Analysis to evaluate soil tare in variety trials with sugar beet

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Introduction

The amount of adherent soil that is transported with the beet to the sugar factory depends mainly on soil and weather conditions. By improved harvesters and cleaner loaders soil tare has been reduced in recent years. For a further reduction of soil tare breeders selected for root types which retain less soil. The aim of the present study was the determination and evaluation of soil tare as a variety trait under common conditions of variety testing of sugar beet. That is testing for at least two years at several trial sites and processing after harvest at different locations (preparation systems, tare house). The preparation systems differ primarily in the cleaning technology for loose soil.

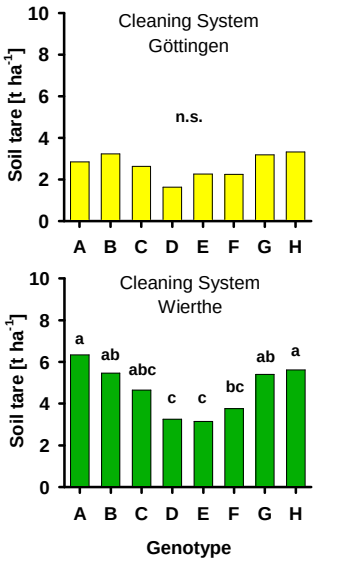
Material and Methods

Trials with eight genotypes (including standard varieties and clean beets) were conducted at four trial sites in 2001 and 2002 each. The experiment was carried out as split-plot design with three types of cleaning systems as main plot factor and the genotypes as subplot factor. After harvest the beet was transported in big bags and processed after usual storage for one week. To compare immediate processing to processing after storage a further main plot was supplemented at 5 environments (year x trial site).

Soil tare per hectar = adherent soil in t ha^{-1}
Soil tare percentage = adherent soil relative to the net weight of roots in %

Adherent soil is calculated by the difference from gross weight (after removal of loose soil) and net weight after washing.

Results



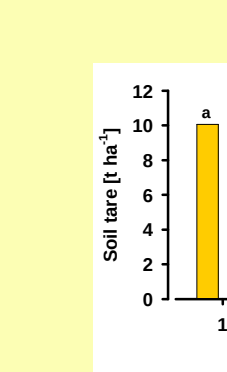


Fig. 1: Average soil tare [t ha^{-1}] for the genotypes and the different cleaning systems. Results from three environments.
Different letters indicate significant differences (Tukey, $\alpha < 0.05$)
n.s. = not significant

Fig. 2: Average soil tare for the genotypes. Results from the different cleaning systems and from seven environments.
Different letters indicate significant differences (Tukey, $\alpha < 0.05$)
n.s. = not significant

Fig. 3: Average soil tare [t ha^{-1}] for environments when beets were immidiately processed in comparison to processing after storage (one week). Results from eight genotypes.
Different letters indicate significant differences (Tukey, $\alpha < 0.05$) between processing dates

Tab. 1: Estimation of variance components for root yield, sugar content and soil tare (as percentage of total variance).

Effect	Root yield	Sugar content	Soil tare
Environment	59.3	66.1	34.6
Cleaning system	0.0	0.0	37.9
Genotype	5.1	16.6	2.4
Interactions	4.0	7.1	11.1
Residue	31.7	10.1	13.9

Conclusions

- **The analysis of variance revealed significant effects of the environment, the cleaning system and the genotype but also significant interactions between these factors. So that for interpreting results subsets of environments were formed. Comparing cleaning systems and subsets of environments three genotypes (D, E, F) showed the lowest soil tare.**
- **Variety performance is normally expressed by the overall mean as the cause of interactions could not be specified. The overall mean of soil tare compared to the soil tare percentage showed nearly the same genotype ranking.**
- **Results from environments with very low or high amounts of soil tare show that extreme values and high variances are due to unfavourable harvesting conditions. Such environments are not suitable for variety trials because the morphological characteristics were superimposed by the environmental influence.**
- **Estimation of variance components revealed a minor amount of variance that can be attributed to the genotypes. Highest amounts of variance derived from environments and cleaning systems.**
- **Processing after storage (one week) resulted generally in lower amounts of adherent soil. The genotype x processing date interaction was not significant.**