



# Combining ability of maize populations for Al resistance based on callose formation

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## Introduction

Maize yield on acid soils is mainly limited by Al toxicity. However, there is considerable genetic diversity in maize for Al resistance, a potential for developing varieties tolerant to soil acidity. This work aims at studying combining ability and mode of gene action of open-pollinated maize populations using callose formation as physiological marker for Al

## Materials and methods

13 maize populations from different origin and their 78 diallel crosses were grown in nutrient solution and treated with or without 25 µM Al at pH 4.3. After 12 hours of Al treatment, root tips were excised and analysed for callose. Diallel data analysis was made to estimate general and specific combining abilities.

## Results

### 1. Al induces callose formation

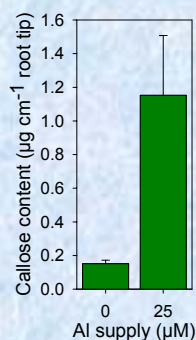


Fig.1. Effect of Al (25µM) on callose content (mean±SD) of root tips

### 2. Genotypes differ in Al-induced callose formation

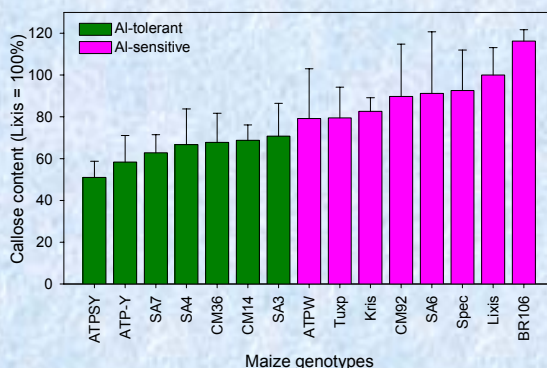


Fig.2. Callose content (mean±SD) of maize genotypes (parents) treated with 25 µM Al at pH=4.3.

### 3. General combining ability (GCA) is, but specific combining ability (SCA) is not significant

Source	DF	MS	F
Cross	77	200.89	
GCA	12	1011.38	19.73**
SCA	65	51.27	0.29
Error	231	178.38	

Tab. 1. Analysis of variance of a 13x13 diallel of maize (\*\* p < 0.01)

### 5. Observed performance of the crosses is close to their expected performance under Al stress

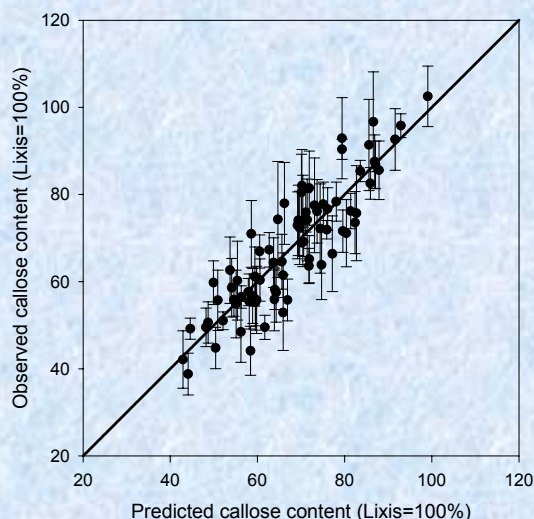


Fig.4. Predicted vs. observed (mean±SE) callose content of maize diallel crosses treated with 25 µM Al at pH=4.3. Vertical distance from the diagonal line is the SCA effect of each cross.

### 4. Genotypes with negative GCA effects are good combiners.

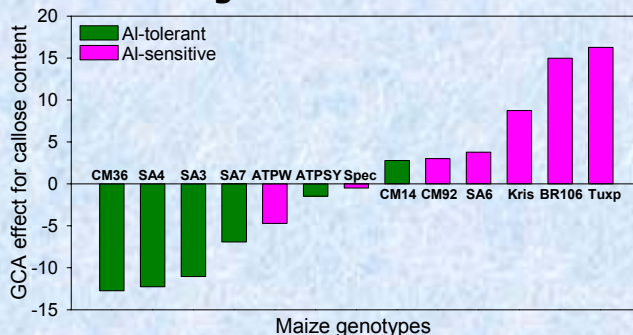


Fig.3. GCA effect of maize genotypes (parents) under Al stress (25 µM Al, pH=4.3)

## Conclusion

Significant GCA indicates a significant contribution of additive genes for Al resistance. Thus, populations or lines of superior Al resistance can be developed from populations having good GCA effects, through a recurrent selection strategy, which increases the frequency of favourable genes with additive effects.

## Acknowledgements

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