UNIVERSITY OF HOHENHEIM

Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute) (490)

Assessing Seed Germination and Seedling Vigour in Rice under Different Thermal Regimes

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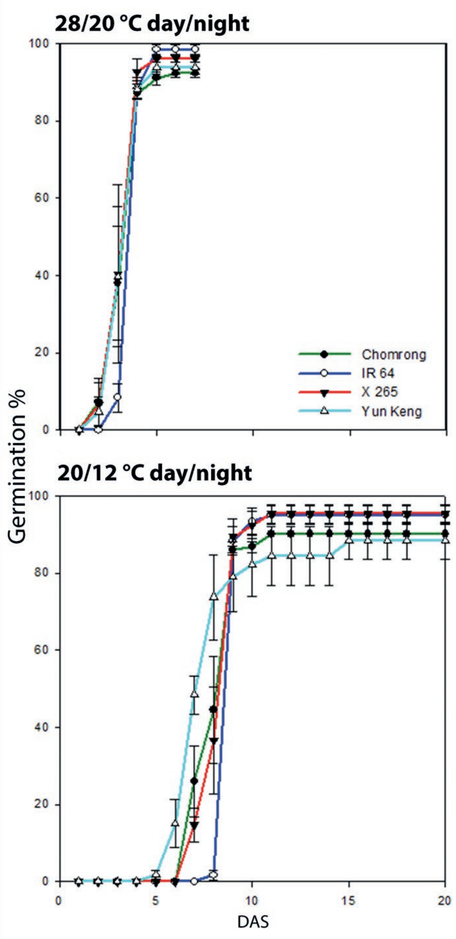
Introduction

Sustainable intensification requires flexibility in the choice of cultivar, sowing date, and management options. Hence, it is important to know germination dynamics and early seedling vigour capacity of genotypes potentially subjected to new growing environments. Here we report on the effects of two temperature regimes typical for tropical low altitude (28/20 °C day/night) and tropical high altitude systems (20/12 °C day/night) on germination capacity, mobilisation efficiency of seed reserves and days to onset of photo-autotrophy for four contrasting irrigated lowland rice genotypes.

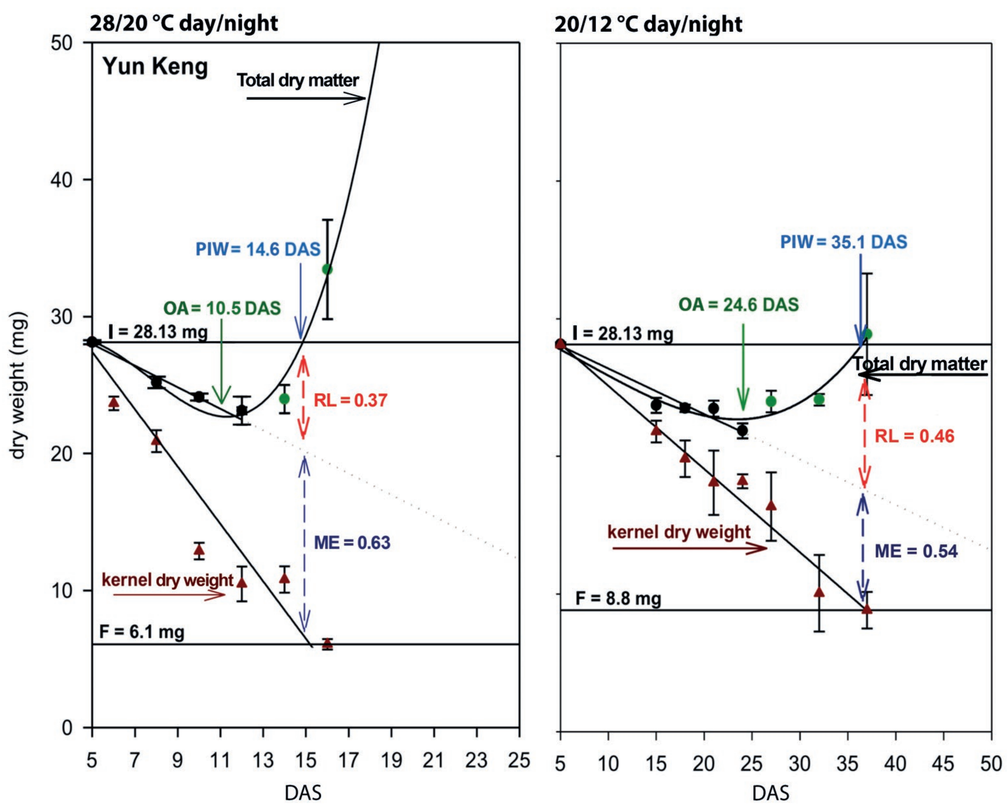
Conclusion

- Initiation of germination is greatly influenced by temperature
- Mobilisation efficiency of seed reserves depends on temperature and cultivar
- *Japonica* seedlings proved to be more vigourous at low temperatures compared to *indica* cultivars as more reserves are assigned to growth

Results and Discussion



Time course of cumulative germination percentage of four contrasting cultivars.



Cultivar	Temp.	ME	RL	OA	PIW
Yun Keng*	28/20	0.63^{ab}	0.37^{ab}	10.5^{bc}	14.6^{b}
	20/12	0.54^{AB}	0.46^{AB}	24.6^{AB}	35.1^{A}
IR 64	28/20	0.55^{b}	0.45^{a}	12.8^{a}	16.1^{a}
	20/12	0.43^{B}	0.57^{A}	20.2^{B}	36.3^{A}
Chom-rong*	28/20	0.71^{a}	0.29^{b}	11.7^{ab}	15.1^{ab}
	20/12	0.65^{A}	0.35^{B}	26.7^{A}	34.7^{A}
X 265	28/20	0.69^{a}	0.31^{b}	9.9^{c}	12.8^{c}
	20/12	0.43^{B}	0.57^{A}	26.9^{A}	36.9^{A}

Effects of different temperatures and cultivars on reserve mobilisation
ME = Mobilisation efficiency; RL = Respiration losses; OA = Onset of autotrophy (days)
PIW = Plant attains intial kernel weight (days); I = Initial kernel weight; F = Final kernel weight;
DAS = Days after sowing; Temp. = Temperature in °C day/night.
* = *Japonica* ssp.; Different small/capital letters indicate significant differences between the cultivars at 28/20 °C day/night/ 20/12 °C day/night at $p < 0.05$

- Temperature delayed germination but did not influence germination rate

- Seedling contribution to plant growth was smaller at low temperature due to higher respiration losses
- Seed reserve depletion was slower at low temperature treatment

- *Japonica* cultivars showed reduced respiration losses as compared to *indica* cultivars
- Low temperatures had an impact on the onset of photo-autotrophy and consequently compensation time was extended

Materials and Methods

- Seeds were grown on moist filter paper in growth chambers at 28/20 °C day/night and 20/12 °C day/night
- Germination were assessed every 24 hours
- Seeds were grown in wet loamy sand in climate chambers at 28/20 °C day/night and 20/12 °C day/night
- After emgergence 7 destructive samplings were carried out every 2 days for seedlings growing at 28/20 °C day/night and every 3 days for seedlings growing at 20/12 °C day/night
- Dry weights of plant organs were obtained after 72 hours drying at 70°C

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