

Studies on the effect of the "Complex Fertiliser" of the Neyveli Lignite Corporation on Paddy Yield and on some Soil Properties of Cauvery Alluvium

by

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Introduction: Nitrogen and Phosphorus are two of the most important nutrients for crop production. Many compound fertilisers containing these two nutrients in various proportions have been manufactured under different names by the Fertiliser Industry. Several compound fertilisers like ammonium phosphate, nitrophosphate and others under different proprietary names have been put in the market. Experiments conducted with ammonium phosphate (Anon., 1945—'48) at Aduthurai and Pattukkottai during the *Kuruvai*, *Thaladi* and *Samba* seasons have shown that there was no significant difference between ammonium phosphate and ammonium sulphate-*cum*-super application on paddy yields. At the Paddy Breeding Station, Coimbatore (Anon., 1964) another compound fertiliser called "Engrais" Fertiliser (containing 8.3 per cent N and 14 per cent P_2O_5) was compared against ammonium sulphate-*cum*-super application and it was found to be inferior to the ammonium sulphate-*cum*-super combination on equal N and P_2O_5 basis for paddy. However, according to Zemite (1963), the compound fertilisers produce about the same yields as combinations of single fertilisers supplying equivalent amounts of nutrients. Recently, the Neyveli Lignite Corporation has developed a "Complex Fertiliser". The effect of this "Neyveli Complex Fertiliser" on paddy yield and also on the soil (Cauvery alluvium) was studied at the Regional Research Station, Aduthurai for three years from 1962—'63 to 1964—'65 and the results are presented.

Material and Methods: The "Neyveli Complex Fertiliser" was dirty brown in colour and contained 19.7 per cent total nitrogen (8.5 per cent nitrate N and 11.2 per cent amide N) and 9.35 per cent total P_2O_5 (8.8 per cent water soluble P_2O_5) along with 12.3 per cent moisture. It was highly acidic in nature, the pH being 2.3 to 2.5. The field experiment was laid out in a randomised block design, with six treatments, replicated four times during *Thaladi* season on Co 25 paddy strain. The six treatments were:

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1. Green leaf alone at 5000 lb/acre (as *Gliricidia maculata*)
2. Treatment (1) + 30 lb N. — half as 'Complex Fertiliser' as basal and half as urea top dressed at 45 days after planting.
3. Treatment (1) + 45 lb N. — half as 'Complex Fertiliser' as basal and half as Urea at 45 days after planting.
4. Treatment (1) + 7.12 lb P_2O_5 basal as super (as contained in the 'Complex Fertiliser' used in Treatment (2) + 30 lb N. half as ammonium sulphate as basal and half as urea top dressed at 45 days after planting.
5. Treatment (1) + 10.68 lb P_2O_5 basal as super (as contained in 'Complex Fertiliser' used in Treatment (3) + 45 lb N. half as ammonium sulphate basal and half as urea top dressed at 45 days after planting.
6. Treatment (1) + 25 lb P_2O_5 as super as basal + 30 lb N as ammonium sulphate, half as basal and half as top dressing at 45 days after planting.

The yield data of grain and straw recorded for three years (1962—1965) were subjected to combined statistical analysis. The economics of treatments were also worked out.

Composite surface soil samples (0–6") were drawn before the commencement of experiment and also after harvest the crop were analysed for organic carbon by rapid colorimetric method (Datta *et al* 1962) and for available P_2O_5 (Olsen *et al.*, 1954). The estimations of pH and electrical conductivity were also carried out.

