

Impact of climate-smart push-pull technology on maize ear rots and mycotoxins: Incidence and severity

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INTRODUCTION

The cropping system is a factor in maize ear rot (pictured below) and their mycotoxin incidence. Additionally, insect pests and nutritional stress are indicated as predisposing factors. The current study was conducted to establish effects of push-pull cropping system (maize and desmodium intercrop, with *Brachiaria* grass as a border crop) on maize ear rot incidence and severity. Plots comprised maize planted, either as sole crop, or in mixtures with food legumes - common beans (treated as 'monocrop'), or in a climate-smart push-pull strategy (treated as 'push-pull'). Also, due to fungal similarities shared between ear rot causative agents and producers of mycotoxins, detection and quantification of mycotoxins, aflatoxin B1, deoxynivalenol, zearalenone and fumonisins, were carried out on symptomatic (infected) and asymptomatic (clean) maize ears to establish extent of contamination with maize ear rots.

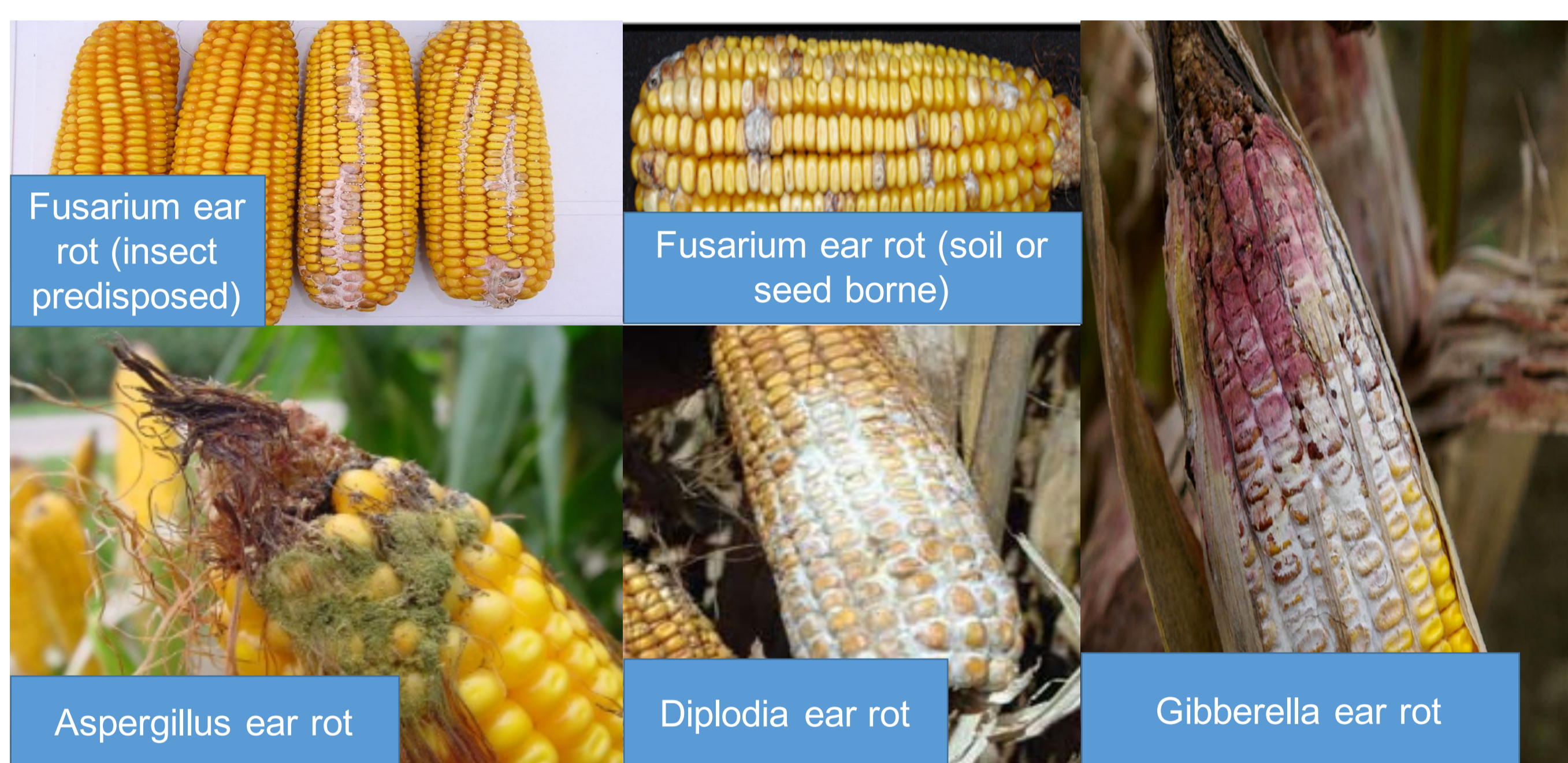


Photo source: www.pioneer.com

METHODS

Farmers' fields (both push-pull and monocrop) in western Kenya (Butere, Vihiga, Kisumu, and Siaya) were sampled for incidences and severity of maize ear rots. We carried out a physical count of the number of infected maize ears of a random sample of 100 mature maize plants in four different positions. Severity was calculated on visual rating on a scale of 0-5, where 0 = no infection, 1 = 1-10%, 2 = 11-25%, 3 = 26-50%, 4 = 51-75%, and 5 = 76-100% infection (Jeff, 2000). Mycotoxins were analysed by ELISA in both symptomatic (infected) and asymptomatic (clean) ears.

