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Under high temperature the daily amplitude during seed filling of pea (*Pisum sativum* L.) affects seed growth and nitrogen partitioning within the plant

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Context

High temperatures occur frequently during the reproductive phase of pea. Mean daily temperature above 20°C has been shown to affect final yield, but the effect of daily temperature amplitude that may vary widely in field conditions remains unknown.

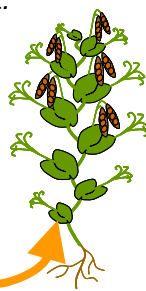
Objectives and methods

Monitoring sources functioning to understand plant responses to temperature

Pisum sativum L.
cv. Baccara

Non stressing conditions in greenhouse

fixation inhibition



End of seed abortion

N₂ air High NO₃

2 day/night temperatures

Day/night
28/23°C

Day/night
30/20°C

2 day/night amplitudes

Amplitude
5°C

Amplitude
10°C

1 mean daily high temperature

Mean
25.8°C

N fluxes monitoring:

3-days-labeling experiments

¹⁵NO₃⁻ = exogenous N

¹⁴NO₃⁻ = remobilized N

Dry matter monitoring:

Regular plant sampling

Plant compartments :

organs (seeds, pods, leaves, stems, roots)

ESA

SEED FILLING

Maturity

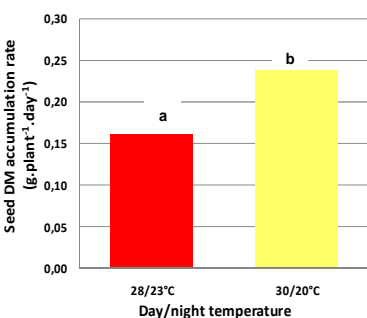
Response to daily temperature amplitude

Seed growth

Nitrogen sources and partitioning

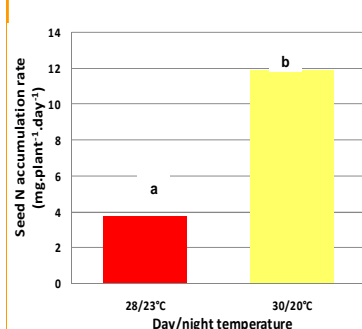
Dry Matter accumulation rate

when daily T° amplitude



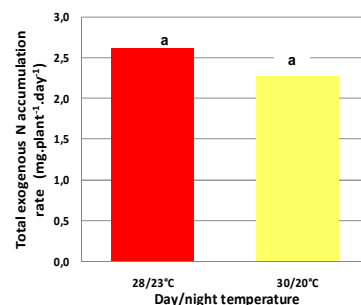
N accumulation rate

when daily T° amplitude



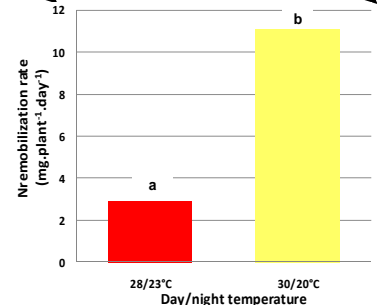
Total plant exogenous N

when daily T° amplitude



Remobilized N from vegetative parts to seeds

when daily T° amplitude



remobilized N is the major source for seed N

^a same letter: not significantly different at probability level 5% (Newmann-Keuls test)

Conclusion and Perspectives

For a similar mean daily high temperature, a decrease in the day/night amplitude seems to reduce seed growth and N remobilization to seeds.

The daily temperature amplitude during the seed filling period seems to be a crucial environmental factor determining the effects of high temperature on yield. It should be taken into account for a modelling prospect to predict seed filling response to temperature.