Secondary plant products of *Parthenium hysterophorus* L. and their possible impact on human health in Ethiopia

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Introduction

Parthenium hysterophorus L. (parthenium) is a genus in the family Asteraceae. It is native to South America and the Gulf of Mexico. Parthenium is one of the worst weeds in countries were it has been introduced. After its introduction in Ethiopia it developed to an invasive weed and spread over the whole country within a few years. It causes direct losses to the grazing industry and is a human health hazard, causing allergic rhinitis and contact dermatitis. Human health impact is often associated with secondary plant metabolites found in parthenium such as partenin, a sesquiterpene lactone.

Fig. 1: Flowering parthenium plant

Methods

(1) Parthenium was sampled from different geographic areas in Ethiopia, India and Taiwan. Additionally, plants were cultivated in Ethiopia and Berlin under regular greenhouse conditions and under water stress. We assume that the secondary metabolite profile of parthenium will change in quantity and quality depending on water stress conditions. We analyzed the phenolic acids and parthenin contents by HPLC.

(2) Furthermore we interviewed 64 Ethiopian farmers in four heavy infested regions to estimate the health impact of parthenium.

Fig. 2: Interview of farmers with health problems; Ayub, Ethiopia

Results

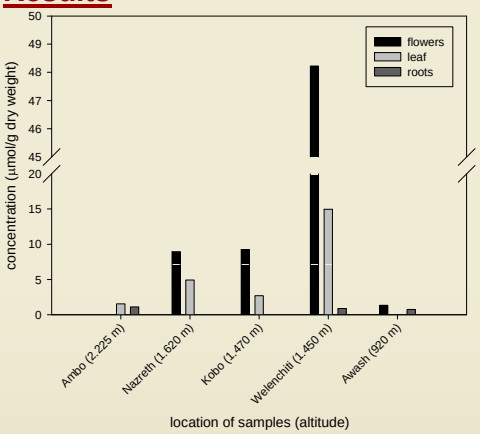

Fig. 3: Concentration of total phenolic acids in different plant compartments of parthenium plants collected from different locations

The results show that the phenolic acid content is depending on plant compartment and growth location. In flowers we found the highest content of phenolic acids. The concentration of phenolic acids varies strongly depending on growth location.

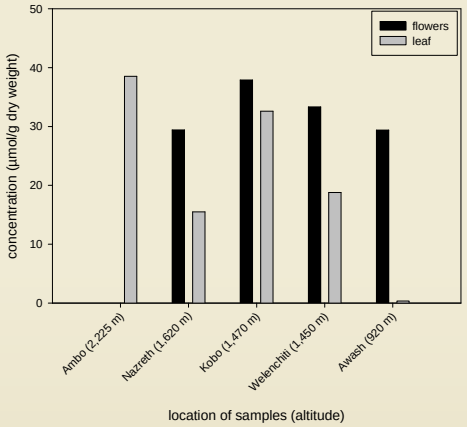

Fig. 4: Concentration of parthenin in Parthenium plants of different locations

Analyse of parthenin, the major sesquiterpene lactone in parthenium, are quite different to these of phenolic acids. The concentration of the samples differs not in such range but they tend to be decrease with declining altitude .

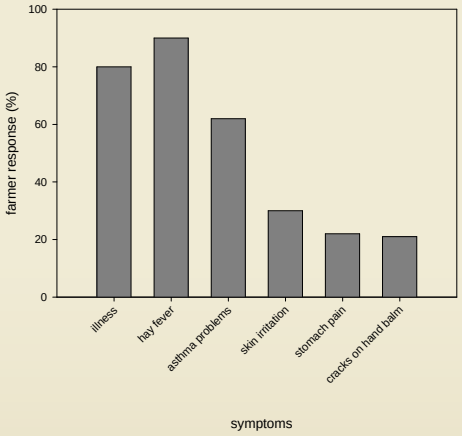

Fig. 5: Health hazards of Parthenium by farmers in highly infested areas

The response of the 64 interviewed farmers in Ethiopia showed that all of them have health problems in different nuances. Most frequently they responded to parthenium contact with light allergic symptoms like hay fever or skin prickle on arms and hands. Some farmers had worse health problems: cracks on hand balms, fever, prickle on the whole body, skin irritations, and asthma.

Conclusion

Health problems with *P. hysterophorus* are in the literature often associated with parthenin. Concentration of parthenin differs between plant components and is depending from growth location. However, we found in addition to parthenin high concentrations of phenolic acids which might also contribute to health problems. Most farmers dealing with *P. hysterophorus* report severe health problems. In further studies we are looking into the impact of single compounds for skin irritations and other health problems.

This research project was financially supported by Stiftung für tropische Agrarforschung, DAAD, BHGL, Verein der Freunde und Förderer der LGF der Humboldt-Universität zu Berlin, Bayer CropScience and Syngenta.