Short-term drought effect on biochemical processes and microbial growth in the rhizosphere of two maize genotypes

RHIZOSPHERE SPATIOTEMPORAL ORGANISATION SPP 2089

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Introduction

The rhizosphere is a highly dynamic biological interface where most decomposition processes of soil organics are performed by actively growing microorganisms producing extracellular enzymes. We **aimed** to reveal genotype effect of wild (**WT**) and root hair deficient (***rth3***) maize plants after a short-term drought stress compared to well-watering. We **hypothesized** that (**H1**) under drought, maximum enzymatic rates (V_{max}) for ß-glucosidase, leucine-aminopeptidase, acid phosphatase, and N-acetylglucosaminidase will decrease due to low accessibility to substrates; and (**H2**) microbial growth will be retarded due to limited nutrients availability. For this, we collected soil samples from root-affected and rhizosphere soil of 6 biological replicates (**Fig. 1**).

Methodology

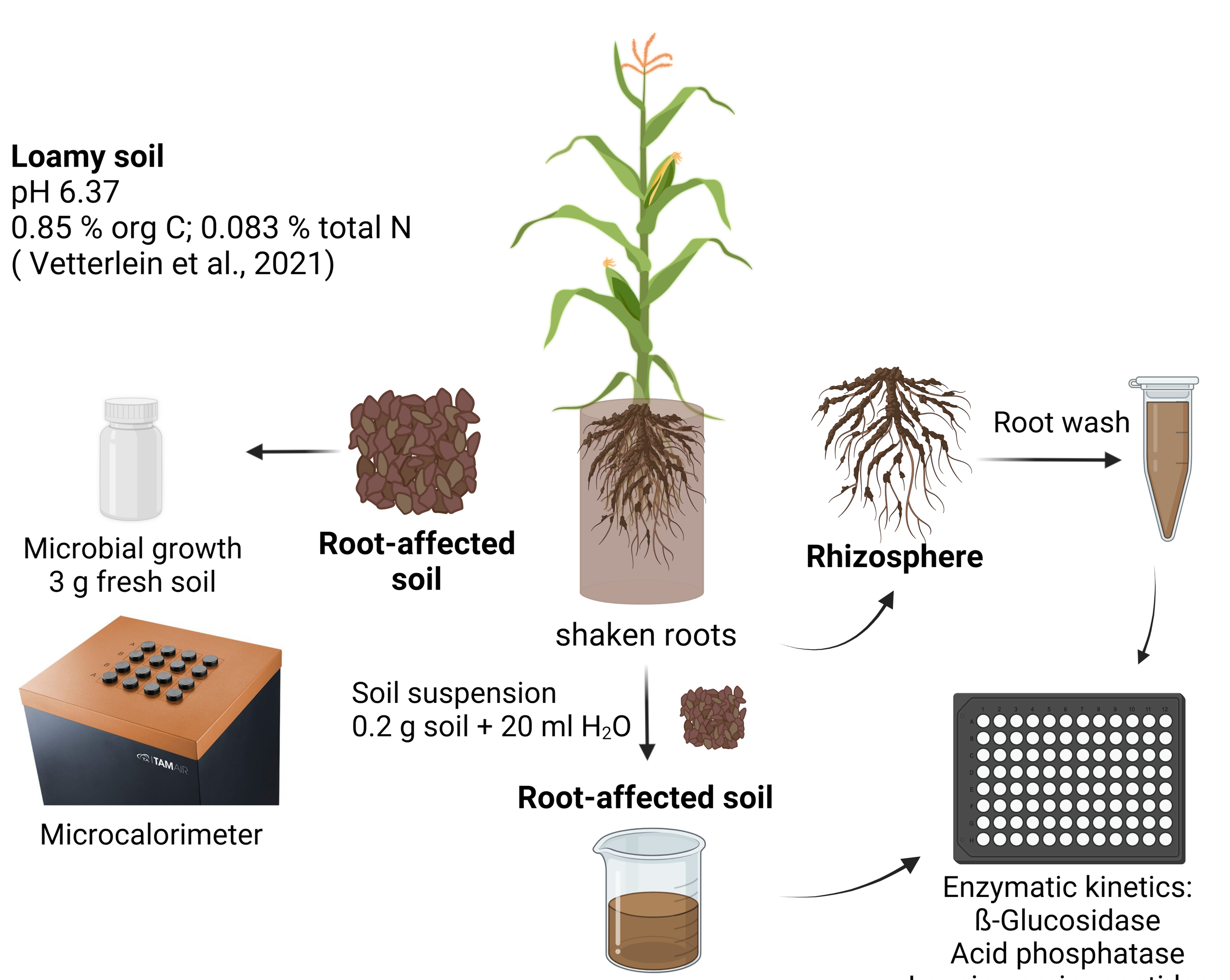


Fig. 1. Experimental design

Results: Microbial substrate-induced growth

→ The time required to achieve the microbial growth peak was 20 hours longer for drought stress vs. well-watered treatment (**Fig. 2**)

