

**RESISTANT CULTIVARS:  
A SUSTAINABLE MANAGEMENT  
OPTION FOR THE TOBACCO ROOT-  
KNOT NEMATODE IN ZIMBABWE**

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**TOBACCO RESEARCH BOARD**  
**KUTSAGA**

# Presentation Outline

1. Introduction
2. Main objective
3. Materials and methods for field trial
4. Results and Discussion
  - i. Greenhouse bioassays
  - ii. Yield Field assessments (Stalk heights; Final gall rating)
  - iii. and Grading Index
5. Conclusion
6. Acknowledgements



# Introduction

- Root-knot nematodes (RKNs), *Meloidogyne* spp. are major pests threatening tobacco production worldwide;
- In Africa the most dominant species are *M. javanica*, *M. incognita* and *M. arenaria*;
- Yield losses of 30% or more in tobacco have been attributed to this pest;



# Introduction (cont'd)

- In Zimbabwe RKNs had ceased to be a major challenge to tobacco growers;
- This was due to decades of research on the management of this pest from which several nematicides were recommended;
- The recent banning of a wide range of nematicides has necessitated the need to find alternatives;



# Introduction (cont'd)

- Greener nematicides, Katambora (Rhodes) grass and RKN-resistant varieties;
- Since 1954, TRB developed an array of RKN-r cultivars;
- However, the wide range of effective nematicides negated the plant resistance option;
- Additionally, no documentation of the performance of KRK varieties.



# Main Objective

- Evaluate the performance of Kutsaga's most popular RKN-resistant varieties grown without nematicides, under high nematode pressure

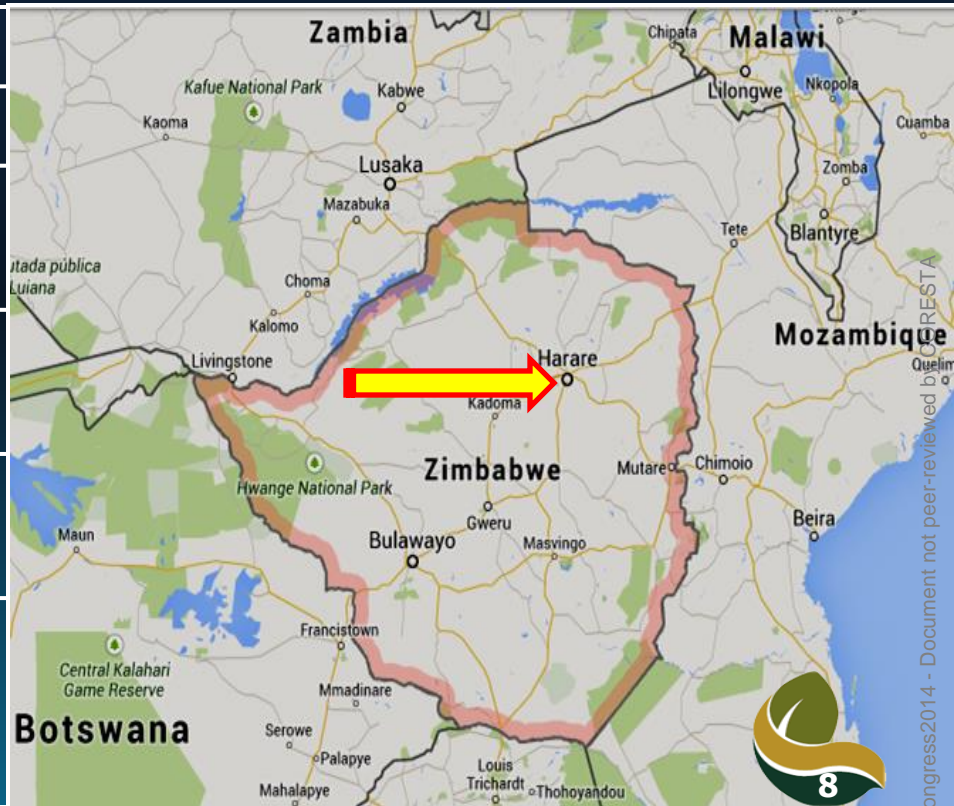


# THE FIELD TRIAL



# Study Area: Kutsaga Research Station, Harare, Zimbabwe

Location	17 ° 55' S ; 31 ° 08' E
Altitude	1479 m above sea level
Mean annual rainfall	750 - 950 mm
Mean summer temp.	32°C
Mean winter temp.	18°C
Soils	Generally light textured sandy loams, which are deep and permeable





# Materials and Methods



# Procedure

- Six KRK26, KRK29, KRK64, KRK66 T71 and T72 all bred for high resistance to RKN used;
- A RKN-susceptible cultivar, K M10 included;
- Planting done in mid-October;
- To enable comparison the trial was replicated in EDB fumigated plots.



# Design

- A split-plot design used;
- Fumigation - Main plot and Variety as the Subplot;
- Each plot consisted of three rows of 32 plants per row;
- Spacing : inter-row 1.20 m and 0.56 m in-row;
- The middle row was used for assessment.



# Measurements



# 1. Monitoring of Nematode population trends

- Soil samples collected at 3, 8, 13 & 18 w.a.p.;
- Added to 12 cm dia. pots in the greenhouse;
- 3 week-old tomato plants *Lycopersicon esculentum* – Rodade transplanted;
- Plants pulled and root-galling assessed 5 w.a.p.



## 2. Stalk height assessments

- Between 8 - 13 w.a.p. plant height measurements were done for all plants.



