

Elevated Temperature Affects Grain Set and Reproductive Growth of Tropical Maize Hybrids

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Background

- ◆ Maize is one of the most widely grown food crops worldwide.
- ◆ Climate change models predict a temperature increase of 2-6°C by 2100.
- ◆ These temperature increases are predicted to cause a yield decrease in current maize genotypes.
- ◆ Effects of high temperature on maize grown to maturity is not well understood.

Objective

- ◆ To determine temperature effects on growth and reproduction of genotypes differing in heat tolerance.

Materials and Methods

- ◆ Completely randomized design with 7 replicates
- ◆ Genotypes: CML333/W22, CML322/W22, CML103/W22, and B73/Mo17
- ◆ Treatments
 - ◆ 29/21°C
 - ◆ 33/25°C
 - ◆ 37/29°C
 - ◆ 41/33°C
- ◆ Treatment was initiated when plants were at the V5 stage
- ◆ Ears were pollinated using cool pollen from the control room
- ◆ Data collection
 - ◆ Leaf phenology and senescence was collected on a weekly basis
 - ◆ Pollen viability was measured 3 days after pollen shed started. The pollen was stained with aniline blue. Stained pollen was considered viable. See figure 1.
 - ◆ Anthesis-silking interval
 - ◆ Harvest: Plant height, node number, total yield, root and shoot biomass

