

Composition of harmful nitrogen in different N sugar beet varieties

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Introduction

The technical quality of sugar beet is determined on the basis of its K-, Na-, and a-amino-N content. Total soluble nitrogen content (harmful nitrogen) is estimated via the analysis of a-amino-nitrogen. Objectives of the present study were to estimate the genetic variability for nitrogen compounds in the current sugar beet varieties and to determine differences in the proportion of the components of harmful nitrogen (a-amino-nitrogen, betaine, nitrate, Fig. 1) in these sugar beet varieties. 51 sugar beet varieties were tested in multi-environmental field trials.

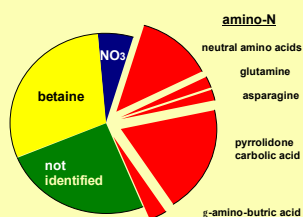


Fig. 1: Composition of harmful N in thick juice of sugar beet (Schiweck et al. 1994)

Material and Methods

Beet material was taken from 10 different sites of the official variety trials in Germany (Fig. 2). In the Al₂(SO₄)₃ clarified brei filtrates total soluble N was determined after dry combustion in a Nitrogen-Analyser, a-amino-N fluorometrically (Burba & Georgi 1975/76), nitrate (NO₃-N) according to Milham et al. (1970) and betaine colorimetrically (Storey & Wyn Jones 1977).

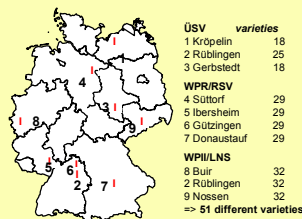


Fig. 2: Sites of variety trials sampled in 2000

Results

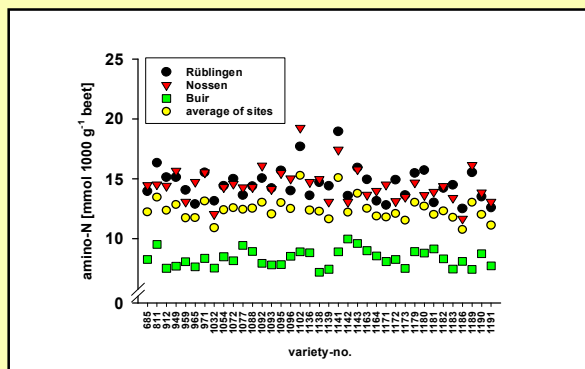


Fig. 3: a-amino-N-concentration of different sugar beet varieties at 3 sites (WPII/LNS, 32 varieties, 2000)

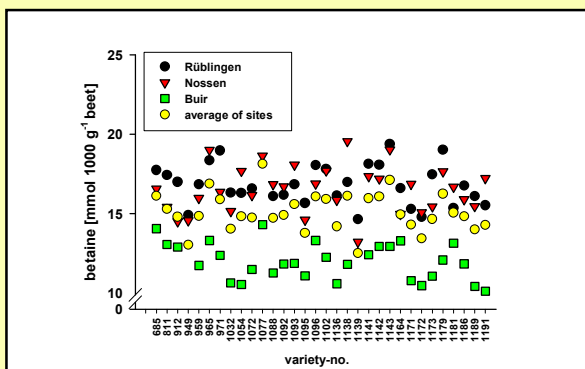


Fig. 4: Betaine concentration of different sugar beet varieties at 3 sites (WPII/LNS, 32 varieties, 2000)

Tab. 1: Components of variance for different N compounds in sugar beet varieties (51 varieties, 10 sites, 2000)

	variance			
	total N	amino-N	NO ₃ -N	betaine
environment (E)	44.92**	8.88**	1.44**	3.25**
genotyp (G)	14.12**	3.16**	0.16**	0.67**
G*E interaction	8.82	1.78*	0.05*	0.71*
total error	34.97	3.89	0.47**	1.91

Tab. 2: Pearsons correlation coefficients for different N compounds in sugar beet varieties (51 varieties, 10 sites, 2000)

	total N	a-amino-N	NO ₃ -N
a-amino-N	0.90***		
NO ₃ -N	0.47***	0.54***	
betaine	0.57***	0.42***	-0.10*

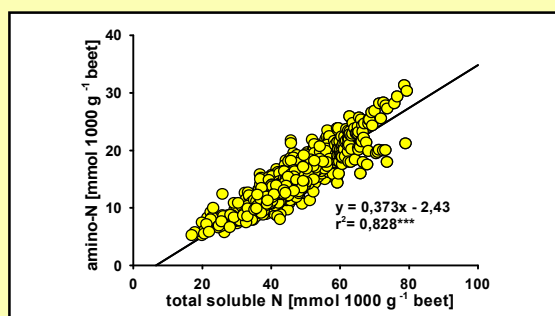


Fig. 5: Relationship between the concentration of total soluble N and a-amino-N in sugar beet varieties (51 varieties, 10 sites, 2000)

Conclusions

- The components of harmful nitrogen / total soluble N in sugar beet, a-amino-N, NO₃-N and betaine, showed significant variability for environment and variety (Fig. 3, 4, Tab.1).
- Although the proportion of a-amino-N and betaine on total soluble N is similar, a-amino-N had a higher correlation coefficient with total soluble N than betaine (Fig. 1, Tab. 2).
- On average of all varieties and sites in 2000 the a-amino-N accounted for 37% of total soluble N, but with differences among varieties (Fig. 5).