Summary

Plantago ovata Forssk., Plantaginaceae, and *Tamarindus indica* L., Fabaceae are traditionally used for treatment of wounds, diarrhea and digestive disorder in Africa and India. Both plants contain polysaccharides with a high amount of xylose with elementarily different structures. In this work the bioactivity of both polysaccharides on human skin cells was compared with the main focus on the effectiveness. But also the underlying structure was part of investigation. For this, the water-soluble slightly acidic arabinoxylan from *P. ovata* seed husks (P1) and two xyloglucans from *T. indica* seeds (TSw and TSc) were isolated and their bioactivities on human skin fibroblasts (NHDF) and keratinocytes (NHEK and HaCaT) were thoroughly investigated. *In vitro* test systems including LDH-release determination for necrotic cytotoxicity, MTT, WST-1 and ATP assays for cell viability, BrdU incorporation for cell proliferation, flow cytometrical analysis for cell cycle progression, xCELLigence® system for overall cellular status and scratch test for cell migration were performed.

The results indicated that 0.01-100 µg/mL of P1, TSw and TSc exerted significant promoting effects of all the three polysaccharides on cell proliferation of human skin cells. TSw induced migration of HaCaT and NHDF while only NHDF migration was stimulated by P1 and TSc. Enzymatic hydrolysis resulted in an increased affectivity if the arabinose residues were cleaved from the backbone of the arabinoxylan In case of xyloglucans the enzymatic breakdown into smaller fractions showed also structure-dependent activities but there was no possibility to reduce it to a special structure element. Mechanistic studies reveal that the arabinoxylan as well as the xyloglucan were internalized into keratinocytes and fibroblasts. In doing so P1 was up-taken more rapidly than TSw. Nevertheless both polysaccharides increased the number of cells in S- and G_2-phase already after 3h incubation. PIQOR™ Skin Microarray and Real-Time PCR as well as protein phosphorylation analysis revealed that the ERK1/2 signal pathway as well as proteins of ECM as well as protein of the cytoskeleton were influenced by the arabinoxylan already after 6h. Comparison of the effect on gene expression of NHDF and keratinocytes exhibited that P1 mostly repressed the proliferation inhibiting pathways while the pro-proliferative genes were up-regulated in NHDF. In case of the xyloglucan it got obvious that the gene expression was minor influenced after 6h.

In conclusion the enzymatic hydrolysis showed that the xylose content in P1 was more crucial for the effect on human skin cells than the xyloglucan. Further P1 acted differently on the underlying mechanisms of the skin cells but the resulting effect was nearly the same.