

Agave: application of ancient bionics and biomechanics

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Abstract

Few years ago I visited Teotihuacan, near Mexico City, where two large pyramids (of the Sun and of the Moon) were built by ancient people of that region. In the vicinity of those pyramids a Museum of Teotihuacan Culture was established. Outside area is covered with vegetations, including agave. This is a plant with thick lives and has about 2 m of height. The products obtaining from agave include: food, especially sugar, fibre, medicines, soap, beverages, including alcoholic bevarages like tequila and bacanora. A tip of agave leaf ends with very sharp skewer. When very thin part of a leaf is separated from the rest of a leaf there is a possibility of using it as a paper.

Introduction

While being in Mexico, I visited the capital city, namely Ciudad de Mexico (Mexico City). I booked an excursion to the historical place Teotihuacan about 40 km northeast from the modern day Mexico City. Teotihuacan is thought to have been established around 100 BCE. It is known today as the site of pre-Columbian culture, especially Pyramid of the Sun and the Pyramid of the Moon (Figure 1 and 2).¹



Figure 1 Pyramid of the Sun.



Figure 2 Pyramid of the Moon.

Teotihuacan exported fine obsidian tools to all Meso-america. It was used as a fine knife (Figure 3).



Figure 3 Obsidian as a cutting tool.

The valley of Teotihuacan was occupied by the members of the society between the sixth century BC up to eighth century CE. Excavations and studies at the site of Teotihuacan date back to 1675. In 1910, by order of President Porfirio Díaz, the first site museum was built in the archaeological zone, the Archaeological Museum of Teotihuacan.²

Today Museum of Teotihuacan Culture has more than 600 exhibits (stone, wood, bone, shell, obsidian). Outside area is covered with vegetations, e.g. agave (Figure 4).



Figure 4 Agave of about 2m height.

According to Davis and Ortiz-Cano³ “Crassulean [from Latin *crassus* = thick] acid metabolism (CAM) is an intriguing physiological adaptation in plants that are widespread throughout many ecosystems. Despite the relatively recent mechanistic understanding of CAM in plant physiology [a plant opens its pores at night for collecting carbone dioxide and keeps it shut during a day], evidence from historical records suggest that ancient cultures in the Americas also recognized the value of CAM plants. *Agave* species, in particular, have a rich cultural legacy that provides a foundation for commercially valued products.”

Parts of agave were cut out with the help of obsidian or metallic knives (Figure 5 and 6). There are several products that can be produced from agave species. There are: food, especially sugar, fibre, medicines, soap, beverages, including alcoholic bevarages like tequila and bacanora.



Figure 5 Leaves are cut out using an obsidian or special metal knife.



Figure 6 Cut out leaf of agave.

A tip of agave leaf ends with very sharp skewer. It can be used to make holes or as a front part of a weapon like a javelin – Figure 7.



Figure 7 Very sharp tip of agave's leaf for mechanical purposes.

From ancient times agave fibres were used to produce clothes, mats, blankets and other products. They were colored with various colors – Figure 8.

Other utilization of agave leaves is as a writing surface. When very thin part of a leaf is separated from the rest of a leaf there is a possibility of using it as a paper – Figure 9.



Figure 8 Agave's fibres used to produce material of various colors.



Figure 9 Very thin part of agave's leaf can be utilized as writing surface.

Projections of growth with future climate change suggest that agave will be some alternative for commodity crops that suffer declines during increased temperatures and drought.³

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Conflicts of interest

The author declares that there is no conflict of interest.

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