

ON THE EFFECT OF SOLUBLE IRON AND ALUMINIUM ON RICE SEEDLINGS

Acidity is a common problem in many rice tracts in India. Different salts of iron and aluminium are commonly present in acid soils the intensity of which varies inversely with soil pH. Several investigators have attributed the poor growth of rice seedlings in acid soils to the toxic effect of soluble iron and aluminium. However, the nature of injury to rice seedlings at post-germination stage by soluble iron and aluminium either alone or in combination has not been investigated so far. Therefore this piece of work was taken up to study the effect of these elements on young paddy seedlings immediately after germination. The test was conducted with three rice varieties viz., *Kochuvithu*, *Tainan 3* and *Taichung Native 1*. Iron and aluminium were applied as ferrous sulphate and aluminium sulphate respectively. The two elements were supplied in seven concentrations ranging from 0 to 300 ppm with an interval of 50 ppm, individually and also in combinations. Seeds were sown in petridishes containing the concerned solutions and observations on the influence of aluminium and iron on the root and shoot growth were made on the tenth day of germination. The results are represented in Figures 1 to 4.

It is seen that root shoot growth in all the three varieties decreased progressively with increase in the concentration of soluble aluminium (Fig. 1). A tendency towards **stubbiness** and a decrease in the number of lateral roots were evidenced due to the injurious action of aluminium at a very early stage itself. Even at a concentration of 50 ppm the root system showed **stubbiness** and at higher concentrations root systems were completely lacking. The shoots showed considerable reduction in length and developed brown patches. Soluble aluminium was found to be more injurious to root system than to the shoot system which might be due to the **greater accumulation** of aluminium in the root than in the shoot (Forman and Basil 1927). The toxicity between 6.7 to 40.5 ppm of soluble iron and stimulation in growth above a concentration of 200 ppm as observed by Lockard and McWalter (1956) were not seen in the present studies.

Soluble iron was less toxic when compared to **aluminium**, for all the three varieties, as evidenced from the longer and healthier root and shoot systems. Upto 200 ppm. soluble iron was found to have a stimulating effect on the **growth** of young rice seedling (Figs. 2, 3). But as concentration increased, leaves became smaller and pale and roots turned brownish.

When seedlings were grown in solutions containing both iron and aluminium, the root system was found to be lacking in all the three varieties. The visible toxic symptoms were almost the same as observed in the case of aluminium. At a concentration of 200 ppm the growth of radicle was completely arrested.

Among the three varieties tried *Kochuvithu* was found to be more susceptible to **the** toxic effect of soluble aluminium and iron followed by *Taichung Native 1* and

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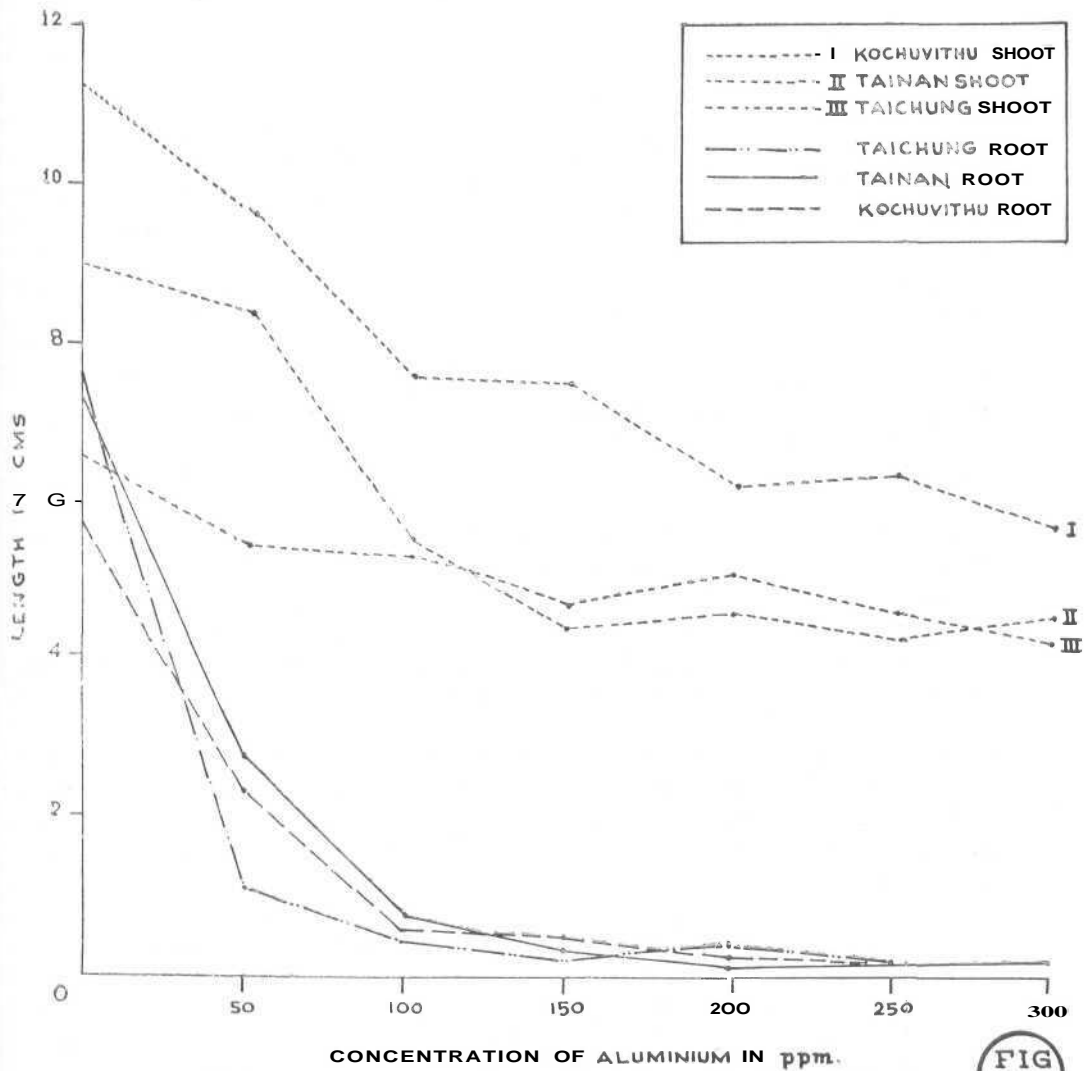


