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# Regulatory effect of topping on $K^+$ flux and gene expression in tobacco roots

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# CONTENT

# Introduction

- Topping is an important agronomic measure in tobacco production.
- Topping can cause serious damage to tobacco plant, which can lead to the loss of potassium.
- The mechanism of $K^+$ uptake and efflux from tobacco roots after topping is not very clear.

# Introduction

- Why does topping lead to potassium loss in tobacco plants?
- Can exogenous substances make up for the loss of potassium in tobacco plants caused by topping?

Objective:

Through the study of $K^+$ flow rate and gene expression in tobacco roots, to reveal the mechanism of potassium loss of tobacco plants caused by topping.

# Materials and Methods

Cultivar： **EY-1（high potassium content）**

**Y87（low potassium content）**

Culture medium: **Sand pot culture**

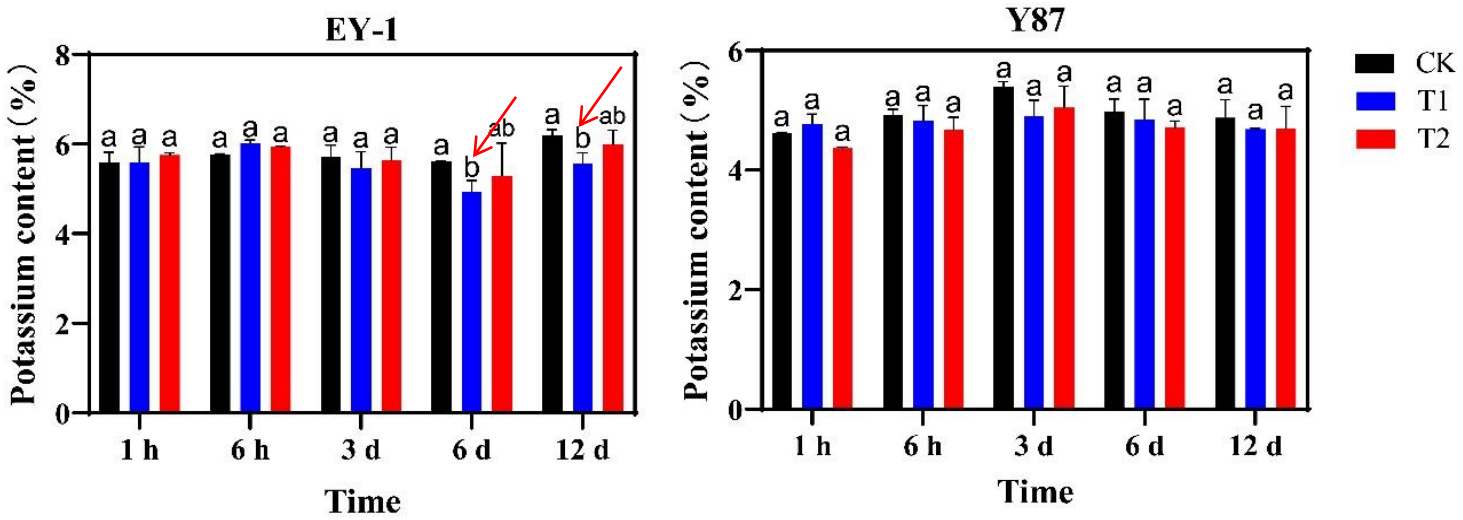
Simulated topping design

CK: control T1:Topping T2: Topping + IAA

Non-invasive Micro-test Technology

# Results

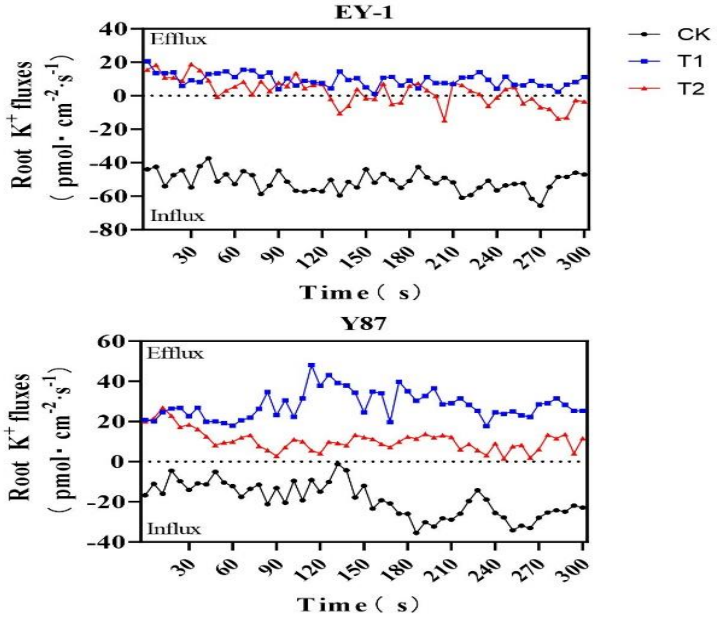
## 1. Potassium content

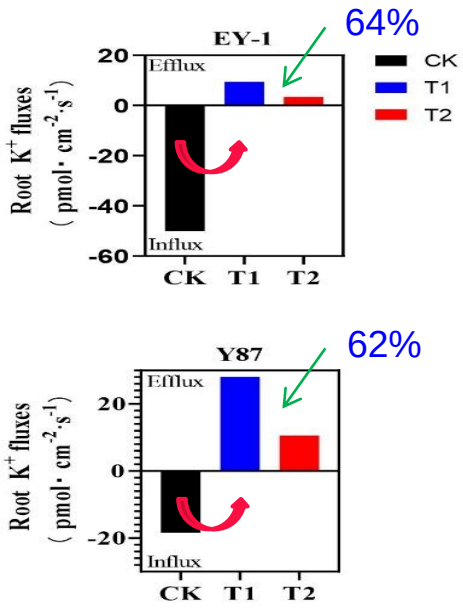



The potassium content of EY-1 decreased significantly in 6d and 12d after topping. Topping also reduced the potassium content of Y87 leaves.

# Results

## 2. Root $K^+$ flux

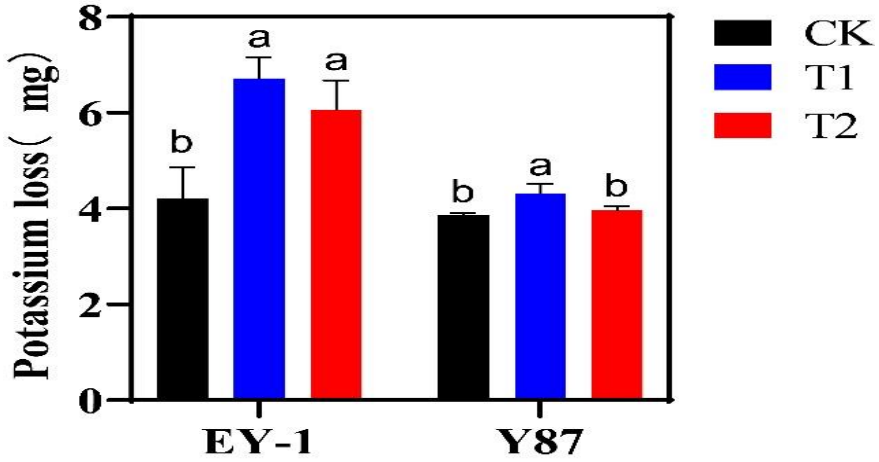



- The $K^+$ flux direction of the two varieties changed from influx to efflux after topping.
- IAA reduced the $K^+$ efflux caused by topping.