# 3. Tobacco root galling scale



0



1



2



3



4



5



6

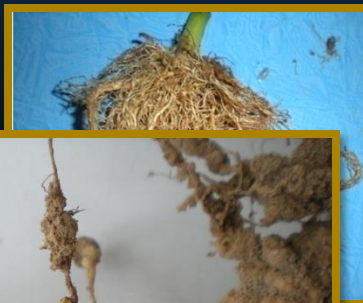
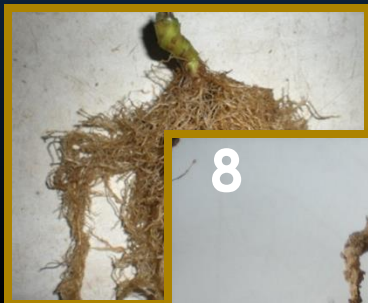


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# 3. Tobacco root galling scale



0



3



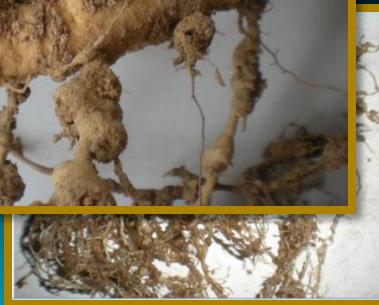
4



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8



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7



# 4. Yields

Leaves sequentially reaped and cured



# Data analysis

- Genstat Statistical Package (Version 17)
- ANOVA
- 5 % level of significance
- LSD's post-hoc test was performed for the multiple comparisons.





