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Research Article

Efficacy of micro nutrients for controlling diseases in transplanted rice

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Abstract

The experiment was conducted to evaluate micro nutrients i.e. $MnSO_4$ (T-2), Na-Silicate (T-3), Borax (T-4), $MnSO_4$+Na-Silicate (T-5), $MnSO_4$+Borax (T-6), Na-Silicate+Borax (T-7), $MnSO_4$+Na-Silicate+Borax (T-8), Thiovet (T-9) and $FeSO_4$ (T-10) each was used as foliar spray @1.25 $kgha^{-1}$ for controlling diseases compared to Control (T-1) at Adaptive Research Farm, Gujranwala during Kharif 2010-2012. Maximum disease control (%) was recorded by spraying of $MnSO_4$+Borax (33.80%; 32.30 & 32.91%) followed by Na-Silicate+Borax (31.73%; 31.93% & 32.13%) compared to control. Maximum 1000 grain wt. was recorded in $MnSO_4$+Borax (25.22; 23.42 & 23.22g) followed by $MnSO_4$+Na-Silicate+Borax (24.07; 22.83 & 22.69g) compared to control (18.78; 18.27 & 17.53g). Maximum benefit was recorded in $MnSO_4$+ Borax (Rs. 27651ha^{-1}) followed by Na-Silicate+Borax (Rs.18476ha^{-1}); Thiovet (Rs.15200ha^{-1}) respectively. At the end the farmers were advised to use $MnSO_4$+Borax; Na-Silicate+Borax; Thiovet and $MnSO_4$+Na-Silicate+Borax for controlling diseases.

Keywords: Micro nutrients, Effectiveness, diseases, Basmati Rice, Gujranwala.

Introduction

Importance of sustainable agriculture has become one of the most important issues in agriculture. Diseases attack the crops and cause huge loss to the farmers. No doubt pesticides are important in modern farming but quality and human health are also equally important as the quantity (Iqbal *et al*., 2009). So that it is an imperative to find alternative measures for controlling diseases which are environment friendly and increase yield and product quality (Batish *et al.*, 2007). On the other hand nutrients are important for plant growth; micro organisms and creating resistance against diseases (Agrios, 2005). Silicon is involved to control many diseases such as blast, brown spot, sheath blight, bacterial leaf blight and bacterial leaf streak in rice crop. It creates physical barrier to restrict fungal hyphae penetration into the cell wall of leaf sheath and accumulation of anti-fungal compound (Alvarez *et al*., 2004). Manganese helps for controlling diseases and plays vital role in lignin and phenol biosyntheses, photosynthesis and several other functions in plants. Boron plays an important role in cell wall structure; cell membrane and metabolism (Lichtfouse and Lal., 2009). These nutrients are essential elements for plant growth and act as biocides; cost effective; environment friendly; controlling plant diseases and having no residual effect. This study has been planned to evaluate the efficacy of some nutrients sprayed single and in combinations at booting stage for controlling rice diseases at Adaptive Research Farm, Gujranwala, Punjab.

Materials and Methods

The experiment was conducted to evaluate micro nutrients i.e. $MnSO_4$ (T-2), Na-Silicate (T-3), Borax (T-4), $MnSO_4$+ Na-Silicate (T-5), $MnSO_4$+ Borax (T-6), Na-Silicate + Borax (T-7), $MnSO_4$+ Na-Silicate+ Borax (T-8), Thiovet (T-9) and $FeSO_4$ (T-10). Each was used as foliar application @1.25 $kgha^{-1}$ for controlling rice diseases compared with Control (T-1) at Adaptive Research Farm Gujranwala during Kharif 2010-2012. Recommended dose of DAP and SOP was spread in the field just before planking. Transplanting of basmati rice was done manually at 30th of July each year. Acetachlor @ 250 $mlha^{-1}$ was applied 03 DAT in the field with shaker bottle and keep water level upto 3 inches for 20 days. $ZnSO_4$ 21% crystalline form was spread @ 25 $kgha^{-1}$ in the field 15 DAT and urea was spread @ 250 $kgha^{-1}$ 35 DAT and 75 DAT. Cartap @ 22.50 $kgha^{-1}$ was spread twice against attack of borers, leaf folders and hoppers after thorough pest scouting after 60 and 90 DAT. No fungicides to control diseases were sprayed in the field; all the agronomic and plant protection measures were kept constant to avoid any biasness. The micro-nutrients were sprayed at booting stage with knap sack hand sprayer using 250 lha^{-1} water. The data was recorded before and after spraying of these nutrients and disease control percentage was calculated and compared with control (T-1). The parameters i.e disease control percentage, 1000 grain wt (g), yield (tha^{-1}) and economic analysis were recorded. The increase in yield over control (tha^{-1}) was recorded by taking mean yield of three years. The normality of the data was tested by Shapiro-wilk Test and analyzed statistically by using analysis of variance technique at 5% level of probability (Steel *et al*., 1997).

