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COMMUNICATION I

Optimum Substrate for the Establishment of the Epiphyte *Dischidia nummularia* (Asclepiadaceae)

ABSTRAK

Serpihan batu-bata atau kayu reput (substrat yang mempunyai penahanan air dan pengudaraan yang baik) dengan penambahan zat makanan adalah substrat optimum untuk penghidupan anak benih epifit Dischidia nummularia. *Biji benih* D. nummularia, *yang dilembabkan menunjukkan percambahan 100%. Percambahan adalah giat. Radikal tumbuh sepenuhnya dalam masa satu hari dan kotiledon dikeluarkan dalam masa empat ke lima hari. Tumbesaran anak benih selanjutnya, terutama perkembangan sistem akar, adalah lebih baik di atas serpihan batu-bata atau kayu reput daripada di atas pasir, menunjukkan penahanan air dan pengudaraan yang baik adalah perlu untuk menghidupkan anak benih. Dalam jangkamasa lapan minggu tumbesaran anak benih di atas substrat yang mempunyai zat makanan yang rendah adalah lambat berbanding dengan substrat yang dibekalkan baja dagangan pada jumlah yang disyorkan untuk okid epifit. Tinggi dan bilangan daun adalah hampir sekali ganda dan jumlah berat kering bertambah antara 3 ke 4 kali ganda. Tambahan pula, dengan menggunakan serpihan batu-bata sebagai substrat yang ditambah dengan zat makanan menghasilkan sistem akar yang lebih meluas.*

ABSTRACT

Brick fragments or wood crumbs (which are substrates with good water retention and aeration) with the addition of nutrients are optimum substrates for the establishment of seedlings of the epiphytic Dischidia nummularia. *Seeds of* D. nummularia, *when moistened show 100% germination. Germination is rapid — the radicle is fully grown within a day and the cotyledons emerge within four to five days. Subsequent seedling growth, especially for root system development, was better on brick fragments or wood crumbs than on sand indicating that good water retention and aeration are necessary for seedling establishment. Within an eight-week period, seedling growth on substrates low in nutrients was slow compared with substrates where commercial fertiliser was applied in the recommended amount for epiphytic orchids. The height and number of leaves was roughly doubled and the total dry weight increased between three and four-fold. Further, with brick fragments as a substrate, addition of nutrients resulted in a more extensive root system.*

INTRODUCTION

Dischidia nummularia R. Br. is the most common and widespread *Dischidia* species in Malaysia. It grows on a wide range of trees in the lowlands, generally in conditions of light shade, such as orchards, rubber estates and on road-side trees. (*Dischidia gaudichaudii* Decne. is a synonym of *D. nummularia,* Rintz, 1980).

Seeds collected from the field germinate very rapidly and show 100% germination. When the seeds are moistened, the testa splits within six hours. After a day the radicle is fully grown and after four to five days the cotyledons emerge from the testa. However, if grown on filter paper, growth thereafter is very slow. The first pair of leaves is produced eight weeks after germination and in a few plants another pair is produced within twelve weeks. Root development is poor and all seedlings are dead after 16 weeks. Filter paper is obviously unsuitable as a substrate. In this study various substrates were used a) to assess the factors which facilitate seedling establishment, such as water retention, aeration and nutrients, b) to assess their relative importance in the establishment of this *Dischidia* species and c) to relate the experimental results to the distribution of *D. nummularia* in the field.

MATERIALS AND METHODS

Thirty seeds were used for each treatment. The seedlings were grown under light shade. The substrates included i) fine sand which has poor water retention and aeration, ii) crumbs of rotten mango wood which have good water retention and moderate aeration compared with iii) brick fragments with a diameter of ± 5 mm which have moderate water retention and good aeration (Otani, 1972). The sand and brick fragments were heated at 500°C for 6 hours to provide a sterile medium. The effect of nutrients was assessed by adding the commercial fertilizer, Welgrow, to a sample of sterile sand and a sample of sterile brick fragments. Welgrow was used in the recommended concentration for growing epiphytic orchids (0.62 g per litre of water) every two weeks. Welgrow contains 15% nitrogen, 30% soluble phosphate, 15% potash and the trace elements iron, magnesium, manganese, copper, boron, molybdemum and zinc.

For the five treatments (germination on (a) sand without nutrients, (b) sand with nutrients, (c) crumbs of mango wood, (d) brick fragments without nutrients and (e) brick fragments with nutrients), all samples were kept moist by watering daily with distilled water. Growth was measured by an increase in stem length and in the number of leaves; after eight weeks their dry weight was obtained by drying the seedlings at 60°C for 48 hours.

