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Evaluation of *Striga* management strategies for sustainable cereal production in sub-Saharan Africa: A meta-analysis

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Abstract

Striga spp. remain a major constraint to cereal production in sub-Saharan Africa, causing significant yield and economic losses. Effective management is hindered by the parasite's prolific seed production, wide adaptability, genetic variability, and long-term seed viability. Although numerous control options have been proposed, no single strategy has proven sufficiently effective, particularly for smallholder farmers. This meta-analysis quantitatively evaluated the efficacy of available *Striga* control practices. A systematic literature search was conducted using Scopus and Google Scholar databases, identifying 1,555 studies. After applying inclusion and exclusion criteria, 115 peer-reviewed articles were included in the final analysis. Five key response variables were assessed: grain yield, host aboveground biomass, emerged *Striga* count, *Striga* biomass, and *Striga* damage rating. Effect sizes were calculated using the response ratio, and a random-effects model was used to estimate pooled outcomes. The results revealed that all management practices significantly outperformed the control (no intervention), though with varying degrees of effectiveness. On average, *Striga* control practices increased grain yield by 63 % and host biomass by 75 %. Conversely, reductions of 57 %, 53 %, and 28 % were observed in emerged *Striga* count, *Striga* biomass, and damage rating, respectively. Integrated and push-pull management strategies were the most effective, delivering the highest yield increases and *Striga* suppression. Genetic and biological control methods showed moderate efficacy, while chemical and cultural approaches were comparatively less effective. Cumulative probability distributions supported these findings, highlighting integrated management as the most consistent and sustainable approach for *Striga* control in the region. Grain yield had a strong negative correlation with emerged *Striga* count and *Striga* damage rating and positive correlation with host biomass ($p < 0.001$).

Keywords: Grain yield, push-pull, *Striga* control practices, *Striga* suppression