Results and Discussion

Disease control

Figure 1 maximum disease control was recorded in $MnSO_4$+ Borax; (33.80%, 32.30% and 32.91%) and Na-Silicate + Borax (31.73%, 31.93% and 32.13%) during respective years they were statistically non-significant with each other followed by $MnSO_4$+ Na-Silicate+ Borax (29.64, 29.14 & 29.07); Thiovet (28.15, 27.10 & 26.96); $MnSO_4$+ Na-Silicate (25.15, 24.72, 24.12); $FeSO_4$ (23.13, 22.90, 22.13); Borax (18.90, 18.09 and 17.15); $MnSO_4$+ Na-Silicate (11.10, 11.85 and 11.75) and Na-Silicate (10.10, 10.90 and 10.52) compared with untreated control (0%). Disease control percentage was recorded by using rating scale previously illustrated by (Chaudary *et al*., 2009). These results are in accordance with (Miah, 1985, Mia *et al*., 2001, Aluko, 1975 and Ahmad *et al*., 2002) who reported that diseases of cereals caused huge loss to the crops. It was reported by (Shabana *et al*., 2008) that disease pathogens of rice were controlled by using phenol-antioxidants.

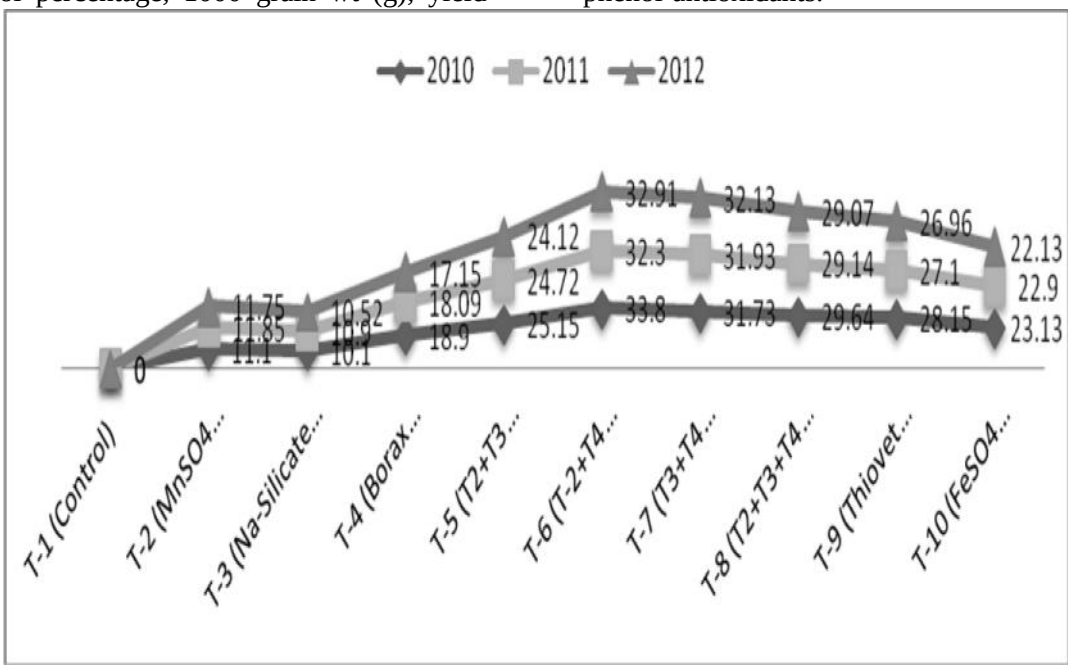

Fig 1 showing efficacy of micro nutrients for controlling disease (%)

