**Statens Forsøgsvirksomhed i Plantekultur** **996. beretning**

*Statens Væksthusforsøg, Virum (V. Aa. Hallig)*

# Morphological studies on the growth and flower formation of *Anthurium scherzerianum* Schott and *Anthurium andreanum* Lind

(*Morfologiske undersøgelser af vækst og blomsterdannelse hos* Anthurium scherzerianum *Schott og* Anthurium andreanum *Lind*).

**O. Voigt Christensen**

**Abstract**

Examinations of *Anthurium scherzerianum* Schott and *Anthurium andreanum* Lind show that the plants have a juvenile phase followed by a generative phase. The difference can be seen at the base of the petiole. The first formed leaves have a short sheath and a vegetative bud at the axil and the latter have a flower bud at the axil and no sheath, but the stipules, which make up the sheath, now cover the axil and the upper part of the petiole base and thus protect the flower bud.

When the plant is in the generative phase a flower is initiated each time a leaf is produced and the bud at a certain stage go into dormancy and first after breaking of this dormancy, the bud resume development to full bloom. Consequently, it is only possible to control the breaking of the dormancy and the further development. However, the flower bud can under certain circumstances die before the dormancy is broken.

The plants which remain in the vegetative phase for a longer period than normal divide rapidly at the same time and are therefore called "bush plants".

## Previous investigations

When plants advance from vegetative growth to flowering they go through several physiological stages. These different stages can require different environmental conditions for a successful flower development. When the control of flowering has to be investigated it is necessary to know which of these stages it is possible to influence.

It appears from the literature that information on the flowering of Anthurium is very scarce. *Bailey* (1930) states that "they ought to be continually in flower" because "a bloom is produced from the axil of each leaf". In 1930 the propagation method of Anthurium consisted of dividing the old plant. To-day the prevailing method is seed propagation and in the light of the results from the present investigation it can be said that *Bailey* probably has not examined young plants propagated by seed. *Enche* (1958) on the contrary found a short sheath at the base of the petiole but as these sheaths are not found on the older leaves *Enche* has presumably only examined young seed plants.

The influence of the temperature on the flowering of *Anthurium scherzerianum* has been investigated by *Otto* (1967), and *Maatsch* and *Bachtaler* (1964). The latter has examined the influence of different night temperature on the flower formation (Blütenbildung) and -development (-entwicklung). The results of *Maatsch* and *Bachtaler* show that the flower development is most rapid at 20 °C, but they were not able to show any influence of the temperature on the flower formation (das Anlegen der Blütenstande). Consequently, the authors state that "this question should be the object of further investigations". *Maatsch* and *Bachtaler* report that at the beginning of the experiment (one year old

plants) flower primordia apparently were present in many plants, but not visible.

**Materials and methods**

The plants used for these investigations were propagated by seed. Plants 18 months to 2 years of age were used in the main investigation but furthermore a number of plants were examined at different ages and development. *Anthurium scherzerianum* was used for the many investigation while *Anthurium andreanum* was used in order to check the results. The examinations were made by dissection or removal of the petioles or by dissection of the shoot tips.

The investigations were started in the beginning of 1965 and continued in the summer of 1970 where the photographing also took place.

**Results**

When 18 month to 2 year old plants of *Anthurium scherzerianum* are examined, it can be seen that the old leaves at the base of the petiole have a sheath around the stem. This can be seen in fig. 1 which shows a diagram of a *Anthurium scherzerianum* plant. From fig. 2 it appears that the sheath does not surround the stem completely.

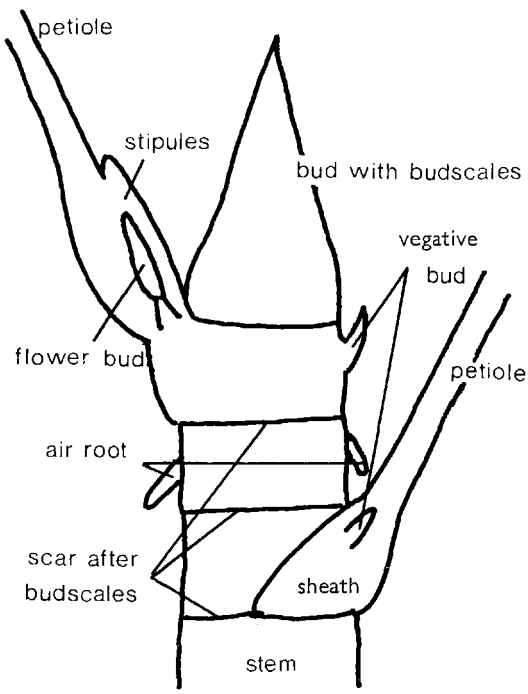


Fig. 1. Diagram of *Anthurium scherzerianum*.

