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Response of micronutrient (Zn, Cu & B) for wheat crop variety (NIAW 1994) under late sown condition

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Abstract

A field experiment was conducted to study response of micronutrients (Zn, Cu & B) to wheat crop variety (NIAW 1994) under late sown condition at Wheat & Maize Research Unit, VNMKV, Parbhani during rabi *2015-16. The experiment was laid out in randomized block design (RBD) with three replications and ten treatments : T_1- Control, T_2-RDF (90:50:40 kg NPK ha^{-1}), T_3- RDF + 3 Content, through soil (Cu+Zn+B) (10kg, 20kg, 5 kg ha^{-1}), T_4- RDF + Cu (10 kg ha^{-1}) soil application at the time of sowing, T_5- RDF + Zn (20 kg ha^{-1}) soil application at the time of sowing, T_6- RDF + B (5 kg ha^{-1}) soil application at the time of sowing, T_7- RDF + foliar application at 15, 35 & 55 DAS of Cu + Zn + B @ 1%, T_8- RDF + foliar application at Cu at 15, 35 & 55 DAS @ 1%, T_9- RDF + foliar application at Zn at 15, 35 & 55 DAS @ 1%, T_{10}- RDF + foliar application at B at 15, 35 & 55 DAS @ 1%. Total 16 observations on growth attributes, yield and yield attributes, and quality were recorded. that among all the treatment T_7 (RDF+$CuSO_4$+$ZnSO_4$+B spraying @ 1% at 15, 35 and 55 DAS) was at par with treatment T_9 (RDF + Zn 1% spraying at 15, 35 & 55 DAS) and T_3 (RDF+Zn@20kg ha^{-1}+Cu@ 10kg ha^{-1}+B @ 5kg ha^{-1} soil application at the time of sowing) and significantly superior over rest of the treatments. Application of micronutrients through foliar sprays gave significant results as compared to soil application under late sown condition.*

Key words : Wheat, Micronutrients, Zinc, Copper, Boron

Introduction

Sowing of wheat is delayed generally due to late harvest of some *kharif* crops and resulted in poor yield. The delayed sowing also affects the efficiency of inputs such as fertilizer and water. However, the adoption of improved agronomic practices, suitable varieties and fertilizer dose can increase crop productivity. Growing suitable late sown varieties with proper dose of fertilizer increase growth and yield of crop.

The role of macro and micronutrients is crucial in yields. Nitrogen is a primary constituent of proteins and thus all enzymes (Raun and Johnson, 1999). Six micronutrients i.e. Mn, Fe, Cu, Zn, B and Mo are known to be required for all higher plants. These have been well documented to be involved in photosynthesis, N-fixation, respiration and other biochemical pathways (Marschner, 1986, Romheld, 1987 and Warman, 1992).

The micronutrients play an important role in increasing crop yield. Micronutrients have prominent effects on dry matter, grain yield and straw yield (Asad and Rafique, 2000). Iron plays role in biological redox system, enzyme activation and oxygen carrier in nitrogen fixation (Romheld and Marschner, 1991); zinc is important to membrane integrity and phytochrome activities copper is vital for physiological redox processes, pollen viability and lignification (Marschner, 1995) and boron is required for reproductive plant parts cell wall formation and stabilization, membrane integrity, carbohydrate utilization, stomatal regulation and pollen tube formation (Marschner, 1995). Therefore much attention is needed for adequate and balanced use of macronutrients along with micronutrients to enhance

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the response of wheat to organic fertilizers (Baddaruddin*et al.*. 1999).

Considering the above points, experiment was conducted to study the response of micronutrient (Zn, Cu & B) for wheat crop variety (NIAW 1994) under late sown condition. With an object to Study the effect of micronutrients (Cu, Zn, B) on growth and yield, to study the effect of micronutrients on quality of wheat and to study the effect of micronutrients on physiological traits in wheat.

