

# Hohe Glucosinolatgehalte in Raps - eine Folge der Klimaänderung

## High glucosinolate levels in rapeseed - a consequence of changed climate

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### Abstract

In 2012 rapeseed (*Brassica napus* L.) grain yield and glucosinolate levels (GSL) were significantly affected by varying environmental conditions. The lowest grain yield (19.5 dt·ha<sup>-1</sup>) together with the highest level of GSL (40.8 μmol·g<sup>-1</sup>) was observed in North East Austria while highest yields (70.1 dt·ha<sup>-1</sup>) were observed in Upper Austria together with low to moderate GSL levels. Year specific peculiarities were the occurrence of frost after flowering in the second half of May and a lack of precipitations in the Northeastern areas from April until harvest time. Therefore, it was hypothesized that high GLS levels may be the consequence of an increased nitrogen supply due to reduced increase of biomass during the vegetation period. Our observations made clear, that grain yield is influenced by local climatic conditions - low yields in Eastern Austria due to frost and lack of water and high yields in Western Austria. But no reliable relation could be established between yield and nitrogen uptake, which was indicated by the crude protein level of the seeds. The relation between yield and protein was strongly influenced by the location of the trials. It may be argued, that there are too many environmental influences on the distribution of nitrogen to the different parts of the plant. For high yields the protein and GSL levels seem to be limited by the available nitrogen but low yields are not necessarily associated with high protein levels. The high GSL levels in the present study are caused by the majority by a high nitrogen uptake before damaging of the

yield by freezing. Good linear correlations were found between protein and GSL levels of the seeds ( $R^2 = 0.44$ ). Excluding the varietal impact in the calculation improved the correlation to  $R^2 = 0.61$ . From our observations it may be concluded that whilst there is no direct relation between yield and protein level in the seeds, the linear relation between proteins and GSL indicates these two compounds have the same precursors. The linearity of this relation may also be interpreted as a hint that there is no metabolism activated by circumstances inducing higher protein levels. This and the observed limitation of protein levels by high yields are in good agreement to studies reporting increased GSL concentrations in *Brassica* shoots by environmental stress as a consequence of reduced biomass increase (ANTONIOUS et al. 2009), while the enhancement of GSL production by stimulation of the metabolism is reported as a response to pathogen challenge, herbivore damage and mechanical wounding (GRUBB and ABEL 2006). In sound plant material GSL synthesis seems to be dependent mostly on the genotype and not on the environment (FRANCISCO et al. 2011). In some distinct cases, especially in broccoli, reactions of GSL synthesis to environmental conditions (e.g. osmotic stress) are reported, but these seem to be dependent to a high degree on the genetic preconditions of the plant (ZAGHDOUD et al. 2012).

### Keywords

*Brassica napus*, drought, environment, frost, protein

### References

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