The younger leaves, which are larger than the older ones, do not have this sheath around the stem. However, the two stipules which make up the sheath are still present but now surround the axil and the upper first part of the petiole at the base. This makes the base of the petiole appear swollen (see fig. 3).

By dissection or by removal of the petiole it can be seen that the old leaves have a vegetative bud in the axil (fig. 4), while the younger leaves have a flower bud (fig. 5). Fig. 6 shows a flower bud which is just appearing through the two protecting stipules. The vegetative buds associated with the younger leaves are located on the stem opposite the leaf (fig. 3). When the plants get older the old leaves disappear and no leaves with sheaths at the base can be seen anymore. Whether the side shoots has a juvenile growth phase or not, is not known.

The time when the flower primordia is initiated has not been ascertained, but by dissecting the shoot tip still covered by budscales, the leaf and the flower bud primordia easily can be seen. The leaf shown in fig. 7 is 35 mm long and has a flower bud which is 5 mm long. Whether the flower of *Anthurium* is terminate or not has not been investigated.

The flower bud does not develop directly from the initiation to full bloom. At a certain stage a dormancy period take place. The degree of differentiation of the flower before it goes into the dormant period has not been investigated, but both the spadix and the spathe can be observed. By dissecting the oldest of the leaves on plants growing under unfavourable conditions it has often been noticed, that the flower bud is dead (fig. 8 and 9). However, how long a period a flower bud in the axil can be dormant but still alive is not known.

In nearly all of seed raised *Anthurium scherzerianum* there are plants which remain in the vegetative phase for a longer period than normal.

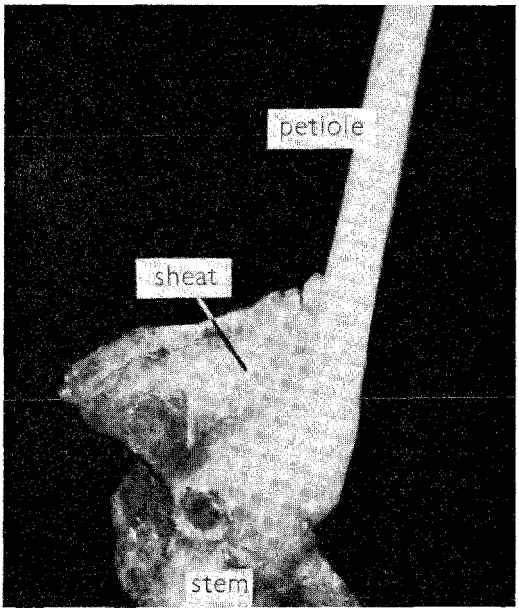


Fig. 2. A stem cut off and only with a single leaf showing the petiole with a short sheath at the basis.

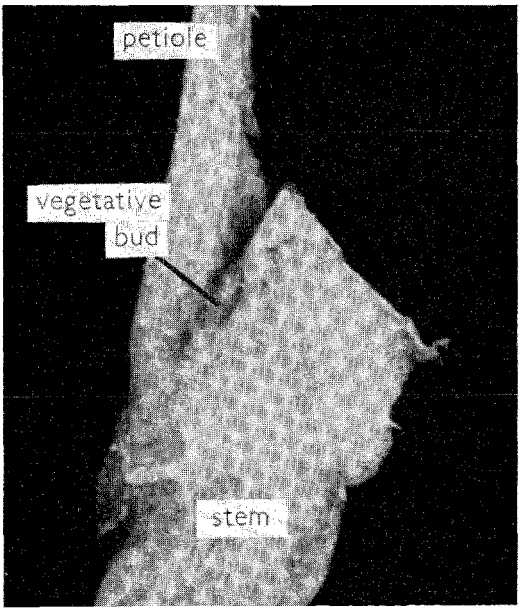


Fig. 4. Longitudinally section of a stem and a leaf petiole showing the vegetative bud at the axil.

