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Growth and Yield Response of Basmati-385 (*Oryza sativa* L.) to ZnSO₄ Application

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Abstract

The various levels of ZnSO₄ included in the experiment were 0, 5, 10, 15 and 20 kg ha⁻¹ applied at the time of puddling. The results showed that T₃ (15 kg ZnSO₄ ha⁻¹) treatment produced maximum paddy yield (3.80 t ha⁻¹) than all other treatments. This higher yield was attributed to increase number of fertile tillers m⁻² and greater harvest index in this treatment as compared to other treatments. It was concluded that application of ZnSO₄ at 15 kg ha⁻¹ at the time of puddling is the most economical to obtain higher yield under Faisalabad conditions.

Introduction

Pakistan is basically an agricultural country and in agriculture sector, production of rice is taken as effective weapon for increasing the national income. Rice crop is also important for earning much needed foreign exchange. It provides more than 50 percent of the caloric intake for one third population of the globe. A big gap exists between the potential rice yield and actually being obtained by the farmers. By narrowing down the gap, the production technology, judicious use of artificial fertilizers including micro-nutrients also (Awan *et al.*, 1989).

In Pakistan, rice is cultivated on an area of 2206 thousand hectares with an annual production of 3991 thousand tons and its average yield i.e. 1594 kg ha⁻¹, is much lower than that of other rice producing countries in the world (Anonymous, 1994).

Zinc is an essential plant nutrient and was recognized few decades ago. It is associated with many enzymatic functions in plants and is involved in nitrogen metabolism and functions as a metal component of series of enzymes mainly carbonic anhydrase and number of dehydrogenases, (Tisdale *et al.* 1985). The present study was therefore, planned to see the effect of different levels of ZnSO₄, application on growth and yield of fine rice variety Basmati-385 given at the time.

Materials and Methods

The present study was carried out at the Agronomic Research Area, University of Agriculture, Faisalabad during the year 1993. The experiment was laid out in a Randomized Complete Block Design with four replications and a net plot size of 2.5 x 5 m was used. Treatments were 0, 5, 10, 15 and 20 kg ha⁻¹ of ZnSO₄ and applied at the time of puddling. There were 5 plots in each replication with ten lines in each plot.

The nursery was sown in the last week of May and one seedling per hill was transplanted in the first week of July. Plant to plant and row to row distance was 20 and 25 cm, respectively. Phosphorus and potash (50 kg ha⁻¹ each) was given at the time of final and preparation as a basal dose.

Nitrogen 90 kg ha⁻¹ was applied in two doses i.e., 2/3rd in dry soil at final land preparation and rest of nitrogen was given at panicle emergence stage i.e. 45-50 days after transplanting. Irrigation water were applied five days after transplanting and at a week interval later on according to the requirements of the plant. All other agronomic practices were uniform for all the plots.

Crop was harvested in the last week of October, 1993. From each plot five plants were selected at random and growth and yield data were recorded.

Final plant height was recorded from the soil surface to the tip of panicle/flag leaf with the help of a meter rod at harvest time of crop. After harvesting fertile and unfertile tillers were counted from the area of 1 m². The paddy and straw yield were recorded on plot basis and then expressed in t ha⁻¹. Harvest index was calculated as the ratio of economic yield to total biomass yield.

Data collected on growth and yield response of Basmati-385 to ZnSO₄, application were analysed statistically by using Fishers Analysis of Variance Technique and LSD test at 5 percent probability was applied to test the significance among the treatments (Steel and Torrie, 1984).

Results and Discussion

All the yield components like plant height, number of tillers per m², and fertile tillers m⁻², were affected significantly by the application of ZnSO₄. Maximum plant height, number of fertile tillers m⁻² and fertile tillers m⁻² were produced by T₃ (15 kg ZnSO₄ ha⁻¹) and T₂ (10 kg ZnSO₄ ha⁻¹) which was followed by T₁ (5 kg ZnSO₄ ha⁻¹). The maximum paddy yield (3.80 t/ha) was recorded in case of T₃ (15 kg ZnSO₄ ha⁻¹) than rest of the treatments under study. The minimum paddy yield (2.90 t/ha) was recorded in case of check. The treatments T₂ gave higher yield than T₄ which were non-significant from each other. Harvest index was maximum (22.94%) in treatment T₃ which was non significant to rest of treatments except T₄ 920 kg ZnSO₄ ha⁻¹ which produced the lowest harvest index (19.66%) value (Table 1).

It was concluded that the application of ZnSO₄ 15 kg ha⁻¹ at the time of puddling is the most economical to obtain higher paddy yield under Faisalabad condition.