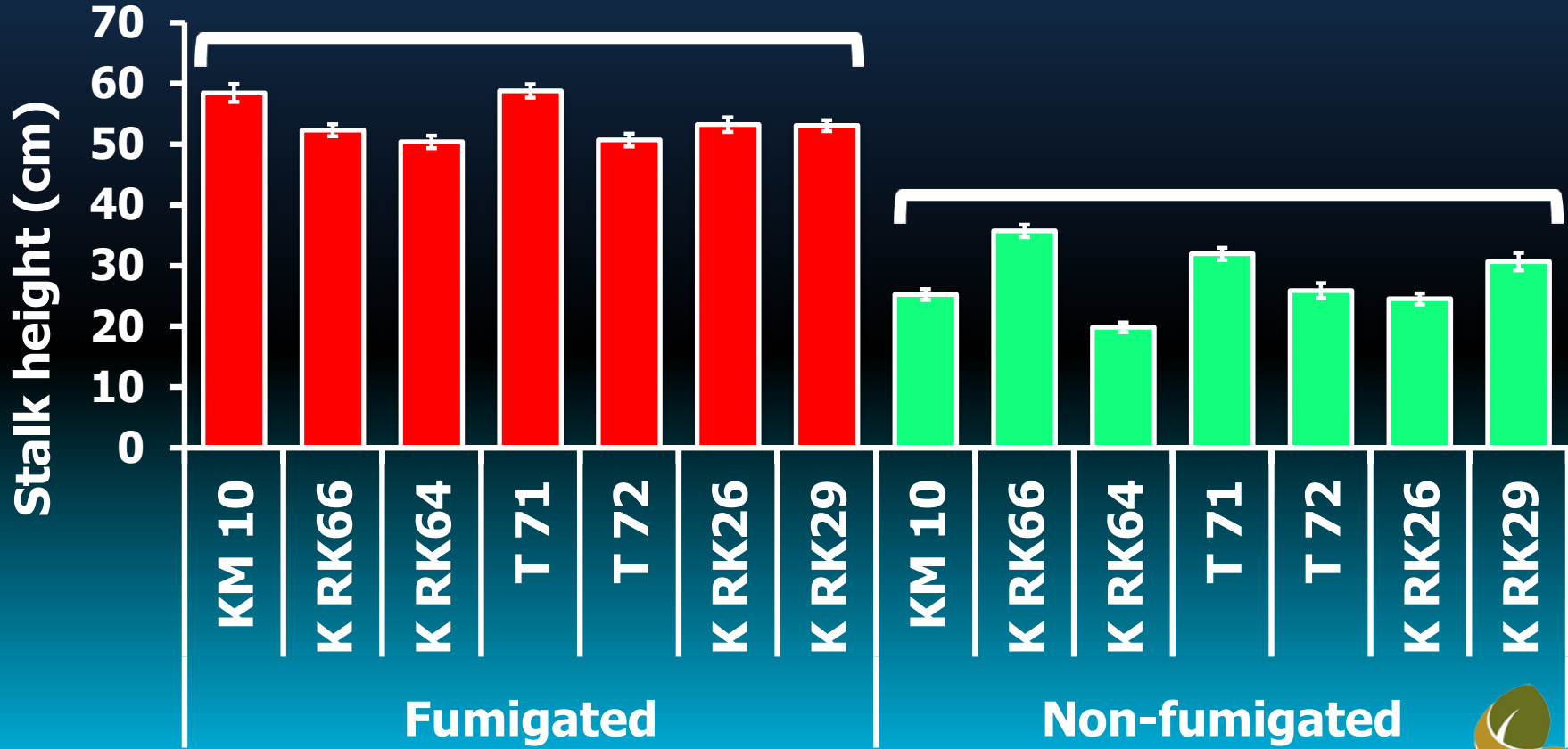
# RESULTS



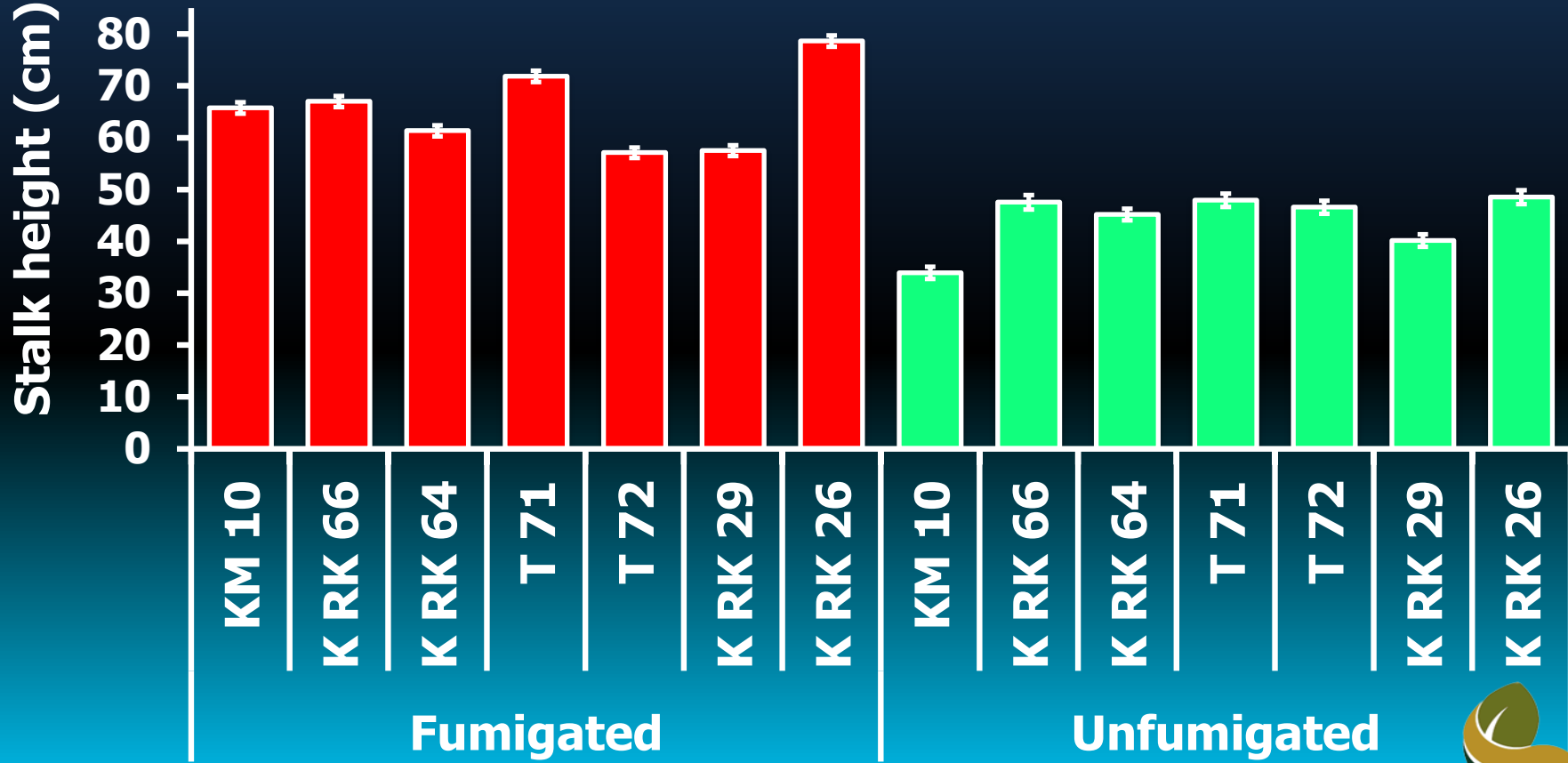
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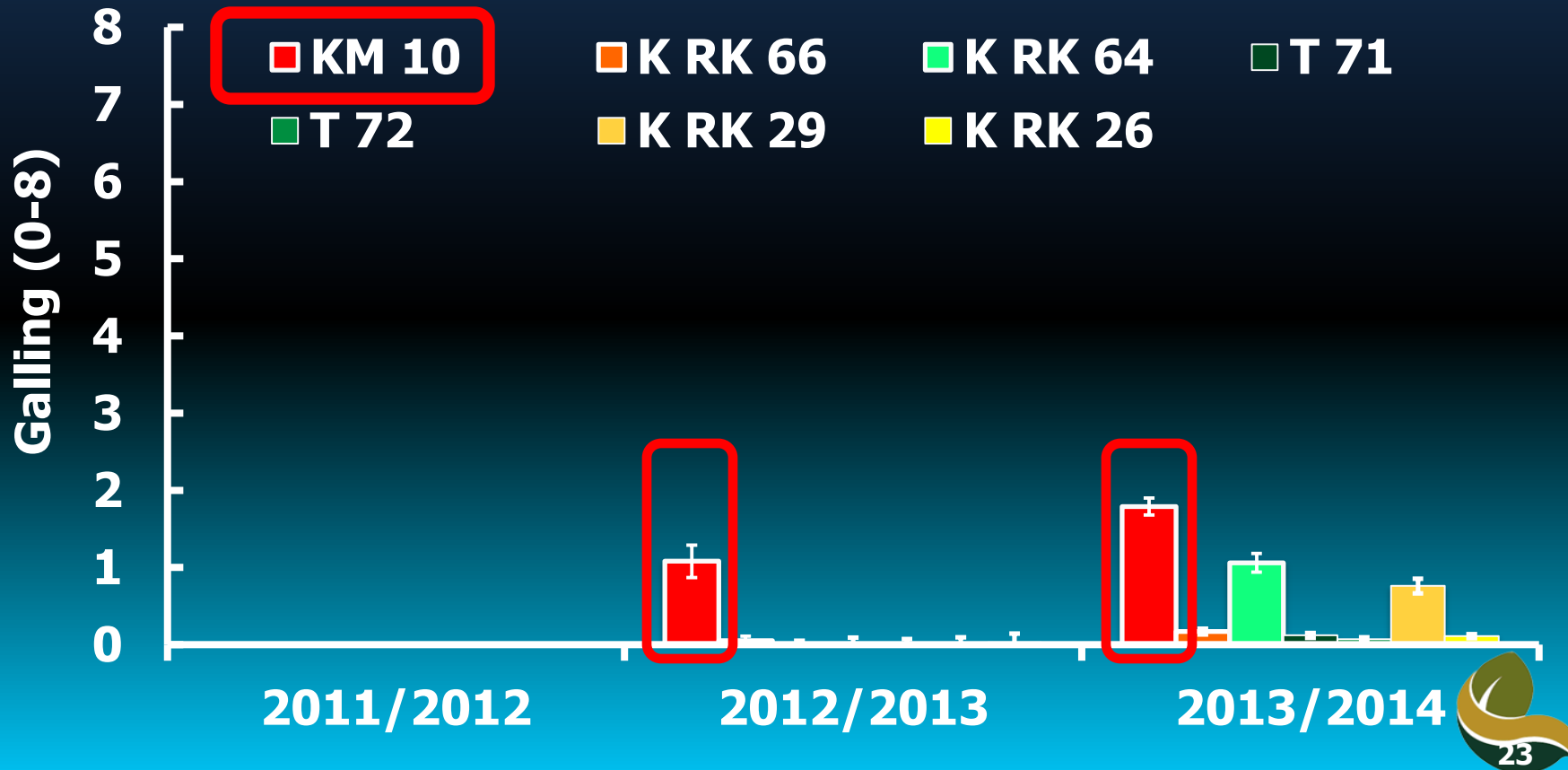
## 2. Stalk heights at 8/9 w.a.p. in 2012/2013



