

Application ZnSO₄ on Tomato Growth under Drought Stress Conditions

A T Sakya¹, E Sulistyarningsih², B H Purwanto² and D Indradewa²

¹Department of Agrotechnology, Universitas Sebelas Maret, Jl. Ir. Sutami 36 A, Kentingan, Surakarta, 57126, Indonesia (email: amaliatetrani@staff.uns.ac.id)

²Department of Agronomy, Gadjah Mada University, Jl. Flora Bulaksumur Yogyakarta 55281, Indonesia

Introduction

Water stress significantly reduced dry matter production, yield components and yield in tomato cultivars. Various strategies have been developed to maintain the plant production during drought conditions, one of this is applying nutrient. Zn is possible used for reducing the damage caused by drought stress is zinc (Zn). Zinc plays a role in various activities of enzymes, it involved in carbohydrates and proteins metabolism needed in tryptophan synthesis also maintains membrane integrity [1,2]. The information regarding on the effect of Zn on water in limited conditions is more common in food crops and rarely in tomato plants. Hence, this study aims to determine the effects of Zn application on tomato growth in drought stress.

Methodology

- Treatments
 - Cultivar ('Tyrana F1' and 'Permata F1')
 - Zn dosage and ZnSO₄ doses (0, 10, 20, 30 and 40 mg Zn kg⁻¹ soil)
- Drought conditions are applied by watering through once every eight days
- Design: factorial complete randomized block design
- Observation: root length, root dry weight, leaf area, plant height, total dry weight, and shoot root ratio at 10 week after transplanting
- Data analysis: Anova and Tukey test

Result and discussion

Table 1. Root dry weight and plant height of tomato under drought stress applied with ZnSO₄

| ZnSO ₄ dosage (mg Zn kg ⁻¹ soil) | Root dry weight (g) | Plant height (cm) |
|--|---------------------|-------------------|
| 0 | 2.13 b | 64.92 a |
| 10 | 2.12 b | 67.92 a |
| 20 | 2.92 ab | 65.42 a |
| 30 | 3.09 a | 65.42 a |
| 40 | 3.47 a | 71.33 b |
| Mean | 2.75 | 67.00 |

Note Numbers followed by the same letters in the same column show insignificant difference in the Tukey test 5%

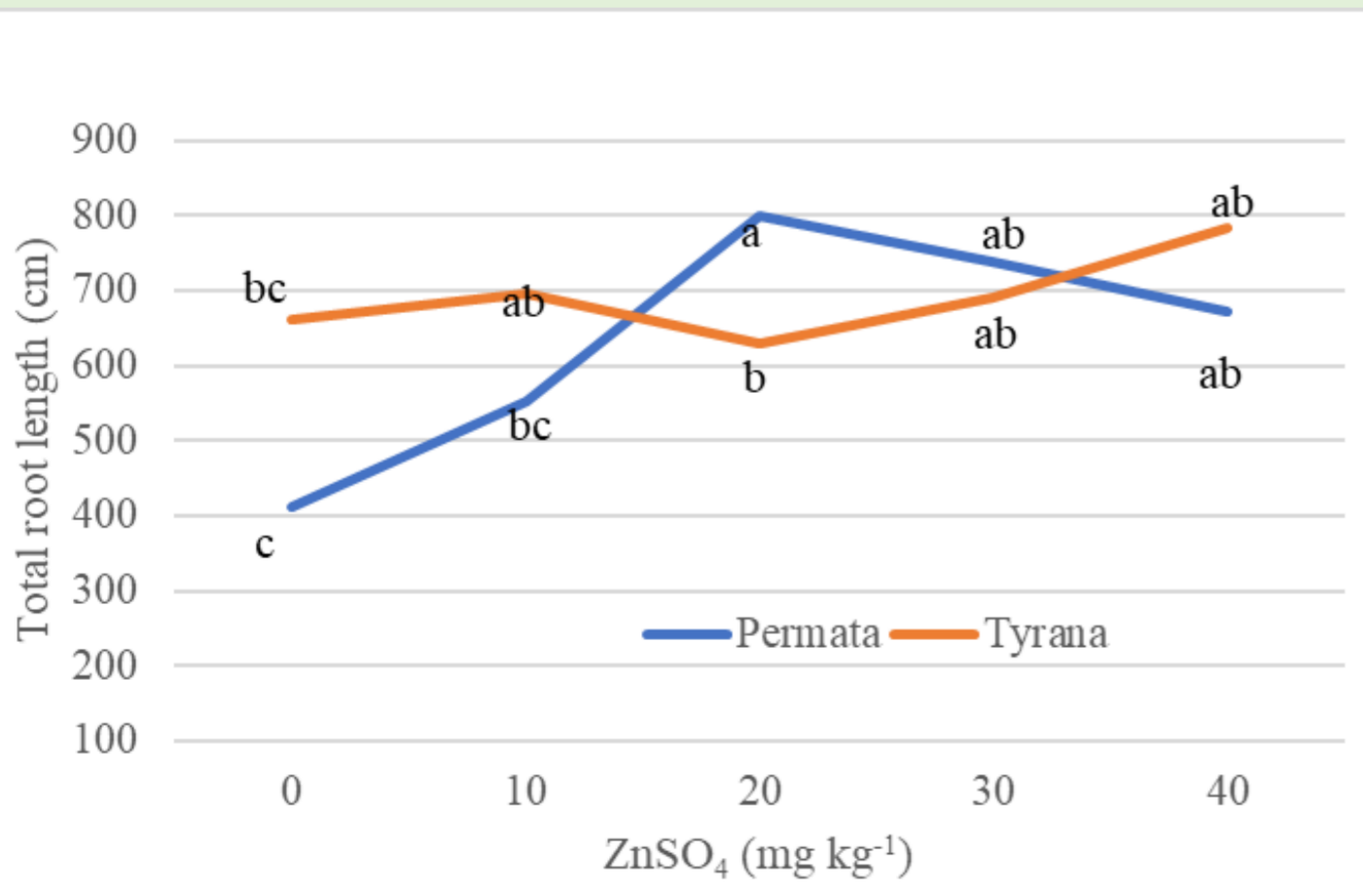


Figure 1. Total root length of tomato plant in drought stress with ZnSO₄ application

Note: the line followed by the same letter is not significantly different in the Tukey test 5%

Application of ZnSO₄ in drought conditions increased plant height, leaf area and plant dry weight by 0,7 – 9,9%, 4.6-6.7% and 5-9% respectively compared without Zn, but only significant differences in plant height.

Application of ZnSO₄ to drought-stressed tomatoes increased root length, with an increase of 34.5-94.1% in Permata and 5.0-18.2% in Tyrana.

ZnSO₄ application increases root growth because increasing Zn in root area will helps tryptophan synthesis and cause the IAA concentration in the meristem, thereby stimulating cell expansion.

Conclusion

1. The total root length responses of both cultivars were different on the ZnSO₄ application.
2. ZnSO₄ application increases the root dry weight of drought stress tomato
3. There is no different response in the shoot growth of tomato under drought stress with applying ZnSO₄

Reference

- [1] Cakmak I 2000 *New Phytol* **146** 185–205
- [2] Waraich E A, Ahmad R, Saifullah, Ashraf M Y, Ehsanullah 2011 *Aust J Crop Sci* **5** 764–77