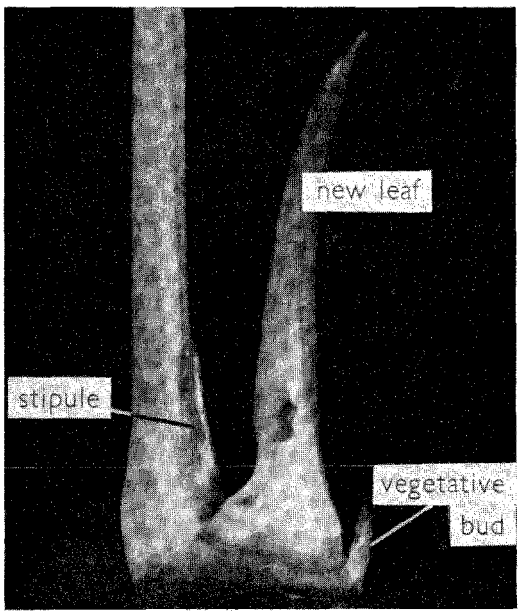


Fig. 3. The tip of shoot showing the petiole with stipules surrounding the axil and upper first part, and with the vegetative bud opposite the leaf.

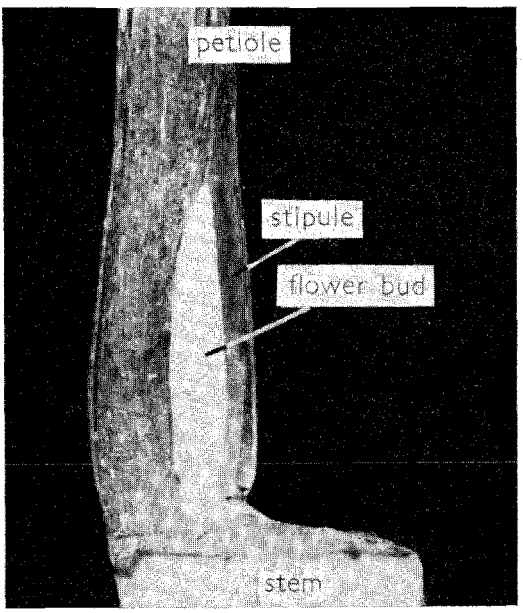


Fig. 5. Longitudinally section at the base of a petiole showing the flower bud at the axil and one of the stipules.

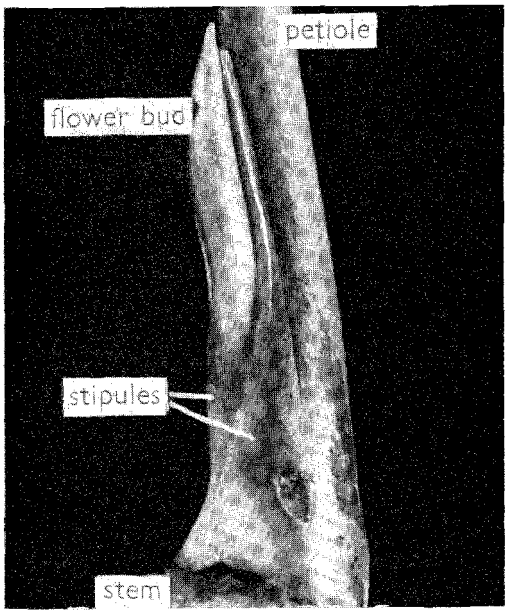


Fig. 6. A flower bud just appearing through the two protecting stipules.

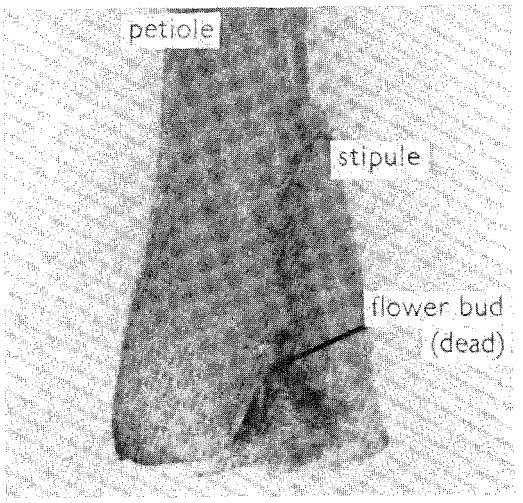


Fig. 8. Longitudinally section of a petiole showing a dead flower and the stipule.

