Strategies to Address Soil Micronutrient Deficiencies for Flooded Rice

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Problems

- Multiple micronutrient deficiencies (Zn, Mn, Cu, B, Mo) occur in soils of the South Asia and are becoming more prevalent as cropping intensity increases.
- Low soil organic matter levels and little retention of crop residues and limited return of animal manures to soils exacerbate these deficiencies.
- A soil testing for micronutrient is not widely available in the region and soil maps have limited value in Bangladesh because man has altered much of the landscape.
- Farmers in Bangladesh are, for the most part, not using micronutrient even in areas with known deficiencies.

Solution

- Micronutrient enriched seed, seedling root soaking, micronutrient application in seedbed may be alternative methods as strategies for overcoming Micronutrient deficiencies of flooded rice.
- Soil solarization in seedbed or main plots can be raised soil temperature and increased availability of micronutrients and reduced diseases infestation by killing soil born pathogens.

Materials and Methods

- The treatments for six micronutrients, Zn, Mn, Cu, Mo, B and Ni were used, the total amount of micronutrient sprayed was 4kg/ha for Zn and Mn, 1 kg/ha for Cu and 0.5 kg/ha for B, Mo and Ni.
- All foliar applications of micronutrients were made during crop growth, beginning at early tillering and ending at grain filling stage.
- Enriched and un-enriched seed also used as treatments.
- Soil solarization was done by covering either seedbed or main field by transparent polythene sheet.
- The blanket dose of fertilizer N_{100} P_{26} K_{48} S_{20} kg/ha was used.

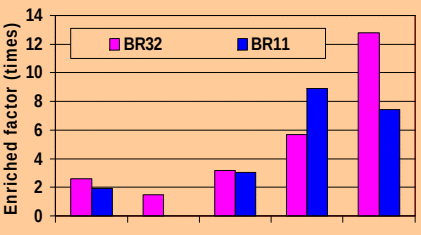

Fig. 1 Enriched of rice grain by foliar application of micrinutrients in 1997

Important Findings

- A substantial enrichment of Zn, Cu, Mo and Ni was achieved by spraying micronutrient at different growth stages of rice.
- The yield of three popular monsoon rice varieties in Bangladesh did not respond to foliar application of micronutrients. However, three other newer lines were responsive.
- A 26 and 19% yield increased of BR32 was found to micronutrient sprays over control in 1997 and 1999, respectively.
- Enriched rice seed significantly increased yield of BR32 by 1.1 t/ha (37%) in 1998 and by 0.74 t/ha (21%) in 1999 over un-enriched seed at on station trials.
- Micronutrient enriched seed of BR32 gave significantly higher yield in 12 out of 17 on farm sites
- The average yield increased was 22 over un-enriched seed, where enriched seed performed better.
- Application of 4 Zn kg ha-1 to the soil only increased yield by 18% compared to 41% with seed enrichment over control in Zn deficient soil.
- All micronutrient application methods could increase rice yields, but micronutrient application in seedbed as basal and micronutrient enriched seed were most effective.
- The percent yield increased was 28 and 36% for solarized seedlings over non-solarized seedlings on station and on farm trials, respectively.
- Solarized seedlings transplanted in solarized plots produced higher yield than non-solarized plots.

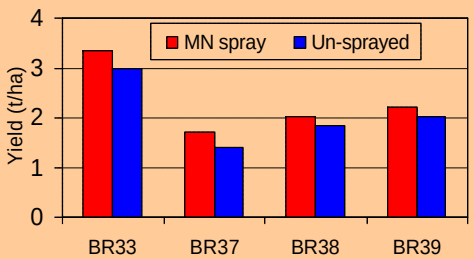

Fig. 2 Effect of MN spray on yield of rice varieties in 2000

Conclusion

- The results indicated that micronutrient enriched seed could produce higher rice yields, and that was even more effective than soil application of the same micronutrients. Also micronutrient application to the soil of the seedbeds as basal was equally effective to produce higher rice yields.
- Farmers could use enriched seed or could apply micronutrients to the soil of the seedbed as basal to overcome micronutrient deficiencies and to get higher yields.
- The seedlings from the solarized seedbed or solarized main plots could increase rice yield. Farmers could use these technologies to get higher yields.

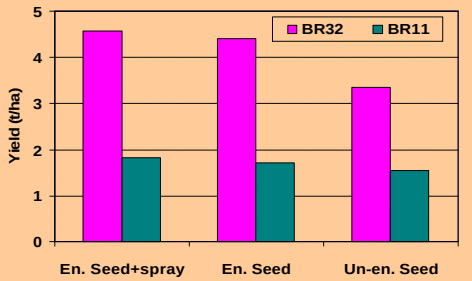

Fig. 3 Impact of MN enriched seed of BR32 and BR11 in 1998

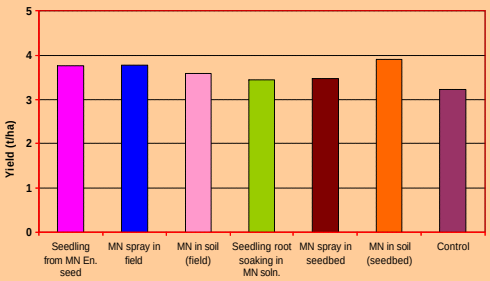

Fig. 4 Effect of micronutrient application methods on yield of rice, BR32 in 2000

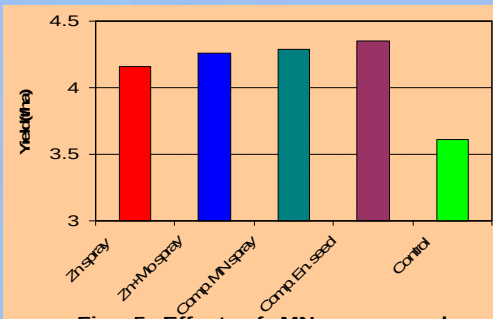

Fig. 5 Effect of MN spray and enriched seed on rice (BR32) yield in 1999

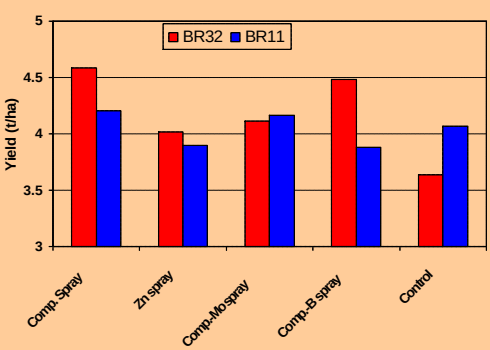

Fig. 6 Effect of micronutrient spray on yield of BR32 and BR11 in 1997