# Results

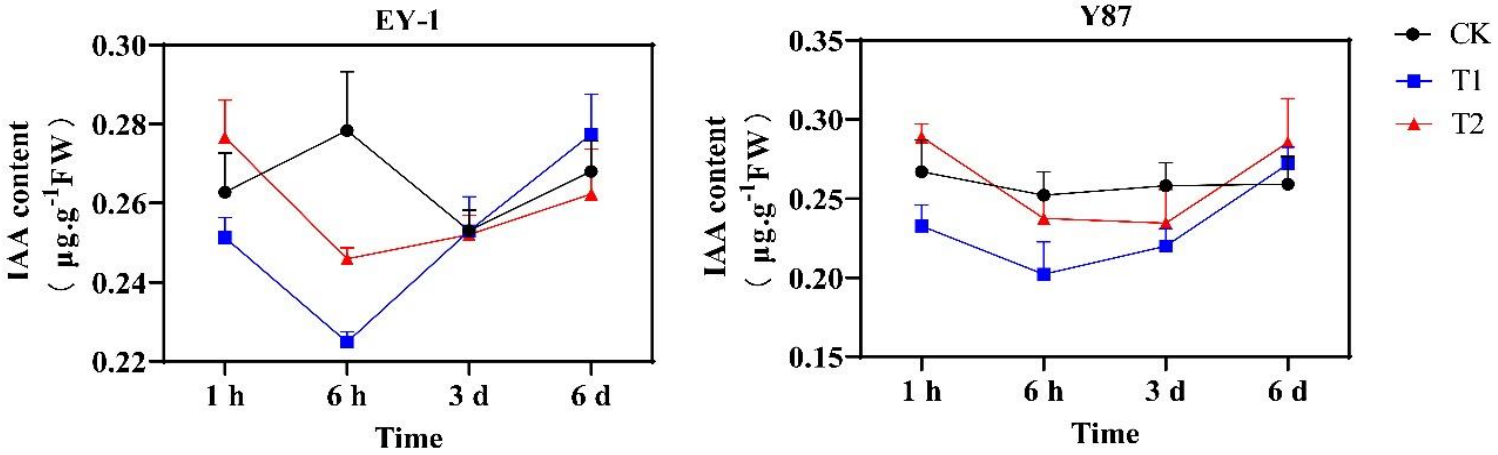
## 3. Potassium loss




Topping increased the potassium loss of tobacco plants significantly. IAA could effectively reduce the potassium loss of tobacco plants caused by topping.

# Results

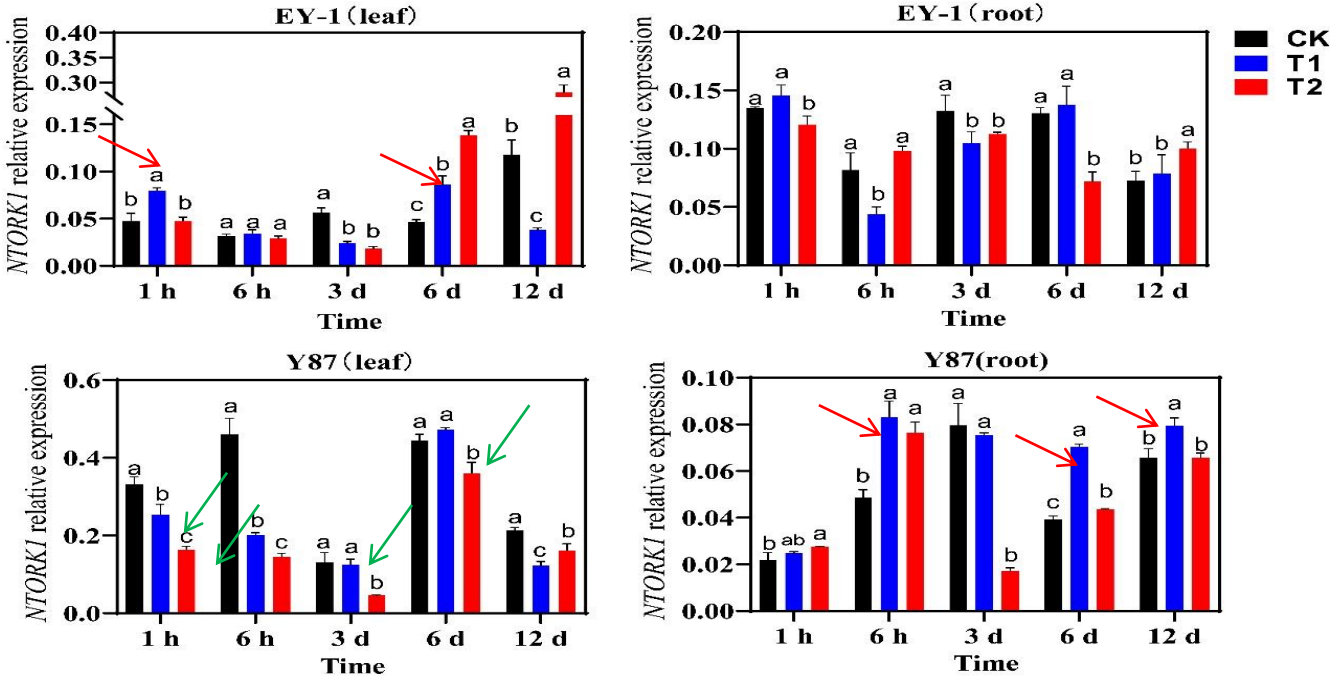
## 4. IAA content




Topping significantly reduced IAA content in tobacco plants.
Exogenous IAA has a compensation effect on IAA loss caused by topping.

