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Well-being & Health Assessment Research Unit

Diet and Health Research team in Life Sciences at Aberystwyth University: **In depth focus on innovative and functional food products and their influence on human health and wellness.**

The Diet and Health Research team in Life Sciences at Aberystwyth University (AU) is a partner/lead of the Welsh government programmes 'Decarbonisation and Covid Challenge Fund', 'Covid Recovery Challenge Fund' and the Future Foods Programme. These Research and development projects focus on innovation in the Welsh food and drink sector in relation to bioactives and human health, bioactive compositional analysis and nutritional quality assessment.

Functional foods are those which, besides basic healthy nourishment, confer additional health benefits such as altering the gut microbial balance and its metabolic function. Aberystwyth University and the linked company AberInnovation provide advanced analytical methods to study the chemical and bioactive composition of these products and relate findings back to potential effects on human health and well-being. 'Functional' food/beverages include fermented tea (kombucha), apple cider vinegar, herbal green tea, iminosugars and mead.

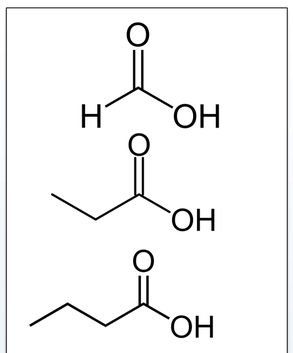

Figure 1. from top to bottom: acetic, propionic and butyric acid skeletal formulas.

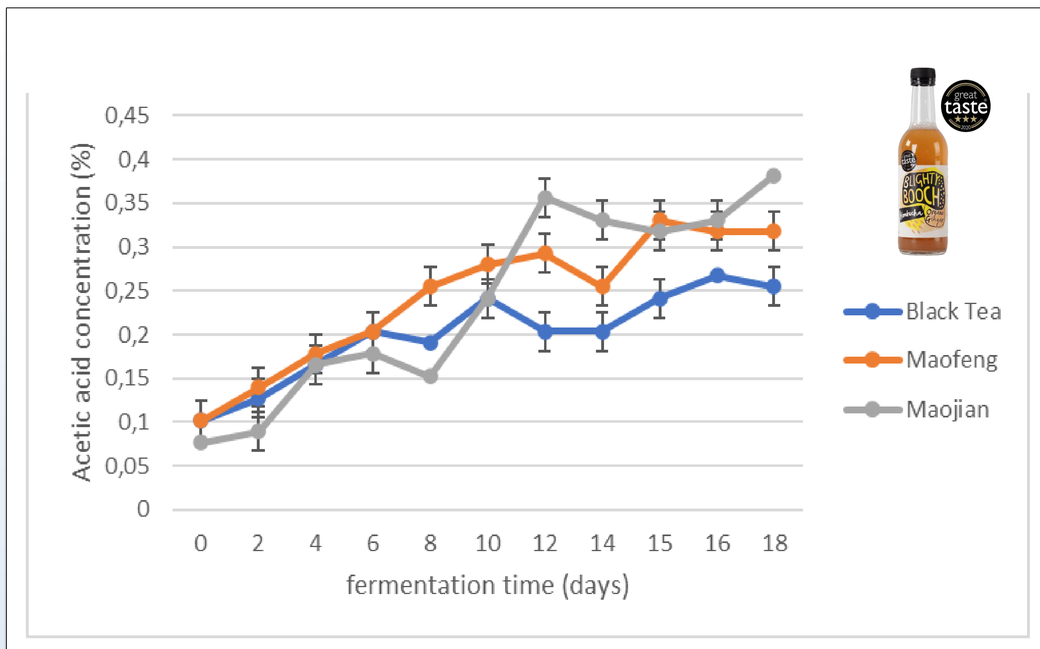

Figure 2. Acetic acid concentration change in Blighty Booch kombucha fermentation.

Short chain fatty acids (SCFA)

- SCFA are produced in the gut as a result of degradation of undigestible sugars or polyphenols by the gut microbiome.
- These SCFA include acetic acid, propionate, butyrate (Figure 1) and gluconic acid. They are also abundant in fermented beverages as kombucha (Figure 2), vinegar, sauerkraut, kimchi or kefir.
- SCFA bind to G protein-coupled receptors as FFAR2 and FFAR3 present in the gastrointestinal mucosa. Activation of FFAR3 receptor, for example, promotes sympathetic activity, increased energy utilisation and gluconeogenesis.
- The result of this mechanism is that SCFAs protects against obesity, suppreses liver weight and lipid synthesis.

