



Nitrate corrected the negative effects of ammonium and urea nutrition on the growth of *Capsicum* plants

The aim of this study was to compare the effects on plant growth of the main mixed N forms containing urea with that of nitrate and nitrate-ammonium as an N source for two plant species, wheat (tolerant to ammonium) and

*Capsicum*

(sensitive to ammonium). The experiment was performed in a growth chamber and plants were grown in siliceous sand pots.

*Capsicum*

plants received only one level of N: 8,5 mmol/L, whereas wheat plants received three levels of N: 2, 8,5 and 15 mmol/L. Treatment compositions for 8,5 mmol/L are described in Table 1.

Table 1. Composition of treatment solutions for a N level of 8,5 mmol/L. All concentrations are in mmol/L.

Treatment	NO <sub>3</sub> <sup>-</sup>	NH <sub>4</sub> <sup>-</sup>	U	NA	NU	AU	NAU
Ca(NO <sub>3</sub> ) <sub>2</sub>	2						
KNO <sub>3</sub>	4,5				4,25		
(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>		4,3				2,13	
Urea			4,25		2,13	2,13	1,4
NH <sub>4</sub> NO <sub>3</sub>				4,25			2,85
K <sub>2</sub> SO <sub>4</sub>	0,3	2,5	2,5	2,5	0,38	2,5	2,5
KH <sub>2</sub> PO <sub>4</sub>	1	1	1	1	1	1	1
Mg <sub>2</sub> SO <sub>4</sub>	2	2	2	2	2	2	2

Nota U = urea, NA = nitrate/ammonium, NU = nitrate/urea, AU = ammonium/urea, NAU = nitrate/ammonium/urea

Results showed that for both wheat and

*Capsicum*



the growth of plants, fed with mixed nitrogen forms containing urea, was similar to that of plants receiving nitrate and nitrate/ammonium. Only for

*Capsicum*

, fed with ammonium/urea a significant decrease in plant growth was found (Table 2). The presence of nitrate (as for example supplied with  $\text{KNO}_3$ ) corrected the negative effects of ammonium and urea nutrition on the growth parameters of

*Capsicum*

plants.

Table 2. Effects of different nitrogen forms on growth parameters of

*Capsicum*

plants.

Treatment	Height (cm)	Number of leaves	Leaf dry weight (g per plant)	Root dry weight (g per planta)
$\text{NO}_3^-$	19,0 cd	40,8 ab	4,85 b	2,72 bc
$\text{NH}_4^+$	13,0 ab	26,7 a	2,16 a	1,52 a
U	15,3 abc	55,0 b	3,92 ab	1,85 ab
NA	16,5 abc	43,5 ab	4,80 b	2,17 ab
NU	20,8 d	44,5 ab	4,97 b	3,29 c
AU	12,8 a	26,0 a	2,38 a	1,64 a
NAU	17,3 bcd	45,0 ab	4,72 b	2,16 ab

Nota U = urea, NA = nitrate/ammonium, NU = nitrate/urea, AU = ammonium/urea, NAU = nitrate/ammonium/urea