South African Sugarcane Research Institute

Selection for *Eldana saccharina* borer resistance in early stages of sugarcane breeding in South Africa

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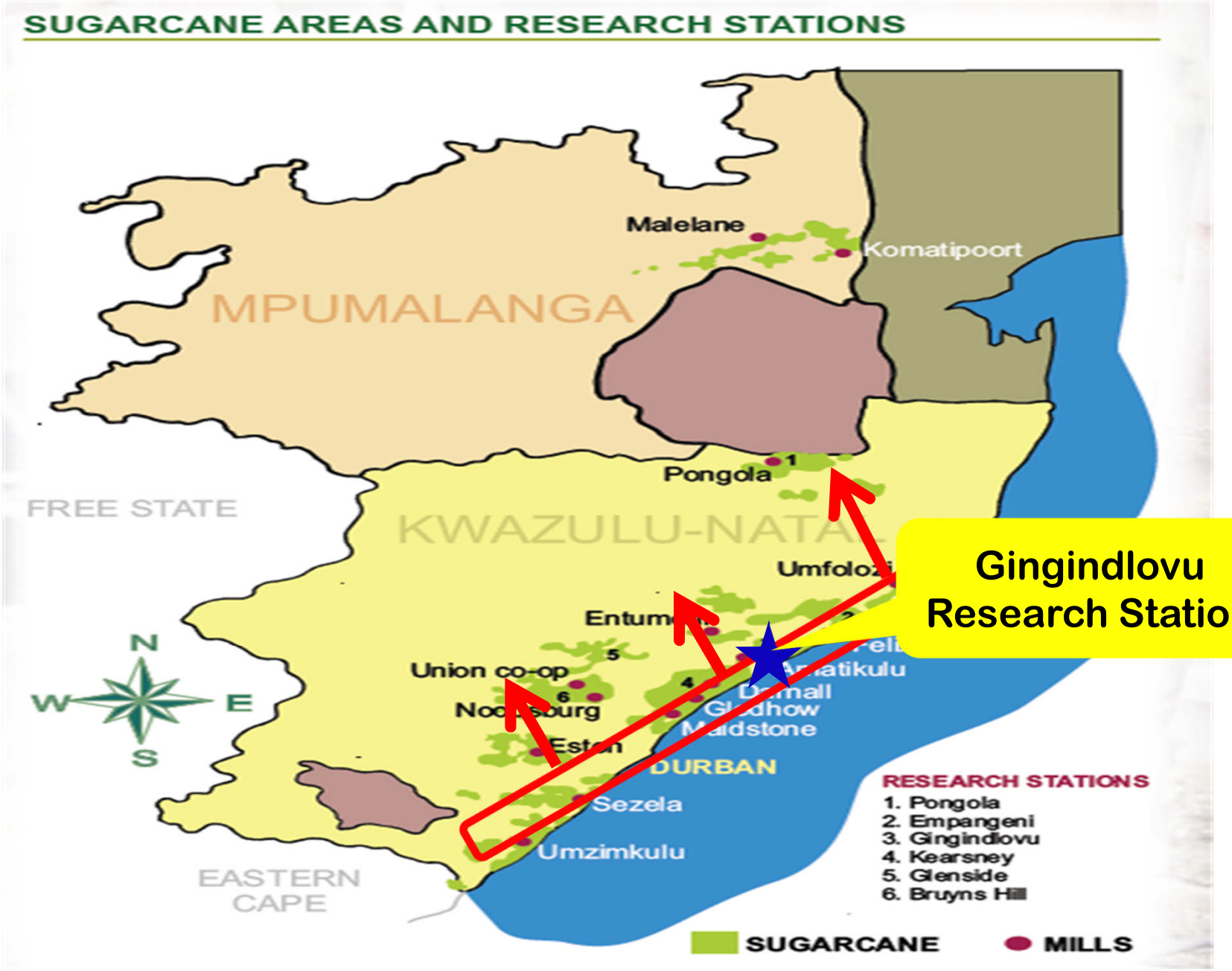
UNLOCKIN
SUGARCA