Fig. 1. Effect of different concentrations of aluminium on the shoot and root growths in rice seedlings.

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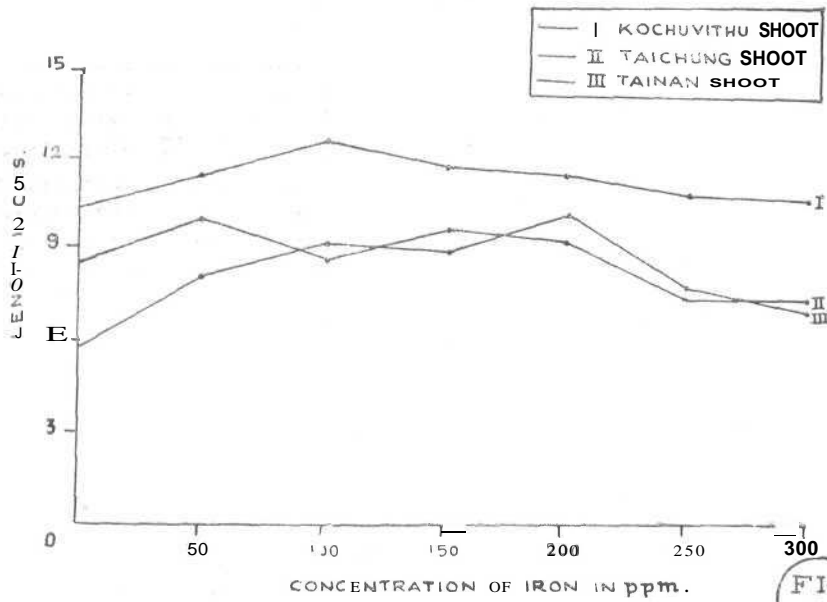