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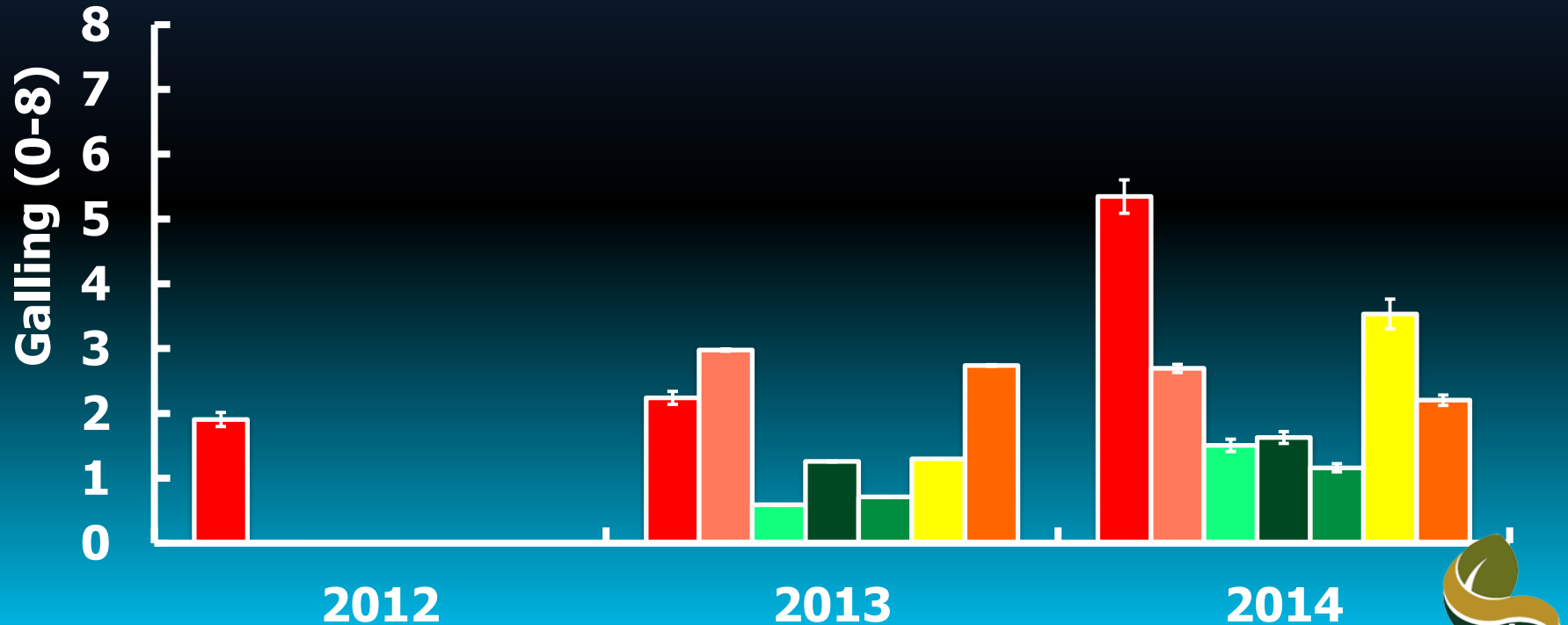


