

Influence of abiotic and biotic stress on plant growth parameters and quality of specialty crops

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Plants under stress react with changes in their primary and secondary metabolism which directly can affect quality aspects. Many herbs and spices develop a stronger aroma and taste under Mediterranean in comparison to humid climate. Reasons are most likely moderate drought stress in combination with a higher UV irradiation.

In the current research the hypothesis was tested if it is possible to increase valuable plant ingredients by applying controlled stress conditions. Crops from different plant families which contain secondary plant metabolites from different classes were tested. Test crops were thyme (*Thymus vulgaris*), greater celandine (*Chelidonium majus*), nasturtium (*Tropaeolum majus*), parsley (*Petroselinum crispum*), and St John's wort (*Hypericum perforatum*). With these plants the following classes of secondary plant compounds could be investigated in response to stress: essential oils, alkaloids, glucosinolates, polyphenoles, and hypericine. Stress parameters that were applied to the plants in pot experiments were drought, salt stress and the simulation of biotic stress by application of the phytohormones methyljasmonate (MeJA) or salicylate (SA). Both phytohormones are involved in pathogen defense. Plants were harvested at different growth stages and a selection of stress parameter and secondary plant compounds as well as the biomass development was recorded. It was shown that with drought stress and MeJA application it was possible to increase the concentration of most secondary compounds (Bloem et al., 2014; Kleinwaechter et al., 2015; Paulsen et al., 2014) but drought stress always reduced biomass development. Therefore the overall yield of secondary compounds was lower in plants grown under water deficit. Application of MeJA caused an increase in the

concentration of valuable compounds in the dry matter and very often as well in the overall yield of the compounds when harvesting the plants. SA and salt stress revealed a positive effect on vegetative growth of parsley and St John's wort and increased metabolite yield via increasing the total vegetative biomass.

The results show that it is possible to adjust metabolite concentrations in plant parts by applying stress to the plant but plants react differently to stress and it is important to know the species-specific mechanisms of stress related secondary metabolite accumulation.

References

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