SELECTED SOIL CHEMICAL PRORPERTIES UNDER THE INFLUENCE OF CROPPING SYSTEM, SITE AND NITROGEN FERTILIZATION

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INTRODUCTION

The conservational cropping systems such as rotation and intercropping are known to improve soil structure and fertility. Cropping system has an immense effect on physical and chemical soil properties and also on crop productivity. The main objective of this study was to determine the soil chemical composition amongst different sites and cropping systems.

MATERIALS AND METHODS

A factorial experiment randomized in complete block design with two replications was conducted during 2011/12 and 2012/13 planting seasons. The experiment consisted of five management systems, namely, monocropping cowpea, Monocropping maize, rotational maize, rotational cowpea and intercropping maize-cowpea. The amount of 0 and 95; 0 and 92; 0 and 113.5 kg N ha-1 were applied on maize plots, while the amount of 0 and 20; 0 and 17; 0 and 23.5 kg N ha-1 were applied on cowpea plots at Potchefstroom, Rustenburg and Taung respectively. The laboratory analysis involved soil N-NO3, N-NH4, Bray 1-P and exchangeable K. The level of significant was at (P< 0.05).

RESULTS

Soil nitrate (N-NO3) content at harvest

Cropping system had significant effect on soil nitrate (Figure 1). Cowpea plots planted on intercropping, rotational and monocropping systems had significantly higher soil nitrate of 3.12, 3.24 and 3.68 mg kg-1 respectively than other cropping systems. Site had significant effect on soil nitrate. Soil collected at Potchefstroom and Taung had significantly higher soil nitrate of 3.10 and 2.83 mg kg-1 respectively than soil collected at Rustenburg. Nitrogen fertilizer had also showed significant effect on soil nitrate. Plots applied with N fertilizer had significantly higher soil nitrate of 2.95 mg kg-1 than plots without N fertilizer application. Soil nitrate was significantly higher at the depth of 0-15 cm (3.55 mg kg-1) than at the depth of 15-30 cm. The interaction of cropping system x soil depth; site x soil depth and site x season had significantly affected soil nitrate.

Soil ammonium (N-NH4) content at harvest

Site had significant effect on soil ammonium (Figure 2). Soil collected at Potchefstroom and Rustenburg had significantly higher soil nitrate of 0.94 and 0.60 mg kg-1 respectively than soil collected at Taung. Soil ammonium was significantly higher at the depth of 0-15 cm (0.71 mg kg-1) than at the depth of 15-130 cm. Season had significant effect on soil ammonium. Soil collected during 2011/12 planting season had significantly higher soil ammonium of 0.73 mg kg-1 than soil collected during 2012/13 planting season. The interaction of site x soil depth and site x season had significantly affected soil ammonium.

Soil Bray 1-P content at harvest

Cropping system had significant effect on soil Bray 1-P (Figure 3). Maize plots planted on monocropping and intercropping systems had significantly higher Bray 1-P of 13.56 and 14.67 mg kg-1 respectively than other cropping systems. Site had significant effect on soil Bray 1-P. Soil collected at Potchefstroom and Taung had significantly higher Bray 1-P of 17.45 and 15.46 mg kg-1 respectively than soil collected at Rustenburg. Soil Bray 1-P was significantly higher at the depth of 0-15 cm (18.39 mg kg-1) than soil at the depth of 15-30 cm. Season had also showed significant effect on soil Bray 1-P. Soil collected during 2012/13 planting season had significantly higher Bray 1-P of 13.76 mg kg-1 than soil collected at 2011/12 planting season. The interaction of site x soil depth and interaction of cropping system x site x season had significantly affected Bray 1-P.

Soil exchangeable K content at harvest

Site had significant effect on exchangeable K (Figure 4) . Soil collected at Potchefstroom and Rustenburg had significantly higher exchangeable K of 234.96 and 125.95 mg kg-1 respectively than soil collected at Taung. Soil depth had significant effect on exchangeable K. Soil exchangeable K was significantly higher on the depth of 0-15 cm (176.42 mg kg-1) than at the depth of 15-30 cm. The interaction of site x soil depth; site x season and the interaction of cropping system x site x nitrogen x season had significantly affected exchangeable K.

