Targeted influence on rhizospheric conditions for enhancing secondary metabolism in some tropical crops

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Introduction

The rising awareness of environmental, nutritional and health concerns has led to changes in consumer behavior, increasingly demanding for more healthy products. There is growing evidence to suggest that secondary plant metabolites in vegetables can bring health benefits. For example, carotenoids or glucosinolates, in vegetables can reduce the risk of some human chronic diseases such as different types of cancer and cardiovascular diseases. Consequently, the health benefit of vegetable is considered as an important quality aspect by an increasing number of consumers. Whether the synthesis of β-carotene concentrations in sweet potato tubers, or glucosinolate in Brassica species, they are known to be regulated both ontogenetically and environmentally.

Arbuscular mycorrhizal fungal inoculation effects on β-carotene concentrations in sweet potato tubers (A)

Mycorrhizal inoculation significantly increased β-carotene concentration in sweet potato tubers at a low P supply level and there was indication of a direct AM-stimulated carotenoid metabolism rather than by elevated nutrition in AM plants.

Drought inducing water supply conditions on glucosinolate concentration in Brassica carinata (B)

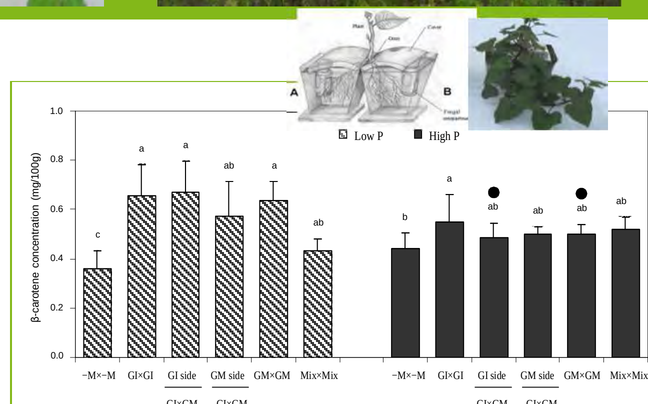
Similarly, drought-inducing water supply led to a distinct increase of glucosinolates in *B. carinata*, with indication of a *B. carinata* line-specific drought response. It seems that under drought, there is a shift from primary to secondary metabolism, thereby promoting glucosinolate synthesis.

Drought stress or additional sulphur supply effects on leave glucosinolate content in different ecotypes of Moringa oleifera.

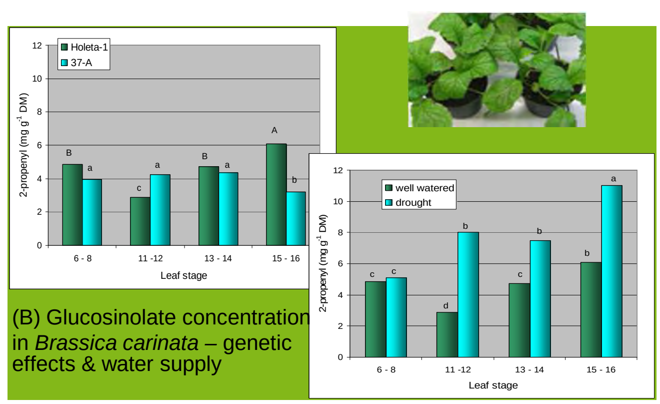
In the drought resistant *M. oleifera* tree, drought and sulphur fertilisation-mediated effects on glucosinolates depended on the ecotype and significant changes were not determined for all ecotypes analysed. While no significant influence of the cultivation variant for ecotype TOT4880 and TOT7267 was found, ecotype TOT5028 showed these differences. A statistically significant correlation between the cultivation variant and the ecotype was not found. Ecotype TOT5028 showed in the DV and SV a significantly higher glucosinolate content than ecotype TOT4880.

Conclusion

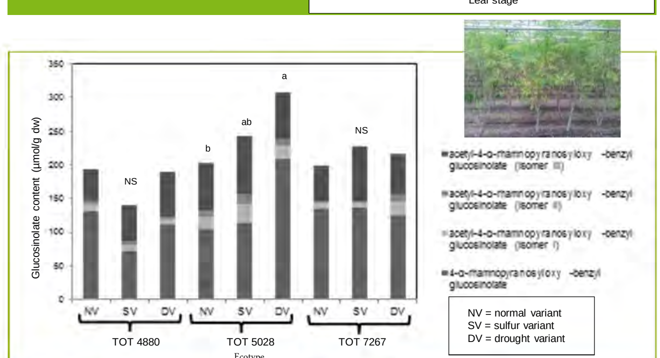
The results indicate a remarkable potential of mycorrhizal fungi to improve β-carotene concentrations in sweet potato tubers in low-P soils E.g. in SSA), to alleviate human vitamin A deficiencies Controlled drought as well as sulphur application can improve plant quality by increasing the concentration of health-promoting glucosinolates in a targeted plant. Exploitation of these regulatory factors could have strong implications for the production of health-promoting food for human nutrition.



(A) Mycorrhizal effect on β-carotene concentrations in sweet potato tubers at 2 P supply levels



(B) Glucosinolate concentration in *Brassica carinata* – genetic effects & water supply



(C) Glucosinolate content in different *Moringa oleifera* ecotypes – genetic, drought & sulphur supply effects

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