Table 1: Effect of ZnSO₄ application on the yield components of rice Basmati-385

Treatments		Plant height (cm)	No. of tillers m ⁻²	No. of fertile tillers m ⁻²	1000-grain weight	Paddy yield t/ha	Straw yield	Harvest index
T ₀	Check	81.37c	192.48c	175.73b	15.81 N.S.	2.95c	10.7d	21.69a
T ₁	5	92.57b	228.92b	274.69a	18.15	3.50b	12.12bc	22.41a
T ₂	10	110.09	262.99a	277.24a	18.59	3.57b	12.20b	22.64a
T ₃	15	103.62a	272.54a	288.68a	20.34	3.80a	12.80a	22.94a
T ₄	20	91.66b	259.03a	269.81a	19.09	3.47c	12.35b	19.66b

* = Significant at 5 percent probability. N.S = Non-significant

Ahmad (1988) pointed out that the application of ZnSO₄ at 5 kg ha⁻¹ through soil during puddling to rice CV. Basmati-370 and IIR1-6 although tended to improve number of tillers/hill, paddy and straw yield s but the differences among the various treatments were statistically non-significant. Javaid (1989) stated that the application of zinc sulphate at 12 and 18 kg ha⁻¹ in RCBD with 4 replications to rice CV.

Basmati-370 increased the height of plants, number of total tillers/hill, number of fertile tillers/hill, number of grains/panicle, paddy yield, straw yield and 1000-grain weight but the effect of ZnSO₄ was non-significant on number of non-fertile tillers/hill. Ditta (1990) applied ZnSO₄ at various rates to rice CV. Basmati-370 and KSK-385 before and after transplanting. He found that ZnSO₄ application increased plant height, number of tillers/hill, paddy and straw yield while it reduced sterility %age, abortive and opaque kernels. Khan *et al.* (1991) studied effect of gypsum and zinc on the growth and yield of rice grown under saline water stress in coastal saline soil and reported that the application of gypsum + zinc produced the highest yields. Bansal *et al.* (1993) observed the critical deficiency level of 2 m and field response of rice to Zn application and reported that 5.6 kg 2 n ha⁻¹ significantly increased the grain yield in deficient soil. He further reported that on the most deficient soil (0.30 kg Zn kg⁻¹ soil), application of 5.6 kg Zn ha⁻¹ increased yield from 6.23 to 7.61 t grains ha⁻¹. Gupta and Kala (1992) studied the response of paddy to Zn application and concluded that 0, 25 or 50 kg ZnSO₄ ha⁻¹ produced grain yields of 7.15, 7.30, 6.94 and 6.80 t ha⁻¹, respectively compared with the control yield of 6.34 t. He further concluded that Zn application generally increased uptakes of Zn, Cu, Mn and Fe.

Reference

- Ahmad, S., 1988. Role of zinc in salt tolerance of rice. M.Sc. Thesis, University of Agriculture, Faisalabad.
- Anonymous, 1994. Economic survey, 1993-94. Government of Pakistan, Finance Division, Economic Advison's Wing, Islamabad.
- Awan, I.U., H.U. Alizai and F.M. Chaudhry, 1989. Comparative study of direct seeding and transplanting methods on the grain yield of rice. *Sarhad J. Agric.*, 5: 119-124.
- Bansal, R.L., S.S. Thind, V.K. Nayyar and D.S. Rana, 1993. Critical deficiency level and field response of rice to Zn application on typic Ustochrepts. *Acta Agron. Hungarica*, 41: 101-105.
- Ditta, A., 1990. Response of rice to various rates and techniques of ZnSO₄. M.Sc. Thesis, University of Agriculture, Faisalabad.
- Gupta, V.K. and R. Kala, 1992. Response of paddy to zinc application and its effects on Zn, Cu, Mn and Fe concentration and uptake. *Haryana J. Agron.*, 8: 81-84.
- Javaid, M., 1989. Effect of copper and zinc on the growth, yield and chemical composition of rice (Basmati-370). M.Sc. Thesis, University of Agriculture, Faisalabad.
- Khan, H.R., B. Faiz, K.R. Islam, S. Rahman, T. Adachi and I. Ahmed, 1991. Effect of gypsum and zinc on the growth and yield of rice grown under saline water stress in coastal saline soil. *Int. J. Trop. Agric.*, 9: 182-189.
- Steel, R.G.D. and J.H. Torrie, 1984. Principles and Procedures of Statistics. 2nd Edn., McGraw Hill Book Co. Inc., New York, pp: 172-177.
- Tisdale, S.L., W.L. Nelson and J.J. Beaton, 1985. Soil Fertility and Fertilizers. 4th Edn., MacMillan Publishers Co., New York, pp: 754.