*Enhancing Phytosanitary Systems for Healthy Plants, Safe & Sustainable Trade"*

# Effectiveness of Imazapyr Coated Hybrids and Selected Striga-tolerant Varieties on *S. hermonthica* Management and Maize Yield Performance in Western Part of Kenya


**Presented by:**

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# Introduction

- Maize is the most important cereal crop globally due to its higher demand and wider adaptability
- It is the second most important crop after rice and wheat
- Globally production stood at 1147 MT tonnes in 2021 (Yang and Yan. 2021)
- USA and China contributes about 38% and 23%, respectively (Jaidka *et al*., 2019).
- Primary used for food, biofuels, extraction of starch, oil (Premlatha and Kalamani, 2010)

# Introduction cont’

- In Kenya yield remains below 1.2t/ha-1 compared to 1.9 t/ha in the SSA (Nigatu *et al*,. 2019) and 10.7 t/ha in USA (Ghani *et al*., 2017)
- Decline in yield due weed infestation, decline in soil fertility and climatic changes(Danda *et al*., 2015)
- Among the weeds witch weed (*Striga hermonthica*) causes huge losses 20-100 % (Atera *et al*. 2013)which is estimated at US$7 billion.

# Problem Statement

- Western Kenya is heavily infested with striga affecting 246,000 ha
- Affects the major foodstuff (Maize) leading to paltry harvest <1 t/ha against potential of 5 t/ha
- Pandemic is promoted by continuous mono-cropping, long seed dormancy (up to 20 years), use of contaminated seed, tillage tools, spread by grazing animals.
- Management is difficult due to prodigious seeds production, dependence on strigolactones, early parasitism (75% loss underground), declining soil fertility.

# Justification

- Despite use of intercropping, crop rotation, hand weeding, use of certified seed, application of inorganic fertilizer striga weed still persist.
- Smallholder farmers in region are not able adopt these technologies as they are expensive
- Striga is further spreading to regions where it was not existing
- Adoption of IR seed technology has the ability to manage striga parasitism at its early growing period thus depleting striga seed bank.
- Use of IR is mostly compatible with other existing farming system

# Objectives

**Broad objective**

- To contribute to improved food security of smallholder farmers in Western Kenya through use of Imazapyr resistant (IR) hybrids and resistant/tolerant maize.

**Specific objective**

- To determine the effectiveness of IR hybrid and selected striga-tolerant maize varieties on *Striga hermonthica* control and their yield performance under field conditions in western Kenya

# Methodology

Field experiments were conducted at three sites during the short rains of 2018 and long rains of 2019;

KALRO Alupe Research Station (0°30´N, 34°07´E) that lies at 1157m elevation in Lower Midland (LM3) agro-ecological zone (AEZ) in Busia County.

Rangwe (0°37'S, 34°37'E) which lies at 1700 m elevation in Lower Midland (LM2) AEZ in Homa Bay County (natural infested )

Koibatek Agricultural Training College (10° 35´S, 36°66´E) which lies at 1890 m elevation in upper midland (UM4) AEZ in Baringo County (striga free site).

The experiment was laid on a randomized complete block design (RCBD) with three replicates in each site

Ten early maturity (110-120 days) consisting of H528IR, FRC425IR, KSTP94, GAF4, DK8031, H513, DUMA 43, DH04, Haraka 101 and one local landraces for each site

# Methodology cont'

- Experimental plot measured 4.5 m by 5.0, planted at 0.75m x 0.25m inter and intra-row spacing, respectively
- Two maize seeds were placed in each hill and covered with lighter soil and later thinned, 14 days after planting, to one maize plant per hill giving a final expected plant population of 53,333 ha-1.
- The preconditioned striga seeds were mixed in a ratio of one tea spoonful (2.5 g) of preconditioned striga seeds to 5 kg sand prior to planting in ALUPE station
- Basal application of 60 kg N and 50 kg P2O5 ha-1 using DAP; 18:46 at one tea spoonful per hill and top dressing with CAN applied in two splits.
- Weed flora other than striga were carefully hand pulled at 2, 4 and 8 weeks after planting (WAP) and spraying against fall armyworm was done at first appearance and repeated at intervals of two weeks using Match 50EC at 500 ml ha-1.

