

Short Communication

Economic importance of living gymnosperms in India

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(Accepted :August, 2006)

The paper throws light on economic importance of living Gymnosperms including indigenous and introduced taxa in India.

In countries where *Cycas* plants grow wild and even in far off places from their home they have found a variety of uses; e.g. for food, medicine, horticulture, decoration, rituals etc. In the Tonga Islands, *C. circinalis* is even cultivated as a food plant. The nutritive value of *Cycas* plants has been known to man for a very long time. From very ancient times, in Eastern and Southern parts of India, Japan, South East Asia, Australia and other native regions of *Cycas*, people have used its plants as a sources of food. The Japanese have been using the plants of their indigenous species, *C. revoluta*, not only for preparing starch (sago) and alcoholic drinks but in times of famine its stems have served as invaluable living stores of food. According to Thunberg (1793) the importance of *C. revoluta* plants in 18th century Japan was so great that their export was banned by prescribing capital punishment for it. The starch contained in the stems (chiefly the pith and the cortex) and the endosperm of the seeds of *C. circinalis*, *C. revoluta* *C. rumphii*, and other species is variously extracted and forms a useful item of food. In some species e.g., *C. circinalis* and *C. rumphii* the annual yield of starch from the seeds and the felled stems is about the same and in the long run it is always more profitable to use the seeds of these slow growing plants.

The stem starch is widely extracted and prepared into "sago" (Sabudana in Hindi) in the various parts of South and South East, e.g. India. Fiji Indo-China, Japan, Indonesia, Malaya, New Caledonia, Myanmar, Sri Lanka and other islands of the Indian and Pacific Oceans including Madagascar. The starch is usually prepared by felling the plants flush with the ground when they are about seven years old. The yield of starch is greater if the trunks are cut off just before the production of a crown of leaves and before they produce any cones. The male plants of *Cycas revoluta* are said to yield more starch than the females. A common method of extracting starch consists of peeling off the outer layers of the trunk and thereafter slicing it into small bits or rounded discs. These are then spread out over mats, dried in the sun and when

they have become crisp they are pounded and powdered. The powder is then sifted and stirred with excess of water and then allowed to stand. A white precipitate (starch) now settles down at the bottom of the vessel. The supernatant liquid is drained off and the white deposit is generally washed repeatedly in water and finally the fresh washed precipitate is rolled about, between boards, until it turns into spherical pellets called "sago". (cf. Pant 1962).

The substantial endosperm of the seeds (often called "fruits") in various species contains 20 to 30 percent starch. In South Malabar the sun dried and subsequently ground kernels of the seeds of *Cycas circinalis* are repeatedly washed in water and turned into a flour called 'indum podi' which is stored and used in times of need.

The 'Sinhalese' and the 'Weddas' of Sri Lanka, use the washed flour prepared from the seeds of their native species for making cakes. Starch is extracted from the seeds of *Cycas revoluta* in Japan. The original inhabitants of Australia and other Australasian Islands prepare a kind of porridge from the seed kernels of *Cycas media*. The seeds of this species form an important source of their food and often gathered and stored in large quantities.

In the Andamans, Aru and Key Islands, and in New Caledonia the roasted or cooked seeds are eaten as such. The inhabitants of the Fiji Islands eat the boiled kernels of the seeds. The hill tribes of Assam eat the seeds of *Cycas pectinata*. The sweet mucilagenous testa of the seeds of *Cycas revoluta* is edible. The kernels of the seeds too are eaten in Japan after being roasted. The people of Tumbocca, according to Rumphius, have to eat the seeds during mourning. Some tribes of the Northern Territory in Australia use the seeds of *Cycas media* as sacramental foods.

Young succulent leaves of various species, e.g. *Cycas circinalis*, *Cycas pectinata*, *Cycas rumphii*, and *Cycas siamensis*, are often cooked as vegetables in Assam, Malaya, Philippines, Aru and Key Islands, parts of Indonesia and the Moluccas. In Sri Lanka people add them to their curries. Japanese also eat the tender leaves of *Cycas revoluta*.

The various parts of the plants and the starch extracted from *Cycas* seeds and stems often contain a