UNIVERSITY OF HOHENHEIM
Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute)
Agronomy in the Tropics and Subtropics

Impact of Deficit Irrigation on Biomass and Nitrogen Accumulation in Mungbean (*Vigna radiata* L.)

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Background

- Mungbean (*Vigna radiata*) produces high-protein food and nitrogen-rich residues through biological N fixation
- Dryland cultivation in South and Central Asia is constrained i.a. by shortage of water and poor soil fertility

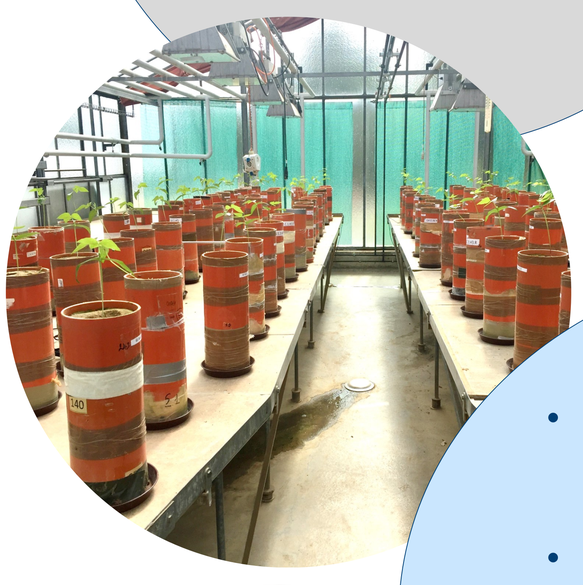
Objectives

To estimate N input of mungbean into a cropping system by:

- Testing four varieties
  1. NM 2011 (control)
  2. AVMU 1604 (bruchid resistant)
  3. KPS2 VC21184 (heat/salt tolerant)
  4. AVMU 1635 (mildew resistant)
- Assessing their biomass distribution and N accumulation under water stress

Methods

- Three irrigation treatments: control, moderate deficit, severe deficit
- Harvest at maturity
- Assessment of dry matter
- Stable isotope ($^{13}C/^{15}N$) composition of above- and belowground plant parts

