		1.0
'SPH 388'	35.96	84.75	35.96	35.96	10,677		1.0
Pigeonpea	8.06	34.18	8.66	31.36	5,973		1.0
Greengram	7.42	17.71	7.64	22.93	4,867		1.0
Soybean	13.45		13.45	39.26	5,574		1.0
SE (m) ±					261		
CD (P = 0.05)					735		

Figures in parentheses denote intercrop grain and fodder yields respectively

Market price (Rs/q) : Sorghum (grain) 159, 180, 360; sorghum (fodder) 60, 60, 100; pigeonpea (grain) 620, 845, 1,000; pigeonpea (straw) 70, 30, 40; greengram (grain) 650, 675, 825; greengram (fodder), 70, 70, 100; and soybean (seed) 650, 508, 780 respectively in 1989, 1990 and 1990

RESULTS AND DISCUSSION

Mean grain and fodder yields of main and intercrop declined considerably in intercropped treatment compared with their respective sole crops. Relatively longer crop-span in general and competition for light in particular (Hegde and Saraf, 1978) may be the probable reasons for such decrease in yield. Sorghum genotypes 'SPH 388' and 'SPH 468' recorded the maximum mean total grain productivity over rest of the sole and intercropping systems. Mean sorghum equivalent was maximum when soybean intercropped with all of the 3 sorghum genotypes in 3 : 3 row proportion.

Sorghum genotype 'SPH 468' intercropped with greengram recorded the highest mean land-equivalent ratio (LER) value, followed by 'SPH 388' + greengram, 'SPV 669' + greengram and 'SPH 468' + soybean intercropping systems. Similar results were also reported by Choudhary (1979). In general, LER values were higher when all the 3 sorghum genotypes intercropped with greengram pulse.

Pooled data revealed that 'SPH 468' + greengram intercropping was found significantly superior to other intercropping treatments and at par with 'SPH 388' + soybean and 'SPH 468' + soybean intercropping systems. Our results contradict those of Lomte and Dabhale (1990), who reported that sorghum–pigeonpea intercropping was more stable and profitable than sorghum–greengram and sorghum– sunflower intercropping systems. 'SPV 669' + soybean intercropping gave 3.2% more net monetary returns than sole crop of 'SPV 669'. 'SPH 468' + pigeonpea, 'SPH 468' + greengram and 'SPH 468' + soybean recorded 0.53, 6.2 and 8.8% increase in net monetary return than sole crop of 'SPH 468'. 'SPH 388' + greengram and 'SPH 388' + soybean gave 7.3 and 2.2% more net monetary return over sole crop of 'SPH 388'. Jain and Jain (1986) also reported the highest net profits from mixed biomass system from sorghum + blackgram, followed by sorghum + pigeonpea as compared to single crop of sorghum.

Thus intercropping of newly evolved sorghum genotypes ('SPV 669' and 'SPH 468') with soybean and intercropping of 'SPH 388' with greengram in 3 : 3 row proportion were found the best compatible intercropping for getting higher net monetary return.

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