CEPHALOTUS FOLLICULARIS THE WESTERN AUSTRALIA PITCHER PLANT

by Robert Riedl

Cephalotus follicularis is the sole member of its own plant family, the Cephalotaceae. No varieties of forms are officially recognized, yet several growers have noted significant differences of growth habit in different clones of the plant, an observation which might be further substantiated as more plant material becomes available.

Cephalotus follicularis (from the Greek word 'Kephalotos' meaning 'headed' which refers to the filaments of the stamens, and the Latin word 'folliculus' meaning 'small pouch', which describes the shape of the pitcher) is a plant of strange and singular appearance even amongst pitcher plants. It is a relatively small, rosetted plant with a thick, branching root system which bears numerous clusters of pitchers during most of the year. During the cool season, particularly during late winter and spring, more conventional foliage leaves are produced, oblong in shape, glossy green and fleshy. The typical pitchers appear at the onset of the warmer months and are continuously formed until late autumn. The pitchers may be green when grown in shade, but colour deep crimson in a sunny position and may reach up to 6 cm in length. Their shape has been compared to the one of a moccasin, ornated with three ribs stretching from the toe to the top, with its heel turned up and over to form an awning or lid over the pitcher mouth which has a well developed rim of smooth, glossy ribbings which curve over into the pitcher opening where they end abruptly in downward pointing teeth. Inside the pitcher, just below the teeth, is a downward pointing, light green, smooth collar or ledge overhanging the cavity of the pitcher. Insect-attracting nectar glands are scattered over the entire surface of this ledge, but are also found, like an initial lure to insects, a preliminary invitation device, on the internal and external surfaces of the lid itself, which has numerous, unpigmented, translucent 'windows' or areolae similar in appearance to those found in *Sarracenia minor* and *Darlingtonia*.

Insects feeding along the collar surface have frequently been observed to lose coordination of their movements as if under the influence of some narcotic fed to them with the nectar. Once they have lost their footing, they fall into the purplish-black coloured cavity of the pitcher which contains a small amount of fluid, which seems to have a clogging, paralysing effect on the victims. The cavity or well of the pitcher is equipped with numerous digestive glands in its upper part which reach their greatest concentration in two distinct, thickened, elongated areas about halfway down on each side of the cavity.

It is still unclear whether digestion of prey is entirely affected by the digestive enzyme system secreted by the plant or whether part of the digestion process is to be contributed to bacteria present in the pitcher fluid. While I was able to demonstrate the presence of bacteria in the pitcher fluid and an increase in their population density subject to the age of the pitcher and the relative concentration of accumulated prey, I was unable to demonstrate any significant contribution by bacteria in the digestion process.

In an experiment the same number of ants was introduced to mature pitchers of about the same age; the fluid in half the pitchers was then sterilized using the antibiotics Streptomycin and Penicillin, and the lids of all test pitchers were artificially sealed over the pitcher openings to prevent further introduction of the prey. Periodically the degree of prey solubilisation was visually examined by lifting the lids from the pitcher openings to inspect the cavity contents with the aid of a dentist's mirror. The observed result was that the rate of prey break-down appeared to be about the same in all pitchers. This would suggest that bacteria found in pitcher fluid may be

Cephalotus growing through base of pot.

Photo by Phill Mann.

present primarily in the role of opportunists feeding on nutrients made available by enzymes of the plant acting on the bodies of prey. Ultimately, it would seem that this 'pirating' of nutrients from the plant by bacteria is only temporary as the food assimilated by bacteria becomes to a large extent available again to the plant upon the death and ensuing lysis of the bacteria cells. Irrespective of the effect or absence of any effect by bacteria upon prey digestion in *Cephalotus,* it was interesting to note that the rate of digestion seemed more rapid in the temperature range between 25 and 35 deg. C, slowing down if the temperature was further increased and virtually coming to a standstill at temperatures below 15 deg. C. This may suggest a direct confirmation of the behavior of most biochemical processes, reaching an optimal reaction rate over a more or less narrowly defined temperature range and slowing down again if the reaction takes place below or above the optimum temperature limits due to inactivation or denaturation respectively of the chemical compound eliciting a particular reaction sequence. The fact that efficient digestion of prey and subsequent nutrient assimilation is very slow or non-existent in *Cephalotus* at low temperatures could give a clue to why this plant produces different kinds of leaves at different times of the year; it seems more opportune and of greater survival value for the plant to invest and expend its energies during winter and spring in more conventional foliage leaves which are better equipped than pitchers to photosynthesize and therefore more suited for the manufacture of sugars and starches, and it only produces summer leaves or pitchers when the enzyme system associated with them can be utilized to the full in the translation and assimilation of insect-derived nitrogen, potassium, phosphorus, saccharides and trace elements.