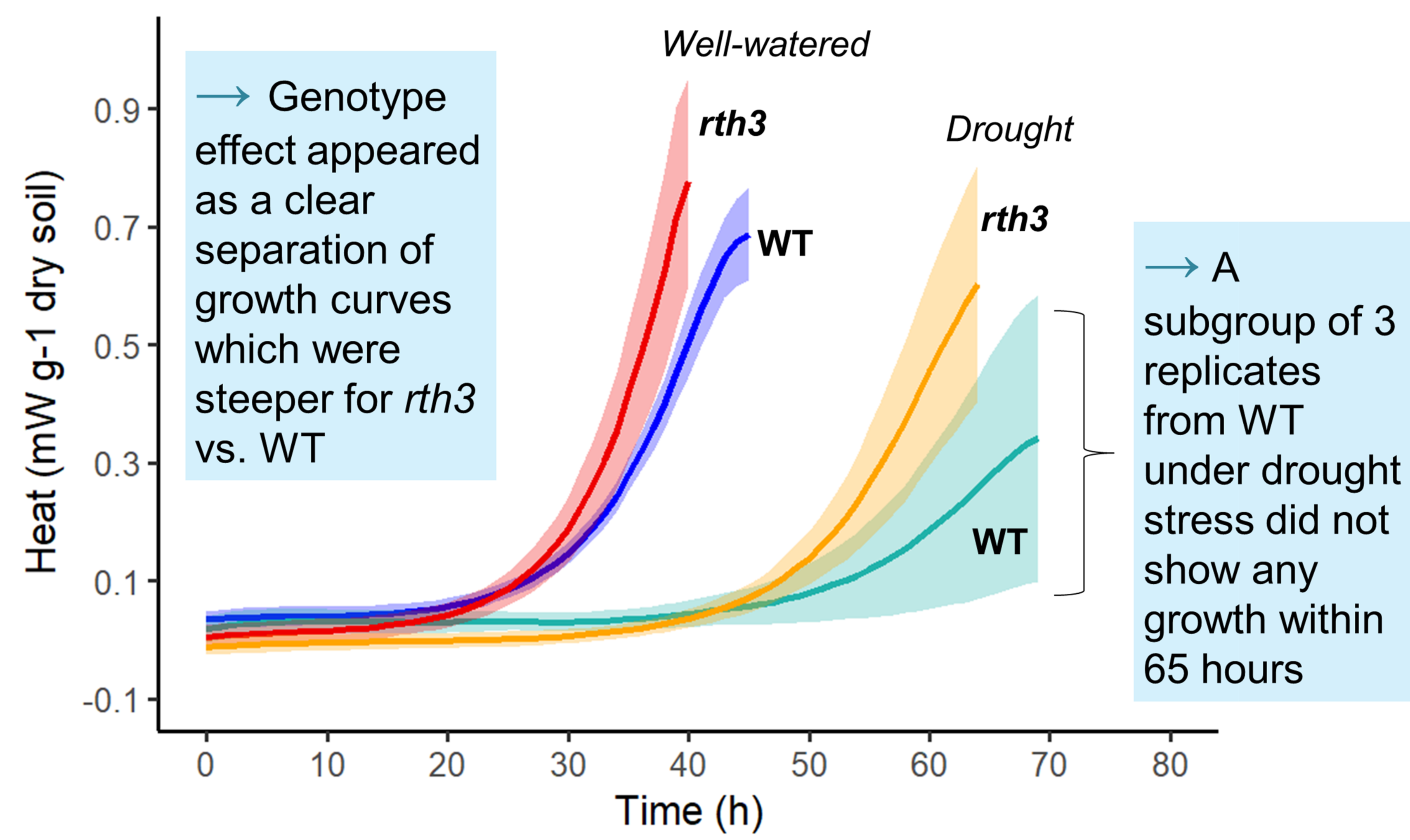


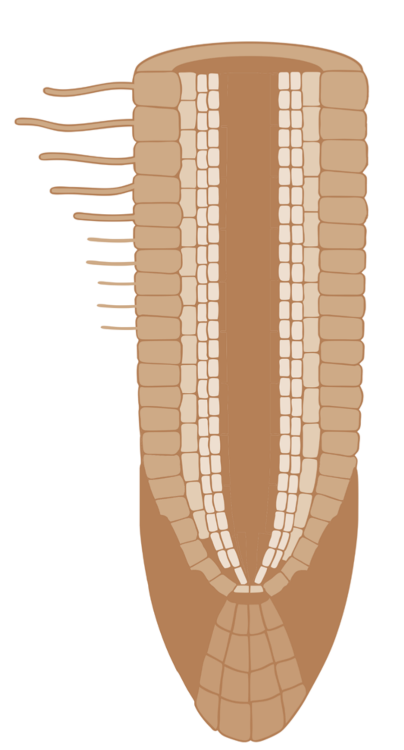
Fig. 2. Microbial substrate-induced growth expressed as heat flow over time. Curves represent the mean of 6 biological replicates and shadows the level of confidence for a value of α= 0.05.

