Anti-*Campylobacter* Activity of Australian Food Industry By-Products.

M. Navarro *[1], F. Sonni[3], M. Chaliha[4], A. Cusack[4], R. Stanley[2] and Y. Sultanbawa[1].

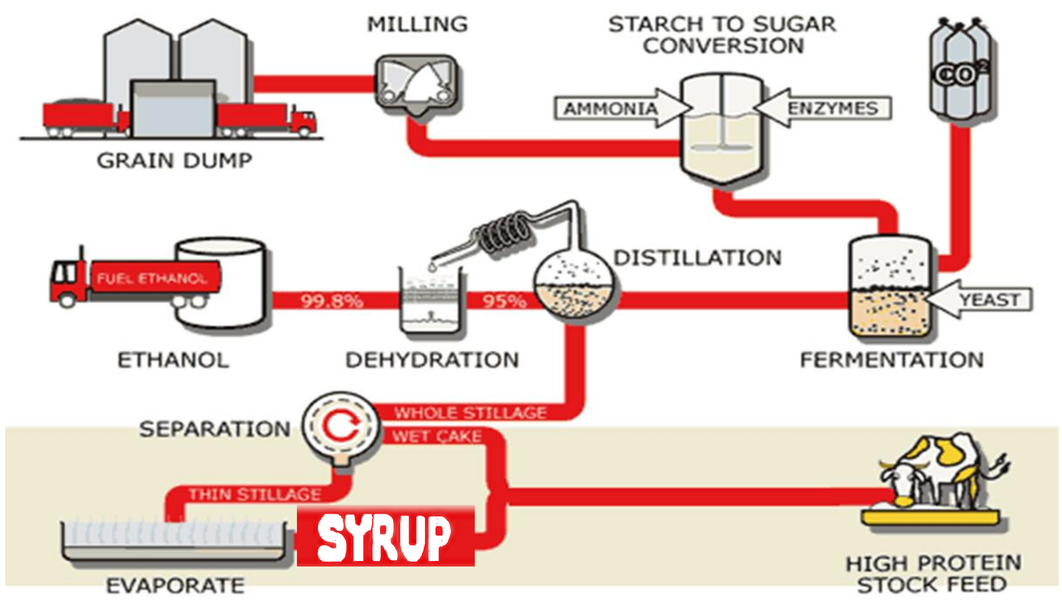
[1] Centre of Nutrition and Food Science. The University of Queensland. [2] Centre for Food Innovation. The University of Tasmania.

[3]Department of Agriculture and Food Science. University of Bologna. [4]Department of Agriculture, Fisheries and Forestry.

Background

- ✓ Campylobacteriosis is the most commonly reported food borne infection in humans and chicken meat is the main source.
- ✓ Plant phytochemicals can have antimicrobial and antioxidant activities that can be applied to food protection.
- ✓ Sorghum syrup from biofuel production is a by-product that could contain these activities.
- ✓ Extraction using different solvents can concentrate biological activities.

Source: Sciencephotolibrary



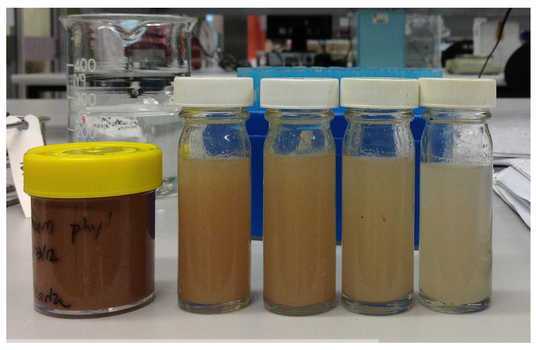
Source: DBR Ltd

Objectives

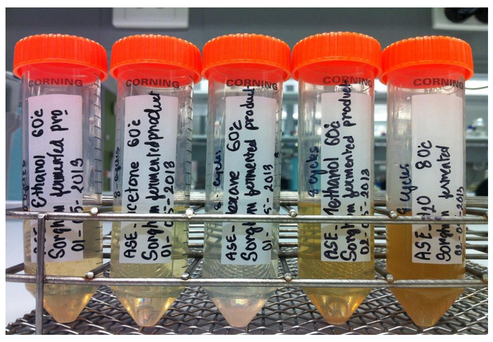
- ✓ Determine the levels of phytochemicals in sorghum syrup by-product.
- ✓ Test the possible anti-*Campylobacte*r activity of the syrup and its fractions.
- ✓ Determine the phytochemical content of antimicrobial fractions.
- ✓ Suggest possible new functional uses of the sorghum syrup.

