



Ethnobotany: The Study of Cycads - Human Relationships

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Abstract

Cycads are the group of ancient plants which survived since Jurassic period on earth. The plants have important ethnobotanical applications and have been conserved in the remote areas world. Presently due to deforestation, frequent forest fires, cultivation, encroachment on forest areas, transformation for human settlement, agriculture and agroforestry, and excessive seed and leaf harvesting for food, the existing cycad populations have rapidly decreased. Only a few small, dispersed populations are now present, mostly in remote locations. Given the ongoing cultural and economic shifts brought about by globalisation, it is imperative to preserve all of the ethnobotanical data on cycads. This publication discusses the traditional usage of cycads for food, medicinal, and social and religious activities. This research was prompted by the pressing need to improve cycad conservation techniques by utilising ethnobotanical data and to get a deeper knowledge of applications of cycads that have not been previously documented.

Keywords: *Cycad ethnobotany, Neurotoxicity, and Conservation*

Introduction

The world's oldest method of healthcare, medicine is used to prevent both physical and mental disorders. People have utilised these plants from the dawn of humanity. Traditional medicines and home remedies both heavily rely on medicinal plants since they maintain healing powers. In 1984, 119 secondary metabolites were utilized as medications globally, and at least 25% of Western medicine prescribed in the US and Canada was derived from or modeled after plant natural compounds (Farnsworth, 1994). Medicinal plants are used to manage and treat a wide range of illnesses because of their abundance in naturally occurring bioactive compounds such as phenolics, flavonoids, saponins, alkaloids, and terpenoids glycosides, carbohydrates, coumarin,

amino acids, resins, gums, and mucilage, as well as phytosterols, sterols, cardiac glycosides, and steroids.

A living class of gymnosperms, cycads have a lengthy evolutionary history that dates back to the Jurassic period. There are 351 recognised species of gymnosperms with cones and cycadales (Order Cycadales) (NS Nagalingum 2011). Previous literature suggests that the medicinal advantages of gymnosperms have not been studied as thoroughly as those of angiosperms. A class of vascular plants known as gymnosperms is responsible for the discovery of various secondary metabolites and for producing nude seeds. The various components of cycads are used to treat a variety of illnesses, including piles, cancer, hepatoma, diarrhea and dysentery, flatulence, vomiting, and cancer that is estrogen dependent. Cycad leaves are used as a vegetable while the edible root nodules of *C. revoluta* have been described as having a "potato-like" consistency (J. W. Thieret, 1958). The shoots of *C. revoluta* are used as an astringent diuretic, while the seeds are used as an expectorant, antirheumatic, and tonic (JA Duke 1985). The leaves are edible, and their juice has been used to treat nausea and vomiting (RN Chopra 1969). The cytochrome P-450 aromatase inhibitors found in the leaves of *C. revoluta* may be effective in treating estrogen-dependent cancer (MT Kowalska 1995). The objective of this essay is to review the literature on cycad ecology with an emphasis on ethnobotany and the preservation of the cycads on the continent. We address important questions that have global ramifications for understanding human interactions with cycads and, to a lesser extent, other species; we also provide a knowledge foundation for community conservation strategies. (1) What functions do cycads serve in the diets of humans? (2) What negative consequences can cycad intake have on one's health? (3) How do cycads impact an individual's cultural and feeling of place? (4) What connections can be drawn between minor uses like ethnomedicine and the other queries? A resource to direct future cycad research and conservation-related activity is also provided by the report, which also aims to clarify general trends and indicate areas for additional investigation.

Ethnobotany of Cycads

In tropical and subtropical parts of the world, cycads have long been utilised as a traditional food source, especially during famines (Beaton 1982; Bonta 2010; Dyer 1965; Thieret 1958). For example, during a severe drought in 1951, hundreds of people in Mexico survived by consuming *Dioon* species (Bonta 2010). In warmer areas, cycads (*Cycas* spp.) such as sago palms and others are commonly planted as interior and outdoor ornamentals. Sago palms are also occasionally referred to as seed ferns. People in Australia and the South Pacific eat cycad seeds, but only after a thorough processing because the raw seeds are believed to be harmful. The ALS-PDC (amyotrophic lateral sclerosis/parkinsonism-dementia complex), a condition that deteriorates the muscles and nervous system, has affected the Chamorro people. According to Paul Alan Cox 2003, ALS-PDC illness begins as a result of cycad poisoning, the cyanobacteria (previously known as blue-green algae) produce the extremely toxic amino acid beta-methylamino-L-alanine (BMAA), It is harmful to nerves in general and the spinal cord in particular and is not proteinogenic. The outermost seed layer of seeds has the highest proportion of BMAA. The main