ACKNOWLEDGEMENTS

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Figure 1. The interaction effects of cropping system, nitrogen fertilization, soil depth and site on soil N-NO3 in mg kg-1.

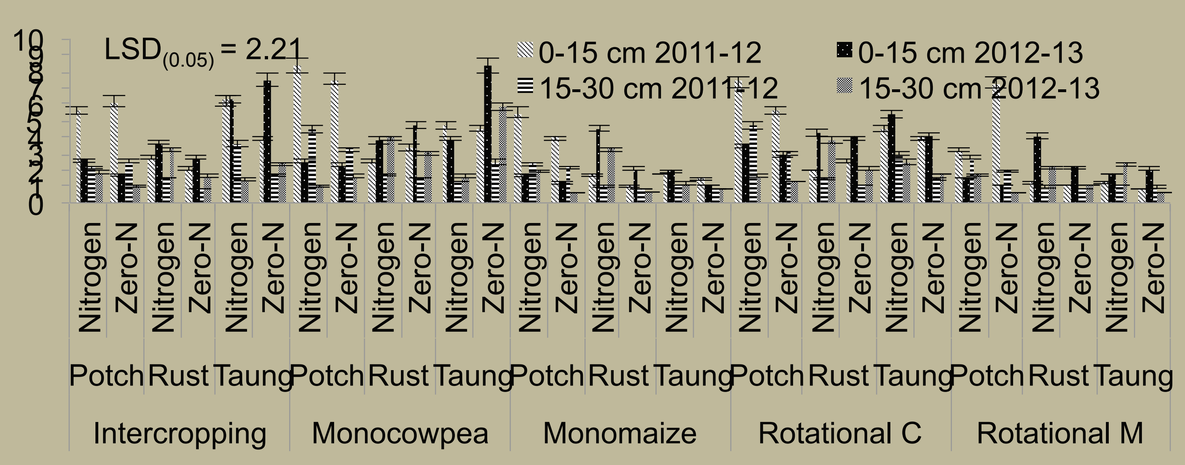


Figure 2. The interaction effects of cropping system, nitrogen fertilization, soil depth and site on soil N-NH4 in mg kg-1.

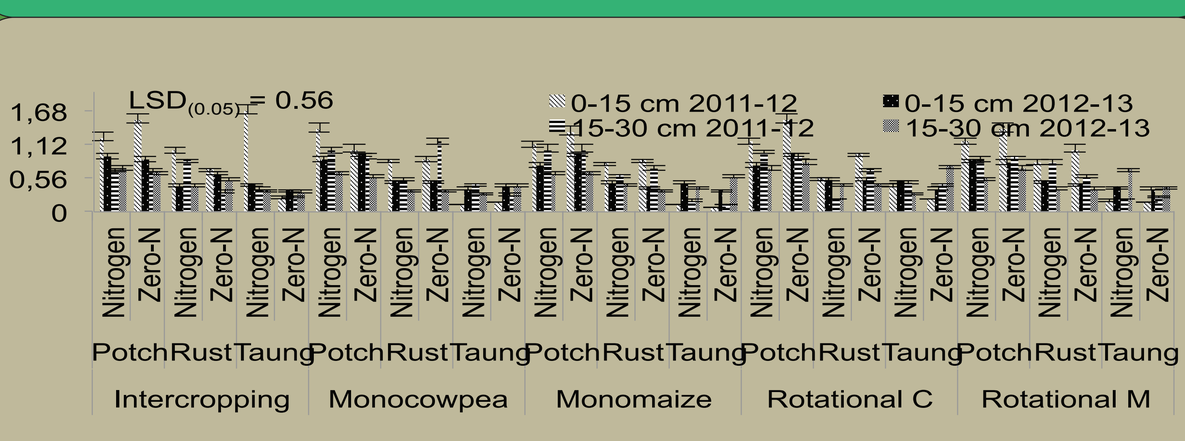


Figure 3. The interaction effects of cropping system, nitrogen fertilization, soil depth and site on soil Bray 1-P in mg kg-1.