# 3. Root Galling Fumigated



# 3. Root Galling Unfumigated

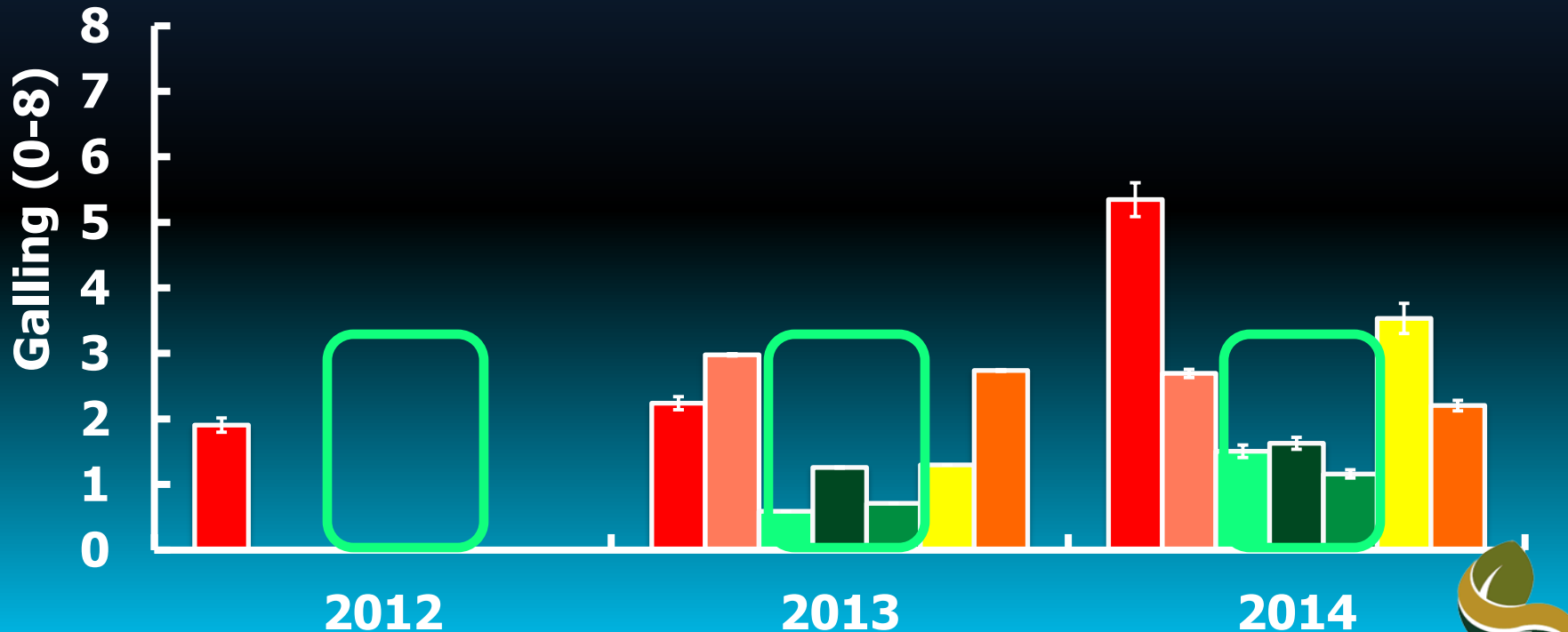
■ KM 10 ■ K RK66 ■ K RK64 ■ T 71 ■ T 72 ■ K RK26 ■ K RK29