1000 grain weight (g)

Figure 2 showed that maximum 1000 grain wt. was recorded in $MnSO_4$+ Borax (25.22; 23.42 & 23.22g) followed by $MnSO_4$+ Na-Silicate+ Borax (24.07; 22.83 & 22.69g); Na-Silicate + Borax (24.02, 22.39 & 22.42); Thiovet (23.13, 22.66 & 22.53); $FeSO_4$ (22.10, 20.91 & 20.72) during three years. However the lowest grain wt. was recorded in control (18.78; 18.27 and 17.53g) during kharif 2010-2012. These results were in accordance to (Alvarez *et al*., 2004 and Shabana *et al*., 2008).

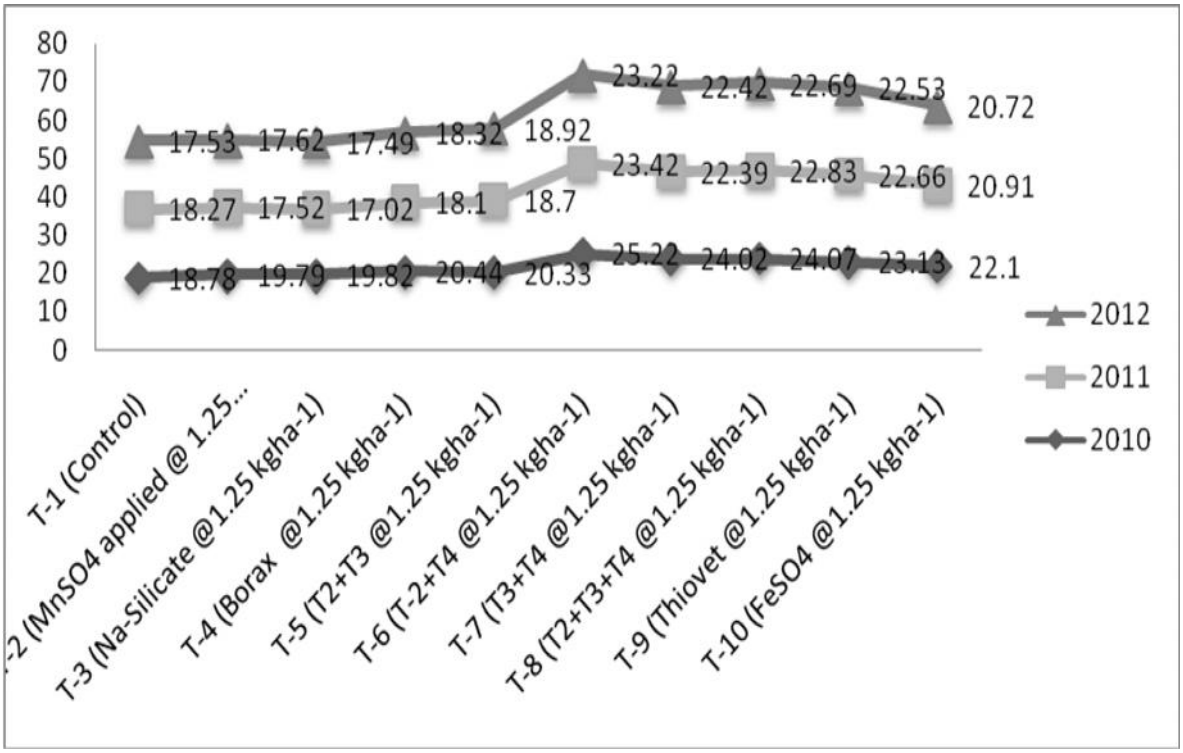

Fig 2 showing efficacy of micro nutrients on 1000 grain wt. (g) of paddy

Yield (tha^{-1})

