EFFECT OF APPLIED POTASSIUM ON BRONZING IN RICE

By
W.M. Jayatilaka Bandara and G.A. Gunatilaka,
Regional Agricultural Research Station,
Bombuwela.

Introduction:

Bronzing occurs in lowland rice soils of Asia (India, Indonesia, Japan, Malaysia, Philippines and Thailand), Africa and Latin America (2). Bronzing of rice plant in Sri Lanka has been considered to be due to iron toxicity (3).

The symptoms are characterised by the development of scattered reddish brown spots on the lower leaves. Later the leaves turn dark grey and die. When the disease is severe brown discoloration appears even in the uppermost expanded leaf while yellowing may be seen in mild cases. Especially after the middle stage of growth, the diseased plants are easily recognized. Root formation and development are markedly retarted. Roots of diseased plants are coarse and scanty and are dark brown, compared to those of healthy ones. The symptoms often differ with age of plant, the variety and the severity of toxicity (5).

The conditions which favour the development of this nutritional disorder are :

a. High content of iron oxide.
b. Low pH of dried soil.
c. Poor drainage.
d. Contiguity of ferrugenous lateritic highland (4).

Iron which normally exists in the ferric form in aerobic soils, is reduced to the ferrous form after submergence. The concentration of ferrous iron in the soil -solution increases after the soil is submerged. 300-500 ppm dissolved iron in the root zone generally causes bronzing. However, with low nutrient levels, especially potassium and phosphorus or in the presence of respiratory inhibitors such as H_2S, an iron concentration as low as 30 ppm may be toxic to rice (1).

Some ameliorative measures, both chemical and cultural are known for iron toxicity. Those considered effective include liming, presubmergence and prevention of deep drainage (during off season) in acid sulphate soils and liming, periodic surface drainage, interception of interflow during crop season and good fertilizer management in other soils (1,2). Another method is the use of tolerant varieties

This paper deals with the effects of the application of K fertilizer on the incidence of bronzing in rice.

Experimental

A field experiment was carried out in an iron toxic sandy soil (1st order valley) in the Kalutara district.

Two rice varieties, one tolerant to iron toxicity (BW 267-3) and the other susceptible to iron toxicity (Bg 94-1) were used in this experiment.

Five K - levels were used.

K_o - 0 kg - K_2O/Ha

K_1 - 34.5 kg - K_2O/Ha

K_2 - 69.0 kg - K_2O/Ha

K_3 - 103.5 kg - K_2O/Ha

K_4 - 138.0 kg - K_2O/Ha

Potash was applied in 3 equal split doses as basal, 5 weeks after sowing and 8 weeks after sowing respectively.

Nitorgen fertilizer as urea was applied as basal (32.6 kg/ha), at 3rd week (30.0 kg/ha), at 5th week (30.0 kg/ha) and at 8th week (60 kg/ha) for all treatments. Phosphorus fertilizer was applied as only basal fertilizer at the rate of 43.6 kg/ha of P_2O_5. Treatments were replicated three times and Randomized Complete Block design was used.

RESULTS

Treatment K_2O level kg/ha	K contents in rice leaves (Percent on dry matter basis)		Iron content in rice leaves (mg/100 g of dry matter)		Grain yield Tons/H	
	Bg 94-1	Bw 267-3	Bg 94-1	Bw 267-3	Bg 94-1	Bw 267-3
K_0 (0.0)	0.739	0.446	95.03	58.46	0.749	1.441
K_1 (34.5)	1.383	1.183	72.56	48.00	1.277	1.810
K_2 (69.0)	1.677	1.373	58.33	45.41	1.397	2.097
K_3 (103.5)	1.894	1.625	52.28	36.01	1.603	2.343
K_4 (138.0)	1.961	1.620	44.69	35.05	1.805	2.490

CV - 14.51 % CV 13.42% CV 18.08%

$LSD_{K\ level}$ 0.245 (P=0.05) $LSD_{K\ level}$ 9.01 (P=0.05) $LSD_{K level}$ 0.373(P=0.05)

$LSD_{variety}$ 0.154 (P=0.05) $LSD_{variety}$ 5.7 (P=0.05) $LSD_{variety}$ 0.236 (P=0.05)

Results and Discussion

Bronzing symptoms occured in the K_0, K_1, K_2, and K_3 levels in the susceptible variety (Bg 94-1). Symptoms were most severe in K_0, K_1, and K_2 levels while K_4 was least affected in this variety. In the variety tolerant to iron toxicity (Bw 267-3) bronzing symptoms occured only in K_0 and K_1 treatments. Visual observations on plant growth indicated that growth was poor in both varieties at the K_0 level and tended to improve with increasing amounts of applied potassium.

These results indicated that increasing the amounts of K applied, K content in tissues is increased in both varieties. But the susceptible variety has absorbed higher amount of potassium than the tolerant variety. At the K_3 and K_4 levels, K contents in tissue of tolerant variety is almost similar.

These results also indicated that increasing the amount of K applied, K content in tissues increased while the tissue Fe contents decreased which is a indication of an interaction between potassium and iron in the tissues. However the susceptible variety had significantly higher Fe contents in the tissues at all levels of applied K. Higher levels of applied K appears to be required to depress the iron contents in tissue of susceptible variety to a level non toxic to the plant. Good status of potassium in plant has been observed to dpress the iron uptake (6).

Thus under conditions of low levels of potassium with high levels of iron in the soil, potassium deficiency may increase he susceptibility to the iron toxicity.

According to the results obtained application of more potash than what is recommended for these varieties increased the grain yield in both varieties. The yield increase was more pronounced in the tolerant variety. In sandy soil where iron toxicity occurs, higher yields could be obtained using tolerant varieties with the use of moderate amounts of potassium fertilizers.

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HISTORY OF RICE IPC ACTIVITIES IN SRI LANKA

I.D.R. Peries, Entomologist,
Division of Entomology,
C. A. R. I., Peradeniya.

Integrated Pest Control (IPC) in rice has come to be well known by the officers of the Department of Agriculture. It is recognized by the Department as the most desirable approach to pest control in rice. Encouraged by the success of this approach in rice athe department is even considering to extend IPC to vegetables and other field crops.

At a time when IPC in rice is gathering momentum it is pertinent to take a brief look at the history of activities that lead the department to the present phase. There had been many officers in the department who initiated this series of activities with much foresight. It is only but right that their role in this field of activity be not forgotten. Therefore, this is to present a chronological sketch of activities that lead to the present level of achievement.

1978 March 20-24: Dr. H E Fernando, Entomologist, attended a conference in Bangkok on Regional Rice IPC Project.