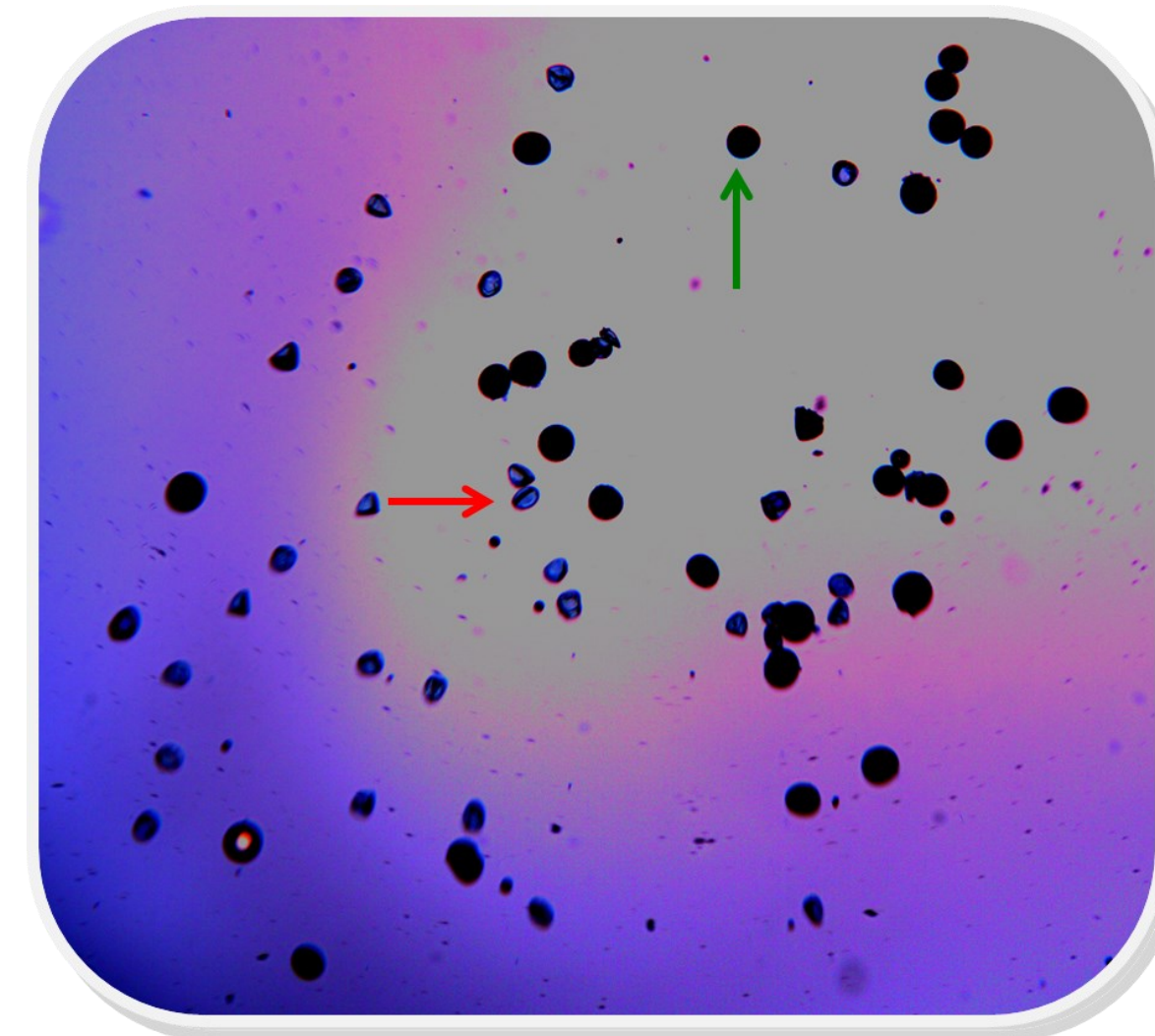


Figure 1. Stained pollen grains. Red arrow shows an unstained, or non-viable, pollen grain. The green arrow shows a stained, or viable, pollen grain.

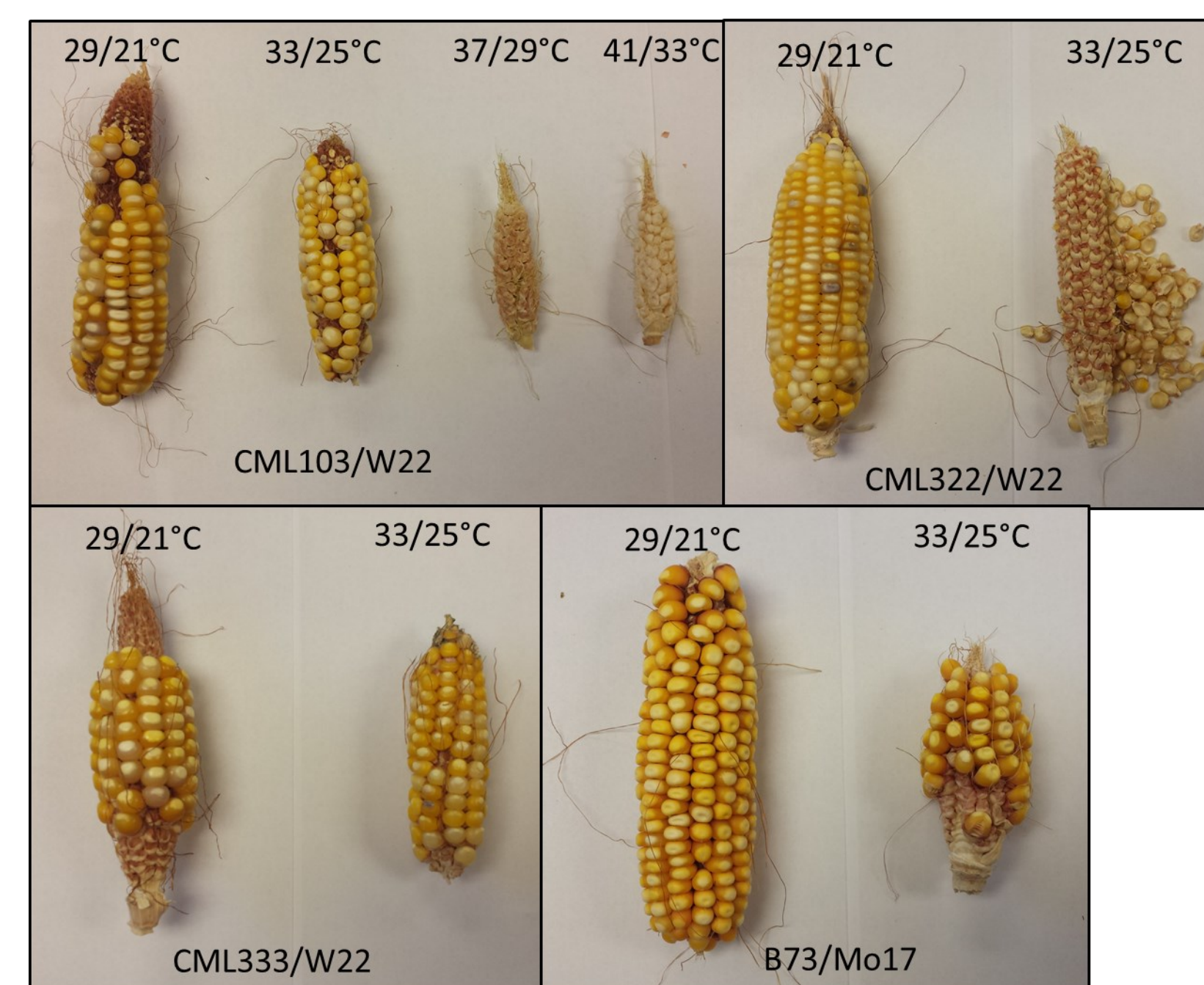


Figure 2. Grain yield across treatments with each genotype. No ears were produced for CML322/W22, CML333/W22, and B73/Mo17 at 37/29°C or 41/33°C.