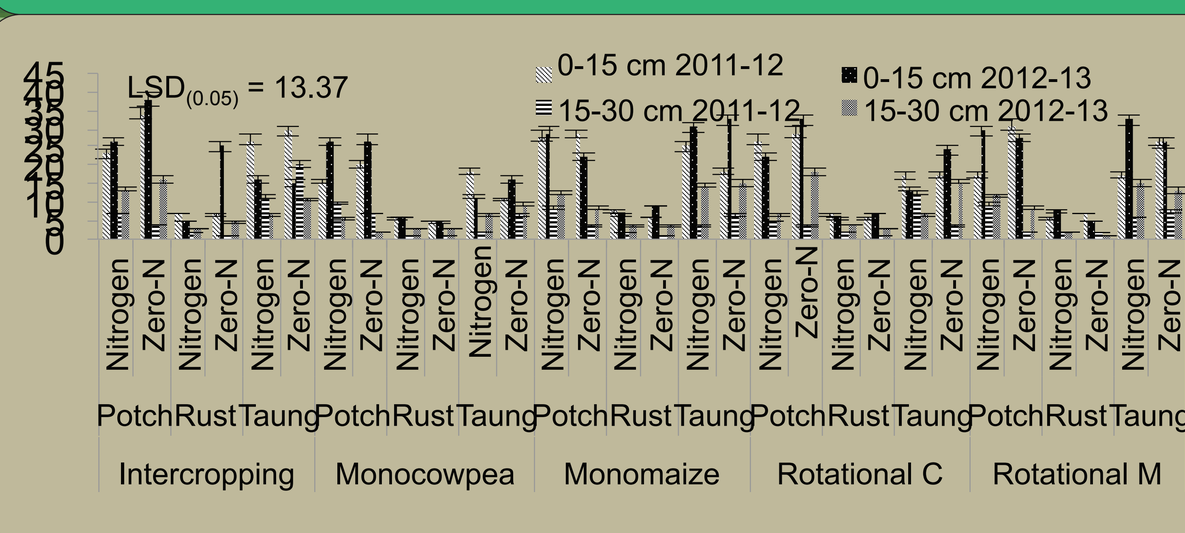
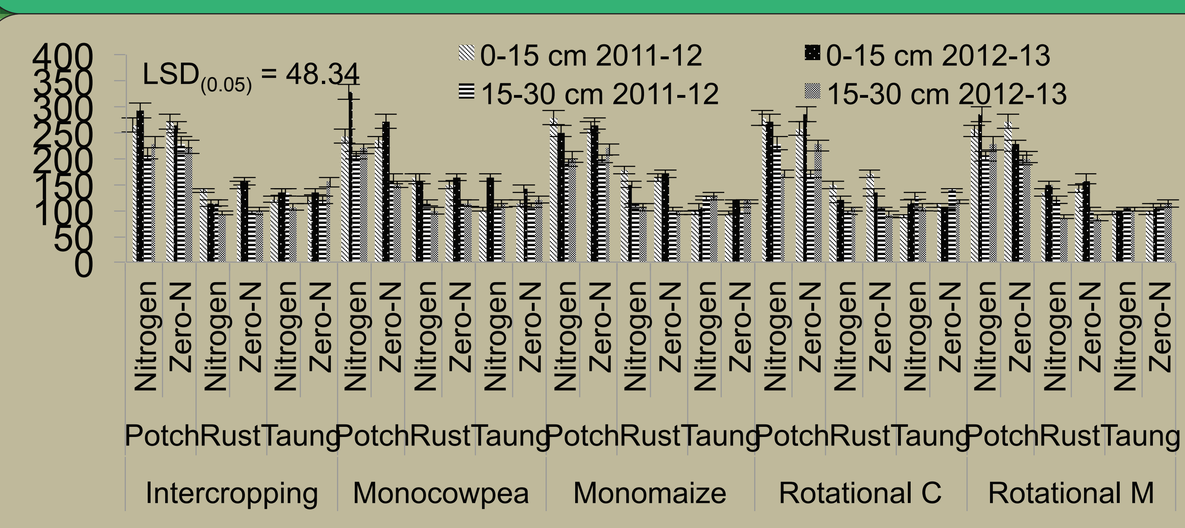


Figure 4. The interaction effects of cropping system, nitrogen fertilization, soil depth and site on soil exchangeable K in mg kg-1.



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