Madras Agric. J., 80(5): 255-258 May, 1993 https://doi.org/10.29321/MAJ.10.A01662

INTEGRATED NUTRIENT MANAGEMENT FOR RAINFED SORGHUM IN RED SOILS OF NORTH WESTERN ZONE OF TAMIL NADU

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ABSTRACT

Field experiments conducted during 1986-88 at Regional Research Station, Paiyur, revealed that application of 30 Kg N and 20 Kg P_2O_5/ha in the form of enriched farm yard manure along with Azopirillum inoculation registered the highest yield increase over the traditional practice of application of farm yard manure alone, in rainfed laxpanicle sorghum grown in rad soils. Application of fertilizers in the form of enriched Fym produced greater response to applied nutrients than when applied as straight fertilizers.

Sorghum is grown in about 1.6 lakh hectares in the North western zone of Tamil Nadu comprising Salem and Dharmapuri Districts. Nearly 90% of the crop is raised under rainfed conditions in red soils. A long duration (150 days) lax panicle type of sorghum is the ruling variety and it gives a high tonnage of straw but low grain yield. Poor fertility status of the soils is one of the major constraints for higher productivity. Yet, farmers in most instances apply farm yard manure only and fertilizers use is seldom practised, due to the cost of the input and an unwarranted fear of scorching of plants by chemicals. But, increased yield in rainfed sorghum by fertilizer application is a well documented fact. (Rao and Das, 1982). With a view to identify a nutrient management technique that is economical as well as efficient, trials were conducted at Regional Research Station, Paiyur to develop an integrated nutrient supply system through the combined use of fertilizers, organic manures, biofertilizers and legume intercropping.

MATERIALS AND METHODS

Field experiments were conducted during July - December 1986-87 and 1987-88 at Regional Research Station, Paiyur. The soil of the experimental field was red noncalcareous sandy loam with low available N and P and medium available K content. Sorghum variety, Co.19, a lax panicle type of 150 days duration was raised. The experiment was laid out in split plot design, replicated thrice. Intercropping with lablab varieties of different durations constituted the main plot treatments and nutrient management practices were taken in sub plots. Sorghum was sown with a spacing of 45 X 15 cm and one row of lab-lab was raised for every four rows of sorghum. The nutrient management practices evaluated were the application of Fym, Fym + Azospirillum, N and P as straight fertilizers with Fym and as enriched Fym with and without azospirillum.

Enriched Fym was prepared by thoroughly mixing 125 Kg superphosphate with 750 Kg of well decomposed powdered Fym, heaping the mixture under shade and covering it with cowdung plaster. The heap was opened 30 days later and required quantity of urea was mixed with the contents of the heap, applied in plough furrows and covered before sowing. Nitrogen as urea was applied 50% at sowing and 50% at 30 DAS. Azospirillum inoculation was done through seed and soil. For seed inoculation, 400 g of peat based Azospirillum culture was mixed with 500 ml. of cool rice gruel and the slurry was thoroughly coated on 10 Kg. of sorghum seeds required per hectare. The treated seeds were shade dried for 30 minutes and used for sowing. For soil application, 2 Kg of azospirillium culture per hectare was mixed

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Table 1. Effect of nutrient management on growth and yield of rainfed sorghum - 1986-87

Nutrient management	Plant height at harvest (cm)	Grain yield (kg/ha)	Straw yield (t/ha)
1. Fym at 12.5 t/ha	210.5	434	5.4
2. Azospirillum	203.1	396	5.4
3. Fym + Azospirillum	214.3	454	5.8
4. 30 kg N/ha + Azospirillum	212.1	429	5.8
5. 40 kg N/ha	218.9	475	5.7
6. 40 kg N/ha + Azospirillum	218.9	477	5.7
7. 40 kg N + 20 kg P_2O_5/ha as enriched Fym + Azospirillum	218.4	476	5.8
8. 40 kg N + 20 kg P_2O_5/ha as enriched Fym + Azospirillum	224.3	484	5.8
9. 40 kg N + 20 kg P_2O_5/ha as straight fertilizer + Fym at 12.5 t/ha	237.4	571	6.2
SED	10.0	52	0.27
CD	N.S.	N.S.	0.55

with 50 kg of powdered Fym and broadcast uniformly at sowing.

RESULTS AND DISCUSSION:

During 1986-87, the increase in grain yield due to fertilizer use was not significant as a result of the long dry spell after flowering (Table 1). In 1987-88, distinct influence of nutrient management practices on sorghum growth and yield was registered. Application of N and P as straight fertilizers with Fym or as enriched Fym produced taller plants than with Fym alone (Table 2). This effect was reflected in additional straw yield of 2.4 to 3.2 t/ha with fertilizer application (Table 2). The improvement in yield attributes like earhead length and grain weight per earhead due to fertilizer use was also quite discernible.