Conclusions

H1 √ (partly) :

WT:
Rhizosphere – **ß-Glu** and **AP** decreased activity after drought vs. well-watered plants

Root-affected soil – **ß-Glu** decreased activity after drought vs. well-watered plants



rth3:
Rhizosphere – **ß-Glu** decreased activity after drought vs. well-watered plants

Root-affected soil – **ß-Glu** decreased activity after drought vs. well-watered plants

H2 √ Microbial growth was retarded 20 hours and *rth3* showed faster growth vs. WT maize

Results: Enzyme kinetics

→ Only ß-glucosidase (**ß-Glu**) and acid phosphatase (**AP**) responded to the short-term drought stress (**Fig. 3**):

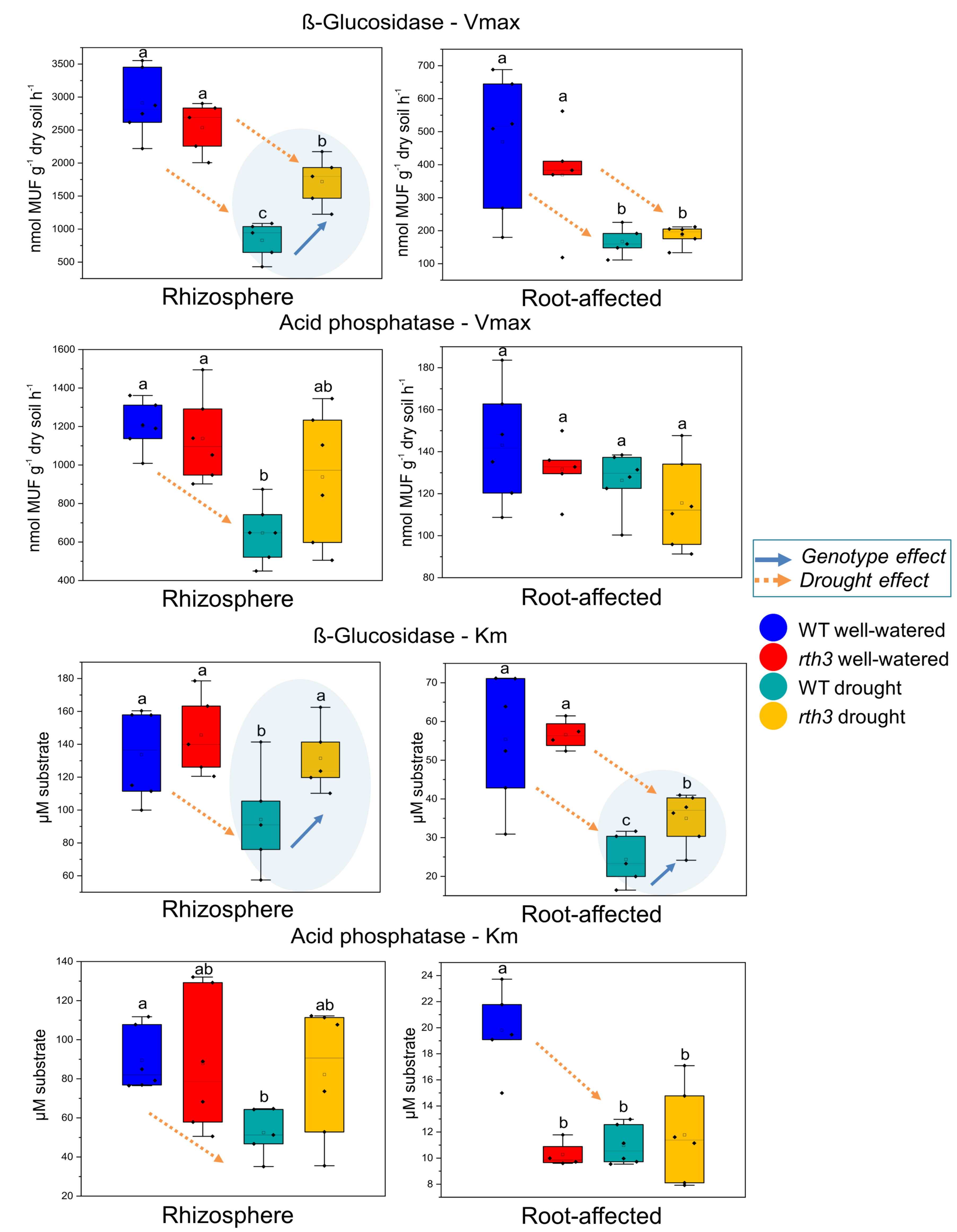


Fig. 3. Maximum enzymatic rate (V_{max}) and enzyme affinity constant (K_m) of β-glucosidase and acid phosphatase

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