Growth performance and correlation studies on Maize under different soil tillage conditions

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1. Introduction

a) Conservation agriculture maintains soil moisture, improves yield and income and farmland ecosystems (Ibrahim *et al.,* 2020).

b) Negative effects of ploughing like destroyed soil structure, reduced organic matter, water loss, and leaching reduced by no/minimum tillage (Zhang *et al*., 2020)

c) The instability of sole no-tillage can be reduced by straw mulching or residue retention. (Lamptey *et al*., 2020)

d) Short-term effect of conservation tillage practices on maize yield and its correlation with other traits have been evaluated here.

Fig. 1: Maize field, Balindi CAAST plaform, BCKV

2. Materials and Methods

- Five varieties were sown in split plot design in the month of November in 1.08 ha of Rice fallow (each variety 0.189 ha) under two different conservation practices (zero and reduced) along with control. Other standard cultivation practices were followed regarding seed rate and fertilizer doses.
- **Station:** Balindi research farm., BCKV;
- **Season:** 2018-2019
- **Varieties:** 'ADV -9293', 'PAC-751', 'ADV-757', 'ADV-759', 'PAC-741'
- **Land preparation:**
  a) Conventional tillage system was done with disc plough as primary tillage followed by two pass disc harrow and one pass rotavator combined with planking as secondary tillage
  b) The system of reduced tillage was done with disc plough as a primary tillage followed by one pass disc harrow as a secondary tillage. 50% Rice residue of previous year was spread(6.5t/ha). The soil type was sandy loam.
- **Analysis:** The statistical analysis was done using Graphpad Prism version 8.

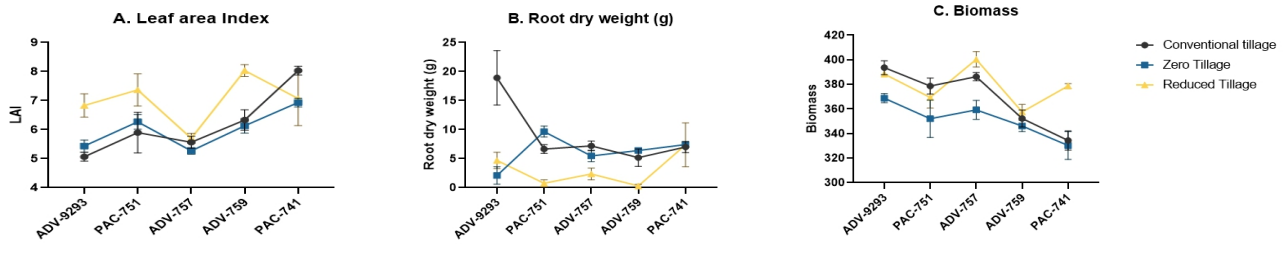

Fig. 2: Growth parameters across three tillage systems (error bars represent standard deviation)

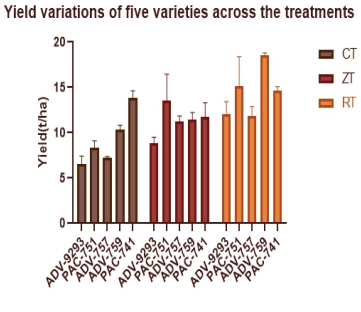

Fig. 3: Yield variations among the varieties under the conventional (CT), zero (ZT) and reduced (RT) tilled systems (error bars represent standard deviation of each observation).

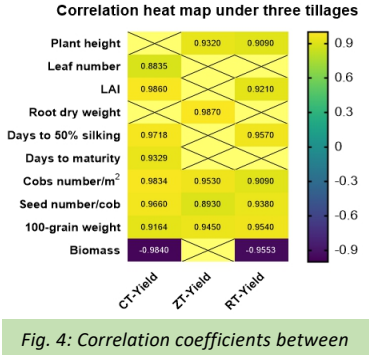

Fig. 4: Correlation coefficients between Yield and other growth and yield parameters under conventional (CT), zero (ZT) and reduced tillage (RT); [X-marked areas have nonsignificant values]

3. Key findings

a) Significant variations in the growth and yield parameters across the varieties and treatments except for leaf numbers.

b) **PAC-751:** highest yield (13.52 ± 2.93 t/ha) in zero tillage, **ADV-759:** highest yield (18.58 ± 0.22 t/ha) in reuced tillage.

c) In zero tillage, yield parameters are positively correlated (P<0.05); while only Plant height (cm) [r=0.932, P<0.05] root dry weight (g) is showing positive yield correlation [r=0.987, P<0.01].

d) In reduced tillage plant height [r=0.909, P<0.05], LAI [r=0.921, P<0.05] and all the yield parameters (P<0.05) are showing positive correlation with yield. Only biomass is showing negative correlation with yield [r= -0.955, P<0.05].

e) Root dry weight has no effect on yield under both conventional and reduced tillage system.

Reference

Ibrahim, M., Khan, A., Anjum Ali, W., Akbar, H., 2020. Mulching techniques: an approach for offsetting soil moisture deficit and enhancing manure mineralization during maize cultivation. Soil Tillage Res. 200, 104631 https://doi.org/10.1016/j. still.2020.104631.

Lamptey, S., Li, L.L., Xie, J.H., Coulter, J.A., 2020. Tillage system affects soil water and photosynthesis of plastic-mulched maize on the semiarid Loess Plateau of China. Soil Tillage Res. 196, 104479 https://doi.org/10.1016/j.still.2019.104479.

Zhang, Y., Xie, D.T., Ni, J.P., Zeng, X.B., 2020. Conservation tillage practices reduce nitrogen losses in the sloping upland of the Three Gorges Reservoir area: No-till is better than mulch-till. Agric. Ecosyst. Environ. 300, 107003 https://doi.org/ 10.1016/j.agee.2020.107003.