From Table 1 statistically significant difference on yield (tha^{-1}) was recorded within treatments $MnSO_4$+ Borax (4.13) followed by Na-Silicate + Borax (3.83); $MnSO_4$+ Na-Silicate+ Borax (3.80); Thiovet (3.64); $MnSO_4$+ Na-Silicate (3.51) and $FeSO_4$ (3.47). However treatments T-7 and T-8; T-9 and T-10 showed statistically non significant effect with each other during kharif 2010. A non significant difference on yield (tha^{-1}) was recorded amongst $MnSO_4$+ Borax (3.19), $MnSO_4$+ Na-Silicate+ Borax (3.08) and Na-Silicate + Borax (3.03) followed by Thiovet (2.76) and FeSO4 (2.72). However treatments T-9 and T-10 was statistically non significant from each other during 2011. However no significant difference on yield (tha^{-1}) was also recorded amongst $MnSO_4$+ Borax (3.18); Na-Silicate + Borax (3.08); $MnSO_4$+ Na-Silicate+ Borax (3.02) but showed significant effect with $MnSO_4$+ Na-Silicate (2.90); $FeSO_4$ (2.83); Borax and Thiovet (2.75) treatments during 2011. On the other hand non significant effect in yield (tha^{-1}) was recorded within blocks by $MnSO_4$+ Borax (4.13; 3.19; 3.18); Na-Silicate + Borax (3.08; 3.03) and $MnSO_4$+ Na-Silicate+ Borax (3.08 and 3.02) except treatments Na-Silicate + Borax (3.83) and $MnSO_4$+ Na-Silicate+ Borax (3.80) during 2010. However significantly lowest yield (tha^{-1}) was recorded by untreated control plot (2.96; 2.31 and 2.59) during 2010-12. These results were in accordance to the findings of (Savary *et al*., 2000) who reported that diseases of rice caused qualitative loss in yield upto 5%.

Table 1 showing impact of micro nutrients on yield and economic analysis of paddy

Treatments	Yield (tha^{-1})			Increase in yield over control (tha^{-1})	Additional Income ($Rs\ ha^{-1}$)	Extra Cost ($Rs.\ ha^{-1}$)	Net Benefit ($Rs.\ ha^{-1}$)
	2010	2011	2012				
(T-1) Control	2.96f	2.31e	2.59d	-	-	-	-
(T-2) MnSO4 applied @ 1.25 $kgha^{-1}$	3.24d	2.46d	2.74c	0.19	7125	2787	4338
(T-3) Na-Silicate @1.25 $kgha^{-1}$	3.14e	2.39de	2.72cd	0.13	4875	4737	138
(T-4) Borax @1.25 $kgha^{-1}$	3.33d	2.46d	2.81bc	0.25	9375	2662	6713
(T-5) MnSO4+ Na-Silicate @1.25 $kgha^{-1}$	3.51c	2.54d	2.90b	0.36	13500	7524	5976
(T-6) MnSO4+ Borax @1.25 $kgha^{-1}$	4.13a	3.19a	3.18a	0.88	33000	5349	27651
(T-7) Na-Silicate + Borax @1.25 $kgha^{-1}$	3.83b	3.03ab	3.08a	0.69	25875	7399	18476
(T-8) MnSO4+ Na-Silicate + Borax @1.25 $kgha^{-1}$	3.80b	3.08a	3.02a	0.68	25500	10986	14514
(T-9) Thiovet @1.25 $kgha^{-1}$	3.64c	2.76c	2.75bc	0.43	16125	925	15200
(T-10) FeSO4 @1.25 $kgha^{-1}$	3.47c	2.72c	2.83bc	0.39	14625	1412	13213

LSD 0.050.172 0.149 0.137 Calculation based on paddy @ Rs. 37500 t^{-1}

Economic analysis

Table 1 showed that all the treatments showed benefit but $MnSO_4$+ Borax (Rs. 27651 ha^{-1}) showed maximum profit followed by Na-Silicate + Borax (Rs. 18476 ha^{-1}); Thiovet (Rs. 15200 ha^{-1}), T-8 (Rs. 14514 ha^{-1}) and $FeSO_4$ (Rs. 13213 ha^{-1}) compared to other treatments in the study. However the lowest economic return was recorded in Na-Silicate (Rs. 138 ha^{-1}) during kharif 2010-2012. The economic analysis was carried out by same method as followed by (Kahloon *et al*., 2012).

Conclusion

It is concluded that although all the micro-nutrients are involved for controlling diseases of rice. However the farmers are advised to use $MnSO_4$+ Borax; Na-Silicate + Borax; Thiovet and $MnSO_4$+ Na-Silicate+ Borax for controlling diseases. In sustainable agriculture balanced nutrition is essential component of Integrated Crop Management (ICM) which are cost effective; environment friendly; no residual effect; safe for human beings and naturally growing populations.

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