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Effect of Intercrops on Growth and yield of *Rabi* Hybrid Sorghum in an Intercropping System*

Mixed cropping is an age–old practice of growing simultaneously two or more crops in the same piece of land. Mixed cropping is mainly practiced to cover the risk of failure of one of the component crops due to vagaries of weather or pest and disease incidences (Ayyangar and Ayyer, 1942). Best utilization of nutrients, moisture, space and solar energy can be derived through intercropping system. Investigations in different parts of the country revealed that sowing hybrid sorghum in paired rows gave as much yield as in uniform row system of planting (Tarhalkar and Rao, 1975). Growing of safflower, bengalgram with sorghum during *rabi* season under rainfed conditions is a common practice in Karnataka. Very little research information is available on the suitability of different intercrops in *rabi* hybrid sorghum under irrigated conditions. Hence, the present study was undertaken to study the effect of intercrops like safflower, bengalgram and redgram on the growth and yield of *rabi* hybrid sorghum.

An experiment was conducted on black soil at the Agricultural Research Station, Navalgund during *rabi* season to study the effect of intercrops and irrigation levels on yield and yield attributes of *rabi* hybrid sorghum in an intercropping system. The soil was alkaline in reaction (pH 8.5), low in total nitrogen (0.038 per cent), moderate in phosphorus (29.65 kg/ha) and rich in potassium (755.82 kg/ha), with a field capacity of 40 per cent, permanent wilting point of 19.97 per cent and bulk density of 1.32 g per cc. There were twelve treatment combinations comprising three levels of irrigation (150, 100 and 75 mm. CPE readings with 60 mm irrigation water) and four intercropping treatments (intercropping of redgram (M_1), safflower (M_2) and bengalgram (M3) compared with sole sorghum (M_0)). The experiment was laid out in a factorial randomised block design with three replications with a gross and net plot size of 6.0 m x 5.4 m x 3.6 m respectively.

Seeds of CSH–8R were dibbled at a distance of 10 cm within the paired (30 cm within sorghum row pair and 60 cm between two such row pairs rows.) The seeds of intercrops treated with captan were dibbled in the space between two pairs of sorghum rows spaced 10 cm for bengalgram and 30 cm for redgram and safflower. A fertilizer dose of 50:60:40 kg NPK/ha to sorghum, 30:30:20 kg NPK/ha to safflower and 20:30:20 kg NPK/ha to redgram and bengalgram was band placed five centimeter deep and five centimeter away from the seed rows. Nitrogen at 50 kg per ha was side dressed to sorghum on 30th day after sowing. All possible care was taken to keep the plants free of disease and pests. Irrigations were given at 150, 100 and 75 mm CPE readings with 60 mm irrigation water each time after two common irrigations before sowing.

Significant differences in grain and straw yield of sorghum due to intercropping were observed (Table 1). Intercropping of sorghum with safflower produced the highest grain and straw yield of sorghum which was on par with that of intercropping with bengalgram. Both of them were significantly superior to intercropping with redgram. Sole sorghum (paired row) recorded significantly the lowest grain and straw yield. The differences in grain yield of sorghum may be due to intercropping which can be related to similar differences in yield attributing characters obtained in these treatments (Table 2).

Table 1. Grain and straw yield of sorghum and grain yield of intercrops as influenced by intercropping and irrigation levels

Intercrops	Grain yield (q/ha) of sorghum				Straw yield (q/ha) of sorghum				Grain yield of intercrops			
	Irrigation levels											
	I_1	I_2	I_3	Mean	I_1	I_2	I_3	Mean	I_1	I_2	I_3	Mean
M_0	54.65	58.11	60.55	57.77	63.58	64.05	67.77	63.13	1.20	1.10	0.90	1.06
M_1	60.31	67.72	70.07	66.03	68.00	78.88	84.39	77.09	4.01	4.96	4.53	4.50
M_2	63.85	70.44	77.77	68.68	67.35	83.66	82.27	77.76	2.90	3.29	2.61	2.93
M_3	61.81	68.16	70.90	66.96	68.03	79.79	80.63	76.15	2.90	3.29	2.61	2.93
Mean	60.15	66.11	68.32	64.86	66.74	66.70	78.76	74.03	2.70	3.12	2.68	2.83
Intercrops (M)												
S.Em ±				0.78				1.64				0.10
CD (at 5%)				2.24				4.73				0.32
Irrigation levels (I)												
S.Em ±				0.67				1.42				0.10
CD (at 5%)				1.94				4.10				NS
Interaction (I x M)												
S.Em±				1.34				2.84				0.17
CD (at 5%)				NS				NS				NS

