Journal of Tropical Agriculture 41 (2003): 47-49

EFFECT OF BIOFERTILIZERS VS PERFECTED CHEMICAL FERTILIZATION FOR SESAME GROWN IN SUMMER RICE FALLOW

In Kerala, summer rice fallow is a potential area for cultivation of short duration pulses and oil seeds, even though the crop may face soil moisture stress during the early growth stage. In intensive cropping systems, supplementing soil nutrients by the use of chemical fertilizer is considered inevitable for obtaining optimum yield of crops. But it has been observed that continuous use of chemical fertilizers may affect soil health and may lead to a negative impact on soil productivity. Hence, for sustainable agriculture, all our efforts should be streamlined to protect and maintain soil health. In this context, now-a-days biofertilizers are gaining importance in agriculture.

Sesame, an important oil seeds crop of Kerala, is suitable for cultivation in summer rice fallow. Results of experiments conducted in Tamil Nadu indicated that for sesame, biofertilizers could be used as supplements to chemical fertilizers (Arunachalam and Venkatesan, 1984; Subbian and Chamy, 1984). Hence the present study was undertaken to find out the possibility of using biofertilizers either alone or as supplements to chemical fertilizers for sesame grown in summer rice fallow. The field experiment was conducted in the rice fallow of the Agricultural Research Station, Mannuthy during the summer season (January-April) of 1995. The experiment was laid out in randomized block design with 14 treatments replicated thrice. The treatments included were, the recommended dose of inorganic N at the rate of 30 kg ha^{-1} alone, inoculation of *Azospirillum* or *Azotobacter* along with 50 per cent, 25 per cent or no inorganic N, either with or without lime and an absolute control.

Soil of the experiment site was sandy loam with a pH of 5.7, containing available N 218.4 kg ha^{-1}, available P 86.7 kg ha^{-1}, available K 210 kg ha^{-1}, *Azospirillum* 0.34 x 10^5 cells per g of soil and *Azotobacter* 3.2 x 10^5 cells per g of soil. The total rainfall received during the crop period was 122 mm.

The test variety was Thilak, the seeds of which were sown broadcast at the rate of 5 kg ha^{-1}. Light irrigation was given two days after sowing so as to ensure uniform germination. Acid tolerant strains of *Azospirillum* and *Azotobacter* were used for seed inoculation at the rate of 600 g ha^{-1}. Lime was applied at the rate of 600 kg ha^{-1} at the time of land preparation.

The data presented in Table 1 showed that the plots that received the recommended dose of 30 kg inorganic N ha^{-1} alone produced taller plants with more number of branches per plant and thereby higher dry matter. This is due to the ready availability of N during the initial growth stage.

The better vegetative growth of plants in plots applied with 30 kg inorganic N ha^{-1} alone resulted in a larger photosynthetic area and thereby more photosynthates. Further, the efficient translocation of these photosynthates to the reproductive parts resulted in the production of higher number of capsules per plant, more number of seeds per capsule and higher weight of capsule per plant which contributed to highest seed yield (Table 1).

The population of both *Azospirillum* and *Azotobacter* was comparatively high in all plots irrespective of the treatments (Table 2). Initial soil analysis also showed the presence of these microbes. This revealed the natural occurrence and further multiplication of both these microbes in the summer rice fallow of Kerala.

The data presented in Table 1 and 2 also showed that liming could not bring about any influence on the population and activity of either *Azospirillum* or *Azotobacter*. This revealed that both inoculated and already present strains of these microbes could tolerate soil acidity.

The natural occurrence of both *Azospirillum* and *Azotobacter*, initial medium fertility status of the soil, incorporation of rice stubbles and FYM along with application of the recommended dose of 30 kg inorganic N ha^{-1} contributed to a substantial increase in seed yield of sesame in summer rice fallow and thereby resulted in highest total returns (Table 3).

Table 1. Effect of biofertilizers and chemical fertilizers on the growth and yield of Sesame