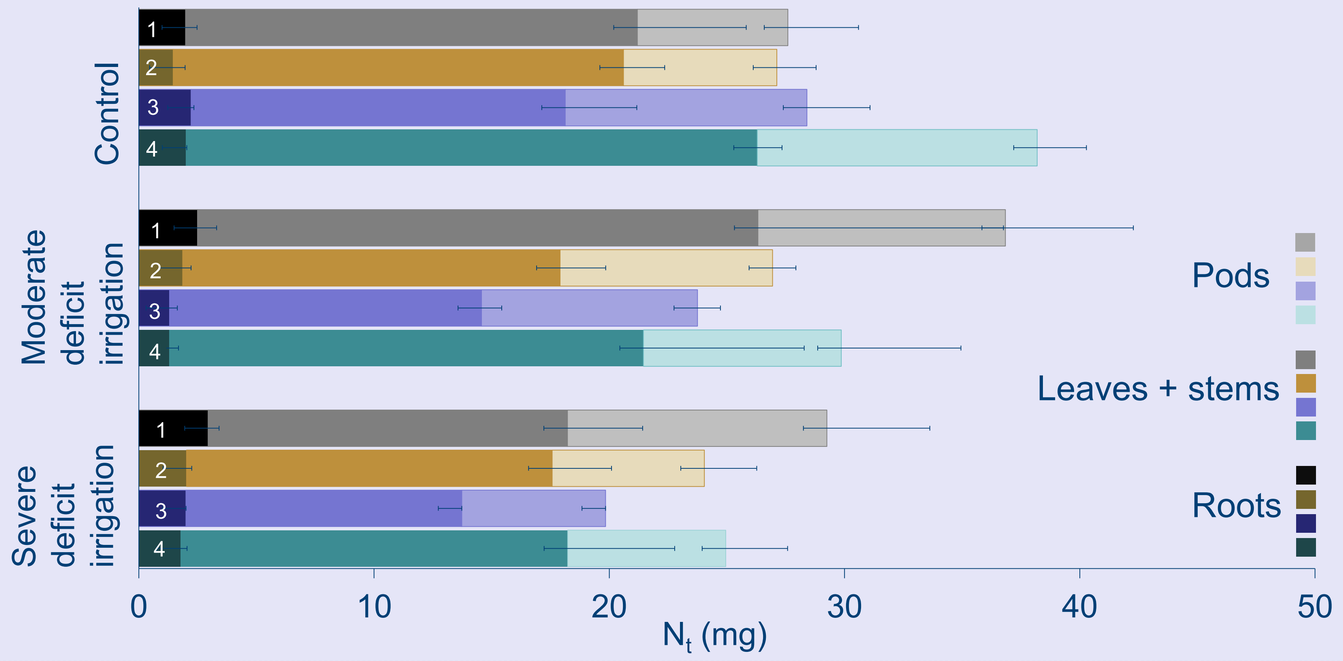


Results

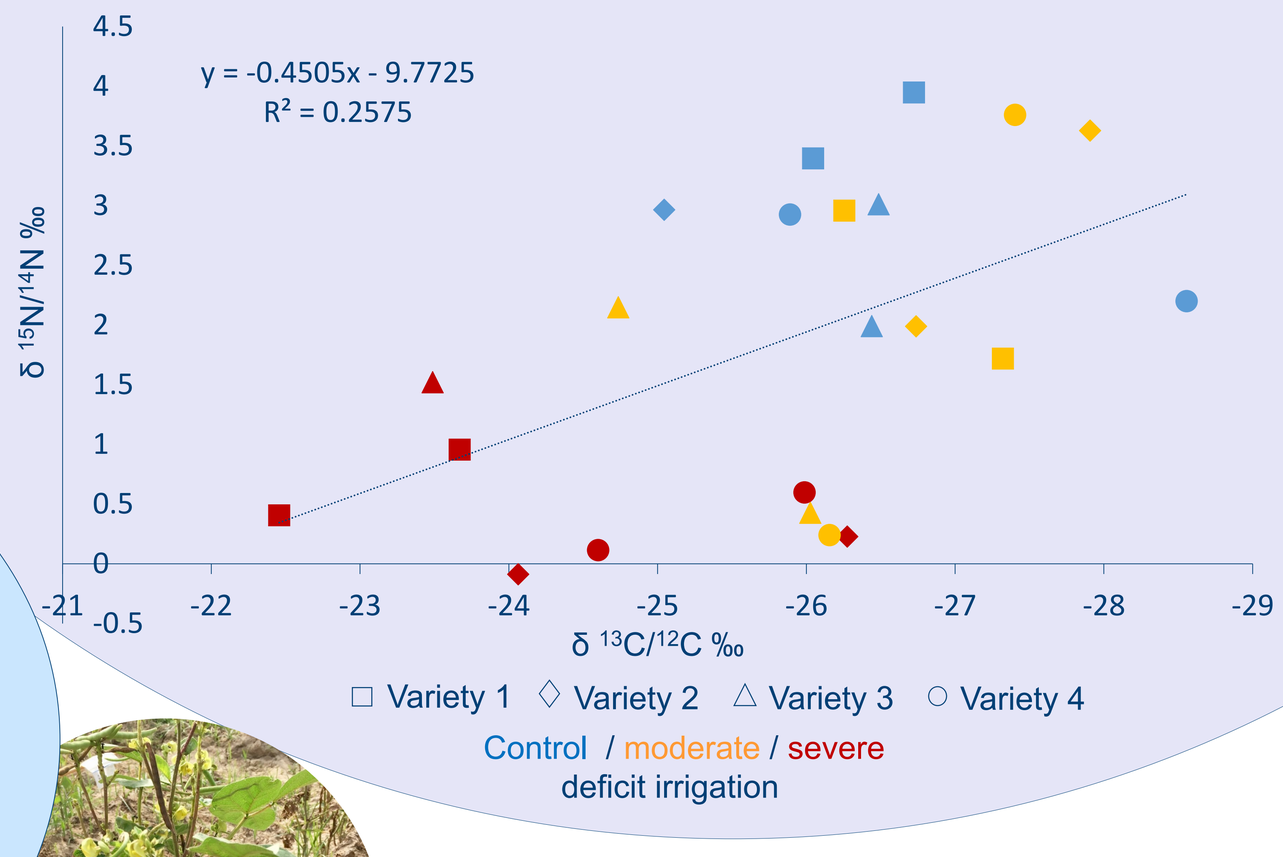
Biomass distribution across varieties (results are not significant, SD in brackets)

	Variety	Control (%)	Moderate deficit irrigation (%)	Severe deficit irrigation (%)
Pods	1	100 (±0.09)	156 (±0.13) ↑	181 (±0.22) ↑
	2	75 (±0.05)	144 (±0.03) ↑	75 (±0.07) →
	3	125 (±0.09)	138 (±0.05) ↑	125 (±0.02) →
	4	144 (±0.09)	106 (±0.13) ↓	125 (±0.06) ↓
Leaves & stems	1	100 (±0.56)	100 (±0.22) →	95 (±0.12) ↓
	2	79 (±0.06)	89 (±0.03) ↑	66 (±0.05) ↓
	3	73 (±0.06)	89 (±0.11) ↑	98 (±0.26) ↑
	4	84 (±0.09)	75 (±0.14) ↓	59 (±0.05) ↓
Roots	1	100 (±0.05)	156 (±0.15) ↑	113 (±0.06) ↑
	2	75 (±0.01)	100 (±0.04) ↑	100 (±0.06) ↑
	3	119 (±0.08)	100 (±0.07) ↓	181 (±0.12) ↑
	4	119 (±0.04)	69 (±0.03) ↓	100 (±0.07) ↓

Total nitrogen content (in mg) across varieties and treatments (results are not significant)



Correlation of δ $^{13}C/^{12}C$ and δ $^{15}N/^{14}N$ in seeds across varieties and treatments



Conclusion

- Drought stress visible in stable isotope composition of the seeds (^{13}C)
- Variety specific N and biomass accumulation
- Indirect effect of stress treatments on δ $^{15}N/^{14}N$ ‰
- No advantages of new accessions under water stress

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