EXPERIMENTAL RESULTS AND DISCUSSION

Figure 1 shows the increase in height and the dry weight gain in 8 weeks for the five treatments. Growth is enhanced by the addition of nutrients. The dry weight of seedlings grown on sand with fertilizer is three times greater than those grown on sand without fertilizer. For the brick fragment substrate, seedlings grown with fertilizer have a dry weight four times greater and are more than double the height of seedlings grown without fertilizer. The dry weight and height of seedlings grown on wood crumbs is more or less that of seedlings grown on brick fragments without fertilizer which suggests that rotten wood is low in available nutrients.

These differences in dry weight are also reflected in the rate of leaf production. The first pair of leaves is produced three weeks after germination for seedlings grown on wood crumbs or brick fragments (with and without nutrients) but after four weeks for seedlings grown on sand (with and without nutrients). The second pair of leaves is produced after four weeks for seedlings grown on brick fragments with nutrients, after eight weeks for these grown on brick fragments without fertilizer or on wood crumbs, while only a few of the seedlings on the sand treatments produced a second pair of leaves. After eight weeks the maximum number of leaves produced was five to six pairs for seedlings grown on brick fragments with fertilizer and three pairs for those on brick fragments without fertilizer and wood crumbs. In addition all seedl-

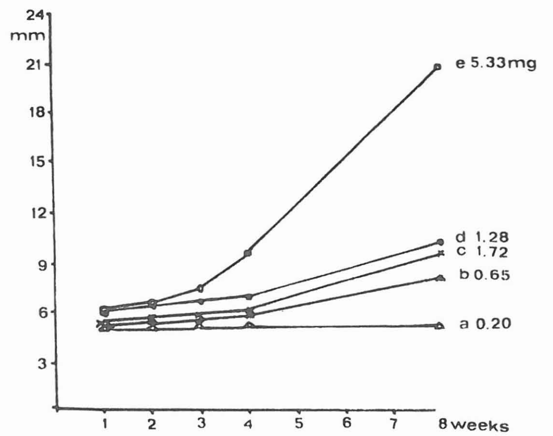

Fig. 1: Growth of Dischidia nummularia *seedlings expressed as increase in stem height (mm) over 8 weeks and as dry weight (mg) after 8 weeks on (a) sand without nutrients, (b) sand with nutrients, (c) crumbs of mango wood, (d) brick fragments without nutrients and (e) (e) brick fragments with nutrients.*

ings grown on wood crumbs and the two brick fragment treatments were alive compared with about 30% for seedlings on sand.

Good water retention and aeration are more important for root formation than nutrients. *Figure 2* shows the extremely poor root formation under conditions of poor water retention and aeration on sand, irrespective of the addition of nutrients. Wood crumbs and brick fragments provide an equally good substrate for root formation and the addition of nutrients allows the development of a more extensive root system *(Fig. 2)*. Interestingly, adventitious roots are formed earliest on sand (within eight weeks of germination) compared with 12 weeks for seedlings grown on wood crumbs, perhaps as a response to the failure to produce a primary root system. Those substrates with good water retention and aeration (brick fragments and wood crumbs) also have a coarse texture which allows the penetration of roots, compared with the fine texture of sand or filter paper.

Fig. 2: Eight-week old seedlings of Dischidia nummularia *grown on (a) sand without nutrients, (b) sand with nutrients, (c) crumbs of mango wood, (d) brick fragments without nutrients and (e) brick fragments with nutrients.*

Establishment under Natural Condition

Seedlings of *D. nummularia* under natural conditions are found in cracks or holes in the bark of a wide variety of trees, though they are not numerous. Investigation of the number of mature *D. nummularia* plants on individual trees shows that they are more common on trees with a rough bark (such as mango, *Mangifera indica* L.) compared with trees with a smoother bark (such as the Indian coral tree, *Erythrina indica* Lamk.) and on older coconut trunks where the bark is cracked and porous compared with young trunks which are smooth and non-porous. Not only does a rough bark surface allow a better penetration of the root system, but it also has better water retention and therefore a better supply of nutrients from the stem flow. Wee (1974) reported the same phenomenon for the epiphytes of Singapore, which were generally found on trees with rough or cracked bark and more especially on older trees.

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REFERENCES

OTANI, K. (1972): Effects of soilless potting compost for the growth of epiphytes. *J. Agric. Sci. Tokyo* **17:** 162 – 166.

RINTZ, R.E. (1980): The Peninsular Malaysia species of *Dischidia* (Asclepiadaceae). *Blumea.* **26:** 81 126.

WEE, Y.C. (1978): The vascular epiphytes of Singapore's Wayside trees. *Gdns' Bull. Singapore* **31:** 114 – 119.

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