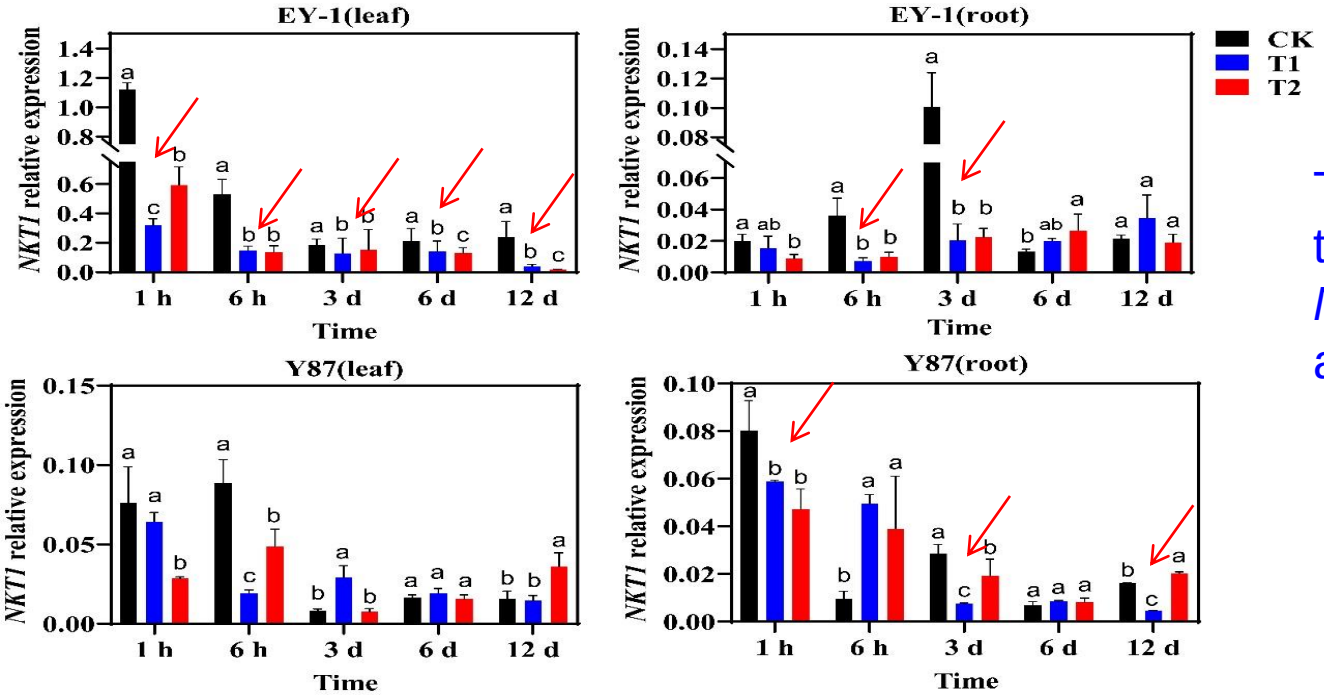
# Results

## 5. Potassium efflux channel gene *NTORK1* expression



# Results

## 6. Potassium influx channel gene *NKT1* expression




Topping decreased the expression of *NKT1* in EY-1 leaves and Y87 roots.

# Conclusion

- Topping changed $K^+$ flow direction of the two varieties from influx to efflux, and finally reduced the potassium content of tobacco plants.
- Topping inhibited IAA synthesis and regulated potassium related gene expression, which was an important reason for potassium loss of tobacco plants.
- The application of IAA can compensate for the negative effects of topping, such as the decrease of IAA content, the down-regulation expression of $K^+$ influx channel gene and the decrease of potassium content.

# Conclusion

- The response of potassium uptake related genes to topping treatment varied with varieties and organs. The response of leaves to topping was greater than that of roots.
- The effect of topping on *NKT1* of EY-1 leaves was greater than that of Y87, which was closely related to the difference of potassium absorption characteristics between the two varieties.


Thanks for your attention!