



Tropentag, September 18-20, 2019, Kassel

“Filling gaps and removing traps
for sustainable resource management”

The Potential of Sustainable Antimicrobial Additives for Food Packaging from Native Plants in Benin

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Abstract

In sub-Saharan Africa, food losses occur mostly in the early steps of the supply chains. The main reasons are damages due to handling during harvest, transport, and accelerated spoilage due to environmental and hygienic conditions. Packaging solutions can help to decrease losses, but packaging waste is an increasing issue in developing countries, and fossil resources are limited. Therefore, the implementation of active biobased and biodegradable packaging solutions is of great interest. Active packaging solutions can increase shelf life and food safety of perishable foods by inhibiting the growth of bacteria. A sustainable approach is the usage of phytochemicals from local plants as additives for active packaging. Consequently, extracts from 16 plants from Benin were screened for their antimicrobial activity against spoilage bacteria of perishable foods, foodborne pathogens and relevant fungi. The antimicrobial activity of ethanolic extracts was determined using the agar diffusion assay and identifying the minimal inhibitory concentration. Also, the potential of synergetic effects of combinations of extracts was studied using the same methods. The active phytochemicals were identified by different chemical analyses. As another important factor in food spoilage, also the analysis of the antioxidative potential was performed. Half of the studied plants showed activity against spoilage and pathogenic bacteria. For example, *Staphylococcus aureus* was inhibited by eight ethanolic plant extracts (n=16) with an inhibition zone of 14-17 mm (well=8mm). Additionally, fungal growth was inhibited. These results could be confirmed by the chemical analyses of the phytochemicals and the antioxidative activity. Positive synergetic antimicrobial effects of combinations of plants give further opportunities in packaging design. The results of the antimicrobial screening showed that native plants from Benin have potential as an additive against pathogens and spoilage organisms of perishable foods. Integrating such antimicrobial additives, in biobased and biodegradable materials, offers advanced opportunities in sustainable food packaging solutions. Besides, the prolongation of shelf life of a few days can deliver an important contribution to the reduction of food losses.

Keywords: Active packaging, antimicrobial, biobased, food loss, sustainability, Western Africa