WAGENINGEN UNIVERSITY & RESEARCH

WUR Knowledge Base Programme

Circular and climate neutral society

KB34-3A-3. Biorefinery & chains: redesign of efficient food and biobased chains. Case: the functional food bittergourd.

Project Team: Sietse Jan Koopmans WLR; G Binnendijk, P v Wikselaar (WLR), N vd Wielen (WU) plus students (Bsc, Msc).
Outside WUR: EFRO project team (SME & knowledge institutes from The Netherlands)

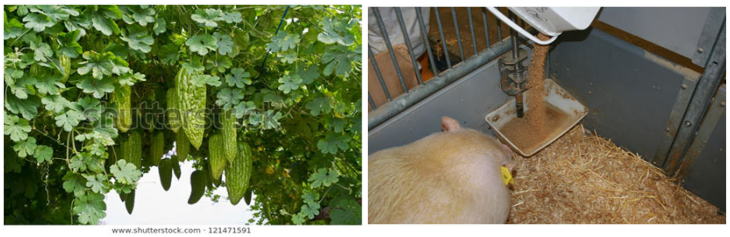
Background

The transition to a circular bio-economy increasingly demands an optimised balance between the resources used and by-product streams (waste). An integrated system, efficiently using resources, involving functional food production (Bittergourd fruit) and waste production (Bittergourd stems and leaves), will be merged in such a way that the Bittergourd plant will produce fresh (functional) fruit and bioactive (biorefinery) nutraceuticals or animal feed from stems and leaves.

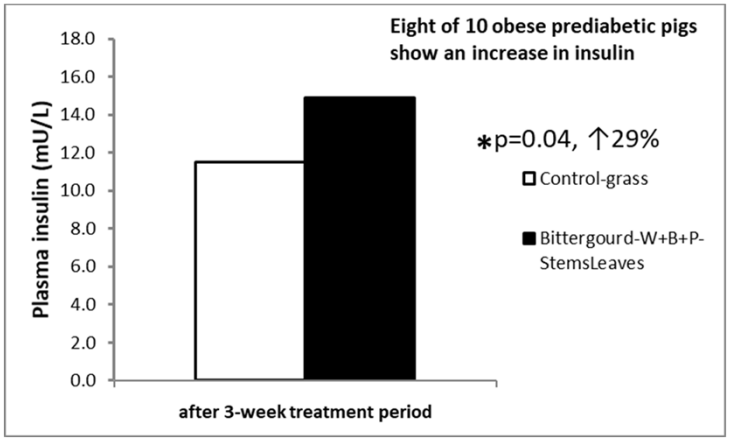
Project objectives

Upgrading biomass-waste from functional food production (case bittergourd) to more valuable products.
Investigate whether stems and leaves from bittergourd cultivation show significant bioactivity so that it can be used for dietary supplements, crop protection, biorefinery or animal nutrition.

Results so far



Bittergourd leaves and stems are fed to pigs and blood samples are collected



Leaves and stems from Bittergourd cultivation increase blood insulin concentrations in a prediabetic pig model. This suggests that biomass-waste of Bittergourd cultivation stimulates insulin secretion in pigs.

Expected impacts

Biomass-waste of Bittergourd cultivation may be used in Livestock production, for instance in young growing pigs to increase the efficiency of protein metabolism. Insulin is known to stimulate efficient protein metabolism in young growing animals and this may lead to improved body weight gain and reduced nitrogen emission in urine (urea and ammonia). In short: biomass waste of Bittergourd cultivation used as dietary supplement in animal feed may improve livestock production and reduce nitrogen emission. Validation experiments in young growing pigs, held under practical (farm) conditions, will be conducted by a partner from the EU-EFRO project (Schothorst, Lelystad) to validate whether stems and leaves of Bittergourd cultivation are able to increase lean body weight gain and reduce blood urea and ammonia concentrations.

Based on our in vivo testing, waste of Bittergourd cultivation (stems-leaves) may be upgraded from biomass for fuel-energy to functional food-feed supplements in the value chain.

Research and outreach plans remaining time

Bittergourd fruit, stems and leaves are thought to have positive effects on metabolism during human diabetes and may increase the efficiency of glucose and protein metabolism in livestock. Based on our in vivo testing, literature study and scientific publication, waste of Bittergourd cultivation (stems-leaves) may be upgraded from biomass for fuel-energy to functional food-feed supplements in the value chain.

The results from the present pig study will be integrated and related to validation studies generated by the various partners of the EU-EFRO project team. Scientific publications will be written. The integrated results will be presented at the Floriade 2022 at Almere.

EXPO 2022 FLORIADE AMSTERDAM - ALMERE, NL

Wageningen University & Research
P.O. Box 123, 6700 AB Wageningen
Contact: email address of Project Leader