GROWING *NEPENTHES* IN A COMPLETELY INORGANIC SUBSTRATE

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Introduction

Nepenthes are usually planted in mixtures incorporating organic matter such as peat, pine bark, *Osmunda* fiber, *Sphagnum*, *etc.* While these materials produce good results, they have disadvantages. Most of the ingredients decompose rapidly, and the result is a compressed substrate that inhibits air circulation among the roots. As a consequence the plants have to be repotted frequently. This means extra expense and work for the grower, and in almost every case, a temporary cessation in growth of the freshly repotted plants which lasts until the disturbed roots acclimatize. Another problem is that the use of peat directly contributes to destroying the wetlands where it is quarried. The destruction of habitat, in turn, is the main reason for the disappearance of many carnivorous plants. Because of these disadvantages, new planting media are always being sought.

In the wild, some *Nepenthes* species are found growing in inorganic soils. For a few examples, *N. danseri, N. neoguineensis*, and other species from New Guinea and the Philippines grow in lateritic soil (see Back Cover), *N. eustachya* grows in bare rock (Figure 1), *N. lavicola* thrives in volcanic rock, and *N. madagascariensis* lives in quartz sand. These observations suggest that it may be possible to grow *Nepenthes* in inorganic media.

Alternative Substrate

Rockwool is commonly tried as a non-organic planting material. In spite of limited success with some *Nepenthes* species, this method is not favoured because of health risks associated with handling this stuff. In two papers, Feßler (1982, 1986) described growing *Nepenthes* in lava-clinkers. He attributed his successes with lowland species to the available N, P_2O_5, K_2O and Mg the lava contains, and also to the fact that it has the ability to store up to 20% water by volume. From this description an alternative potting mix was developed, which works for all sixty *Nepenthes* species tested—lowlanders and highlanders alike. Even species such as *N. ampullaria* and *N. bicalcarata* do well, even though they often grow naturally in peat swamps.

Table 1. Advantages and disadvantages of the new inorganic potting mix.

Advantages	Disadvantages
1)Moistens easily, even when completely dry. 2)Compresses/degrades slowly (repotting is less frequent). 3)Airy mix is optimal for the roots. 4)No peat or *Sphagnum* is required, so habitat destruction is not promoted.	1)Heavy (adding one part Styrofoam chips may help). 2)Initial cost is higher.

The mixture consists of one part each: Seramis® clay perls (Effem, Verden/Aller), lava gravel (sold in aquarium shops, grain size approximately 1 cm),

and Lecaton® (expanded clay perls used for hydroponics, grain size approximately 1 cm) (Figure 2). These ingredients have the advantage of being more widely available than lava-clinkers. The mixture is slightly alkaline with a pH of 7.2, and should be soaked in purified water before being used.

Potting Plants with Inorganic Mix

The best pots are plastic baskets commonly used for cultivating water lilies. These baskets promote air circulation near the roots. They are available in square and round shapes, and the round ones are best used as hanging baskets. Conventional plastic pots may also used, especially for smaller plants.

The potting procedure is as follows. Remove the plant from its old pot, and remove all the old substrate from its roots by submerging it in a bucket of purified water. This decreases the chance of residual organic material, caught in the roots, of rotting. Put a layer of the potting mix in the new pot. Plant the specimen in the middle of the pot, filling the pot with the inorganic potting material. Immerse the whole pot in purified water, at room temperature. Plants grown in organic soil, repotted into the inorganic mix, show almost no interruption of growth.

Repotting plants already grown in inorganic substrate is even easier (although this is rarely a necessity!). The roots easily separate from the substrate, and are ready for repotting.

Watering can be done by immersing the entire pot, or from above until water drains from the pot. Both methods serve to provide the plant moisture as well as to leach accumulated salts out of the planting medium. As long as the pots do not sit in water, it is impossible to overwater them.

The water quality is of great importance. If your rainwater is polluted or contaminated, use reverse osmosis water.

Fertilization

It is necessary to fertilize your *Nepenthes* because this planting medium does not contain decomposing organic matter. Slow-release fertilizers such as Osmocote® 16-8-12(-2) (i.e. 8.3% N from NH_4 + 7.7% N from NO_3, 8% P from P_2O_5, 12% K from water-soluble K_2O and 2% Mg from MgO) are preferred. One third of the amount suggested on the label is enough for *Nepenthes*. The fertilizer is best mixed with the substrate before potting. At six-month intervals, add the same amount of fertilizer onto the top of the pot.

