Why do we lime Dendrobium Speciosum?. Pt. 2 Pot Experiment

Introduction

While it is a common practice amongst growers to apply lime as part of the management practices growing this popular native orchid, it is not certain what kind of benefit(s) can be derived from such practice and indeed, if lime is really necessary for growing this orchid. No scientific study has been carried out on this subject matter.

The pot experiment

In December 2014, a simple replicated pot experiment comparing the effect of liming Den. speciosum with control (no lime) was established. Ten two-year old seedlings were divided into 2 equal groups each of five plants. The Den. speciosum plants used were an intervarietal Den. speciosum ((v. capricornicum 'Big Boy' x v. speciosum 'Windermere') x v. speciosum ('George' x 'JL' AM)) bred by Gerry Walsh. Lime in the form of calcium carbonate (CaCO₃), commonly known as agricultural lime was applied to one group of plants whereas the other group was not limed and treated as the control. Calcium carbonate is the form of lime used in agriculture in control of soil acidity problems. At each liming, fine agricultural lime was added to cover the surface of the pot and then watered in with water. All the plants were kept in the shade house and treated in exactly the same way in terms of other management practices, namely, fertiliser, watering and repotting. Repotting was carried out as appropriate as the plants grew bigger using a bark substrate (Orchiata^R). The fertiliser used was Peter ^R Excel high Ca/Mg Grower at 1g/L rate weekly during the growing season (October – March) and Peter^R Professional Blossom Bloomer at the same rate during the flowering season (April- September). Liming was carried out about twice a year around spring and autumn and pH of the substrate (as leachate from individual pot) was measured at regular intervals using a glass electrode usually a few weeks after lime application. During the course of the experiment, visual inspection of the growth and development of the plants was observed and recorded. Number of pseudobulbs in each pot was also counted.

Results

pH variations

Figure 1 shows the pH of the growth media throughout the duration of the experiment. Without lime, pH of growth media remained at around 4.5 to 5.5, which is within the pH range of that of the natural habitats (see previous article, 'pH in natural habitats' in Orchidophile September 2020). However, with liming, pH was raised to around 6.5-7.0, which was maintained throughout the experiment by the regular liming.



Figure 1. Changes in pH of lime and control treatment during the experiment

Differences in plant growth and development due to liming

No observable difference in growth of the plants was observed in the first 18 months. At 20 months, visual and growth differences started to become noticeable on the plants between the lime and control treatments. The limed plants

- were stunted, with shorter pseudobulbs and smaller leaves (Figure 2);
- had lower number of pseudobulbs (Figure 3);
- were stressed with pseudobulbs often shrivelled and leaves turning brown;
- had less developed root systems (Figure 3).

These differences persisted throughout the rest of the course of the experiment.

Flowering of some of the plants commenced in 2018 and continued in 2019 season in both the lime and control treatments, with one plant from each treatment flowering in each year. With the smaller sized plant, the size of the inflorescence was also smaller in the lime plants compared to the control.





Figure 2. *Den. speciosum* plants in the beginning and at 52 months of the experiment. (In both Figures (2a) and (2b), top row: lime, bottom row: control)

These growth and development differences are more evident as paired comparison at 52 months of the experiment as in Figure 3. It was estimated biomass of the lime plant was about half of that of the control.



Figure 3. Differences between the lime and control plants



Figure 4. Changes in pseudobulb number with time of the lime and control plants

What have we learnt from this pot experiment?

It is worthwhile to point out that in this investigation only one type of liming materials at one application rate on one inter-varietal *Den. speciosum* was investigated.

Results of this experiment did not support the common belief that liming is beneficial to growth and performance of this native orchid. On the contrary, our results clearly demonstrate application of lime (CaCO₃) can have an adverse effect on this orchid, resulting

in stunted and less healthy plants. Is that a case of over liming i.e. too much lime had been used in this experiment? In the absence of additional measurements, e.g. plant tissue analyses and growth substrate analyses, we cannot find out the causes of the reported adverse effects of lime on the plants. However, an equally interesting observation is that the control plants (no lime) had healthy growth and development. The pH of control treatment remained around 5.0, within the range that has been recorded in the natural habitats of this orchid, with no significant decline in pH during the course of the experiment. Therefore, under the management practices of the present investigation, no acidification of the growth media has occurred.

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