Results and Discussion: Results of combined statistical analysis of yield data are presented in Table 1. The treatment differences were significant for all the three years except for straw yield in 1964—'65. The results for combined analysis were also significant for both grain and straw yields. Regarding grain yields, two out of three seasons' experiments, as well as the combined analysis, showed no significant difference between the 'Complex Fertiliser' and the ammonium sulphate *cum* super treatment at 15 and 22.5 lb N per acre. In the case of straw yield, ammonium sulphate *cum* super treatment was significantly superior to 'Complex Fertiliser' at 22.5 lb N level in the first year; while in the second year the differences between treatments were not significant and in the next year the results were not significant. But in combined analysis, and also for lower level of nitrogen, *viz.* 15 lb N in each season, the treatment differences for the

'Complex Fertiliser' and ammonium sulphate were not significant. However, maximum yields for both grain and straw were recorded for the Complex Fertiliser at 22.5 lb N level. The control treatment (5000 lb green leaf alone per acre) recorded significantly lower grain yields than all the other treatments under study. In general, there was no significant difference between the 45 and 30 lb N levels, irrespective of the form of nitrogen applied.

TABLE 1. Effect of Neyveli Complex Fertiliser on paddy grain and straw yield.

Season — Thaladi		Variety — Co. 25 Paddy				Years: 1962—'63 to 1964—'65				
Treatment Nos. (Vide TEXT)	GRAIN Yield					STRAW Yield				
	1962-'63	1963-'64	1964-'65	Mean for 3 years		1962-'63	1963-'64	1964-'65	Mean straw yield for 3 years	
	(lb/acre)			as lb/ac.	as % on control	(lb/acre)			as lb/ac.	as % on control
1	3434	2930	3278	3225	100.0	6780	3364	4362	4851	100.0
2	4048	3153	4512	3870	119.9	7664	3859	5507	5696	117.4
3	4085	3483	4666	4090	126.8	8050	4145	7511	6083	125.4
4	3863	3318	3623	3610	111.9	7663	3472	4268	5322	109.7
5	3962	3313	4008	3797	117.9	8373	3945	5535	5960	122.8
6	3802	3357	3997	3729	115.6	7273	3898	5093	5425	111.9
"F" Test	Satis- fied	Satis- fied	Satis- fied	Satis- fied	Satis- fied	Satis- fied	Satis- fied	Not Satisfied	Satisfied	
S. E. Trts Means	102.6	114.0	170.0	122.5	3.8	93.6	161.9	...	271.0	5.6
C. D. at 5%	307.6	343.6	512.6	339.0	10.5	282.3	487.7	...	748.0	15.5
Conclusion :										
3, 2, 5, 4, 6, 1 3, 5, 6, 4, 2, 1 3, 2, 5, 6, 4, 1 3, 2, 5, 6, 4, 1 5, 3, 2, 4, 6, 1 3, 5, 6, 2, 4, 1... 3, 5, 2, 6, 4, 1										

The economics of different treatments are furnished in Table 2. The cost of the "Complex Fertiliser" (which was approximately Rs. 500/- per tonne ex-Factory) was slightly less than the cost of ammonium sulphate and superphosphate on equal N and P₂O₅ basis. The treatment with Complex Fertiliser at 22.5 lb N level as basal application followed by top dressing of urea at the same nitrogen level gave the maximum net profit of Rs. 145.70 per acre over the control. The next best treatment in this respect was also the 'Complex Fertiliser' treatment at 15 lb N per acre yielding a net profit of Rs. 110.10 per acre. The net profits for the ammonium sulphate cum super at 15 and 22.5 lb N levels were only Rs. 55.35

and Rs. 91.97 respectively. Increase in P_2O_5 application from 7.18 to 25 lb per acre with 30 lb N level (Treatment 6.) was not advantageous since the profit was only Rs. 66.40.

TABLE 2. *Economics of the application of Neyveli Complex fertilizer.*

(Mean of three years)

Treat. Nos.	(Mean extra yield over control in lb per acre.)		Value of extra yield.					Cost of Fertilisers.		Net profit over control.		
	Grain	Straw	Grain		Straw		Total		Rs.	P.	Rs.	P.
			Rs.	P.	Rs.	P.	Rs.	P.				
2.	945	845	117	20	19	20	136	40	26	30	110	10
3.	865	1232	157	20	28	00	185	20	39	50	145	70
4.	385	471	70	00	10	70	80	70	25	35	55	35
5.	576	1109	104	80	25	20	130	00	38	03	91	97
6.	504	574	91	60	13	05	104	65	38	25	66	40

Rates adopted:

Grain—Rs. 40/- quintal.