Table 2. Grain weight per ear (g), 1000 grain weight (g) and grain number per ear of sorghum as influenced by intercropping and irrigation levels

Intercrops	Grain weight (g)				1000 grain weight (g)				Grain number			
	Irrigation levels											
	I_1	I_2	I_3	Mean	I_1	I_2	I_3	Mean	I_1	I_2	I_3	Mean
M_0	34.47	38.14	40.18	35.60	36.88	36.97	38.07	37.31	935	1031	1055	1007
M_1	39.83	42.97	45.75	42.85	37.22	37.97	38.27	37.82	1070	1131	1195	1132
M_2	42.23	45.00	47.80	45.34	36.93	38.60	38.65	38.06	1143	1191	1287	1190
M_3	38.75	43.99	46.74	43.16	36.63	36.47	37.87	36.99	1058	1206	1235	1166
Mean	38.82	42.77	45.12	42.23	36.91	37.50	38.21	37.54	1051	1140	1180	1124
Intercrops (M)												
S.Em ±				0.36				0.22				10.75
CD (at 5%)				1.04				0.65				30.94
Irrigation levels (I)												
S.Em ±				0.31				0.19				9.30
CD (at 5%)				0.90				0.56				26.95
Interaction (I x M)												
S.Em±				0.62				0.39				18.61
CD (at 5%)				NS				NS				NS

The increased grain yield of intercropped sorghum may be attributed due to increased grain weight per ear as a result of increased 1000 grain weight and grain number per ear as compared to sole sorghum. Further, unutilised nutrients from the fertilizer applied seperately for the intercrops might have been utilized by sorghum resulting in higher yield attributing characters and ultimately the increase in grain yield. The differences in the straw yield may be related to the differences in the total dry matter and plant height at the time of harvest. It was observed that intercropped sorghum accumulated more dry matter that entire sorghum.

Redgram, safflower and bengalgram produced 1.06, 4.50 and 2.93 q/ha of seed when grown in association with sorghum. The reduced yield of intercrops can be mainly attributed to the unfavourable effect of shading by hybrid sorghum which resulted in low growth and low grain weight per plant at harvest. Only safflower tended to grow in height with few branches at the top portion produced substantial seed yield (4.50 q/ha).

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Dept. of Agronomy, College of Agriculture, Dharwad –580 005

PUJARI, B. T.
PATIL, V. S.
RADDER, G. D.

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Performance of Soybean Genotypes with Different Plant Densities Under Rainfed Black Soils

Soybean is now gaining popularity among farmers in northern Karnataka. It occupies about 16,000 hectare area in Karnataka (Anon., 1989). Maintaining suitable plant population at proper spacing is one of the important agronomic practices to achieve higher yields. Plant densities found to have varying effect on yield of crop depending on soil fertility, agroclimatic conditions and genotypes. This investigation was undertaken with an objective to know the performance of soybean genotypes at different population densities under rainfed conditions.

The experiment was conducted on medium black soil during *kharif* 1991–92 at Regional Research Station, Raichur. There were 24 treatment combinations consisting of six genotypes (Monetta, PK–471, PK–472, UGM–34, MACS–58 and MACS–124) and four plant populations, 2.22 (45 x 10 cm), 2.96 (45 x 7.5 cm), 3,33 (30 x 10 cm) and 4.44 (54 x 5 cm) lakh plants per ha. The