

Research on cactus pear grabs attention of food, cosmetic and medical industry

The dedicated research and development programme at the University of the Free State (UFS) on spineless cactus pear (*Opuntia ficus-indica*) – also known as prickly pear – has grown steadily in both vision and dimension during the past 15 years. Formal cactus pear research at the UFS started with the formation of the Prickly Pear Working Group (PPWG) in June 2002. It has since gone from strength to strength with several MSc dissertations and a PhD thesis as well as popular and scientific publications flowing from this initiative.

According to Prof Wijnand Swart from the Department of Plant Sciences, the UFS is today recognised as a leading institution in the world conducting multi-disciplinary research on spineless cactus pear.

Cactus pear in SA and Mexico

The cactus pear originates from the dry regions of Mexico where there are many diverse species of *Opuntia*. These all have large spines or thorns, though, which limits their utilisation. By singeing the spines with flames the cladodes can be fed to animals and it serves as important source of water for livestock.

In South Africa, the cactus pear (*O. ficus-indica*) was introduced to the Cape over 300 years ago. Carried by settlers to arid and semi-arid parts of the sub-continent thereafter, the plants gradually reverted to their spiny forms over a period of approximately 150 years.

In 1914, 22 spineless varieties of cactus pears (the so-called Burbank collection) were imported from California, USA to Middelburg in the Eastern Cape. Today the cactus pear is being promoted across South Africa as a versatile crop with multiple applications.

Cactus pear for animal feed

Increasing demands on already scarce water resources in South Africa require alternative sources of animal feed – specifically crops that are more efficient users of water. One alternative with the potential for widespread production is spineless cactus pear. It is 1.14 x more efficient in its use of water than Old man saltbush, 2.8 x more efficient than wheat, 3.75 x more efficient than lucerne and 7.5 x more efficient than rangeland vegetation.

“Studies on the use of sun-dried cactus pear cladodes suggest that it has the potential to provide some 25% of the basic feed resources required by South Africa’s commercial ruminant feed manufacturing sector,” says Prof HO de Waal of the Department of Animal, Wildlife and Grassland Sciences at the UFS.

Until recently, research has focused extensively on the use of cactus pear as drought fodder. However, this is now beginning to shift, with growing interest in the intensive production of spineless cactus pear for other types of animal feed. One example is the spineless cactus pear fruit, produced seasonal, yielding large quantities of fruit in a relatively short period of a few months in summer. Unless kept in cold storage, the fruit cannot be stored for a long period. Therefore, a procedure was developed to combine large volumes of mashed cactus pear fruit with dry hay and straw and preserve it for longer periods as high moisture livestock feed, kuilmoes – a high water content livestock feed similar to silage.

Cactus pear for human consumption

“In addition to its use as a livestock feed, cactus pear is increasingly being cultivated for human consumption. Although the plant can be consumed fresh as a juice or vegetable, significant value can be added through processing. This potential is considerable: the plant can be pickled; preserved as a jam or marmalade; or dried and milled to produce baking

flour. It can also serve as a replacement of egg and fat in mayonnaise,” said Dr Maryna de Wit from the Department of Microbial, Biochemical and Food Biotechnology.

The extraction of mucilage from fresh cladodes can form a gelling, emulsifier, and fat-replacing agent commonly found in food products such as mayonnaise and candy. During an information session to the media Dr De Wit and her team conducted a food demonstration to showcase the use of the cladodes in a juice, chicken stir-fry, biscuits and a salad.

The extrusion of cactus pear seed oil provides a further lucrative niche product to the array of uses. These include high-value organic oil for the cosmetic sector, such as soap, hair gel and sun screens.

The cladodes and the fruit also have medicinal uses. It has anti-viral, anti-inflammatory, pain killing and anti-diabetic agents. It is also high in fibre and can lower cholesterol. The fruit also prevents proliferation of cells and suppresses tumour growth and can even help to reduce a hangover.

Economic benefits

Research suggests that the economic benefits of cactus pear production could also be important. A recent study demonstrated that young plants pruned to stimulate fruit quality yielded 8 000 kg of cladode dry matter per hectare after only four years.

Memorandum of Understanding with Mexico

In March 2006, an International Cactus Pear Conference was hosted at the UFS by Prof Swart. It coincided with the signing of a memorandum of understanding (MOU) between the Autonomous University of Chapingo in Mexico and the UFS. The objective of the MOU was to facilitate the negotiation of international cooperative academic initiatives between the respective institutions with regard to the exchange of students and faculty members, curriculum development, research and community service.

In September 2012, during a visit by members of the Cactus Pear Team to Mexico, Chile and Argentina, a second MOU was signed between the UFS and the UAAAN (*Universidad Autónoma Agraria Antonio Narro*) in Saltillo, Mexico.

“The Bilateral Mexico-South Africa Workshop – which was hosted from 23 – 24 January 2015 by the Cactus Pear Team at the Bloemfontein Campus of the UFS – was aimed at fostering collaboration between Mexican and South Africa Scientific Institutions,” said Prof Swart. It was also attended by representatives from Botswana, Namibia, Zimbabwe and Mozambique. This workshop stemmed from the bi-lateral scientific agreement which was signed in 2008 between the South African Department of Science and Technology (DST) and the Ministry of Science in Mexico.

This Workshop was the result of negotiation over a long period between Prof Swart and Ms Punkah Mdaka, Director: Overseas Bilateral Cooperation (DST), with facilitation and funding by the Mexican Agency for International Cooperation (AMEXCID) via the Mexican Embassy in South Africa. Mr Andrés Medellín of the Mexican Embassy in South Africa played an active role in supporting and facilitating procedures.

Developing cactus pear agro-businesses

Although cactus pear is well-known to many South Africans, misconceptions about its potential persist. Efforts are therefore under way to revitalise interest in the plant’s production, promoting a renewed awareness of its versatility and multiple applications, said Prof De Waal.

In tandem with the Bilateral Mexico-South Africa Workshop the Cactus Pear Team hosted an International Cactus Pear Workshop (ICPW) which was held from 27 – 28 January 2015 at the UFS in Bloemfontein. The Food and Agriculture Organization (FAO) of the United Nations (UN) provided major financial support to host the event. It was attended by scientists from Mexico, Chile, Argentina, Brazil, Italy, Tunisia, Jordan, France, Botswana, Namibia, Zimbabwe and Mozambique. The main objective of the ICPW was to develop a cactus pear agro-business for the sub-Saharan Africa Region.

It was preceded by a field trip to two sites:

- Oppermansgronde where cactus pears are being developed as a multi-use crop and
- Waterkloof where research is being conducted by Dr Herman Fouché of the ARC-API with a collection of 42 spineless cactus pear varieties.

During a third field trip to the Sandveld Nature Reserve a team of international advisors assisted the Cactus Pear Team to formulate the Framework and Cactus Pear Research and Development Programme for the sub-Saharan Africa Region.

In South Africa the outdated perception of cactus pears as thorny, alien invaders, is rapidly disappearing. Instead, farmers now recognise that cactus pear can play a vital role as a high yielding, water-efficient, multi-use crop, said Prof de Waal and the members of the Cactus Pear Team.