Treatments	Plant height at 60 DAS, cm	Branches / plant, No.	Dry matter production, kg ha^{-1}	Capsules / plant, No.	Seeds / capsule, No.	Capsule wt./ plant, g	Seed yield, kg ha^{-1}
30 kg N/ha as urea	73.7	8.0	6201	76.8	59.0	16.3	729.5
Azospirillum + 50% N + lime	70.0	7.4	6005	75.8	58.7	15.2	712.4
Azospirillum + 50% N	70.1	7.4	6085	75.0	57.0	15.0	708.5
Azospirillum + 25% N + lime	68.7	7.2	5770	72.9	53.0	14.0	686.6
Azospirillum + 25% N	71.0	7.3	5880	74.3	55.2	15.4	684.3
Azospirillum + lime	70.0	7.4	6040	76.6	52.8	15.0	676.8
Azospirillum	70.3	7.6	5815	76.5	50.7	14.6	676.1
Azotobacter + 50% N + lime	74.0	7.4	5925	74.1	58.0	16.5	700.0
Azotobacter + 50% N	69.0	7.6	5960	73.9	53.6	15.4	698.2
Azotobacter + 25% N + lime	69.0	7.6	5990	75.6	54.9	13.9	683.5
Azotobacter + 25% N	69.9	7.5	6105	74.9	50.4	15.8	683.8
Azotobacter + lime	71.0	7.5	6003	72.7	54.5	15.7	673.9
Azotobacter	72.9	7.5	5750	66.0	50.7	14.0	668.9
Absolute control	68.2	7.4	5900	69.0	54.0	15.0	660.9
CD (0.05)	3.1	NS	357	2.9	4.2	1.3	16.0

Table 2. Effect of biofertilizers and chemical fertilizers on the population of *Azospirillum* and *Azotobacter* at 60 DAS (x 10^6 cells / g of soil)

Treatments	*Azospirillum*		*Azotobacter*	
	T	O	T	O
30 kg N/ha as urea	6.24	1.74	6.95	8.89
Azospirillum + 50% N + lime	6.46	2.86	6.95	8.89
Azospirillum + 50% N	6.41	2.25	6.95	8.84
Azospirillum + 25% N + lime	6.40	2.54	6.93	8.42
Azospirillum + 25% N	6.44	2.78	6.92	8.37
Azospirillum + lime	6.35	2.25	6.92	8.30
Azospirillum	6.36	2.28	6.91	8.19
Azotobacter + 50% N + lime	6.18	1.52	7.09	12.35
Azotobacter + 50% N	6.15	1.42	7.07	11.79
Azotobacter + 25% N + lime	6.24	1.72	7.05	11.44
Azotobacter + 25% N	6.27	1.85	7.03	10.73
Azotobacter + lime	6.26	1.84	7.00	10.22
Azotobacter	6.27	1.86	7.01	10.01
Absolute control	6.26	1.77	6.92	8.28
CD (0.05)	0.05		0.02	

T= Transformed value O = Original value

Table 3. Economics

Treatments	Cost of cultivation excluding the treatment, Rs	Cost involved in the treatment, Rs	Total cost of cultivation (Rs ’000)	Total returns (Rs ‘000)	Profit, Rs	Benefit cost ratio
30 kg N/ha as urea	7110	230.0	7.34	11.67	4332	1.59
Azospirillum + 50% N + lime	7110	1627.0	8.74	11.39	2661	1.30
Azospirillum + 50% N	7110	127.0	7.24	11.34	4099	1.56
Azospirillum + 25% N + lime	7110	1569.0	8.68	10.10	2304	1.26
Azospirillum + 25% N	7110	69.5	7.18	10.88	3769	1.52
Azospirillum + lime	7110	1512.0	8.62	10.82	2261	1.26
Azospirillum	7110	12.0	7.12	11.20	3695	1.51
Azotobacter + 50% N + lime	7110	1627.0	8.74	11.17	2463	1.28
Azotobacter + 50% N	7110	127.0	7.24	10.94	3934	1.54
Azotobacter + 25 N + lime	7110	1569.5	8.68	10.94	2256	1.25
Azotobacter + 25 N	7110	69.5	7.18	10.78	3761	1.52
Azotobacter + lime	7110	1512.0	8.62	10.70	2160	1.25
Azotobacter	7110	12.0	7.12	10.70	3580	1.50
Absolute control	7110	0.0	7.11	10.58	3464	1.48

Thus the results indicate that exclusive inoculation of biofertilizers or inoculation supplemented by partial chemical fertilization cannot fully match 30 kg inorganic N ha^{-1} alone in influencing the productivity of sesame grown in summer rice fallow of Kerala.

College of Horticulture
Vellanikkara 680 656, Trichur, Kerala

Indu K. Paul
K. E. Savithri

REFERENCES

Arunachalam, L. and Venkatesan, G. 1984. Effect of biofertilizer application on the yield of sesame. M*adras agric. J.* 71 : 259-260

Subbian, P. and Chamy, A. 1984. Effect of *Azotobacter* and *Azospirillum* on the growth and yield of sesamum (*Sesamum indicum*). *Madras agric. J.* 71: 615-617