CONCLUSIONS

- Mixing rot-infected (symptomatic) ears with clean (asymptomatic) ears should be avoided; but, if this is impossible, the incidence of ear rot must be reduced in the field.
- With about 80% of smallholder farmers in sub-Saharan Africa contributing to maize production (Wiggins, 2008) in an open market without mycotoxin regulations, push-pull technology is practicable for high quality and quantity production of maize.

IMPACT

- Climate-smart push-pull reduces maize ear rots.
- There is increased food security due to less ear rots.
- Time for sorting maize ears is reduced.
- Reduced costs to the farmer due to reduced level of fungicides and insecticides for control of maize ear rot.
- Improved health of consumers from low incidence of pre-harvest contamination by corresponding mycotoxins from various maize ear rots.

OBJECTIVE

To determine the impact (if any) of climate-smart push-pull on maize ear rots and mycotoxins incidence and severity.

RESULTS

Climate-smart push-pull had significant ($p < 0.001$) effects resulting in low incidences of ear rots (Fig.1). However, it had no significant effect on severity of penicillium, but only on most toxigenic ear rots. Symptomatic (rot infected) ears had high significant incidence and levels of mycotoxins exceeding maximum limits compared to asymptomatic ears (Fig.2).

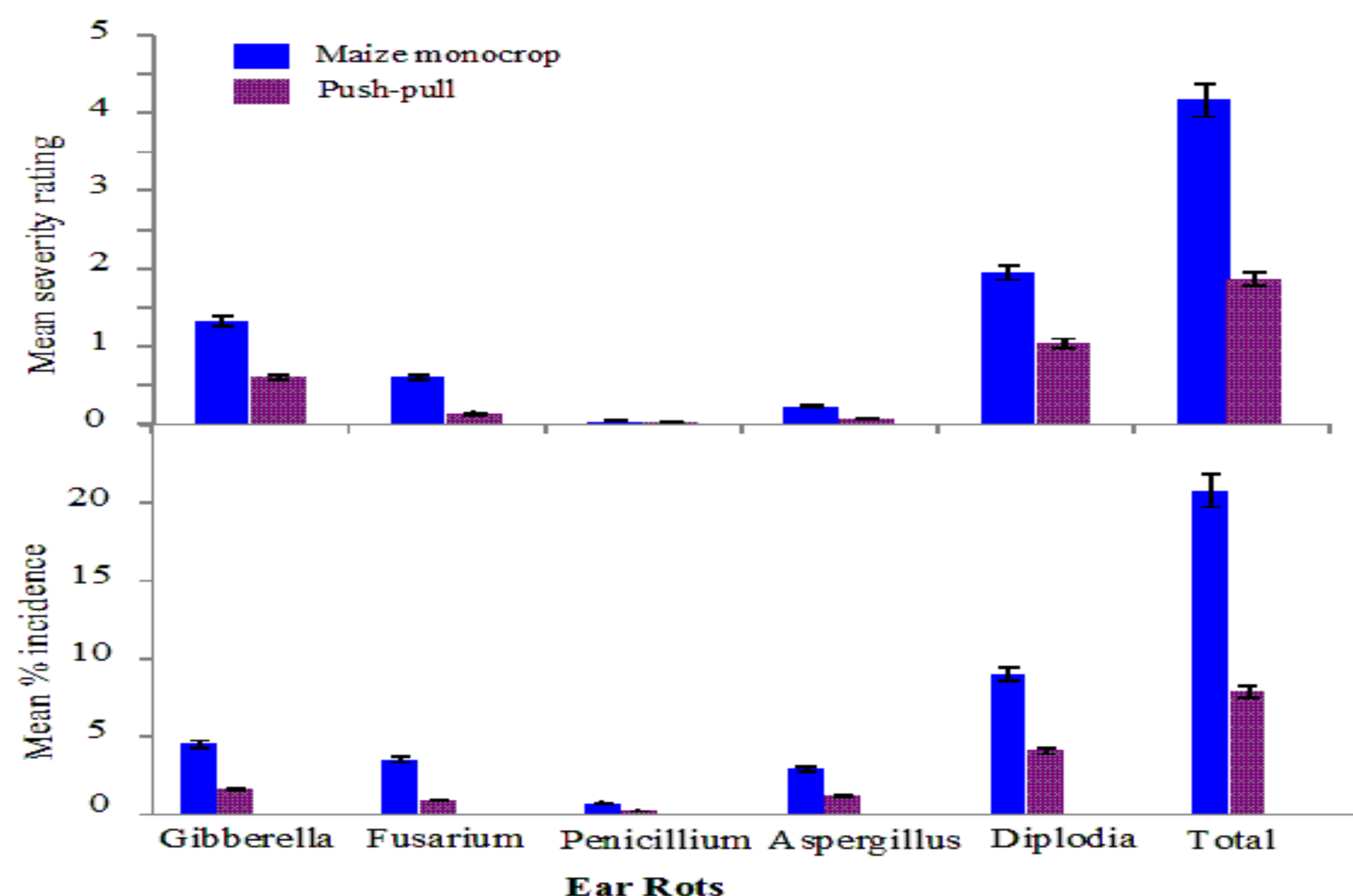


Figure 1: A survey of the Incidence and severity of different ear rots in push-pull and maize monocrop plots in western Kenya.

