ASIAN JOURNAL
ISSN: 0976-3376

Available Online at http://www.journalajst.com

ASIAN JOURNAL OF
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 4, Issue, 10, pp. 004-006, October, 2012

RESEARCH ARTICLE

STUDIES ON THE EFFECT OF FOLIAR APPLICATION OF ZINC CHELATE (BOLD) AND IRON CHELATE (GRIP) IN RICE

***Kandasamy, S.**

Associate Professor, Department of Agronomy, Annamalai University, Annamalainagar

Received 09th July, 2012; Received in Revised from; 03rd August, 2012; Accepted 10th September, 2012; Published online 30th October, 2012

ABSTRACT

Field experiment was conducted at Experimental Farm, Annamalai University, Annamalainagar to study the effect of zinc chelated (BOLD) and iron chelated (GRIP) on the growth and yield of rice, during 2010 (Thaladi). The experiments were laid out in randomized block design. The experiments consists of nine treatments viz., (T1) 2 gm (GRIP) in 1 ltr of water, (T2) 2 gm (BOLD)} in 1 ltr of water, (T3) 3 gm (GRIP) in 1 ltr of water, (T4) 3 gm (BOLD) in 1 ltr of water, (T5) 2 gm liberal zinc chelate in 1 ltr water, (T6) 2 gm liberal iron chelate in 1 ltr water, (T7) 3 gm liberal zinc chelate in 1 ltr water (T8) 3 gm liberal iron chelate in 1 ltr water, (T9) control (no foliar spray). Among the different treatments tried, foliar application of zinc chelated (BOLD) @ 2 g in 1 ltr of water favourably influenced the yield components viz., No. of filled grains panicle-1, panicle length, Test weight, grain yield 4858 kg ha-1 and straw yield and nutrient uptakeof 114.27 kg Nha-1, 38.43 kg P2O5 ha-1and 126. 5 kg K2O ha-1. This was followed by iron chelated (GRIP) @ 2 g in 1 ltr of water. The control treatment (no nutrient application) registered the lowest values in yield components and yield 3126 kg ha-1 of rice and nutrient uptake.

Key words: Foliar application, Chelated micronutrients.

INTRODUCTION

To feed the exploding projected population of India's rice production target for 2025 AD is 140 million tonnes, which can be achieved only by increasing the rice production by over 2.0 million tonnes per year in the coming decade. For achieving sustainability in food production, the rate of nutrient supply to crop plants should keep pace with the rate of nutrient removal by the crops. Balanced fertilizer use in food grain crops including rice is one of the most important considerations in providing food security to the burgeoning Indian population and promoting soil fertility in sustainable intensive agriculture. In the recent years, the bottleneck in enhancing the rice productivity is occurrence of multiple micronutrient deficiency of which zinc and iron deficiency seems to be dominant and it adversely affects the yield of rice. Unbalanced fertilizer use at higher yield levels is one of the major factors contributing to nutrient mining in intensive rice production. Zinc deficiency is a widespread nutritional disorder in rice. Its vital importance was made known after the discovery of widespread deficiency in rice which is commonly, known as Khaira disease. Hence, it is necessity for fertilizing the rice crop with zinc has been stressed by Fageria*el al*., 2002. Iron chlorosis may lead to yield loss or complete crop failure, even when the total iron content of the soil exceeds plants demand by three orders of magnitude. Among the different forms of micronutrients, chelated form of zinc and iron is very effective because of some underlying facts about their nature that makes them different from other sources. It is also able to move freely through the soil for uptake by the plant root system. Moreover, foliar nutrition of zinc and iron chelate is a simple and cheaper technology which ensures the supply of nutrients to the crops directly where they are needed without spending energy for their transport, application and without any losses in transit. Earlier research reports on zinc and iron management on rice have shown conflicting response to methods, sources and levels of zinc and iron application. Considering the above facts, field experiments were conducted to evaluate effect of foliar application Zinc Chelated (BOLD) and Iron chelated (GRIP) in rice.

Corresponding author:* **Kandasamy, S.
Associate Professor, Department of Agronomy, Annamalai University, Annamalainagar

MATERIALS AND METHODS

A field experiment was conducted at the Experimental farm, Department of Agronomy, Annamalai University, Annamalai Nagar during 2010 (Thaladi). The soil of the experimental field is clay loam in texture with low in available nitrogen, medium in available phosphorus, high in available potassium and low in available Sulphur and Iron. The experiment comprising of Nine treatments viz., (T_1) 2 gm (GRIP) in 1 ltr of water, (T_2) 2 gm (BOLD)} in 1 ltr of water, (T_3) 3 gm (GRIP) in 1 ltr of water, (T_4) 3 gm (BOLD) in 1 ltr of water, (T_5) 2 gm liberal zinc chelate in 1 ltr water, (T_6) 2 gm liberal iron chelate in 1 ltr water, (T_7) 3 gm liberal zinc chelate in 1 ltr water (T_8) 3 gm liberal iron chelate in 1 ltr water, (T_9) control (no foliar spray). The trial was laid out in a randomized block design with three replication plot size was 5 x 4 m for crop seed rate is 40 kg ha^{-1} (CO 43).

