

Impact of corn stubble management under different tillage systems on nitrogen dynamics of the subsequent wheat crop in a cereal based cropping system

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INTRODUCTION

Finding of an appropriate tillage systems combined with effective strategies of residue management practices could enhance organic N pools, and ultimately available N for the subsequent crop production. Therefore, there is a need for residue management practices in continuous cereal based cropping systems that could alleviate decline in soil fertility status. The aim of our study is to enhance the organic source of soil mineral N pools in a cereal based cropping system with residue management practices and tillage systems for sustainable crop production and productivity.

MATERIAL AND METHODS

- Spring wheat was tested during 2009-11 under irrigated conditions in a continuous crop rotation of corn-wheat on silt clay loam soil of Cereal Crops Research Institute Pirsabak, Nowshera, Pakistan.
- Main Factor: Three tillage systems, 1) minimum (rotavator=10 cm), 2) conventional (cultivator=20 cm) and 3) deep (moldboard =30 cm)
- Sub Factor: Six corn stubble management practices (RM) 1) physical removal, 2) burn and 3) incorporation alone, 4) physical removal + 120 kg N ha⁻¹, 5) burn + 120 kg N ha⁻¹ and 6) incorporation + 120 kg N ha⁻¹
- A total of 18 treatments laid out in split plot design with four replications.

RESULTS

- Significantly higher total nitrogen uptake by plant (127.15 kg ha⁻¹), nitrogen uptake efficiency (42.00 g kg⁻¹ soil N), nitrogen harvest index (59.10 %) and grain yield (3833 kg ha⁻¹) were observed in the residue incorporated plots mix with N fertilizer (Figs. 1, 3, 4 & 5) as compared to other residue managed plots either in sole or mix with fertilizer N.
- Statistically higher (60.17 kg grain ha⁻¹/ kg N supply ha⁻¹) nitrogen use efficiency were observed over the years in sole bare plots followed by sole burned plots (53.92 kg grain ha⁻¹/ kg N supply ha⁻¹) and sole incorporated plots (53.27 kg grain ha⁻¹/ kg N supply ha⁻¹) (Fig. 4).

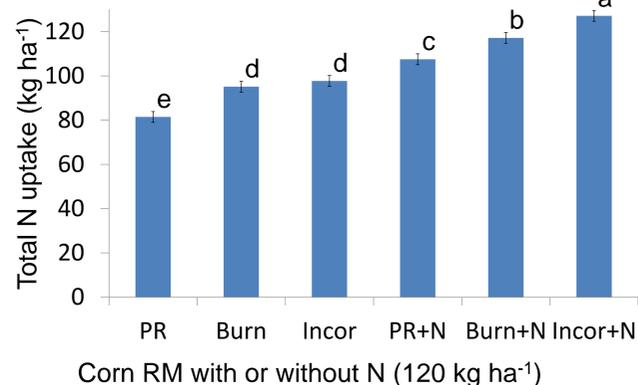


Fig.1. Different corn stubble management practices effects on total N uptake by wheat