Acknowledgments

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Results

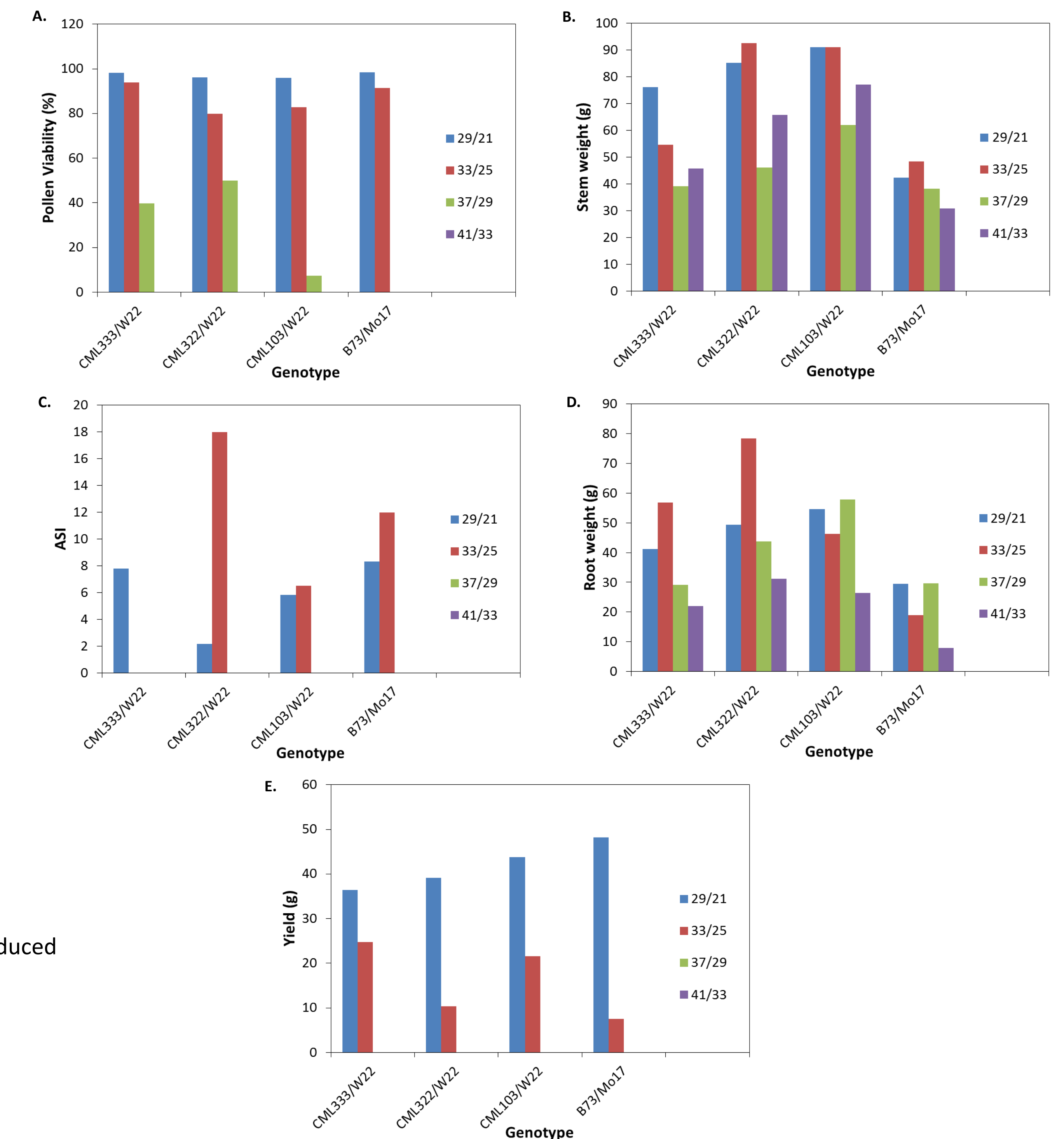


Figure 3. Comparisons of treatment and genotype of different physiological factors. A) Pollen viability. B) Shoot biomass. C) Anthesis-silking interval (ASI) D) Root biomass E) Total grain yield.

Conclusions

- ◆ Plants were able to produce tassels but not pollen at 41/33°C. Increased temperature caused a decrease in pollen viability.
- ◆ Temperature increased the anthesis-silking interval.
- ◆ Root and shoot growth were greater in 33/25°C and 37/29°C and then declined in 29/21°C and 41/33°C.
- ◆ Grain yield declined with temperature in all hybrids but CML103/W22 performed best and B73/Mo17 performed worse.