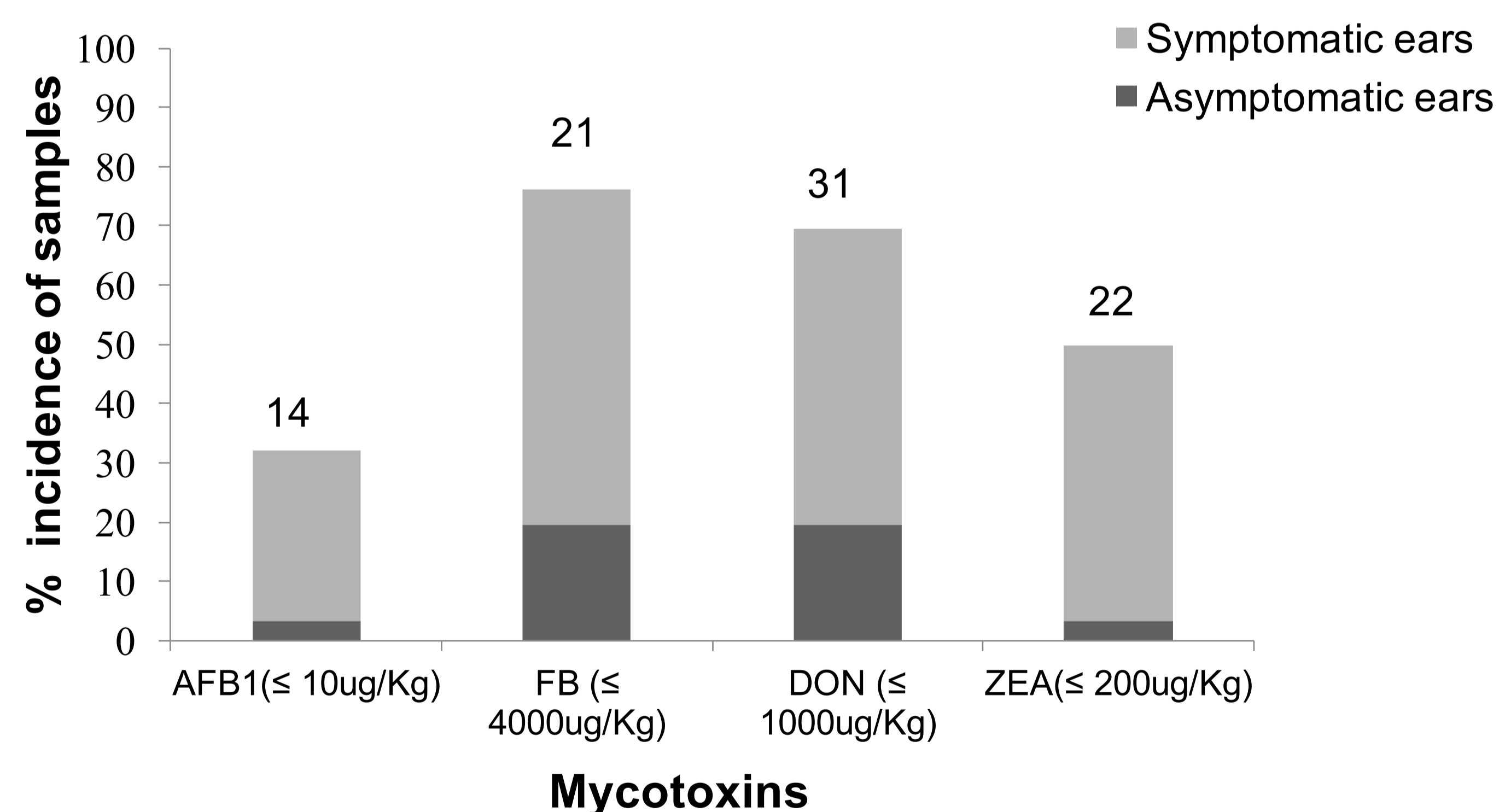


Figure 2. Percent (%) incidence of symptomatic and asymptomatic samples with mycotoxins levels exceeding maximum limits set by European Union. On each bar is the number of samples beyond maximum limits of the total (76) samples analysed for all mycotoxins.

REFERENCES

- Jeff D. (2000) Maize pathology activities at CIMMYT-Mexico. Paper presented to Reviewers in September. CIMMYT, El Batan, Mexico.
- Wiggins S. (2008) *The Future of Smallholder Agriculture*. Platform Policy Brief I No. 2. Global Donor Platform for Rural Development, Bonn.