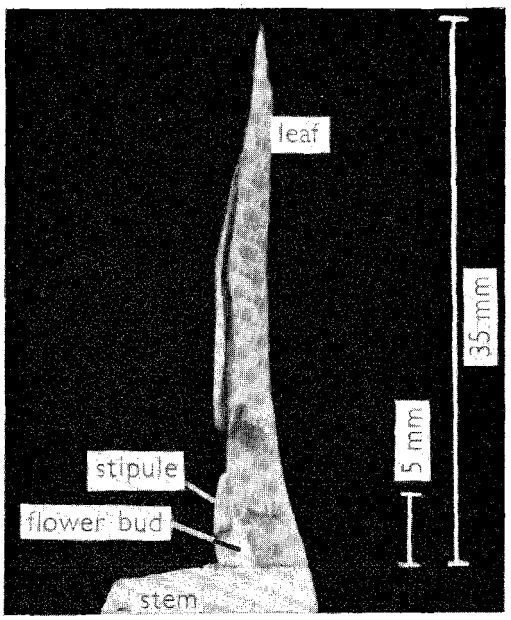


Fig. 7. Longitudinally section of the petiole of a young leaf showing the flower bud and the stipule.

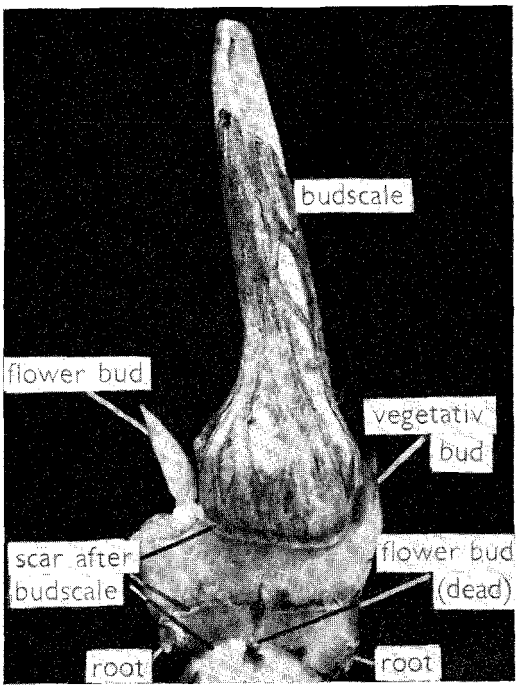


Fig. 9. The tip and the stem from where the leaves have been removed, but the flower buds in the axils still remaining. Also showing the budscales and the scar after the budscales and the air root (cut off).

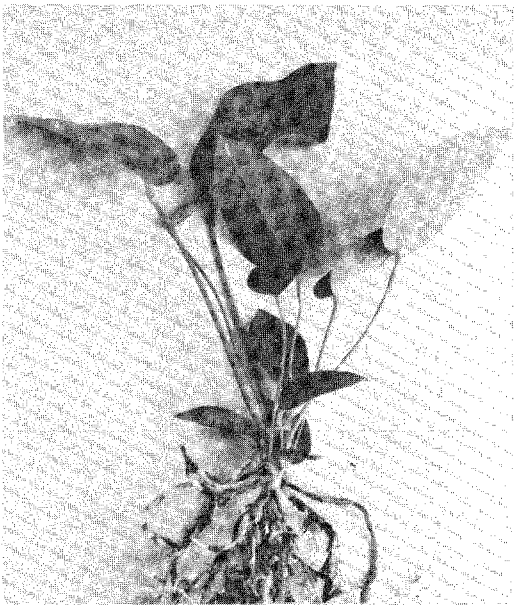

Fig. 10. A normal plant, 15 months old.