FIG
2

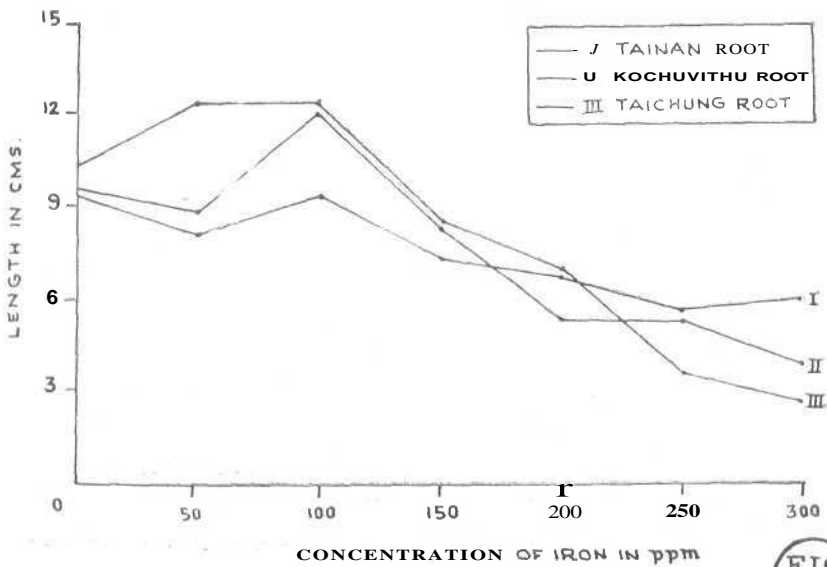
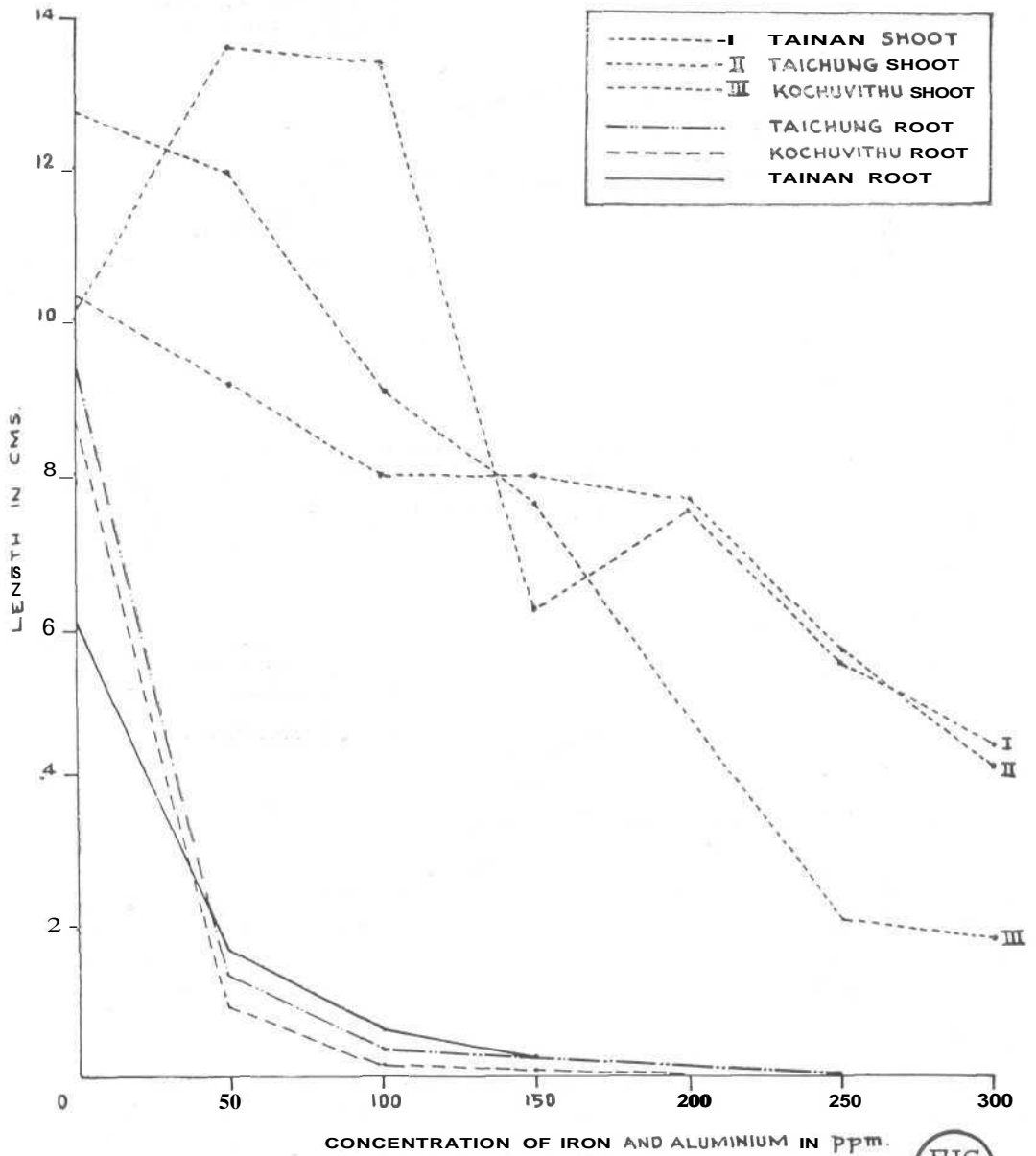


FIG
3

Fig. 2. Effect of different concentrations of iron on shoot growth in rice seedlings.

Fig. 3. •— do — on root growth.

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(FIG
4)

Fig. 4 Combined effect of different concentrations of iron and aluminium on shoot and root growths of rice seedlings.

Tainan 3. Differential tolerance to the toxic effect of these elements may be a varietal character (Fig. 4),

References

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Lockard, R. G. and McWalter, A. R., 1956. Effect of toxic levels of sodium, arsenic, iron and aluminium on the rice plant. *Malayan Agric. J.* **39**: 256-267

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