Cephalotus follicularis is easily cultivated in a variety of media: pure sphagnum; quartz-sand and peat in about equal parts with a little perlite added for better soil aeration; and some growers claim excellent results by using a mix of 2 parts peat, 2 parts sieved, well rotted leaf mould, one part perlite and one part quartz-sand. Irrespective of the particular potting medium used, it is of utmost importance that the plants are not kept too wet, especially not during the cooler months of the year. While I stand my *Cephalotus* containers into a 5cm deep tray with water during the summer months, I keep the plants just slightly damp during the cool season, watering them only about once a week from above, but avoiding wetting the foliage or crown to prevent rotting. Most failures with this species seem to be the direct result of keeping the compost too wet, having insufficient soil aeration or using an unsuitable potting mixture. These plants eventually form long underground root systems which branch over long distances. Secondary plants arise at some distance from the parent plant. Bearing this in mind it is better to grow *Cephalotus* in plastic trays of a depth not less than 15cm, provided with additional drainage and aeration holes (I use polyurethane fruit boxes available from most greengrocers). Although the Albany Pitcher Plant grows in nature in a Mediterranean climate of relatively dry summers and wet winters, I have no problem growing these plants in Sydney all the year around unprotected in the open, in spite of the fact that the climate here is more subtropical with relatively dry, long spells of high humidity. At first I used to grow *Cephalotus* in broken light which yielded luxurious growth of long lasting winter leaves, but produced few, although slightly larger, plain-green pitchers. Since I have moved my plants to a position where they receive almost full sun for most of the day, they have started to grow pitchers much earlier in the season, in greater quantity and of much more vivid colouration.

Cephalotus blooms from mid to late summer. The flowers are borne on a slender 50cm long stem. The actual flowers are inconspicuous, lack petals, are whitish-green and rather small. I am not certain whether the flowers can be self-pollinated as I have never had more than one plant in flower in any given year and all my attempts to produce seeds under these circumstances have so far failed.

Vegetative propagation is easily accomplished by taking 3-5cm long cuttings of the thick, fleshy root from a large plant in late spring. The cut pieces are allowed to air-dry for a few hours, are dusted with a fungicide (Benlate, Captan, Difolatan, etc.) and rooting hormone (available from most nurseries) and are placed horizontally and not deeper than about 1 cm into a pot filled with a sand/peat mix. The potting mix is then lightly watered and the pot covered with a piece of window glass to minimize evaporation and placed into light shade. Water should be applied only sparingly during this period, but in sufficient quantity to maintain the soil mix slightly damp. About 3-4 weeks later young plantlets can now be gradually hardened off. About a year later the young plants can be subdivided and treated like adult plants.

Another method of vegetive propagation is to take leaf cuttings. An entire leaf or pitcher with the stalk intact is removed, washed in diluted fungicide and the cut base of the stalk is dipped into rooting hormone. The stalk or petiole is then lightly pushed into a bed of live sphagnum with the leaf blade or pitcher sitting flat on its surface. The propagation container is covered with glass or clear plastic to prevent excessive evaporation of moisture and placed into light shade. The tiny corm, which may eventually form near the cut end of the leaf, will with time differentiate into leaves and tiny roots. The plantlet can then be gradually accustomed to stronger light. Repeated spraying with fungicide during the differentiation process seems necessary to prevent damping off.

It must be borne in mind that propagation by root or leaf cuttings only increases the number of plants of the same clone, which makes them all genetically identical. Only plants grown from cross-pollinated seed, and let us assume that cross-pollination is necessary to produce viable seed in *Cephalotus*, will give rise to new clones, to new genetic combinations. To successfully grow *Cephalotus* from seed should be a challenge for all CP enthusiasts.

Cephalotus follicularis (like most CP's) is remarkably free from disease and pests. Fungal and bacterial decay of the crown and root system only occurs if plant and potting mix are kept too wet and under-aerated. Caterpillars occasionally become a nuisance, but they can be easily picked off by hand or killed using a pyrethrum spray.

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REMINDER

While the editors are very interested in looking at color prints of your plants, this medium is not suitable for reproduction in CPN. Results are noticeably better with color transparencies (slides); therefore, the editors prefer them over prints.

In taking pictures of your plants, keep in mind that CPN can use vertical shots very nicely as quarter or whole page photos (see p. 71). Horizontal shots are used as half-page photos.

Black and white photos are very welcome as long as they have good contrast and focus.

NOTICE

ICPS Business Manager Pat Hansen has resigned from her duties with the society because of an upcoming transfer and move to Arizona. The new business manager will be Joanne Klingensmith. All routine correspondence should be addressed to her c/o The Fullerton Arboretum, Fullerton, CA 92634. Items of a more urgent nature should be sent to her home: 437 Las Riendas, Fullerton, CA 92635.