South African Sugarcane Research Institute is a division of the South African Sugar Association

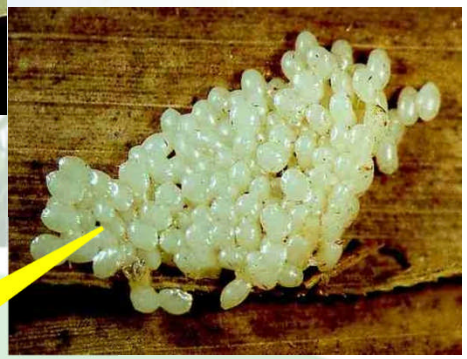
SASA

Introduction

- *Eldana saccharina* (eldana borer) is an indigenous pest of Southern Africa, naturally found in sedges along rivers,
- Eldana, a bottom borer, first recorded in RSA in 1939, and has spread,
- Yield losses = US$90million,
- Control = IPM strategies,
- Breeding started in 1980,
- Few resistant cultivars released.


SUGARCANE AREAS AND RESEARCH STATIONS
MPUMALANGA
KWAZULU-NATAL
FREE STATE
EASTERN CAPE
Malelane
Komatipoort
Pongola
Umfolozi
Union co-op
Sezela
Umzimkulu
DURBAN
Maidstone
N
S
E
W
Gingindlovu Research Station
RESEARCH STATIONS
1. Pongola
2. Empangeni
3. Gingindlovu
4. Kearsney
5. Glenside
6. Bruyns Hill
SUGARCANE
MILLS

Eldana damage



Eggs

Larvae

Frass

Severe stalk damage

Early stage selection

- Family selection = is being applied in several breeding programs for yield, quality…
- Logistic regression models have been adopted as an aid in non-replicated single row plots in RSA.

Objectives

- Examine the potential of evaluating families for eldana damage in seedlings (Stage I),
- Test logistic regression models as aids to selection against eldana damage in non-replicated clonal rows (Stage II).

Materials and methods

Data collection

- Seedlings = BML12, FML13,
  - 20 seedlings per family.
- Single Lines = BSL12, SSL12
  - 12 stalks per plot.
- Stalks trashed to remove leaves,
- Total and bored stalks counted.

Data analysis

Family $Y_{ijk} = R_i + F_j + RF_{ij}$

$$H_F = \sigma_F^2/(\sigma_F^2 + \frac{\sigma_{FR}^2}{r})$$

$$G_s = k\sigma H$$

$$\pi(x_{i1}, x_{i2}, x_{i3}, x_{i4}, x_{i5}, x_{i6}) = \frac{e^{\beta_0+\beta_1 x_{i1}+\beta_2 x_{i2}+\beta_3 x_{i3}+\beta_4 x_{i4}+\beta_5 x_{i5}+\beta_6 x_{i6}}}{1 + e^{\beta_0+\beta_1 x_{i1}+\beta_2 x_{i2}+\beta_3 x_{i3}+\beta_4 x_{i4}+\beta_5 x_{i5}+\beta_6 x_{i6}}}$$

Results and discussion

Parameter	BML12	FML13
H	0.52	0.51
Gs	1.66	1.04
%Gs	19.9	68.89

Identifying superior families

	BSL12			SSL12		
Parameter	β	χ	Pr>χ.	β	χ	Pr>χ.
Intercept	-71.47	30.44	0.0001	-44.23	21.17	0.0001
Stalks	0.10	29.27	0.0001	0.05	20.39	0.0001
Height	9.81	21.17	0.0001	6.38	11.21	0.0008
Diameter	13.64	29.32	0.0001	6.96	20.12	0.0001
ERC %	0.42	4.27	0.0389	0.34	1.79	0.1815
Fibre %	0.17	0.47	0.4914	0.38	3.02	0.0825
Eldana	-1.11	18.42	0.0001	-0.27	5.16	0.0232

Conclusions

- Family selection will increase identification of superior families for eldana resistance selection.
- In un-replicated single row plots, logistic regression models improved simultaneous selection for yield, quality and eldana damage.