Tropentag, September 16-18, 2015, Berlin, Germany

"Management of land use systems for enhanced food security: conflicts, controversies and resolutions"

Characterisation of the Secondary Metabolite Pattern of Vegetable Amaranth

Ronald Maul[1], Jenny Zehring[1], David Schröter[1], Valeria Reim [2], Monika Schreiner[1], Benard Ngwene[1], Sascha Rohn[2]

[1] *Leibniz-Institute of Vegetables and Ornamental Crops Grossbeeren/Erfurt e.V., Dept. of Quality, Germany*

[2] *University of Hamburg, Dept. of Food Chemistry, Germany*

Abstract

Vegetable amaranth represents one of the most consumed African leafy vegetable. However, there is a multitude of species cultivated for human consumption and little is known about the various secondary plant metabolites in these vegetables. Phenolic substances as well as saponins belong to the groups of potentially bioactive constituents described so far. Scientific data on the precise chemical nature of these compounds in vegetable amaranth are lacking, however, this is mandatory for an evaluation of the potential health impact of vegetable amaranth on humans. Therefore, the aim of the present work was to characterise the saponin and (poly)phenol pattern of selected amaranth species (*A. hybridus, A. hypochondriacus*, *A. cruentus*). Methanolic extracts of the leaves were analysed by HPLC-DAD-MSn for structural information and quantitative data. The main flavonoids detected in field grown *A. cruentus* leaves were rutin, 120 – 280 mg/100 g; quercetin-3-glucoside, 30 – 50 mg/100 g; and nicotiflorin, 5 – 8 mg/100 g all calculated as flavonoid equivalents in DW. Even more abundant were esters of cinnamic acid derivatives accounting for approx. 650 mg/100 g DW. Only half of these cinnamic acid derivatives could be assigned to e.g. esters of coumaric or ferulic acid and aldaric acid whilst the most abundant compound still needs to be isolated and identified. The saponin pattern was qualitatively analysed and compared between all three amaranth species. In *A. hybridus* and *A. hypochondriacus* high amounts of saponins were detected whilst in *A. cruentus* leaves only trace amounts were found. In *A. hybridus* and *A. hypochondriacus* more than ten different saponins of the oleanan-type (triterpensaponins) could be tentatively identified, whereof six have never been described in amaranth before. Amongst these, at least one derivative possessing significant hemolytic activity could be isolated. Amaranth leaves contain a heterogeneous pattern of phenolic substances and saponins. Many of these substances are chemically and biologically poorly characterised. Moreover, the pattern is strongly dependent on the species, implying that certain species are more nutritious than others. As a consequence a more comprehensive structural identification and biological activity investigation is needed for a thorough evaluation of the potential health impact of vegetable amaranth on humans.

Keywords: Amaranthus species, food analysis, hemolysis, phenolic substances, saponins

Contact Address: Benard Ngwene, Leibniz-Institute of Vegetables and Ornamental Crops Grossbeeren/Erfurt e.V., Dept. of Quality, Grossbeeren, Germany, e-mail: ngwene@igzev.de