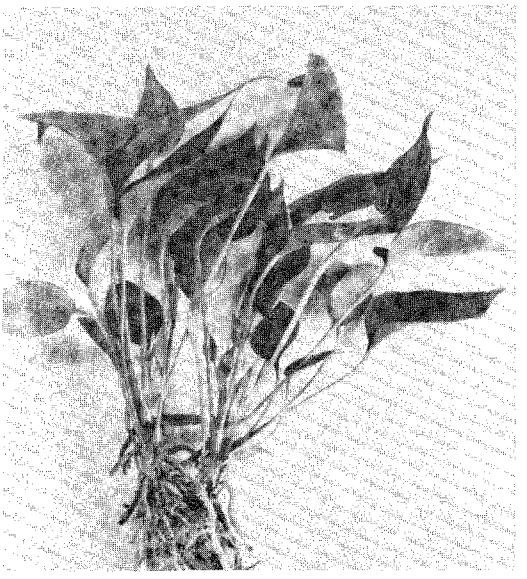

Fig. 11. A bushplant, 15 months old.

These plants begin very early to divide rapidly, which could be due to the longer period of the vegetative phase. In practice these plants are called "bush plants" and are taken out of the production (fig. 10 and 11).

An investigation was undertaken to determine whether other species than *Anthurium scherzerianum* have a similar growth and flower formation. A number of plants of *Anthurium andreanum* Lind. were examined and it appears that both the juvenile and the generative phases, as well as the flower initiation, bud dormancy and flower development all are the same as described for *A. scherzerianum*. It is, however, not kown if "bush plants" occur in *Anthurium andreanum*.

**Conclusion**

When propagated by seed, *Anthurium scherzerianum* and *Anthurium andreanum* develop a certain number of leaves with a vegetative bud at the axil. After this the plants develop leaves with a flower bud at the axil. From this it seems reasonable to postulate that *Anthurium scherzerianum* and *Anthurium andreanum* have a juvenile phase followed by a generative phase. This explains the contradicting results of *Bailey* (1930) and *Enche* (1958).

This discovery leads to the assumption, that when the plant is old enough, a flower is initiated each time a leaf is produced. The bud then go into dormancy at a certain stage and first after breaking of this dormancy, resume development to full bloom. When the plant is in the generative phase, it is, consequently, only possible to influence the breaking of dormancy and further development of the bud. This appears to be in accordance with *Maatsch* and *Bachtaler* (1964).

After the initiation and until breaking of the dormancy, the bud sits protected in the axil and can under certain circumstances die before further development is resumed.

Whether it is possible or not to control how many leaves a plant has to produce, before going into the generative phase, is not known. However, if so this control only applies to the initiation of the first flower.

**Dansk resume**

Undersøgelser af *Anthurium scherzerianum* og *Anthurium andreanum* viser,at denne plante først danner blade, hvis basis har enkort skede og i bladhjørnet et vegetativt skud. Senere fremkomne

blade har ikke denne skede, men de flige, der dannede skeden, omslutter nu bladhjørnet og den nederste del af bladstilken. I hjørnet af disse blade findes en blomsterknop, der ser ud til at blive dannet på samme tid som bladet. Den vegetative knop hos disse blade sidder på den modsatte side af stængelen. Det antages, at *Anthurium* både har en juvenil og en generativ vækstfase.

Planter, der i længere tid end normalt forbliver i den juvenile fase, forgrener sig også kraftigt og kaldes derfor »buskplanter«.

Kontrol med blomstringen af *Anthurium* skal bygge på blomsterudvikling og ikke på blomsterdannelse.

## Literature

*Bailey, L. H.* 1930. The Standard Cyclopedia of Horticulture. The Macmillan Com., New York.

*Encke, F.* (Ed.) 1958. Anthurium. Pareys Blumengärtnerei I:168. Paul Parey, Berlin.

*Otto, A.* 1967. Einfluss der Temperatur auf die Blüte bei Anthurium-Scherzerianum-Hybriden. Deutsche Gärtnerbörse 67 (20): 283-286.

*Maatsch, R.* und *Bachtaler,* 1964. Einfluss verschiedener Nachttemperaturen auf die Bildung und Entwicklung der Blütenstände bei Anthurium scherzerianum hort. Gartenwelt 64 (13): 273-274.

Manuscript received 30/4 1971.