Effect of foliar application of zinc chelate (bold) and iron chelate (GRIP) on yield components and yield of rice

Treatments	Number of tillers hill^{-1}	Panicle length	Number of filled grains panicle^{-1}	Test weight	Grain yield kg ha^{-1}	Straw yield kg ha^{-1}
(T_1)- 2 gm (GRIP) in 1 ltr of water	15.1	18.1	83.4	20.10	4646	6859
(T_2) -2 gm (BOLD)} in 1 ltr of water	15.5	19.4	85.1	20.18	4858	6987
(T_3) -3 gm (GRIP) in 1 ltr of water	14.4	15.8	81.0	19.94	4310	6487
(T_4) -3 gm (BOLD) in 1 ltr of water	14.8	16.9	82.6	20.02	4508	6673
(T_5) -2 gm liberal zinc chelate in 1 ltr water	13.9	15.32	80.1	19.85	4063	6365
(T_6) -2 gm liberal iron chelate in 1 ltr water	13.2	14.9	79.1	19.27	3943	6244
(T_7)-3 gm liberal zinc chelate in 1 ltr water	12.6	14.6	78.1	19.69	3832	5986
(T_8) -3 gm liberal iron chelate in 1 ltr water	12.2	14.0	77.1	19.61	3715	5818
(T_9) -control (no foliar spray)	11.2	13.7	75.6	19.53	3126	4987
SEd	0.16	0.15	0.45	0.07	57	59.5
CD(p=0.05)	0.33	0.30	0.90	NS	116	119

Effect of foliar application of zinc chelate (bold) and iron chelate (GRIP)onNutrient uptake of rice

Treatments	Nutrient uptake				
	N kg ha^{-1}	P kg ha^{-1}	K kg ha^{-1}	Zn g ha^{-1}	Fe g ha^{-1}
T_1- 2 gm (GRIP) in 1 ltr of water	113.07	37.89	125.29	579.92	509.12
T_2 -2 gm (BOLD)} in 1 ltr of water	114.27	38.43	126.65	590.42	516.62
T_3 -3 gm (GRIP) in 1 ltr of water	110.35	36.72	121.29	559.32	491.12
T_4 -3 gm (BOLD) in 1 ltr of water	11.85	37.31	120.98	567.56	497.62
T_5 -2 gm liberal zinc chelate in 1 ltr water	107.58	36.18	117.61	546.32	473.28
T_6 -2 gm liberal iron chelate in 1 ltr water	106.00	35.58	116.11	537.89	464.19
T_7 3 gm liberal zinc chelate in 1 ltr water	104.80	35.03	114.81	528.46	450.33
T_8 -3 gm liberal iron chelate in 1 ltr water	102.21	34.55	112.01	514.30	428.22
T_9 -control (no foliar spray)	100.25	33.68	109.51	289.79	329.93
SEd	0.59	0.23	0.64	4.01	3.20
CD(p=0.05)	1.18	0.46	1.28	8.06	6.40

N, P, K were applied in the form of urea, single super phosphate and muriate of potash at 120:38:38 NPK ha^{-1} respectively was followed as RDF. All the agronomic practices were carried out uniformly to raise the crop. The foliar spraying of zinc chelated iron chelated, liberal iron chelated, liberal; zinc chelated @ 2 g and 3 g/lit was done as per the treatment schedule at 20 and 50 DAT using high volume sprayer. All the agronomic practices were carried out uniformly to raise the crop.

DISCUSSION

Yield components

Among the treatments, foliar application of zinc through zinc chelate (BOLD) @ 2 g in 1 ltr of water at 20 and 50 DAT (T_2) recorded the maximum panicle length of 19.4 cm and number filled grains panicle- 1of 85.1 and thousand grain weight of 20.18 . Foliar application of zinc through zinc chelated @ 2 g in 1 ltr of water at 20 and 50 DAT to the crop lead to better photosynthetic activity and enhanced amount of photosynthetic assimilates to sink region might have resulted in better development of yield components. The present results are in line with the findings of Kiramani*et al* 2007. Foliar application of iron through iron chelated (GRIP) @ 2 g in 1 ltr of water at 20 and 50 DAT (T_1) was next in order. The Maximum yield of grain and straw was observed in the treatment T_2 which received foliar application of zinc through zinc chelate (BOLD) @ 2 g in 1 ltr of water at 20 and 50 DAT. This treatment was followed by T_1foliar application of iron through iron chelate (GRIP) @ 2 g in 1 ltr of water at 20 and 50 DAT this might be due to foliar application of Znas zinc chelated, the foliar feed zinc might have produced conducive physical environment coupled will good supply of zinc recorded (highest values of growth and yield components which ultimately increased the grain and straw yield of rice. The treatment T_1 was next in order. Foliar application of iron through iron chelated might have increased the photosynthetic activity there by accumulation of more DMP, ultimately increases the grain and straw yield. The results are in line with the findings of Bhamana and Pradshti (2008). The lowest grain yield was recorded under control treatment. This might be due to lack of availability of adequate amount of essential nutrients to the plants which in turn affects proper development of growth and yield components resulted in low yield. The results are confirmed with the findings of Ramana *et al* (2006) and Singh *et al* (2007).

Effect of foliar application of zinc chelate (bold) and iron chelate (GRIP) on yield components and yield of rice

Nutrient uptake

Foliar application of zinc chelated (BOLD) @ 2 g in 1 ltr of water (T2) registered the maximum uptake of nutrients, which was followed by treatment (T1) iron chelated (GRIP) @ 2 g in 1 ltr of water. The treatments T_3, T_4, T_5, T_6, T_7, T_8 and T_9 were next in order. Increased nitrogen uptake might be due to application of Zn and Fe chelates, might be due to the easy transformation of added nitrogenous fertilizer into available N with addition of Zn. This results concur with the findings of Das *et al* (2004) in rice. The increase in phosphorus uptake due to the Zn and Fe application has been already reported by Bandra *et al*, 2003; Das *et al*, 2003 in rice. Better performance of these treatments on the K uptake by rice corroborate with the findings of Bandra *et al* (2003) and Das *et al* (2003) in rice. The chelating nutrients zinc and iron once introduced to the soil enhances the availability of Zn and Fe through its ability of sequestering Zn and Fe from its native insoluble compound might be the reason for higher uptake of these nutrients by the crop Nayak and Das (2006) in rice.

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