Integrated Weed Management in Conservation Agricultural Systems

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Introduction

Weeds cause a significant economic impact more harmful than insects and fungi. An integrated weed management approach is more effective than a single control. Decades of herbicide use as a single weed control method have caused the rise of herbicide-resistant weeds. Weeds are more difficult to manage in Conservation Agriculture (CA) than in conventional agriculture. In Uganda farmers only adopted crop rotation and minimum tillage. Leaving out mulching as a soil cover practice. Therefore, Weed management is perceived by smallholder farmers, extension workers and researchers as one of the main limiting factors for the widespread adoption of CA Hence, knowledge on integrated weed management in conservation agriculture is needed as farmers adopt reduced tillage and soil cover practices

Methodology

Weed management practices were evaluated using a split-plot experimental design with two main plot tillage practices (T_1=Conventional tillage with animal drawn moldboard plough, and T_2=Minimum tillage with G5 animal drawn ripper (Magoye)). The subplot treatments had five soil cover Practices (SC 1= Mulched Maize, SC2=Control no mulch, SC3= Two lines of soybean in between one line of maize, SC4= One line of soybean in between one line of maize, SC5= Pure soybean). The trials were established for 4 rainy seasons on a sandy loam texture (ferrosols) in Lira, Uganda. Maize crop acted as the test crop and soybean provided soil cover (inter-crop). Data on weed density and diversity collected using a wooden square of 100 x 100cm, placed randomly in each plot and weeds enumerated. Diversity Index "H" and "D" were computed. ANOVA was used for analysis.

Results & Discussion

The diversity of weed species was high in plots treated with T_2 under minimum tillage, 2019B (Shannon Weiner diversity index H= 2.1, Simpsons index D=6.2), 2020A (H= 1.8, D=4.9) compared to T_1 under conventional tillage, 2019B (H= 1.78, D=4.25) and, 2020A (H= 1.78, D=4.67). However, the weed density (N) was higher in T_1 compared to T_2, 2019B (N=207.6/ m^2 V's N=127.3/ m^2), 2020A (N=156.2/ m^2 V's 69.9/ m^2). Tillage practice had significant differences in 2019A, 2020A ($P<0.005$) and no significant difference in 2020B and 2020A($P>0.05$). The effect of the five soil cover practices had a significant difference only in 2020B and no significant difference in 2019A, 2020B and 2021A seasons.

Conclusion

It's important to note that the weed diversity and density depended not just on the amount of rainfall per month, but most importantly on the number of rainy days per month. The higher the number of rainy days per month the higher the weed density and diversity. The number of rainy days per month decreased along the 2019A, 2020A, 2020B and 2021A seasons, hence greatly influencing the weed density and diversity in these seasons. Use of Mulching suppressed weed density but led to high weed diversity, soil cover through intercropping soybean in maize significantly influenced weed density, but did not significantly influence weed diversity. Broad leaved weeds constituted 60% in 2019B, but increased to 80% by the end of the trial in 2021A