

## EXECUTIVE SUMMARY

In Sri Lanka the palm, *Caryota urens* L. is a sparsely distributed understorey tree in the lowland rain forests. It has a multiplicity of uses, such as production of, sugar candy from phloem exudate of its inflorescences, carbohydrates with medicinal properties from the pith of its of young stem, construction timber from its mature stem and fodder from its leaves for domesticated elephants. Not only are all these uses destructive to the plant, but the tapping of inflorescence for manufacture of sugar candy prevents fruit production thus eroding the gene pool of this species in the wild.

This study gathered information on the following: i) Habitat and habit of the plant, ii) Reproductive biology, iii) Population biology, iv) Fruit and seed biology and v) Growth and development, of the species to understand the feasibility of its cultivation and thereby reduce over-exploitation of its wild populations. As Sinharaja MAB Reserve was found unsuitable for detail studies of this species due to its extremely low population density and the practice of tapping their inflorescences by the villagers, the study had to be carried out elsewhere. The site selected was the campus premises of the Peradeniya University and home gardens of a neighbouring village. The results of these studies are as given below.

### i) Habitat and Habit of the Plant

C. urens is a vulnerable species in its natural habitat with a density less than 1 individual per ha. However, it inhabits homegardens of the wet and intermediate zones, where the villagers encourage their growth but never cultivate it on a plantation or home garden scale.

The plant is 15-20m tall with an unbranched stout, stem showing a determinate growth habit. Its compound leaves are 4-5m long and 2.5m wide with over 1000 leaflets. Inflorescence production begins with the terminal one blooming first followed by successive ones below. The species is monoecious and protandrous. Inflorescences are over 2m long with over 150 secondary inflorescence axes, bearing over 60,000 flowers each, arranged in groups of three, where two male flowers lie on either side of a solitary female flower. The drupaceous fruits have a firm pericarp, fleshy mesocarp and stony endocarp.

### ii) Reproductive Biology

In phenological studies carried out, flushing was found to be continuous upto reproductive stage. A new leaf was produced once every 3-3.5 months. Flowering is not related to flushing because leaf production completely ceases once flowering begins. Inflorescence production continues at irregular intervals, each taking about 3-5 years from initiation to fruit fall. Each tree bears several inflorescences in different stages of development at any

given time. The anthesing period of male and female flowers, either in a single inflorescence or adjacent ones do not overlap so that the species is an obligate outbreeder.

From pollination experiments carried out, apomixis, was found to be absent and the level of outcrossing 50-70%. Pollen when stored at 8-9°C was viable for 44 days when tested using Brewbacker solution.

11 different insect species were observed on inflorescences. Of them the effective pollinator was found to be a stingless social bee species, which is not yet fully identified.

### iii) Population Biology

The spatial distribution of 2 populations showed that plants of different ages could grow together in the vicinity of mother trees. Juvenile forms were not seen in open exposed areas but in the shade of hedgerows and tree dominated home gardens.

Four different morphological stem forms were identified. Three of them (basally narrow, centrally narrow and straight throughout) were depicted by mature plants

while the fourth (basally broad) was always associated with juveniles. The latter also have 5-7 nodes per meter length while that in the former was only 3-4.

Both height and girth measurements of mature individuals varied considerably, ranging between 10-19m and 60-179cm respectively. While the extrinsic factors, if any, which lead to these size differences need to be elucidated, the relationship of the quality of the products obtained from larger trees as compared to the smaller ones must also be examined.

#### iv) Fruit and Seed Biology

17,200 and 22,500 fruits were produced in each of two consecutive infructescences examined in a single individual. The ratio of female flowers to mature fruits in them was 3:1 and 2:1 respectively. Although two inflorescences in a given individual did not anthesise at the same time, consecutive infructescences produced ripe fruit concurrently suggesting that the period of fruit development, which takes over one year, varies between infructescences. The size and weight of seeds from different parts of an infructescence showed little variation. Since the species is a prolific fruit producer, and each fruit bears two seeds, it has plenty of propagules for germination. Furthermore, ripe fruits were available from November 1985 to August 1986, in both populations. Thus, seed production is not restricted to short periods. These features are

advantageous to its domestication if their tapping could be regulated by leaving behind one inflorescence out of every 4 or 5 for fruit production. This will ensure at least one seed crop per year.

Fruit predators observed were a Scolytid beetle which bored into seeds of young fruits leading to their premature fruit fall and the pole cat or palm civet (Paradoxurus sp.) which predated ripe fruits digesting the mesocarp and excreting undamaged seeds with their faecal matter. The latter was the main dispersal agent of the species.

Seed viability was lost between 30-90 days in seeds stored at air temperature. Exposure of seeds to sunlight for 3-6 hours considerably decreased their germinability. Seeds stored for 7 days and exposed to 6 hours sunlight failed to germinate. This possibly explains why the species is not found in open exposed areas.

#### v) Growth and Development

Morphological changes associated with seed germination and seedling growth examined showed that, the radicle and plumule emerged about the 20th and 40th day respectively after sowing and that the cotyledonary sheath was 7.6-9.6cm long. The first leaf unfolded only when the seedling was 4.5 months old and leaf development was found to be heteroblastic.

Seedling growth studied showed periods of slow growth alternating with periods of rapid growth. Upto about 250 days, seedlings reached only 10-20cm in height. Thereafter growth was more rapid. Seedlings which performed poorly at first, continued to grow slowly throughout the sampling period. Among the rest better height performers were clearly identified only when they were 500-600 day old.

Therefore, selection of seedlings with faster growth should be done at this age. Leaf production in seedlings was extremely slow. Only 6-8 leaves were produced over 860 days. Successive leaves are not produced at regular intervals.

Dry weight studies of seedlings showed that the ratio of rachis: leaves: roots was 5:4:1 on the 150th day as well as 430th day, but by the 650th day it was 6:3:1. This shows that much resources are provided to the development of the rachis possibly because it serves the twin functions of, supporting leaflets carrying them towards light and protecting young leaves by enclosing them. Thus, the rachis is woody unlike the roots which are succulent and non woody.

Inflorescence development during the first 500 days was extremely slow, (0.01-0.05cm per day) but that between 500-600 days is relatively rapid (0.7-1.4cm per day). There after it remains constant. Infructescence development takes about 270 days. The longevity of an inflorescence, from time of emergence to end of fruit dispersal is nearly 3-5 years.