CHAPTER 6

Illustration of the natural and manipulated plant architecture of *Clivia miniata* (Lindley) Regel.

6.1 Summary

Schematic representations of the natural and manipulated plant architecture of *Clivia* can be used to better understand its phenology and propagation. It is proposed that *Clivia* has a modular growth form in which inflorescences are borne terminally. Under natural conditions, sympodial branching occurs after flower initiation in a module. The number of inflorescences which are produced per season depends on the number of modules produced and this can be manipulated by modifying cultural conditions. The effect of paclobutrazol on architecture could be seen in highly repetitive, basitonic axillary branching while the effect of PRO was to stimulate less repetitive, acrotonic axillary branching and / or dichtomous division of the apical meristem.

6.2 Introduction

The juvenile period in *Clivia*, during which no inflorescences are initiated, ends after the production of 12 -13 leaves and may be as short as 12 months depending on growing conditions and genotype. In general, initiated inflorescences develop up to a certain stage and then enter a dormant period before exposure to a low temperature causes their emergence. Emergence of the inflorescence follows about one year after initiation. Following initiation of the first inflorescence, further inflorescences are produced, on average, after every set of 4-5 leaves. (De Smedt, Van Huylenbroeck & Debergh, 1996). However, no mention is made of modules in the former work and this chapter describes the growth of *Clivia* in terms thereof.

6.3 Materials and methods

A thorough morphological study of *Clivia* is not discussed in this dissertation and results obtained in previous chapters were interpreted in terms of existing terminology (Hallé, Oldeman & Tomlinson, 1978, Bell & Bryan, 1991).

6.4 Results and discussion

6.4.1 Natural architecture

It is here demonstrated that *Clivia* has a modular growth form and that it exhibits sympodial branching under natural conditions. After the juvenile phase, a module consists of about four leaves and a terminal inflorescence. Following initiation of the inflorescence, growth of the flowering module ceases and a new module arises in the axil of a leaf base, adjacent to the inflorescence (Figure 6.1., corresponding to Figure 4.7). When the juvenile stage is ended at the 12-13 leaf stage (De Smedt *et al.*, 1996), it is not known whether the 12-13 leaves present are the product of 3 successive modules with aborted terminal buds or of a single module.

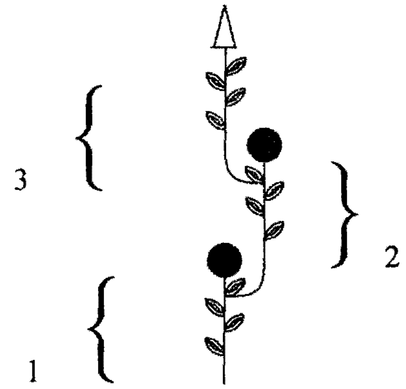

Figure 6.1 Schematic representation of sympodial branching of *Clivia* under natural conditions indicating a plant with 3 modules (1-3).

No axillary buds could be seen in *Clivia* and it is interesting to note that instead, meristematic zones which give rise to new buds and modules are situated on the abaxial surface of leaf bases (Figure 4.8 & 4.9). The position of the bud can be described as being displaced in an acropetal direction and adnation to the abaxial surface of the above leaf base occurs (Bell & Bryan, 1991).

More than one module can be produced per year if cultural conditions are favourable, with the result that there may be up to three inflorescences within a plant at a given moment. Two of these may be sufficiently developed to emerge together, or within close succession of each other, once exposed to either a natural or an artificial cold stimulus. Such plants have been referred to as 'twins'. However, if cultural conditions are not favourable, the production of leaves and therefore inflorescences may be slow and plants may not flower every year. Damage by pests or diseases may result in death of the inflorescence at an early stage with the result that not every inflorescence which has been initiated will emerge.

A specific temperature regime is important in the initiation of flowers in a wide range of plants and it seems likely that this may also be true for *Clivia*. From the information available, it appears that at a temperature of 20 °C, both initiation of flowers and the rate of production of leaves is satisfactory (Mori & Sakanishi, 1974, De Smedt *et al.*, 1996, De Koster, 1998). However, emergence of quiescent inflorescences relies on exposure to temperatures below 20 °C. The effect of higher temperatures on flower initiation, as may occur under outdoor tropical or subtropical climates, is not known.

6.4.2 Manipulated architecture

The effect of paclobutrazol could be seen in highly repetitive, basitonic axillary branching from leaf bases in the proximal, older axils. This is illustrated in Figure 6.2 (corresponding to Figure 4.2 & 4.10).

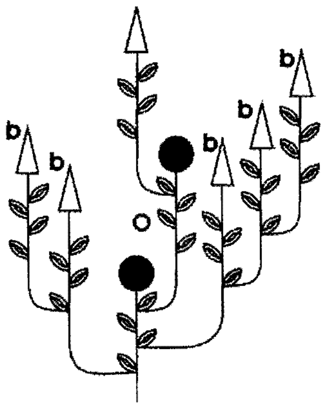

Figure 6.2 Schematic illustration of repetitive basitonic branching in *Clivia* caused by paclobutrazol. The original branch consisting of 3 modules (o) and new branches (b) are indicated.

By contrast, the effect of PRO sprays could be seen in less repetitive, acrotonic axillary branching from leaf bases in the younger, distal axils (Figure 6.3a, corresponding to Figure 4.5 & 4.11). PRO also caused dichotomous branching (a symmetrical split or division) of apical meristems (Figure 6.3b, corresponding to Figure 4.12). The fact that the response to PAC and PRO occurred in specific regions could probably be explained by the different balance of plant hormones which occurs in the different locations of activity.

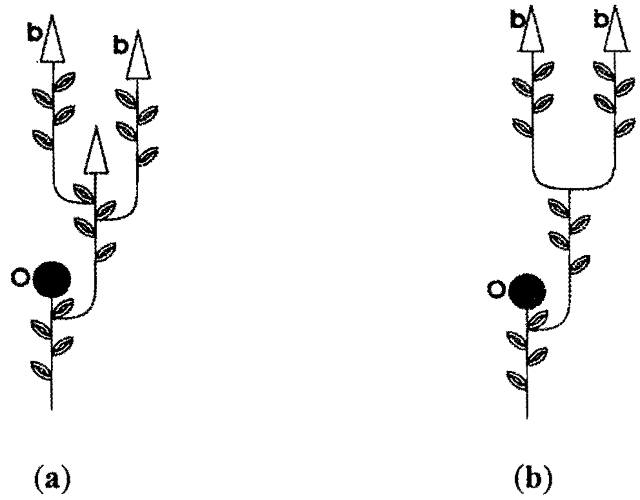

Figure 6.3 Acrotonic (**a**) and dichotomous (**b**) branching caused by Promalin™. The original module (o) and new branches (b) are indicated.

It follows from the above discussion that there is an interaction between the physiology, plant morphology and phenology of *Clivia* and that an understanding thereof will influence the success with which these can be manipulated.

6.5 References

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