# Results

Results showed clear discernible differences in striga related data and response by maize genotypes to S. hermonthica infestation (Table 2).

i) **Duration to striga emergence**

- IR maize genotypes, H528IR and FRC425IR, significantly delayed the emergence of striga by 69-86% to 50-54 days compared to 29-32 days for the commercial susceptible hybrids (Table3).
- The two local landraces, Nyar Uyoma and Shipindi, recorded 10 and 28% delay in striga emergence at Rangwe and Alupe sites respectively (Table3).

# Results cont'

Ii) **Striga emergence count**

- Higher numbers of striga counts were observed in Alupe by 79.1% compared to Rangwe (Table 3)
- In Rangwe IRM reduced the number of shoots per m2 by 58.5% compared to local genotype by 79.5% to commercial genotypes (Table3).
- Similar trends were observed ALUPE

# Results cont'

## iii) Striga damage rating

- There was higher striga damage rating by 5% in Alupe (4.85) compared to Rangwe (4.63). (Table 3)
- Across variety and location the highest striga rating score of 8.20 was recorded in susceptible check (DK8031) and the lowest rating of 2.2 was recorded on H528IR (Table 3)
- use of IR coated varieties reduced the damage score by 69.5% compared to susceptible checks, 37.5% to open pollinated and 17% to the local landraces (Table3).

# Results cont'

Iv) **Number of shoots flowering**

- There was general variation within genotypes in their response to the number of striga shoots that had flowered by the 10th week after planting per m2 (Table 3).
- In general more shoots flowered in Alupe by 27% compared to Rangwe at 10 WAP.
- IRM (FRC425IR, H528IR) had fewer number of shoots that had flowered at the 10WAP compared to all other test varieties used by 89.9% to 1.18-11.76 shoots per m2 in Alupe

## V) plant height

- Height ranged between 146.9 cm (Duma43) to 252 cm (local landraces) in Rangwe to 138.5 cm (DK8031) to 202.2 cm (KSTP94) in Alupe.
- In the control environment (Koibatek ATC) plant height ranged between 176.8 cm (GAF4) to 267.6 cm (KSTP94
- Plants were 16.7% taller in Koibatek compared to Rangwe (Table 4) and 22.5% to Alupe (Table 3),
- similarly plants were 7.0% taller in Rangwe than in Alupe (Table 3).

# Vi) Grain yields

- Results of grain yield performance indicated that there was significant differences ($P<0.05$) in grain yield among the maize genotypes in both sites (Table 2).
- Highest yields were obtained from FRC425IR 2.63 t/ha, H528IR 2.5 t/ha compared to 0.54-0.62 t/ha DH04, Duma43 and DK8031respectively (Table 3).
- Overall IRM genotypes performed better by 50.3% compared to open pollinated genotypes and 79.5% compared to commercial suspetible genotypes in striga infested conditions.
- Additionally, both varieties performed extremely well in Koibatek ATC by 70% compared to Rangwe and 67% compared to Alupe (Table 4).

# vii) Yield differential

- Results indicate that there was variation in yield difference between maize genotypes grown in Striga free environment (Koibatek ATC) and striga infested condition (Alupe and Rangwe) (Table 4).

# Conclusion

- Research findings from this study showed that IR hybrids have the potential of managing striga weed and reducing yield losses in maize in Kenya and enable farmers get substantive yield.
- The two IR coated hybrids FRC425 IR and H528IR used in this study delayed emergence of striga plants, reduced the striga damage and fewer striga plants emerging, resulting in high yields in both condition.

# Recommendations

- Use of IT technology should be integrated with other management strategies to manage striga in striga endemic areas.
- To protect this advanced gains farmers are encouraged to remove rare emerged striga shoots IR maize fields and on some occasion plant IR hybrids that is not coated with the herbicide.

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