

Micronutrient Studies on Paddy in *Kayal* Lands at Vellayani

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It is generally believed that micronutrients are present in adequate quantities in Indian soils for optimum crop production. However, recent investigations do indicate that with the adoption of improved agronomic practices and large scale use of NPK fertilizers the demand for micronutrients will also increase (Stewart, 1947). It has also been established that for the efficient utilisation of major nutrients an adequate supply of micronutrients is essential (Wallace, 1957). Micronutrients, if deficient or present in excess of plant requirements, are known to affect crop growth adversely. The response to micronutrients varies under different soil conditions and the soil reaction is known to have a profound influence on the availability of these elements.

Systematic field experiments to study the response of paddy to micronutrients are of very recent origin and are few in number, especially under Kerala conditions. Some preliminary trials conducted at the Model Agronomic Centre, Karamana, Trivandrum, indicated beneficial effects for application of Mn on paddy (Anon., 1964). The object of the present study has been to determine the effect of micronutrients such as Bo, Cu, Mn, Mo and Zn, individually

and in combination, on paddy in the *Kayal* lands of Vellayani. The effect of spartin, a compound containing all the micronutrients, was also studied.

Review of Literature

Aiyer (1946) reported that applications of Mn, Fe, Cu, Bo and Zn were most essential for the rice plant. Karunakar (1952) opined that application of Cu, Mn and Zn to paddy crop was beneficial. The experiments conducted at the Central Rice Research Institute, Cuttack, showed that foliar application of Zn and Cu and soil application of Bo gave increased rice yields (Anon., 1955). Application of Mn, Fe, Cu, Bo and Zn distinctly improved the tillering and yield of rice at Coimbatore (Nagarajan and Shanmughasundaram, 1963). However, at Delhi and Pusa paddy crop did not show any significant response either to soil or foliar spray application of the micronutrients. (Datta and Bains, 1960). The combined application of all the micronutrients did not show any favourable influence on rice yield in the Punjab (Anon., 1961).

In the trials conducted at Karamana (Muliyar, 1965) it was observed that the application of the different micronutrients

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did not increase grain yield significantly. Pushpangadan (1965) found that micronutrients did not show significant effect on grain and stover yield of maize at Vellayani. Chandrasekharan (1965) reported that spartin had no effect on the growth, yield and quality of bhindi under Vellayani conditions. Alexander (1966) showed that micronutrients, when applied individually and in combination, did not increase the yield of cotton under Vellayani conditions. Jayachandran (1966), from his studies on Mo, Bo and Mn, found that Bo significantly increased the pod yield in groundnut. The effect of Mo was not significant, whereas the application of Mn resulted in a significant decrease in pod yield.

Materials and Methods

A field experiment consisting of nine treatments was laid out in randomised block design with four replications for two years during the *Punja* season, 1964 and 1965, in the *Kayal* lands at Agricultural College and Research Institute, Vellayani. The treatments consisted of the following :

1. Control — No manure.
2. N P K
3. N P K + Bo
4. N P K + Cu
5. N P K + Mn
6. N P K + Mo
7. N P K + Zn
8. N P K + Spartina
9. N P K + Bo + Cu + Mn+Mo+Zn

The soil of the area was clayey loam with the following chemical analysis:

Total N	—	0.019	per cent.
Total P ₂ O ₅	—	0.125	„
Total K ₂ O	—	0.058	„

Total CaO	—	0.031	per cent.
Total MgO		0.045	„
Total sesquioxides	—	21.350	„
Available P ₂ O ₅		0.0003	„
Available K ₂ O		0.0011	„
Exchangeable Ca		1.40	me/100 g
Exchangeable Mg	—	1.82	„
pH		4.2	

The variety selected for the investigation was Ptb 10 having a duration of 95 days in the *Punja* season at Vellayani. Germinated seeds were sown broadcast at the rate of 0.25 kg of seed per plot. The gross plot size was 6.40 m x 6.13 m (21' x 20') and the net size 6.13 m x 5.76 m (20' X 19').

