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The Effects of Copper, Magnesium and Manganese on Yield and Yield Components of Rice (Variety of Shirudi)

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ABSTRACT

An experiment in the form of factorial in randomized complete block design frame and in 3 repetition was done to study the effects of some micro – nutrients elements on rice crop characteristics, the variety of SHIRUDI, in crop year of 2012 in a field located in ABBAS ABAD city, MAZANDARAN province. The experimental treatments included copper in 2 levels to the amount of (0 & 5 kg copper Sulfate.hectare), Magnesium in 3 levels to the amount of (0 , 10 & 20 kg Magnesium Sulfate.hectare) and manganese in 3 levels to the amount of (0, 5, 10 kg manganese Sulfate.hectare). The results indicated that the most of grain yield obtained with the use of 5 kg manganese Sulfate.hectare, that it was because of the increase of leaf number and decrease of un – fertilized tiller number and deaf number. The use of 10 kg Magnesium Sulfate.hectare caused the increase of 12.9% grain yield in comparison with control, because the most number of total tiller per bush and the least number of un – fertilized tiller per bush obtained under this treatment. The use of 20 kg Magnesium Sulfate.hectare caused the increase of bush height and the number of cluster.square meter. The use of copper Sulfate didn`t have any significant effect on grain yield, but the use of copper Sulfate to the amount of 5 kg.hectare caused the increase of harvest index, the length of frag leaf, caulis length, and more cluster per square meter and caused the decrease of deaf number per cluster. The most of grain yield obtained under three genuflexions interactions for conditions without using manganese and copper and with the use of 20 kg Magnesium .hectare (312.5 g.square meter and about 25.6% more than control), and the least of grain yield obtained under treatment without the use of manganese and with the use of 10 kg Magnesium and 5 kg copper.hectare 202.2 g per square meter.

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INTRODUCTION

In spite of little need of crop products to low – use elements in comparison with high – use elements, these compounds have considerable role in the increase of quality and quantity of agricultural products, but paying attention to this issue is really important [6]. Micro elements enter completely in plants` Anzim metabolic system. The limitation between quantity and shortage of these elements are often very little, so their proper designing for natural increase of plant seems very necessary. [11,12]. VILD (2003) announced that shortage of micro – elements such as: copper and zinc in soil, limits the growth of products. This subject is eliminated through using manure with the contents of needed food stuffs [8]. Ghaderi & Malekuti (2006) announced that, regarding performed investigations, because of the use of Magnesium Sulfate with different methods, yield and quality of crop products increased, in spite of this point that soil potassium was in a pleasant level [3,5]. Malekuti (2006) reported that the strength of continuing life in conditions of copper shortage decreased, so the sterile of grain head increased and the number of hollowed grain increased as well [2,4]. Paknezhad & Hashemi Dezfuli (2002) reported that the use of micro – manures in soil causes better absorption of macro – elements and this itself causes the production of more grain heads [1,7].

MATERIALS AND METHODS

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In crop year of 2012, an experimental research was done in a field located in Abbas Abad city. This experiment performed in factorial form, in randomized complete block design frame and in 3 repetitions, so that the amounts of manures included copper in 2 levels to the amount of (0& 5 kg copper Sulfates.hectare), Magnesium in 3 levels to the amount of (0,10,20kg Magnesium Sulfates.hectare), manganese in 3 levels to the amount of (0,5,10 kg manganese Sulfates.hectare). The soft wares of SAS & Excel were used for statistical calculations and drawing diagram and Duncan method was used for the comparison of means.

RESULTS AND DISCUSSION

The effect of copper, manganese, Magnesium and binary effects of copper in manganese, copper X Magnesium and Magnesium X manganese were significant on grain yield in probable level of 1 % , statistically, the interaction effect of copper X manganese X Magnesium on grain yield didn`t have any significant difference. In comparison of means, grain yield under the treatment of copper amounts for treatment of not – using (254.82 gm. . square meter) has been more than treatment of 5kg copper Sulfate (215.05 gm. . square meter). Also, the most of grain yield obtained under treatment of the amounts of manganese for treatment of 5 & 10 kg manganese Sulfate (277.8 and 274.9 gm. . square meter) and the least amount obtained under the treatment of not – using 232.1 gm..square meter. Total number of tiller with fertilized tiller and grain yield have very high and positive correlation coefficient in probable level of 1% , respect (0.638 & 0.588). Also, the number of unfertilized tiller has a high and positive correlation with deaf grain in probable level of 1% (0.415). The length of bush has also a positive correlation in probable level of 1% with caulis length (0.338) and the number of full – cluster* grain cluster 0.357. Change in chlorophyll content by application of micronutrient fertilizer was already reported and relation of low chlorophyll content and decrease in photosynthesis and biomass production at the flowering stage of rice was discussed [9,10].

Table 1: variance analysis of yield components of SHIRUDI variety.

S.O.V	D F	Tiller number	Fertilized tiller	Unfertilized tiller	No. of full cluster	No. of deaf cluster	Total number of cluster	No. of cluster. (m^2)	1000 Grain weight
Repetition	2	1.013	3.242	3.242	2.311	0.0587	71.860	81.056	7.970
Copper	1	12.964 **	0.592	0.592	29.055*	1.173	139.362	332.519	7.297
Manganes	2	2.991**	0.596	0.596	20.871*	0.311	22.887	3621.56 **	1.618
Copper,manganese	2	2.943**	0.866	0.866	118.506**	0.509	16.611	229.407	1.782
Magnesium	2	6.853**	7.174	7.174	7.988	0.623	54.033	474.5**	0.039
Copper,Magnesium	2	6.370**	0.727	0.727	482.321**	1.776**	282.205	357.463 **	1.734
Manganese, Magnesium	4	5.707**	2.957	2.957	84.710**	1.660**	229.723	959.972 **	0.874
Copper,manganese, Magnesium	4	4.111**	0.881	0.881	117.252**	2.434**	85.697**	1301.602**	0.899
Error	34	0.533	2.607	2.607	4.379	0.323	41.946	78.310	2.776
C.V %		5.91	14.22	14.22	2.72	13.31	8.06	3.85	6.30

*and**: Significant at 5% and 1% probability level, respectively.

Table 2: mean comparison of yield components of rice the variety of SHIRUDI under the effect of different treatments.

Treatment	Tiller number	Fertilized tiller	Unfertilized tiller	No. of full cluster.cluster	No. of deaf cluster.cluster	Total number of cluster	No. of cluster. (m^2)	1000 Grain weight
Control	12.84a	10.14a	1.99a	77.6a	4.42a	81.99a	158.24a	26.82a
5 $Kg.ha^{-1}$ (Cu)	11.86b	10.15a	1.67b	76.57a	4.13a	78.77a	180.68a	26.08a
Control	12.19a	11.39a	1.54a	77.48a	4.29a	82.06a	243.3c	26.27a
5 $Kg.ha^{-1}$(Mn)	12.5a	12.13a	1.46a	64.40c	3.34a	67.74a	217b	26.14a
10 $Kg.ha^{-1}$(Mn)	12.25a	11.19a	1.98a	84.08a	5.92a	90.01a	295.7a	26.85a
Control	11.52b	10.94a	2.03a	77.41a	4.47a	82.12a	228.8a	26.40a
10 $Kg.ha^{-1}$(Mg)	13.04a	12.08a	1.68a	77.07a	4.10a	78.65a	225.9b	26.44a
20 $Kg.ha^{-1}$(Mg)	12.15b	11.05a	1.86a	76.12a	4.23a	80.36a	235.6a	26.49a

-In each column, means with similar letter are not significantly different (P<0.05).

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