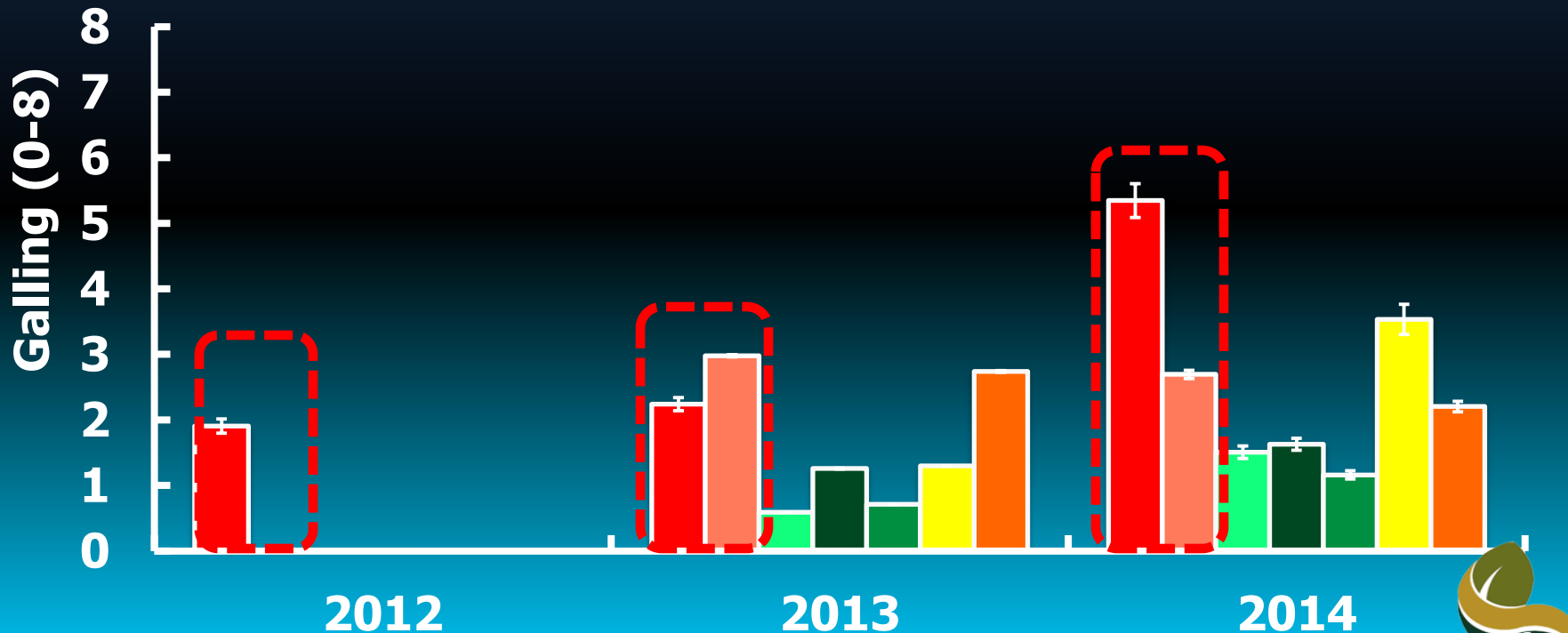
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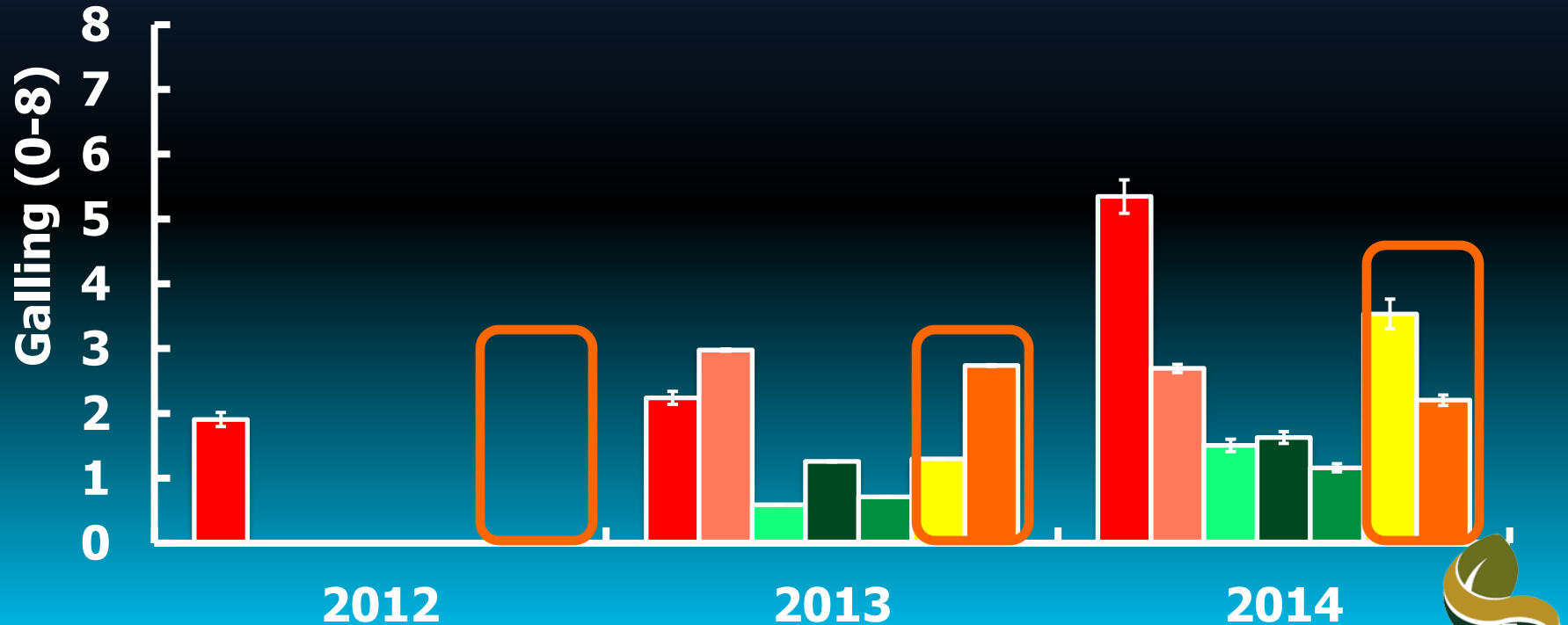
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# 3. Root Galling Unfumigated