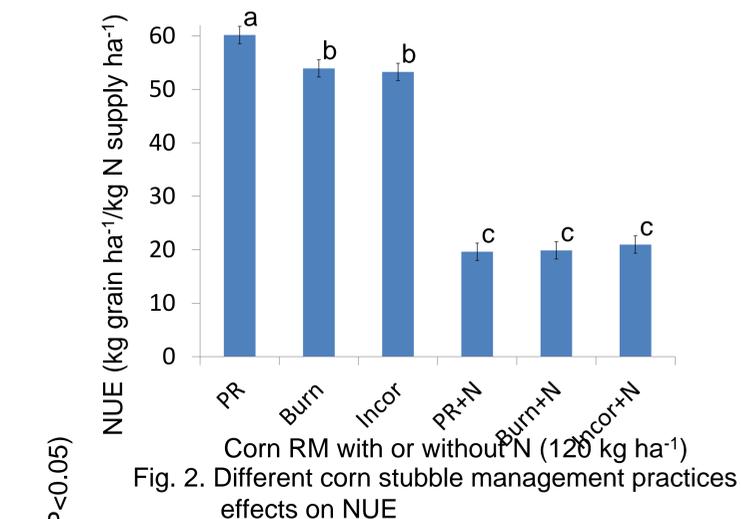


Fig. 2. Different corn stubble management practices effects on NUE

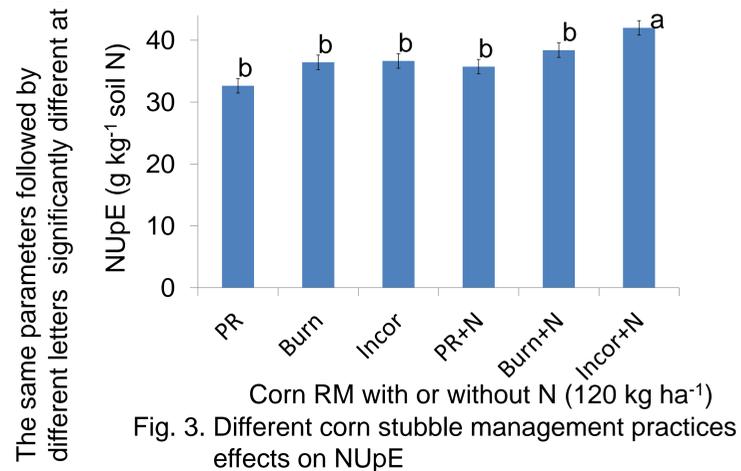


Fig. 3. Different corn stubble management practices effects on NUpE

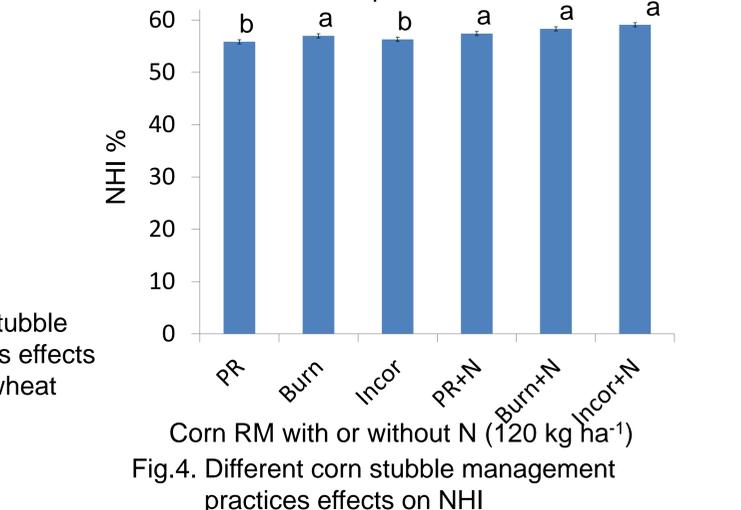


Fig.4. Different corn stubble management practices effects on NHI

- Tillage system effect was not significant, however; minimum tillage resulted in increasing total N uptake by plant, NUpE, NHI and grain yield as compared to conventional and deep tillage system.

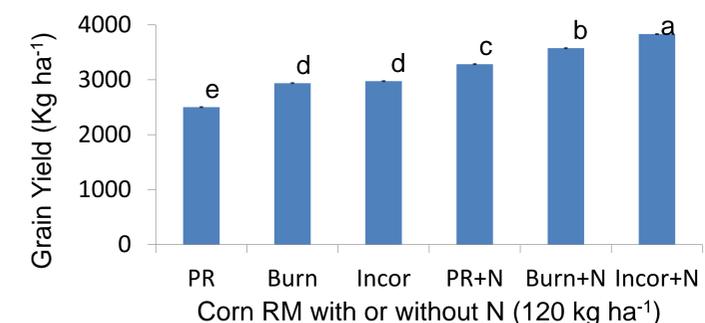


Fig. 5. Different corn stubble management practices effects on grain yield

CONCLUSION

Short term residue incorporation with N fertilizer application had significantly increased mineral N pools by increasing total nitrogen uptake, N uptake efficiency, NHI and grain yield as compared to residue removal and burning alone or with fertilizer N. This improvement in mineral source of soil nitrogen is foster by minimum tillage and addition of recommended dose of N-fertilizer for the subsequent wheat crop that probably narrowed the wide C/N ratio of corn residue for microbial mineralization prior and during the growth season.

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