https://doi.org/10.29321/MAJ.10.A02532

Madras Agric. J. 71 (10) 656 – 658 October, 1984

SOIL FERTILITY AND CROP YIELD UNDER SORGHUM PULSES INTERCROPPING SYSTEM

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The influence of sorghum pulses intercropping system on the soil fertility status was investigated at the Cotton and Millet Experiment Station, Kovilpatti duriug *Rabi* 1982-83 under rainfed conditions. The results revealed that the soil fertility in terms of available N was significantly improved in the sole crop of pulses and intercrop of pulses with sorghum, as compated to sole crop of sorghum. The yield as well as the N uptake by sorghum grains were maximum under sorghum block gram inter cropping system.

Intercropping is an age old practice in India especially under rainfed agriculture. Improvement in soil fertility and reduction in the risk of crop failure are the major objectives of intercropping. Legumes invariably find a place in any inter cropping system. The beneficial effects of legumes are usually attributed to the enrichment of soil fertility, (Subba Rao, 1974 Wetselaar *et al.*, 1973). With a view to study the influence of various legumes as intercrop with sorghum on the fertility status of black soil under dryland agriculture, a field experiment was conducted at the Cotton and Millets Experiment Station Kovilpatti during *rabi* 1982-83.

MATERIALS AND METHODS

The following were the treatments :-

1) Sorghum [CSH 6] - sole crop
2) Sorghum and black gram [Co.3] intercrop [2:1 ratio]
3) Sorghum and green gram [Co.4] intercrop [2:1 ratio]
4) Sorghum and cowpea [Co.3] Intercrop [2:1 ratio]
5) Sorghum and redgram [C.11] Intercrop [2:1 ratio]
6) Black gram - sole crop
7) Green gram - sole crop
8) Cowpea - sole crop
9) Redgram - sole crop

Each treatment was replicated thrice adopting randomised black design Sorghum was grown in paired rows of 30/60 cm with a spacing of 15 cm between plants in the row. Sole crops of blackgram, green gram and cowpea were given spacing of 30X10 cm while redgram was raised in rows of 60 cm apart with a spacing of 30 cm between plants in the row. N and P were applied at 40 and 20 kg/ha for sorghum rows in the sole crop as well as in intercrop. Sole crop of pulses were applied with 20 and 40 kg/ha of N and P. The experimental soil was deep vertisol with low available N [215 kg/ha] and

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P [10kg/ha] and high available K status [530 kg/ha]. The pH of the soil was neutral [8.0] and was free from alkalinity hazards. During the cropping period a total quantity of 272.5 mm of rainfall was received in 18 rainydays. At harvest, treatmentwise grain yield of the base and intercrops were recorded. The post - harvest soil samples were analysed for their available NPK contents as per conventional methods. Treatment - wise grain samples were analysed for their total N content.

RESULTS AND DISCUSSION

The grain yields of sorghum and pluse crops, available NPK status of the soil and N uptake by sorghum grain are furnished in the table. Redgram was a total failure due to severe prolonged drought from the flowering phase of the crop. Sorghum grain yield was maximum under sorghum and black gram combination. There was not much variation in the available P and K status of post - harvest soils. The available N content recorded was maximum under sorghum blackgram intercropping system. The available N content was significantly improved in all the treatments involving pulse crops as compared to sole crop of sorghum. The total N content of sorghum grain was maximum in sorghum redgram intercropping system. All the intercrop treatments enhanced the N content of sorghum grain as compared to sole crop of sorghum. A similar trend was observed in the case of N uptake by sorghum grains also wherein the maximum N uptake was under sorghum and blackgram combination.

Effect of pulses as intercrops on the yield, N content of sorghum grain and soil fertility

Treatment	Sorghum grain yield kg/ha	Intercrop grain yield kg/ha	Available NPK kg/ha N	P	K	N content of sorghum grain (%)	N uptake by sorghum grain kg/ha
Sorghum - Sole crop	2132	—	86	10.2	558	1.67	35.6
Sorghum & Blackgram	2268	254	122	9.6	542	1.86	42.2
Sorghum & Greengram	2074	353	105	10.5	538	1.86	38.6
Sorghum & Cowpea	2004	256	113	9.6	542	1.80	36.1
Sorghum & Redgram	2000	—	100	9.3	546	2.04	40.8
Blackgram - Sole crop	—	896	107	10.3	546	—	
Greengram - Sole crop	—	1234	115	10.2	546	—	—
Cowpea - Sole crop	—	1305	113	10.3	560	—	—
Redgram - Solecrop	—	—	109	10.3	556	—	—
CD	N S	412	8.0	N S	N S	0.06	N S

Beneficial effects of pulses as intercrops in increasing the grain yield of base crop of sorghum had been reported by several workers (Singh, 1982; Balasubramanian *et al,* 1982; Bhalerao and Upadhyay 1981). Such beneficial effects were attributed, besides the enhanced nitrogen supply, to the improvement in the soil physical sratus, more particularly the soil structure [Biswas, 1982] and etficient soil moisture conservation [Bhatia *et al,* 1980]. Soil moisture availability is an important factor for the crop performance under dryland agriculture and the legume intercrops by rheir leaf canopy conserve more moisture for the utilisation of base crop, thereby resulting in increased yield. Kunasekaran *et al,* [1980] also reported a higher net profit in sorghum - blackgram intercropping system and the results of the present investigation are in line with these findings.

Since, pulse crops fix up atmospheric nitrogen in their root nodules evidently there was an increase in the available N status of soils in all the treatments involving pulse crops. Among the legumes blackgram and cowpea are reported to excrete higher amounts of N into the soil [Subba Rao, 1974] and the higher available N content of soils under sorghum and blackgram followed by sorghum and cowpea intercropping system in the present study is in conformity with this finding. Since there was enhanced supply of N to the soil the N uptake by sorghum grain was more under sorghum and black gram treatment.

The highest N content of sorghum grains under the treatment sorghum and redgram might be attributed to the transfer of N from intercrop redgram to sorghum there by enabling the sorghum crop to take up more N since redgram failed to set seed due to severe moisture stress. Enhanced supply of N at the later stages of sorghum crop might have resulted in increased accumilation of N in grains though the same could not reflect in the grain yield.

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