Grain yield registered a significant increase by 150 to 319 Kg/ha due to fertilizer use over Fym application (Table 2). However an increase in N level from 30 to 40 Kg/ha did not cause any corresponding increase in yield. At the same level of N applied, the grain were applied as enriched Fym than when applied as straight fertilizers with Fym (Table 3). With 30 Kg N and 20 Kg P_2O_5/ha applied as enriched Fym with azospirillum inoculation, the grain yield increase over Fym application was 92%. Incubation of chemical fertilizers with well decomposed Fym during preparation of enriched Fym might have led to the sustained availability of applied nutrients to the crop. Increased mobility of phosphorus applied as super digested compost over mere combination of super phosphate and compost has been observed through tracer studies (Subbiah and Surendra Mohan, 1964)

Azospirillum is reported to produce certain growth promoting substances similar to cytokinin and gibberellin resulting in increased root elongation and root surface area. (Okon, 1985, Okon and Kapulnik, 1986). A well developed root system coupled with increased availability of nutrients would have promoted greater uptake of nutrients from applied fertilizers and resulted in higher grain yield. Higher grain sorghum yield by 7 - 18% due to azospirillum inoculation has been reported earlier (Rana, 1985).

Table 2. Effect of nutrient management on growth and yield of rainfed sorghum - 1987-88

	Nutrient management	Plant height (cm)	Ear length (cm)	Grain weight (g) per ear head	Grain yield (kg/ha)	Straw yield (t/ha)
1.	Fym at 12.5 t/ha	351	26.0	12.0	346	8.6
2.	Fym + Azospirillum	360	25.9	12.3	364	9.5
3.	30 kg N + 20 kg P_2O_5/ha as straight fertilizers + Fym	359	26.4	12.7	496	11.0
4.	30 kg N + 20 kg P_2O_5/ha as enriched Fym	380	26.4	14.2	564	11.5
5.	30 kg N + 20 kg P_2O_5/ha as enriched Fym + Azospirillum	389	27.1	14.6	665	11.8
6.	40 kg N + 20 kg P_2O_5/ha as straight fertilizers + Fym	374	26.4	14.3	566	11.2
7.	40 kg N + 20 kg P_2O_5/ha as enriched Fym	385	26.8	14.5	605	11.8
8.	40 kg N + 20 kg P_2O_5/ha as enriched Fym + Azospirillum	383	27.2	15.1	587	11.8
	SE_D	14.1	0.46	1.6	88	0.6
	CD	28.2	N.S.	N.S.	181	1.2

Table 3. Additional grain yield and economics due to fertilizer use over Fym

	Nutrient management	% to Fym	Additional grain per kg of fertilizer Nitrogen applied (Kg/Kg N)	Additional yield per kg of fertilizer P_2O_5 applied (Kg/Kg P_2O_5)	Cost benefit ratio
1.	Fym at 12.5 t/ha	100	-	-	1.03
2.	Fym + Azospirillum	105	-	-	1.08
3.	30 kg N + 20 kg P_2O_5/ha as straight fertilizers + Fym	143	5.0	7.5	1.15
4.	30 kg N + 20 kg P_2O_5/ha as enriched Fym	163	7.3	10.9	1.63
5.	30 kg N + 20 kg P_2O_5/ha as enriched Fym + Azospirillum	192	10.6	16.0	1.79
6.	40 kg N + 20 kg P_2O_5/ha as straight fertilizers + Fym	163	5.5	11.0	1.21
7.	40 kg N + 20 kg P_2O_5/ha as enriched Fym	175	6.5	13.0	1.64
8.	40 kg N + 20 kg P_2O_5/ha as enriched Fym + Azospirillum	169	6.0	12.0	1.58

Considering the constraints in the availability of adequate quantities of Fym and the cost involved in its transport and application, the use of enriched Fym as a carrier for fertilizers in rainfed crops is cost effective also. The cost benefit ratio of

application of 30 Kg N and 20 Kg P_2O_5/ha as enriched Fym with azospirillum inoculation was 1.79 as against 1.15 for the same level of nutrients applied as straight fertilizers with Fym and 1.03 for the application of Fym alone. (Table 3)

The results have clearly indicated that there is a definite yield increase through fertilizer use in rainfed lax panicle sorghum grown in red soils. This yield advantage can be further enlarged by adoption of an integrated nutrient management technology wherein the fertilizer is applied in the form of enriched Fym along with azospirillum inoculation.

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Madras Agric. J., 80(5): 258-261 May, 1993

NURSERY MANURING ON GROWTH AND NPK UPTAKE OF RICE SEEDLINGS

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ABSTRACT

Field experiments conducted at Rice Research Station, Ambasamudram during Kar and Pishanam seasons of 1984-85 with TKM 9 and IR 20 rice varieties respectively revealed that application of DAP at 2 Kg per cent to the nursery resulted in increased seedling height, number of leaves per seedling, shoot dry weight, root length and uptake of NPK.

Rice is the major staple cereal crop in India. Lower average yield in India and Tamil Nadu can be attributed to poor soil fertility, improper water and nutrient management, pest and disease problems and unfavourable weather condition. Intensive research has also been diverted to solve the problems related to soil fertility, drainage, nutrient and pest management through coordinated net works of research all over the country. So far research attention was given to rice in the main filed managment and the nursery managment did not receive adequate attention. Proper managment in nursery will reflect on the behaviour of the crop in the main field. Management of rice in nursery is comparatively less expensive than in the main field. A field experiment was condurced at Rice Research Station, Ambasamudram during Kar (June - September) and Pishanam (Oct. - March) seasons of 1984-85 with the objective to study the effect of nursery manuring on the influence of growth of rice and its uptake of NPK and their interaction.

MATERIALS AND METHODS

Rice veriety TKM 9 was the test crop during Kar season, while IR 20 was the test

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