Straw—Rs. 5/- quintal.

Complex Fertiliser (C. F.) Re. 0.23 per lb.

Ammonium Sulphate (A/s) Re. 0.80 per lb. of N.

Urea Re. 0.62 per lb. of N.

Super phosphate Re. 0.67 per lb. of P_2O_5 .

The results of chemical analysis of the soil samples drawn before and after the experiment for all the three years are presented in Table 3. The Complex Fertiliser, in spite of its very low pH value, viz. 2.3, did not result in lowering the soil pH to any marked extent and was almost similar to ammonium sulphate in this effect. The application of Complex Fertiliser was observed to be somewhat better than ammonium sulphate, in increasing the organic carbon and available P_2O_5 contents of the soil. There was practically no effect on the salinity status of the soil due to application of the Complex Fertiliser, as well as due to other treatments.

Summary and Conclusion: An experiment was conducted during 1962—'63 to 1964—'65 at the Regional Research Station, Aduthurai to test the relative efficacy of the new compound fertiliser named 'Complex Fertiliser' from the Neyveli Lignite Corporation, Neyveli on paddy yield and on soil properties. The results indicated that (i) there was no significant difference between the two nitrogen sources, viz. 'Complex Fertiliser' and

TABLE 3.
Effect of Complex fertiliser from Neyveli Lignite Corporation on some properties of Cauvery Alluvium.

Trt. Nos. (vide Table 1 for details)	% of Organic carbon				Available P ₂ O ₅ in lb. per acre.				pH (By Beckman pH meter)				Electrical conductivity in millimhos per cm.											
	1962-'63	1963-'64	1964-'65	1962-'63	1963-'64	1964-'65	1962-'63	1963-'64	1964-'65	1962-'63	1963-'64	1964-'65	1962-'63	1963-'64	1964-'65									
	S1.	S2.	S1.	S2.	S1.	S2.	S1.	S2.	S1.	S2.	S1.	S2.	S1.	S2.	S1.	S2.								
1	0.64	0.60	0.46	0.45	0.58	0.53	5.0	3.2	10.4	11.6	9.5	9.0	7.4	7.1	7.2	7.2	6.9	7.0	<0.2	<0.2	<0.2	<0.2		
2	0.64	0.60	0.46	0.55	0.58	0.60	5.0	4.0	10.4	12.0	9.5	11.3	7.4	7.2	7.2	7.2	6.9	6.8	<0.2	0.2	<0.2	0.2	<0.2	<0.2
3	0.64	0.69	0.46	0.59	0.58	0.63	5.0	6.4	10.4	12.8	9.5	11.9	7.4	7.2	7.2	7.2	6.9	6.8	<0.2	0.2	<0.2	0.2	<0.2	<0.2
4	0.64	0.61	0.46	0.54	0.58	0.60	5.0	3.6	10.4	12.8	9.5	11.8	7.4	7.2	7.2	7.0	6.9	6.8	<0.2	<0.2	<0.2	0.2	<0.2	<0.2
5	0.64	0.61	0.46	0.53	0.58	0.60	5.0	5.2	10.4	12.4	9.5	11.7	7.4	7.2	7.2	7.0	6.9	6.7	<0.2	<0.2	<0.2	0.2	<0.2	<0.2
6	0.64	0.62	0.46	0.50	0.58	0.61	5.0	4.0	10.4	16.5	9.5	12.3	7.4	7.2	7.2	7.0	6.9	6.9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

N. B.: S1.—Initial soil sample.

S2.—Soil sample drawn after harvest.

ammonium sulphate-cum-super treatment on paddy yield. However, considering the economics of application, the 'Complex Fertiliser' was superior to ammonium sulphate-cum-super treatment, being cheaper. At both the levels of nitrogen tried, the Complex Fertiliser, on an average, gave Rs. 54/- more profit per acre over the ammonium sulphate-cum-super phosphate were almost similar in their effect on soil reaction while the former was slightly better in maintaining the fertility status of Cauvery Alluvial soils.

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