food source for enormous fruit-eating bats and flying foxes is the seed of the *Cycas micronesica* plant. *Cycas* seeds, which contain BMAA, are eaten by flying foxes. The Chamorro people eat entire fruit bats fried in coconut cream. The fact that BMAA builds up in the brain tissues of Canadian Alzheimer's patients suggests other paths for this compound's bioaccumulation in aquatic or terrestrial habitats (Cox et al. 2003). The bark of the *Encephalartos transvenosus*, which is collected for medical uses, is one of the primary factors threatening the survival of cycads in South Africa. The bark of *C. circinalis* is used as medicine by the Irulas of Tamil Nadu. The bark is taken from the tree and cooked to make kashayam, which is given to new mothers to help with breastfeeding and body cleaning. When food supplies are limited, 5,000–6,000 families in Central America use the female cone of *Dioonmejiae* each year (Bonta et al. 2006). Several types of cycad are used in traditional medicine, ornamentation, and social gatherings (Molur et al. 2001; Radha and Singh 2008; Varghese et al 2007). *Ceratozamia Mexicana* seeds are utilized as a vermicide in Mexico because of their poisonous qualities (Osborne 1990 and Vovides 2010). Indians in northern Australia utilize the seeds of *C. angulata* as food after treating leaching and aging (Beck 1992). They consume the seed after removing the cyanogenic glucosides, cycasin, and neocycasin using various culture methods because cycads are hazardous, as Whiting (1962) noted (Barceloux 2009). In Tamil Nadu and Kerala, *C. circinalis* seeds are soaked in water for a day and then put in the dough after being washed seven to ten times, to make the most popular meal in South India, idli. Cycad leaves are sometimes used as decorations for religious celebrations. The most popular *Dioon* and *Ceratozamia* species used for decorating in Mexico (Lazaro- Zermeno et al 2011, Osborne and Vovides 2010, Perez-Farrera and Vovides 2006). Immature leaves of *C. circinalis* are used as food by the Kurumbas and Irulas in Tamil Nadu, and people in Kerala utilize mature leaves to decorate altars, homes, and temples for ceremonial purposes (Radha and Singh 2014). A lot of pollinators are drawn to the powerful scent that matures male cycad cones emit. Farmers in Kerala utilize the male *C. circinalis* cone as a nuisance in their fields. Rheumatic and muscular pain are treated with the cone of *C. beddomei*. Cycad seeds are reportedly consumed by baboons, monkeys, and rats, and during famines, *Encephalartos* species are utilised to make flour for bread and other edibles (Donaldson, 2003; Ravele & Makhado, 2009). Africa is where *Stangeriaeriopus* is harvested for use in medicine (Osborne et al., 1994). Sago flour, baby food, and other food additives may be made from the plant's pith (Reddy et al., 2006). Several cultures prize *C. pectinata* for their traditional medicines. Traditionally, it has been used to alleviate hair swellings, stomachaches, and ulcers (Nair and Van Staden 2012). Some Assamese and Meghalayan ethnic populations also utilise it to boost male sexual potency (Khuraijam and Singh 2015).

Conservation

According to Stevenson (1990) and Chase et al. (1993), morphological and genetic research have decisively shown that cycads are a naturally occurring group of plants with a single evolutionary origin, or that they are monophyletic. Living cycads can be found in both the north and south

hemispheres in tropical, subtropical, and warm temperate climates. Southern Africa, Australia, and particularly Central America and the Caribbean Islands have the greatest cycad diversity. A modest portion of the world's plant diversity—297 species and subspecies—is represented by the cycad flora. Despite their tiny population, cycads are an important category for worldwide conservation. According to the 1997 IUCN Red List of Threatened Plants, 12.5% of all vascular plants worldwide were classified as threatened. The IUCN Species Survival Commission's Cycad Specialist Group was established in 1987 as a global network to support cycad conservation. The illegal collection of wild plants for the horticultural trade by unscrupulous collectors poses the greatest threat to African cycads (Donaldson & Bösenberg, 1999; Golding & Hurter, 2003; Donaldson, 2003, 2008; Okubamichael et al., 2016). Over the past few decades, botanists and conservationists have repeatedly brought up the plight of cycads and warned that the continued extinction of wild plants will result in the extinction of species (Dyer, 1965; Osborne, 1990a; Grobbelaar, 1992; Giddy, 1995; Donaldson & Bösenberg, 1999; Golding & Hurter, 2003; Donaldson 2003, 2008; Coetzer, 2005).

Conclusions

The current review has demonstrated the serious threat that anthropogenic activities pose to cycad populations. These activities include government development projects, clearing forests for the cultivation of commercially viable tree species, cultivation, forest fires, encroachment of agricultural and settlement areas into forested areas, and over-collection for food, medicine, and horticultural purposes. Cycads are still a staple in many cultures. Although they don't seem to cause long-term brain damage, its impacts on health are not well understood. Our proposal was to gain insight into the ways in which cycads support cultural identity and a feeling of place, which may then inform conventional preservation practices. They often support a sense of location and cultural identity, and are important in religion. However, because most traditional knowledge and uses are rapidly vanishing, novel community-oriented biocultural conservation efforts are needed. We contend that even though cycads can be traded for purely decorative purposes, which would enrich harvesters and growers financially, if the motivation for their protection is a crucial element in the preservation of local identities, customs, cultural heritage, and a sense of place, then local people are most likely to protect them in situ over the long run. Cycad populations that Hooker had recorded in 1854, according to Katakai (1983), were eradicated due to the flooding of huge forest regions by hydroelectric reservoirs like Barapani Lake in Meghalaya.

According to Vovides et al. (2002) and Tang (2006), we propose that the forest departments and local governing bodies start a conservation initiative that involves the tribal communities in the area by growing plants from seed in village nurseries. Providing locals with a sense of ownership and accountability over cycad conservation strategies will promote their involvement and increase cycad survival. Before implementing any conservation measures or placing restrictions on the villagers' freedom of movement into the protected region, it is important to recognize that the villagers' way of life depends on the sale of forest goods. Hence, developing solutions for ex-

situ and in-situ Cycas conservation measures will require the combined efforts of researchers, foresters, and local welfare organizations.

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