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

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Abstract

In future legumes should be used as a mean of nitrogen (N) acquisition in cropping systems, since they are able to fix symbiotically atmospheric N and contribute to sustainable farming systems. Grain legumes offer even more benefits due to grain and straw production for human and animal consumption. However, using pulses for N input in a cropping system requires improvements in the accuracy estimating N balances and the N benefit for following crops, since grain and above-ground residues are removed at harvest. Moreover legume crops are often grown in dryland areas and exposed to water stress. This work aims therefore to quantify biomass and N accumulation, as well as N partitioning between above- and belowground parts by mungbean (*Vigna radiata* L.) accessions when influenced by water stress.

In a controlled environment, four mungbean accessions were exposed to three irrigation treatments: recommended irrigation level (control), moderate deficit and severe deficit irrigation. Plants were harvested at maturity and dry matter and yield parameters were assessed. Differences in the response to drought stress between the accessions were determined by stable isotope ($\delta^{13}C/\delta^{15}N$) composition of above- and belowground plant parts. Water stress did not affect pod dry weight and total aboveground biomass, but number of seeds per plant. Root biomass either increased with moderate stress and decreased with severe stress, or vice versa. In three accessions root biomass was higher with severe stress (+22 %) than with recommended irrigation. Root-N accumulation was dependent on the treatment: The proportion of root-N to total plant-N was similar among both stress treatments and around 30–40 % of the total plant-N at maturity. The control accumulated around 20 % of total plant-N in the roots. The isotopic carbon discrimination ($\Delta^{13}C$) in the grain showed clear relations to water shortages.

The results suggest that water stress affected N partitioning between above- and belowground parts.

Keywords: Carbon discrimination, deficit irrigation, nitrogen partitioning, stable isotopes, *Vigna radiata*, water stress

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