

# Materials science and manufacturing

## **CSIR contributes to a potentially new agave industry**

**CSIR:** The Council for Scientific and Industrial Research (CSIR) in South Africa is one of the leading scientific and technology research, development and implementation organisations in Africa. It undertakes directed research and development for socio-economic growth.

The birth of an agave industry in South Africa that could transform rural economy and job creation for subsistence farmers and entrepreneurs, in especially the arid Great Karoo and Lesotho, inches closer after an agreement between the CSIR and Brazil.

This follows a visit by Dr Francois Barkhuysen and Dr Alex Boguslavsky of the fibres and textiles research area of the CSIR to this country, which is the largest producer and exporter of sisal fibre. Brazil produces 61% of the world production of sisal fibre and 90% of this output is from the State of Bahia. The sisal-growing region of Brazil covers an area of 400 000 km<sup>2</sup> and 600 000 people earn a living from sisal.

This visit of Barkhuysen and Boguslavsky was sponsored by the National Research Foundation and centred on the acquisition of technology for *Agave americana* processing and collaboration on a joint project on the establishment of an *A americana* fibre-processing industry in South Africa and Lesotho.

A research study on the greater utilisation of *A Americana* by the CSIR found that all parts of *A americana* can be utilised successfully for various applications. The 'zero-waste' utilisation of the plant would enable its production and processing to be translated into a viable and sustainable agave industry in South Africa.

Associated with liquor beverages (similar to tequila) extraction for decades, the spiky *A americana*, can become a coveted source of utilisation, ranging from paper-making, composites for the automotive industry to the pharmaceutical and food industries. The results of this research formed the basis for developing a general concept for commercialising the *A americana* in especially the rural areas of the Great Karoo.

The Eastern Cape is particularly impoverished, with unemployment of 60% in the Great Karoo alone. The only plant of value that grows in the arid Karoo and that can also grow on eroded soil, is the *A americana*. In the early 1900s, agave plants were distributed throughout South Africa for erosion control and as a fodder crop during droughts.

The plant is currently already being used for the production of an alcoholic beverage by fermentation of the heart (pina) of the plant, chiefly for export purposes. *A americana* is also abundantly available in Lesotho. The output of the project will therefore also benefit the economy of this neighbouring state of South Africa.

According to Barkhuysen a memorandum of agreement between the CSIR and the Secretariat of Science, Technology and Innovation of the State of Bahia, Brazil, will be finalised and signed in due course. "Once funding is available, a commercial-size sisal decorticator will be obtained from Brazil and adapted for *A americana* fibre extraction in South Africa." Technology for animal food production and a short-fibre decorticator (hammer mill) will also be acquired. The consortium members of this collaborative project will consist of the CSIR, the Centre for Integrated Manufacture and Technology and the University of Bahia, both in Brazil.

The Agave genus, comprising around 140 species, occurs and is cultivated in arid and semi-arid regions worldwide. This family includes leaf fibre plants, such as *Agave americana*, *Agave sisalana* and *Agave tequilana*. Agave plants are native to Mexico and other parts of the Caribbean region. The best known and most common application of the *A tequilana*, also known as blue agave, is the production of tequila, an alcoholic beverage, from the sap of the pinas.

In a research study done by the fibres and textiles area of the CSIR, *A americana* leaves were randomly harvested in the Graaff-Reinet area and supplied to the CSIR for evaluation. Tests were carried out with regard to the fibre contained in the plant, particularly fibre extraction and Agave fibre-based paper. Of special interest also were fructans and inulin. Fructans are oligo- or polysaccharides that comprise at least two adjacent fructose monomers. Fructans have value in the health and food arenas, and occur in nature in a polydisperse form. Inulin has been successfully tested as a vaccine adjuvant.

From the CSIR study it was clear that *A americana* fibre can be utilised for the production of nonwovens. Two main applications were identified namely, geo-textiles and composite materials for the automotive industry.

The pina of the *A americana* contains up to 25% of inulin. The leaf base of the local *A americana* contains up to 16% of fructans. Both the pina and leaf base can be utilised for the commercial production of long-chain inulin and fructans that have application as vaccine adjuvants in the pharmaceutical industry and fat substitutes and low calorie sweeteners in the food industry, respectively. Pina waste and short-fibre textiles are also suitable for small scale and commercial paper-making.

**SOURCE:** [http://www.csir.co.za/enews/2008\\_mar/msm\\_01.html](http://www.csir.co.za/enews/2008_mar/msm_01.html)