

Cactus pear to help alleviating life condition of arid lands inhabitants in Africa and Middle East

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Cactus pear (*Opuntia* sps; Cactaceae) are plants native to America, the best species for fruit, cactus vegetables (nopalitos), fodder and carmine were originated in Mexico (Griffith, 2004), but currently they show a presence in five continents by human dispersion. Many countries around the world are taking advantage of this natural resource of dry lands to alleviate the life conditions of their inhabitants, as are Algeria, Ethiopia, Morocco, Tunisia, etc. (figure 1).



Figure 1. Uses of cactus pear (*Opuntia ficus-indica*) in Africa. a) Detaching of spines from cactus pear pads in Mekelle, Ethiopia; b) and c) Cactus pear fruit products show in Morocco.

Cactus pear as many other cacti are species which grow in arid areas and can tolerate high temperatures and salinity. The Middle East and North Africa are the two areas where these conditions exist, and additional sources of food and income are urgently needed by people of low economic means, so Michael Technology Charitable Organization (MTCO) decided to study the possibility of having this species as an economical crop. We understand that other organizations have been working in this direction, but they have not emphasized the importance of the cactus pear; we feel strongly that with emphasis in choosing the right varieties, they can be grown as a crop in marginal (arid) areas, becomes an export crop, and theirs by products can be promoted as having medicinal, cosmetic, and nutritional qualities.

We are in the process of organization to join the Egyptian Foundation's Sohag Project with MTCO facility in Fresno, California. The University of Sohag or the Ministry of Agriculture or

private investors are interested in a joint cooperation. Once we have defined the parties that will be involved, we will go forward. At this time, the machinery is installed in Sohag, Egypt.

Egypt is a country with a very particular position; it has environmental and soil factors that may be possible the cactus pear plantation, moreover, there are some antecedents of cactus pear plantation for experimental purposes with no bad results. Other important point to remark is that cactus pear have been recognized to control diabetes (Castañeda-Andrade *et al.* 1997; Pimienta-Barrios *et al.* 2008; Cassiana *et al.* 2010), and in Egypt this disease represented the 3.11 % of total death in 2011 with more than seven millions of people with diabetes, being one of the top ten countries with this problem. So the advantages to have this plant integrated to the Egyptian diet could offer better options to alleviate life conditions in this country and others from the Arabic world where the problem is quite similar (International Diabetes Federation 2013).

In order to introduce the best varieties of cactus pear to Egypt without any sanitary issues, one useful system has been selected; which is a protocol that includes biotechnology processes using micropropagation (figure 2a). By this means *in vitro* plants in aseptically containers (figure 2b) can be transported and enter with less border requests for an easy establishment after a short *ex vitro* period in greenhouses.

MTCO has started, with few financial supports but with the help from several institutions, the formation of an *in vitro* plant micropropagation laboratory. San Joaquin Valley Agricultural Sciences Center-USAD at Parlier, California (www.ars-grin.gov/npgs/holdings.html) has contributed with elite plant material, as well from Cactusnet members (www.cactusnet.org), and technical advice from University of Guadalajara to apply biotechnological protocols. Up to date six selected genotypes of *Opuntia ficus-indica* and *O. joconostle* have been established and successfully are handled in laboratory, incubator, greenhouses (figures 2c and d) and field. All this plant material show superior quality fruit with adequate morphology to meet the specifications to be used in postharvest machinery. Likewise, MTCO has been experienced with cactus pear food transformation with salad dressing, cakes and soups to add extra value to this interesting crop. At this point MTCO has been participating with local societies and gastronomic shows, and is willing to offer its knowhow to all those projects encouraging the alleviation of life condition of inhabitants of arid lands, where regularly the poverty conditions are extreme due to the scarce of water. Thus, the cactus pear may become a real alternative to improve food agroindustry to support the development of these areas, indeed not only fruit may be obtained from this plant, but cladodes or pads are a source of food for humans and animal consumption.

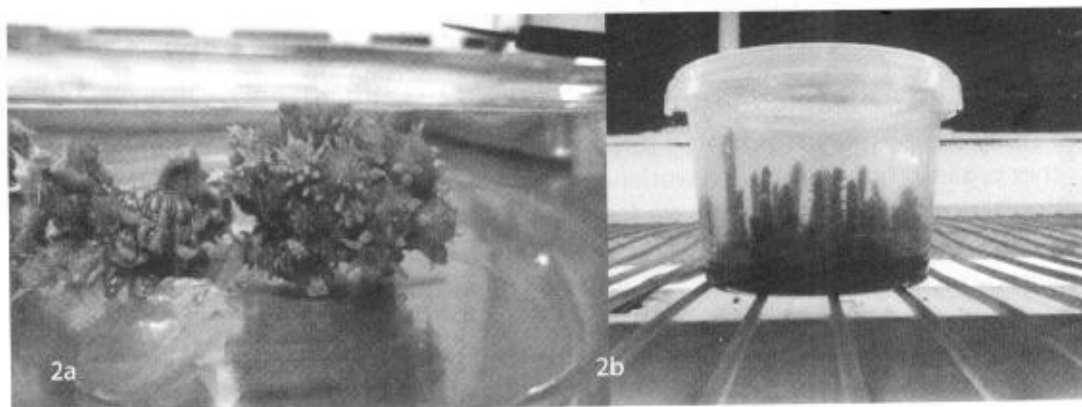




Figure 2. Propagation and use of cactus pear. a) Micropropagation of *Opuntia ficus-indica* by axillary shoots, b) Aseptic container with cactus pear plantlets, c) and d) Ex vitro establishment of *Opuntia joconostle* plantlets in MTCO greenhouses.

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