Iminosugars

- Iminosugars are polyhydroxylated amines resembling carbohydrates where an oxygen atom inside the ring has been replaced by a nitrogen atom.
- Iminosugars, especially glucose derivatives competitively inhibit α-glucosidases in the endoplasmic reticulum
- Both *in vitro* and *in vivo* studies on multiple animal species showed the antiviral efficacy of iminosugars.
- Iminohoney and myrtle berry exctract from *Luma apiculata* contain iminosugars, including causarine, which has been found to modulate the immune response. Causarine has been found to increase the plasma levels of certain pro-inflammatory cytokines, while decreasing plasma levels of other pro-inflammatory cytokines.
- Cucumber fruit extract 'Q-actin' contains a unique iminosugar idoBR1 with anti-inflammatory properties. IdoBR1 reduces plasma levels of pro-inflammatory cytokine TNFα.

Anti-oxidants

- Oxidative metabolism produces reactive oxygen species (ROS) which are highly reactive and can damage cells and DNA, causing mutations and cancer.
- Increased ROS abundance can increase the rate of ageing and can cause the development of diseases such as atherosclerosis.
- Antioxidants protect from the effects of ROS by binding onto them and catalysing their conversion into less reactive compounds.
- Antioxidants include vitamin E, C, glutathione, superoxide dismutase and flavonoids. These are naturally available in foods and concentrations can be enhanced through research and development.
- Tests to quantify the total antioxidant capacity (TAC) of studied beverages, such as apple cider vinegar are being performed (Figure 3).

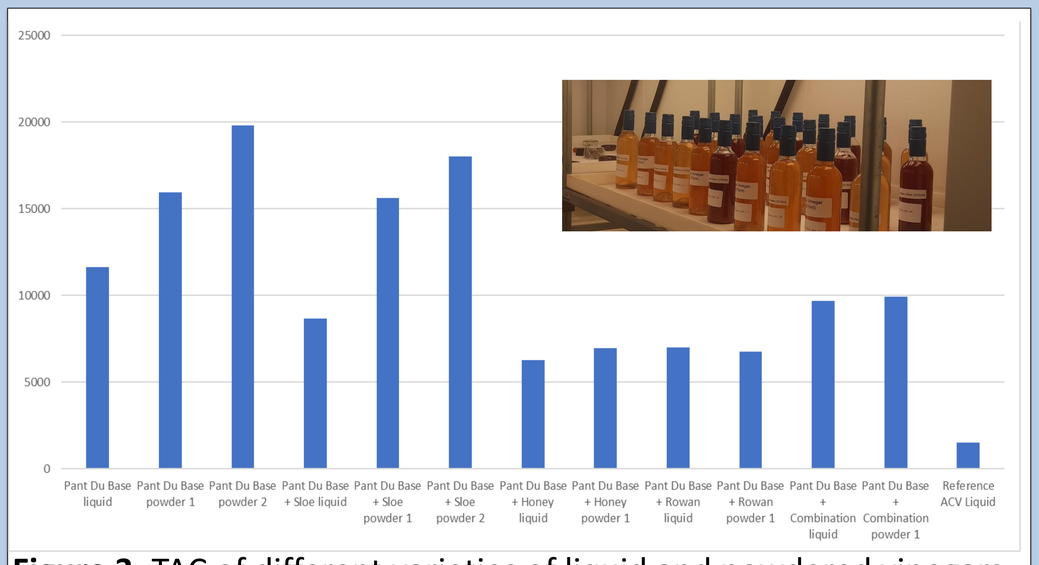

Figure 3. TAC of different varieties of liquid and powdered vinegars.

Advanced analytical instrumentation at AU

Some companies partnered with SMART Recovery, decarb projects, Future Foods and their products.

FutureFoods
Collaborate to Succeed | Cydweithio i Lwyddo

SMART RECOVERY

UNDEB EWROPEAIDD EUROPEAN UNION
Llywodraeth Cymru Welsh Government
Cronfa Datblygu Rhanbarthol Ewrop
European Regional Development Fund

Llywodraeth Cymru Welsh Government

ArloesiAber
AberInnovation