Propagation

Cuttings root exceptionally well in the substrate. They are directly planted in the substrate, (with or without rooting hormones), and are treated like rooted plants. If the cuttings have pitchers, add water to them. The substrate is too coarse to be used for sowing seeds. Use pure Seramis® or fine vermiculite instead.

The medium is very good for the acclimatization of sterile grown (i.e. tissue culture) *Nepenthes*. After removing the agar sticking to the plants, pot them in clear plastic boxes containing the substrate. Maintaining a relative humidity of almost 100% is most important during the first two weeks. Afterwards, the plastic cover is removed and the plants are treated like adult plants. Since the substrate can be autoclaved, the plants may be kept sterile or at least minimally contaminated by troublesome moulds during the beginning of this weaning procedure. Figure 3 shows a specimen of *N. sumatrana* two years after planting it out. When weaned it had a diameter of only 5 cm!

Figure 1: *N. eustachya* growing on bare rock.

Figure 2: The ingredients of the inorganic potting mix.

Figure 3: *N. sumatrana* growing in the potting mix.

The described results are all obtained growing *Nepenthes* in terraria of varying sizes with artificial lights (cool white fluorescent lamps or high pressure mercury lamps). Modifications of the methods described may be necessary to adapt them to greenhouse conditions. Nevertheless, hopefully many other growers are encouraged to experiment and report on their results in the future.

References

Feßler, A. 1982, *Nepenthes* in Lava-Schlacke, Dt. Gartenbau, 36, 1643-1644.
Feßler, A. 1986, *Nepenthes* in Lava-Schlacke, Das Taublatt, 3 (6), 6-8.

Literature Reviews

Cheek, M. & Jebb, M. 1999, *Nepenthes* (Nepenthaceae) in Palawan, Philippines, Kew Bull., 54: 887-895.

In this paper, the two taxa recently described (under the names *N. wilkiei* and *N. mira*) by the same authors are illustrated and discussed in more detail. Fortunately, original herbarium material of *N. philippinensis*, the type specimen of which was assumed destroyed at Manila during the Second World War, has been discovered at Kew. Unfortunately, the plant represented by this material is conspecific with the recently described *N. wilkiei*, making this name a later synonym. *N. philippinensis* is thus reinstated as a species distinct from *N. alata*, and the authors advocate the intriguing theory that it is more closely related to Bornean species, *viz. N. hirsuta*, *N. hispida*, and *N. macrovulgaris*. This is supported by a number of morphological and ecological similarities (e.g. like *N. macrovulgaris*, *N. philippinensis* grows on ultramafic soil). *N. mira* is maintained to be related to the likewise Bornean alliance containing *N. villosa*, *N. edwardsiana* and *N. macrophylla*. Recently discovered specimens (from further localities on Palawan island) that may represent unusual growth forms of the insufficiently known *N. deaniana* are considered in an additional note. The Philippines may thus yield further insights into long lasting *Nepenthes* secrets.(JS)

Clarke, C. 1999, *Nepenthes benstonei* (Nepenthaceae) a New Pitcher Plant from Peninsular Malaysia, Sandakania, 13: 79-87.

A new species of *Nepenthes* from Bukit Bakar, Kelantan, Malaysia, is described. Its most prominent features are a thick, glaucous cuticle, terete stems, and decurrent leaves. The rosette leaves bear brown hairs along their margins. The affinities of this rather distinct taxon are not entirely clear, and it is compared with *N. sanguinea* and *N. macrovulgaris*. Colour and black & white photographs complete the description.(JS)

Godt, M.J.W & Hamrick, J.L. 1999, Genetic Divergence Among Infraspecific Taxa of *Sarracenia purpurea*, Sast. Bot., 23: 427-438.

With allozyme analysis (comparison of numbers and sizes of different genes that code for proteins catalyzing a common biochemical reaction), the morphologically defined infraspecific entities recognized within *Sarracenia purpurea* have been established as genetically distinct entities. A grouping like (*burkii* (*purpurea* (*venosa*, *montana*))) was established, suggesting that a taxonomic reevaluation (especially of the status of var. *burkii*, which should perhaps better be excluded from subsp. *venosa*) may be warranted. Cultivated material of var. *montana* displayed a very low genetic diversity (the plants being practically clones of a single genetical individual), and it is recommended to supplement the cultivated population with propagules from further populations.(JS)