■ KM 10 ■ K RK66 ■ K RK64 ■ T 71 ■ T 72 ■ K RK26 ■ K RK29



# Key Observations

K RK 66

K M 10



# Fumigated and Unfumigated plots – KM10



**UNFUMIGATED KM10**



**FUMIGATED KM10**



# T 71 IN FUMIGATED AND UNFUMIGATED PLOTS

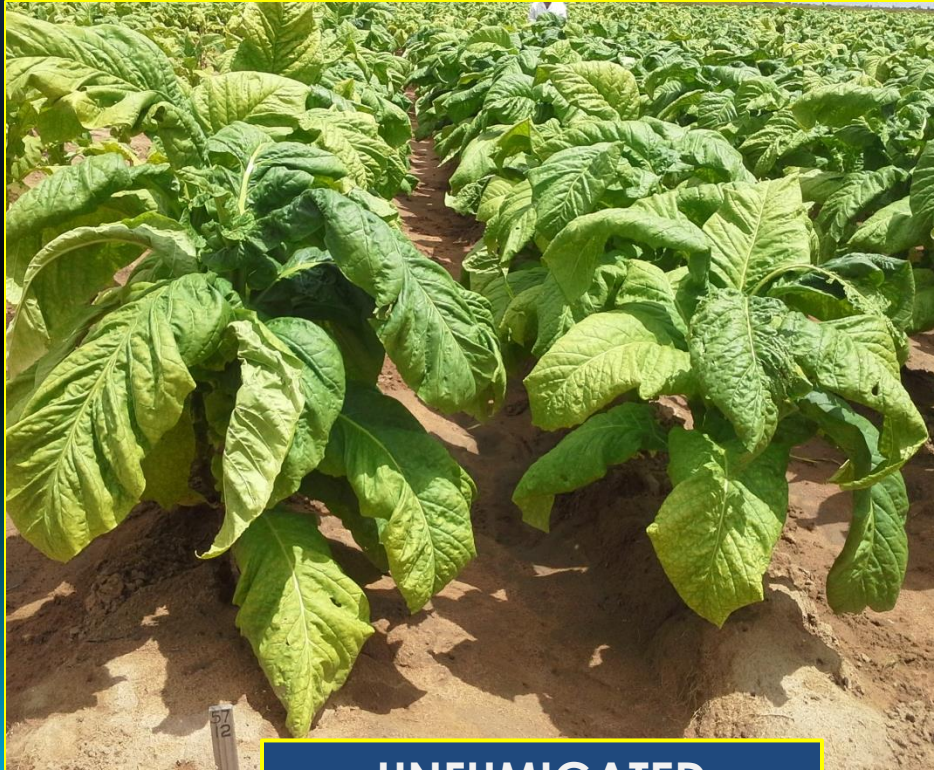


UNFUMIGATED

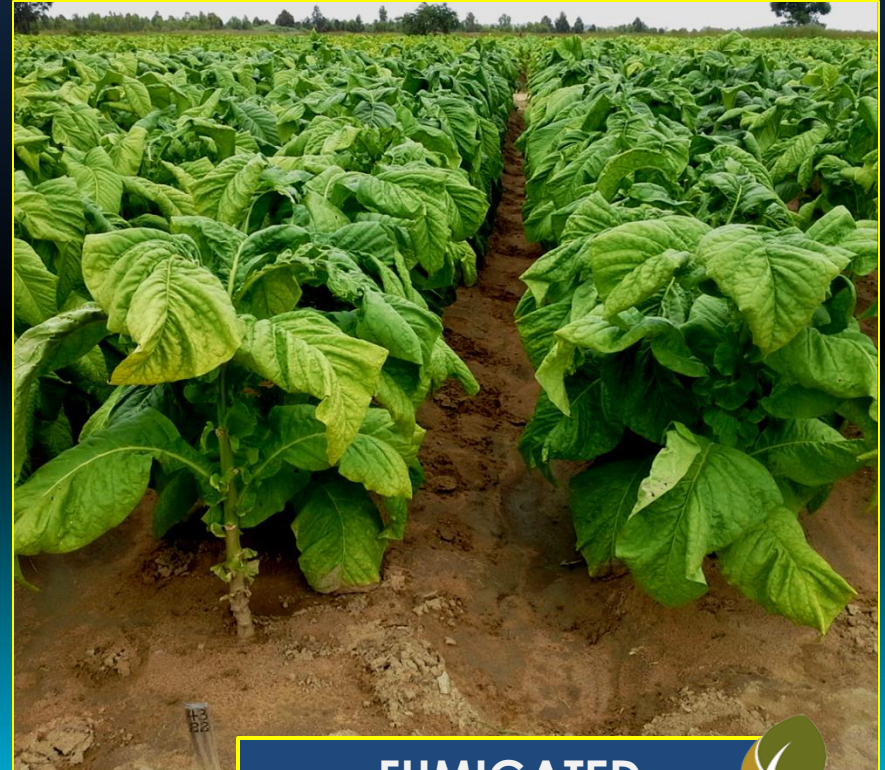


FUMIGATED

# Fumigated and Unfumigated plots – K RK66



**UNFUMIGATED**

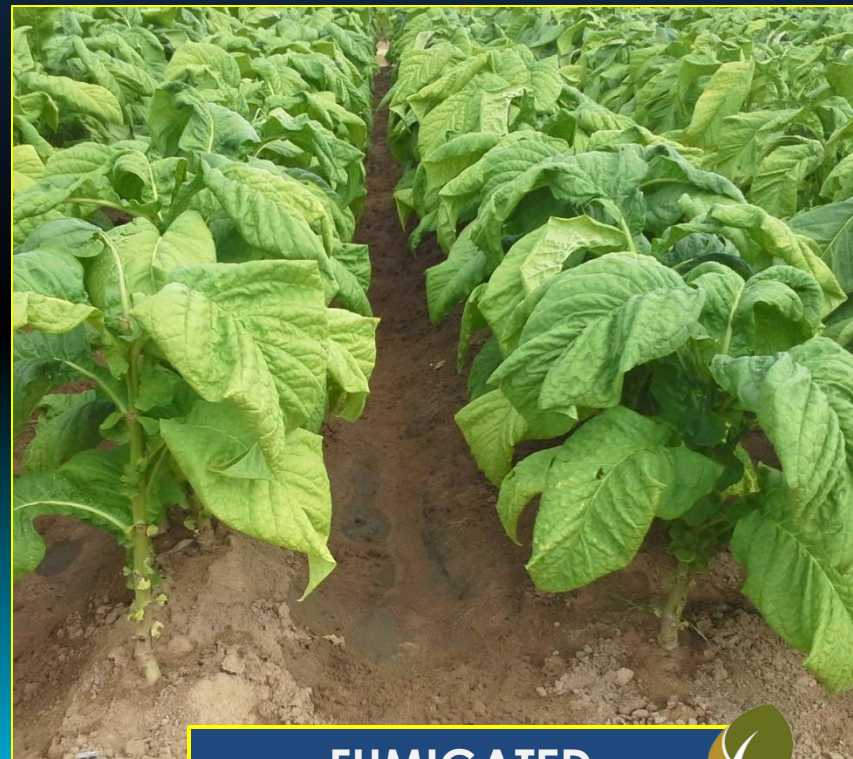


**FUMIGATED**

# Fumigated and Unfumigated plots – T 72



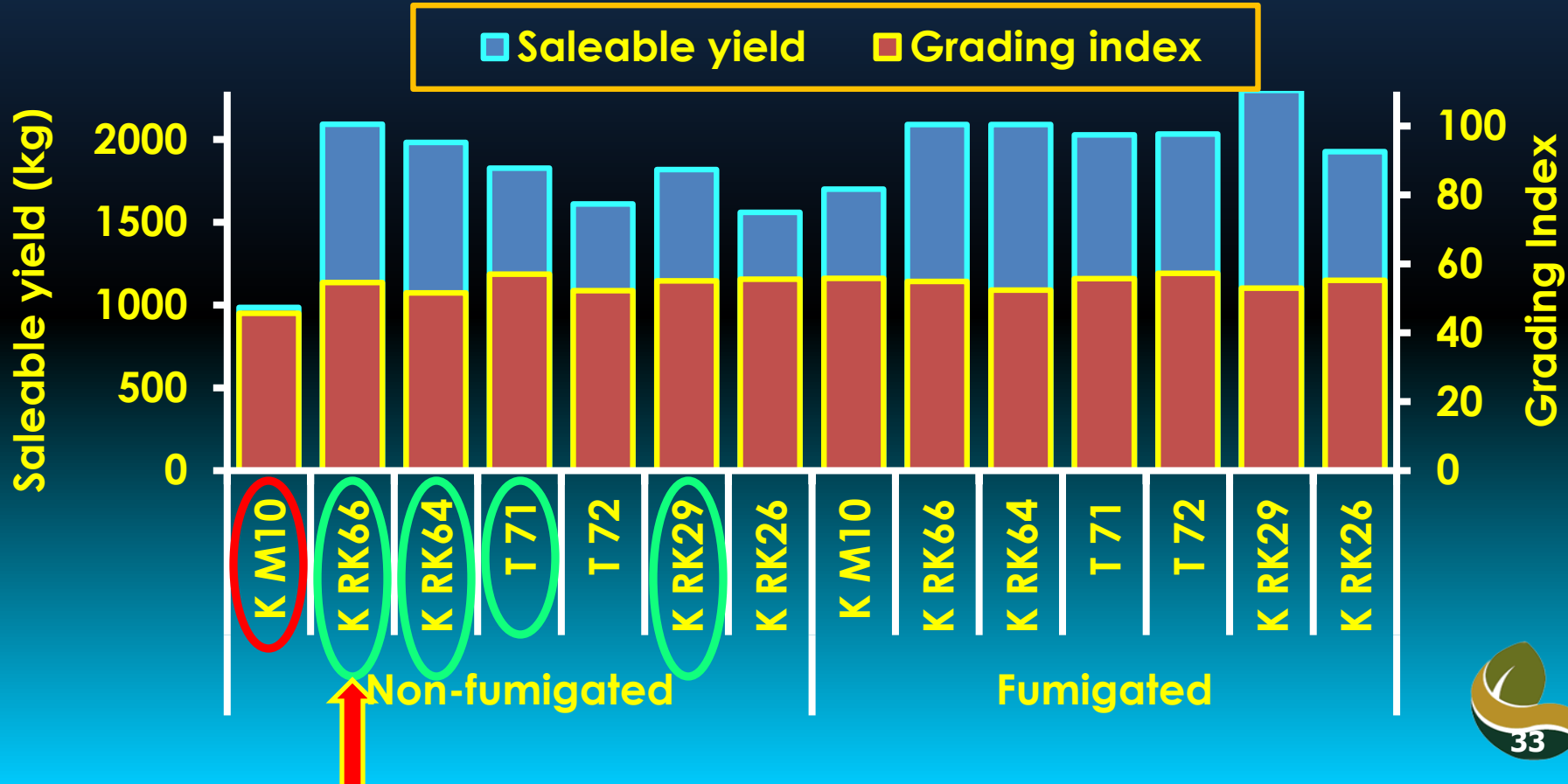
**UNFUMIGATED**



**FUMIGATED**



# Yield and Quality



# Summary of results

- Plants in fumigated plots established and grew faster for the first 8 weeks;
- High levels of resistance shown by K RK varieties, even without fumigation comparable yields were obtained;
- In 2012/13 no fertilizer leaching adjustments after incessant rains resulted in low yields ( $< 2\ 100$  kg/ha)
- Varieties included in study have potential to yield over 4 500 kg per hectare;



# Summary of results cont'd

- KM10 was lowest yielder even in fumigated plots
- Higher galling in KM10 compared with K RK varieties;
- K RK64, T71 and T72 had lowest galling and thus rated highly RKN-R, while K RK66 had higher yields that compensated for the moderate galling.



# Conclusion

- Plant resistance is an effective nematode management option for the Zimbabwean tobacco grower.
- It is recommended they be used in an IPM setting in combination with recommended cultural control measures and the available greener nematicides.

# Acknowledgements

- **TRB Board And Management For Financial Support**
- **Kutsaga PHS Staff**





**Thank you!**