Material and methods

Sorghum syrup was supplied by Dalby Bio-Refinery Ltd and was maintained at 4ºC until processed. A 100g sample was freeze-dried. After 48 hours, 23 grams of dry material was obtained. The dried material were extracted using an accelerated solvent extraction technique (Dionex ASE 200 system) using Acetone, Ethanol, Hexane, Methanol, and Water. The temperature used for the water extraction was 80ºC, while 60ºC was used for the rest of the solvents. All the samples were extracted by four cycles at 1000 psi of pressure.



Sorghum syrup and dilutions



Solvent extraction of sorghum syrup

The extracts obtained were concentrated by evaporation and kept at 4ºC. For testing, the extracts were re-dissolved in 20% w/v Ethanol solution and serially diluted in sterile water.

Anti-*Campylobacter* assay. Antimicrobial activity was measured with a 96 well assay microdilution method using 3 *Campylobacter* strains from poultry droppings (Sultanbawa *et al,* 2009).

Total Polyphenols assay: Polyphenol content in the sorghum syrup and its extracts was determined using the Folin-Ciocalteu assay.

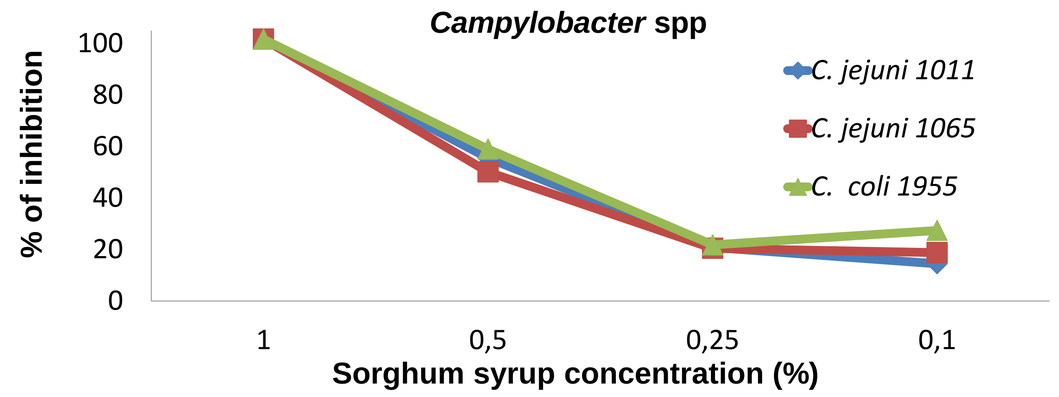
Results

Antimicrobial assay: The sorghum syrup showed a Minimum Inhibitory concentration (MIC) against *Campylobacter* at 1% v/v. Fractions extracted with methanol and water showed anti-*Campylobacter* activity at 4% v/v. Other extracts did not show a significant inhibitory activity at the concentrations tested (Table 1, Figure 1).

Table 1: Anti-*Campylobacter* activity of sorghum syrup and its fractions.

Extract solvent/syrup	Minimum Inhibitory Concentration (%)		
	C. jejuni 1011	*C. jejuni 1065*	*C. coli 1955*
Acetone	> 4	>4	>4
Ethanol	> 4	>4	>4
Hexane	> 4	> 4	> 4
Methanol	4	4	4
Water	4	4	4
Sorghum syrup	1	1	1

Figure 1: Inhibition curve of sorghum syrup against *Campylobacter* spp



Antioxidant assay: Sorghum syrup and water extracts showed the highest level of total polyphenol content compared to other extracts (Table 2).

Table 2: Total polyphenols of the sorghum syrup and its extractions

Extract solvent/syrup	Total Polyphenols (Gallic acid equivalents, mg/L)
Acetone	55
Ethanol	307
Hexane	3
Methanol	579
Water	**1010**
Sorghum syrup	**1756**

Conclusions

- ✓ **The sorghum syrup by-product from the bioethanol industry shows interesting antimicrobial activity and high levels of polyphenols.**
- ✓ **The antimicrobial activity is related to the levels of polyphenols and is mainly found in the water soluble fraction.**
- ✓ **Sorghum syrup could be tested as a natural antimicrobial additive to reduce *Campylobacter* colonisation in chickens.**
- ✓ **Further research is needed to better characterise the product and possible applications as a natural antimicrobial or antioxidant additive.**

References

An innovative microplate assay to facilitate the detection of antimicrobial activity in plant extracts (2009) Sultanbawa, Y, Cusack, A, Currie, M, Davis, C. J. Rapid Methods Autom. Microbiol.**17**. 519-534.

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