Materials and Methods

A field experiment was conducted to study response of micronutrients (Zn, Cu & B) to wheat crop variety (NIAW 1994) under late sown condition at Wheat &Maize Research Unit, VNMKV, Parbhani during *rabi* 2015-16. The crop was sown in plot of 6 x 2.16 m with 18 cm spacing between rows. Fertilizer were applied at the rate of 90kg N, 50kg P and 40 kg K along with recommended package of practices and plant protection measures. The experiment was laid out in randomized block design (RBD) with three replications and ten treatments : T_1- Control, T_2-RDF (90:50:40 kg NPK ha^{-1}), T_3- RDF + 3 Content, through soil (Cu+Zn+B) (10kg, 20kg, 5 kg ha^{-1}), T_4- RDF + Cu (10 kg ha^{-1}) soil application at the time of sowing, T_5- RDF + Zn (20 kg ha^{-1}) soil application at the time of sowing, T_6- RDF + B (5 kg ha^{-1}) soil application at the time of sowing, T_7- RDF + foliar application at 15, 35 & 55 DAS of Cu + Zn + B @ 1%, T_8- RDF + foliar application at Cu at 15, 35 & 55 DAS @ 1%, T_9- RDF + foliar application at Zn at 15, 35 & 55 DAS @ 1%, T_{10}- RDF + foliar application at B at 15, 35 & 55 DAS @ 1%. Total 16 observations on growth attributes, yield and yield attributes, and quality were recorded *viz*., plant height (cm), total no. of tillers m^{-2}, dry matter accumulation g plant^{-1}, total no. of productive tillers m^{-2}, panicle emergence (DAS), day to 50% flowering (DAS), chlorophyll index at 90 DAS (SPAD), panicle length (cm), spikelet fertility (%), no. of grains panicle^{-1}, test weight (g), grain yield (kg/plot), harvest index (%), gluten content (%).

Results and Discussion

Data pertainingto different growth, yield and yield attributing traits are presented in Table 1 & 2. For plant height differences were non-significant at 30 DAS and at 60, 90 and at harvest stage treatment differences were significant. Treatment T_7 (RDF+$CuSO_4$+$ZnSO_4$+B@1% foliar application at 15, 35.&55) was at par with treatment T_9 (RDF + Zn 1% spraying at 15, 35 & 55 DAS) and T_3 (RDF + Zn@20 kg ha-^{1}+Cu @10 kg ha-^{1}+B@ 5kg ha-^{1}soil application at the time of sowing) and significantly superior over rest of treatments (Table 1). Similar result was found by Khan *et al.*. (2006). Total no. of tillers m-^{2} were found non-significant at 30 DAS, however at 60, 90 and at harvest results were found significant. Treatment T_7(RDF + $CuSO_4$ + ZnS O_4 +B spraying @ 1% at 15, 35 and 55 DAS) was at par with treatment T_9 (RDF + Zn 1% spraying at 15, 35 & 55 DAS) and T_3 (RDF+Zn@20kg ha^{-1}+Cu@ 10kg ha-^{1}+B @ 5kg ha^{-1} soil application at the time of sowing) and significantly superior over rest of the treatments (Table 1). These results coincide with Uddin*et al.*. (2008). Differences for total no. of productive tillers meter^{-2} were found significant. Treatment T_7 (RDF+$CuSO_4$+$ZnSO_4$+B spraying @ 1% at 15, 35 and 55 DAS) was at par with treatment T_9 (RDF + Zn 1% spraying at 15, 35 & 55 DAS) and T_3 (RDF+Zn@20kg ha^{-1}+Cu@ 10kg ha-^{1}+B @ 5kg ha^{-1}soil application at the time of sowing) and significantly superior over rest of treatments (Table 2). Spike length or panicle length was found significant. Treatment T_7 (RDF+$CuSO_4$+$ZnSO_4$+B spraying @ 1% at 15, 35 and 55 DAS) was at par with treatment T_9 (RDF + Zn 1% spraying at 15, 35 & 55 DAS) and T_3 (RDF+Zn@20kg ha^{-1}+Cu@ 10kg ha-^{1}+B @ 5kg ha^{-1}soil application at the time of sowing) and significantly superior over rest of treatments(Table 2).These results are in agreement with Abbas *et al.*(2013) reported that spike length may increase due to availability of nutrients in rhizosphere.Significant difference was recorded for test weight. Treatment T_7 (RDF+$CuSO_4$+$ZnSO_4$+B spraying @ 1% at 15, 35 and 55 DAS) was at par with treatment T_9 (RDF + Zn 1% spraying at 15, 35 & 55 DAS) and T_3 (RDF+Zn@20kg ha^{-1}+Cu@ 10kg ha-^{1}+B @ 5kg ha^{-1}soil application at the time of sowing) and significantly superior over rest of treatments (Table 2). This might due to enhanced accumulation of assimilates in grain; present results are also supported by Soleimani (2006).Chlorophyll index (SPAD) recorded significant differences, treatment T_7 (RDF+$CuSO_4$+$ZnSO_4$+B spraying @ 1% at 15, 35 and 55 DAS) was at par with treatment T_9 (RDF + Zn 1% spraying at 15, 35 & 55 DAS) and T_3 (RDF+Zn@20kg ha^{-1}+Cu@ 10kg ha-^{1}+B @ 5kg ha^{-1}soil application at the time of sowing) and significantly superior over rest of treatments (Table 2). Similar findings for chlorophyll index were recorded