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Impact of Foliar Application of Micronutrient on Yield Production and Micronutrient uptake by Rice

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INTRODUCTION

The high production target levels with intensive cropping system and the use of concentrated high grade fertilizers have resulted in the deficiencies of macronutrients in Indian soil. During the last decades the foliar application of micronutrient has become an established procedure in cropping to increase yield (Subbiah and Mittra, 2007) and quality of crop products (Sakal and Singh, 2011). Hence, the present study was undertaken to find out the foliar application of micronutrients on the yield and uptake of nutrient by rice.

MATERIALS AND METHODS

A field experiment was conducted at Annamalai Universitgy Experimental Farm during July- Oct 2021 using rice (var. ADT 43) as a test crop in a randomised block design having four replication in a clay loam soil to study the effect of foliar application of micronutrients on the yield and micronutrient uptake by rice. The experiment soil had pH 7.84 and EC 0.56 dSm^{-1}. The available micronutrients in the experimental soil were 3.94, 8.23 1.78, 1.64, 0.38, and 0.24 mg kg-1 for Fe, Mn, Zn, Cu, B respectively. From fertility point of view it was low in Fe, Zn and Cu and high in Mn. The treatment consisted of control and four concentrations of Kiecite viz. 0.5, 1.0, 1.5 and 2.0 per cent spraying at 15 DAT, maximum tailoring and panicle initiation stages. Kiecite is a micronutrient mixture of Fe- 1.0%, Mn- 0.5%, Cu 0.35%, Zn- 5.0%, B- 0.05% and Mg- 6.0%. A fertilizer dose of 120:38:38 kg ha^{-1} of N:P_2O_2 : K_2O respectively were followed. Required quantity of Kiecite was dissolved in water following a spray volume of 250 Lit ha^{-1} and sprayed using Ganesh hand sprayer to the respective treatments. The parameters viz. no of productive tillers and no. of grains per panicle and grain and straw yield at harvest were recorded. The grain and straw samples were collected, oven dried at 65^0C and powdered in Wiley mill and di acid (4:1 Supphuric : perchloric acid) extract was prepared. The concentration of Fe, Mn, Zn, Cu using Atomic Absorption Spectrophotometry and B Spectrophotomotrically as outlined by Jackson (2013) and their uptake were calculated.

RESULT AND DISCUSSION

The results of the experiment indicated the efficiency of foliar application of micronutrients by increasing the yield components and yield of rice (Table 1). Among the various concentration of Kiecite tried, spraying at 1.0 per cent level enhanced the no. of productive tiller and no. of grains per panicle.

Recommended NPK + Foliar spraying of Kiecite at 1.0 percnet level proved efficacious and recorded a grain and straw yield of 6648 and 7788 Kg ha^{-1}, respectively as compared 4278 and 5286 kg ha^{-1} in control. The increased yield component and yield of rice, might be due to the different micronutrients through kiecite spraying which has resulted in better absorption of these nutrients in turn helping in synthesis of photosynthesis and its effective translocation to storage organs contributing for the increased yield (Tandon 2005).

Foliar application of Kiecite at 1.0% level along with NPK enhanced the concentration and the uptake of Fe, Mn, Zn, Cu and B by grain and straw of rice. Significantly the highest content of 102.2 ppm and 144.6 and 206.8 ppm fe in grain and straw, respectively was recorded with 1% Kiecite spraying. Foliar spraying of Kiecite @ 1.0 per cent also accounted for increase in concentration and uptake of Zn, Mn, Cu and B by grain and straw. The increase in micronutrient content and uptake by grain and straw of rice might be ascribed to the greater absorption of these nutrients sprayed on foliage through kiecite during different growth stages of rice resulting in increase in concentration.

Table 1: Effect of foliar application of micronutrients on yield components and yield of rice

Treatment	Productive tillers	No. of grains panicle^{-1}	1000 grain weight (g)	Yield (kg ha^{-1})	
				Grain yield	Straw yield
T_1-Control	4.88	86.43	20.44	4278	5288
T_2- T_1+0.5% Kiecite	6.08	92.56	20.48	5661	6798
T_3- T_1+1.0% Kiecite	6.64	103.54	20.58	6648	7788
T_4- T_1+1.5% Kiecite	6.44	99.35	20.54	6344	7418
T_5- T_1+2.0% Kiecite	6.29	95.13	20.48	6004	7083
SEd	0.13	2.54	0.18	168	205
CD (p=0.05)	0.25	5.06	NS	332	415

Table 2a: Effect of foliar application of micronutrients on nutrient content and uptake by rice.

Treatment	Fe				Mn				Zn			
	Content (ppm)		Uptake (g ha^{-1})		Content (ppm)		Uptake (g ha^{-1})		Content (ppm)		Uptake (g ha^{-1})	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T_1-Control	102.2	1324	64.4	693	2743	368.3	274.3	368.2	12.4	15.4	52.4	78.3
T_2- T_1+0.5% Kiecite	116.4	1673	82.3	893	446.4	613.0	446.7	613.0	17.5	23.3	103.6	154.8
T_3- T_1+1.0% Kiecite	144.6	2068	102.3	1144	613.4	678.3	613.4	878.7	28.1	36.4	184.9	287.5
T_4- T_1+1.5% Kiecite	136.4	1944	94.4	99.3	568.8	730.6	568.8	730.6	27.3	33.5	172.9	241.6
T_5- T_1+2.0% Kiecite	133.3	1863	86.6	93.3	549.9	654.3	549.9	654.3	25.4	31.3	143.6	222.6
SEd	3.24	3.63	2.86	2.13	27.42	23.47	27.42	23.47	0.54	0.74	3.26	4.08
CD (p=0.05)	6.48	4.28	5.73	4.24	54.84	47.15	54.84	47.15	1.07	1.48	6.43	8.15

Table 2b Effect of foliar application of micronutrients on nutrient content and uptake by rice

Treatment	Cu				B			
	Content (ppm)		Uptake (g ha^{-1})		Content (ppm)		Uptake (g ha^{-1})	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T_1-Control	7.4	8.4	30.5	44.3	7.5	7.0	32.2	35.2
T_2- T_1+0.5% Kiecite	8.0	9.4	46.3	61.3	11.3	9.8	61.8	65.4
T_3- T_1+1.0% Kiecite	9.0	10.0	56.9	77.3	15.6	13.3	102.4	102.4
T_4- T_1+1.5% Kiecite	8.9	9.8	54.6	73.4	14.3	12.3	90.6	90.6

T_5- T_1+2.0% Kiecite	8.8	9.6	52.3	66.3	14.0	11.3	80.3	82.3
SEd	0.14	0.13	2.19	3.03	0.36	0.24	4.8	3.98
CD (p=0.05)	0.29	0.34	4.40	6.06	0.73	0.43	9.68	7.99

Further, the higher dry matter production coupled with high concentration resulted in higher uptake of various micronutrients by rice - Earlier report of Maji and Banyopadhyay (1990) and Mudgal (2008) lend support to the present finding.

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