The micronutrients were applied as basal dressing at the following rates as recommended by the Indian Council of Agricultural Research.

1. Manganese sulphate @ 56 kg/ha
 2. Zinc sulphate @ 28 „
 3. Copper sulphate @ 28 „
 4. Borax @ 11 „
 5. Sodium molybdate @ 1.25 „
- Spartina was applied at the rate of 370kg/ha.

NPK fertilizers were given at the rate of 30 : 40 : 30 kg/ha. The entire dose of P and K fertilizers and half the dose of N were applied as basal dressing. The other half of the N was given as top dressing one month after sowing.

Results and Discussion

The yield data of paddy grain and straw are presented in Tables I and II.

TABLE I
Yield of paddy (kg/ha)

Treatment	1964	1965
1. Control	1421.34	1296.77
2. N P K	1823.40	1959.30
3. N P K + Bo	1565.73	1724.28
4. N P K + Cu	1636.52	1650.42
5. N P K + Mn	1875.97	2143.34
6. N P K + Mo	1741.28	1979.11
7. N P K + Zn	1579.66	1780.92
8. N P K + Spartin	1611.03	1690.32
9. N P K + Bo+Cu+Mn+Mo+Zn	1401.16	1579.91
F. test	N. S.	N. S.
S. E.	99.09	503.98

TABLE II
Yield of straw (kg/ha)

Treatment	1964	1965
1. Control	4034.70	2514.23
2. N P K	5096.45	3292.88
3. N P K + Bo	5255.00	2902.15
4. N P K + Cu	5062.46	2972.94
5. N P K + Mn	6033.64	3646.78
6. N P K + Mo	5415.39	3451.44
7. N P K + Zn	5291.88	3273.05
8. N P K + Spartin	5118.33	2972.94
9. N P K + Bo+Cu+Mn+Mo+Zn	4638.26	2938.95
F. test	N. S.	N. S.
S. E.	605.91	503.83

The results given in Tables I and II show that both grain and straw yield are not significantly increased by any of the micronutrients or spartin in both the years. Similar results were reported on rice by previous workers such as Datta and Bains (1960), Anon (1961) and Muliyar (1965).

It is also seen from the Tables that the combined application of all the micronutrients gave a decrease in yield of grain and straw when compared to NPK treatment. This tendency to reduce the grain yield by the combined application of more than three micronutrients was also reported by Mariakulandai and Chami (1964). Muliyar (1965) also found that a combination of all the micronutrients gave a decrease in yield. In the case of Sea Island Cotton crop also a combination of micronutrients was not found to be beneficial (Alexander, 1966).

The absence of a significant response to micronutrient application, both individually and in combination, and to spartin as found in the present study, might be due to the presence of adequate quantities of these elements in the soil. This is in agreement with the view expressed by Raheja *et al* (1959) who are of the opinion that micronutrients are present in adequate quantities in Indian soils for optimum crop production.

The reaction of the soil in which the experiment was conducted also might have played a decisive role. The pH of the soil was 4.2. Most of the micro-nutrients may be present in available forms to meet the crop requirements at this pH. This is in accordance with the views of Novicki Antoni (1962) who holds that in soils which are slightly acidic or neutral in reaction, the content of micronutrients will be quite sufficient to satisfy the requirements of crops and their application may not increase the yield.

The depressing effect on yield due to application of micronutrients in combination may possibly be due to the antagonistic effect of micronutrients when more than three micronutrients are applied (Mariakulandai and Chami, 1964).

Summary and Conclusions

A trial was conducted to study the effect of the micronutrients, Bo, Cu, Mn, Mo and Zn, applied individually and in combination, and also of spartin on paddy crop for two *Punja* seasons during 1964 and 1965.

The results showed that the application of micronutrients individually did not significantly increase the yield of grain and straw over NPK alone. Spartin, a compound containing all the micronutrients, also had no significant effect in increasing the yield of grain and straw. On the other hand, a combined application of micronutrients tended to show a depressing effect on the yield of grain and straw of paddy.

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