DIALOGUES WITH HUGH: NO. 2 – DO BLOSSOM BOOSTERS WORK?

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BLOSSOM BOOSTERS – are they fact or fiction? Advertising blurbs for fertilisers often contain statements such as: "The high level of phosphates and the N:K ratio of 1:2 make the 'Blossom Booster' the ideal product for improving bud formation and development"; or "Blossom Booster stimulates the development of flowering buds".

Readers will note that such blurbs never categorically state that Blossom Boosters 'make an orchid flower', or 'cause orchids to flower', or 'induce flowering in orchids'. But readers are left in no doubt that to get 'more flowers' or 'improved flowering' of orchids you need to use Blossom Booster fertilisers.

The role of fertilisers in flowering – Are Blossom Boosters needed?

Blossom Booster fertilisers are a fable – they are marketing hype and not much more! Their efficacy is based on the notion that by altering the ratio of nitrogen, to phosphorus, to potassium (i.e. the N:P:K ratio) in a fertiliser, flowering will at least be better or might even occur for the first time. The ratio of N:P:K in a fertiliser will not in itself induce flowering in a poorly growing plant, but too much nitrogen when flowering is due to be induced might quash flowering in a plant that is growing well. To overcome the suppressing effect of too much nitrogen, fertiliser manufacturers add less expensive fillers or potassium and phosphorus minerals to ordinary, high-nitrogen formulas in order to dilute the nitrogen content and relieve the suppressing effect.

The take-home message is that the ratio of N:P:K does not cause flower induction in orchids! But an adequate fertiliser program can decrease the length of time taken for seedlings, mericlones or divisions to flower for the first time. Fertilisers also affect the number and size of flowers produced.

Flower induction in orchids

What decides if an orchid should flower? The first thing to remember is that you must grow a decent plant before it can be induced to flower. You must give close attention to the orchid's **WALF** – the four basic necessities of growing an orchid: (1) **W**ater; (2) **A**ir; (3) **L**ight; and (4) **F**ood.

Now look around the orchid house and note when your orchid species flower. Some genera flower in one season only while others flower throughout the year. Thus, Cymbidiums flower mainly in winter and spring, Paphiopedilums mainly in winter, Miltonias mainly in summer, varicosum-type Oncidiums (now called *Gomesa*), and phalaenanthe type Dendrobiums mainly in autumn, while softcane Dendrobiums flower in winter and spring. While many tropical vandaceous species have a major flowering season, they will frequently flower at any time of the year.

There must have been some advantage in survival of the species for Mother Nature to evolve this seasonality of flowering. So what controls the programming of flowering on a seasonal basis? What is it that changes throughout the year from season to season?

1. In the coastal regions near the equator:
- There is little difference in temperature from season to season;
- The length of day differs very little from season to season; but

- There are usually great differences in the amount of rain that falls in each month; i.e. there is a marked wet summer and dry winter season.
- Here there is little difference from season to season except rainfall pattern, and orchids evolved under these conditions usually flower at any time of the year. Vanda hybrids derived from Vanda sanderiana are good examples of this group.

2. In mountainous regions near the equator:

- There is often a noticeable difference in temperature from season to season;
- The length of day differs very little from season to season; but
- There are usually great differences in the amount of rain that falls in each month; i.e. there is a marked wet summer and dry winter season.
- Here the point to note is the marked difference from season to season in temperature; winters are much cooler then summers, and orchids that evolved in these conditions usually flower in response to changes in temperature. Paphiopedilums, Phalaenopsis, Cymbidiums and Dendrobiums are representative of those types of orchids.

3. As we move further from the equator, in both coastal and mountainous regions:

- The difference in temperature from season to season becomes greater;
- The length of day from season to season becomes greater; and
- The differences in the amount of rain that falls in each month becomes lesser with a marked increase in winter rainfall.
- Orchids that evolved in these regions have developed ways of detecting either alteration of, and/or specific temperatures (called thermoperiodism), or the number of hours of sunlight or dark (called photoperiodism), or in both these seasonal characters. Miltonias and some Cattleyas can detect differences in day-length only, while other Cattleyas detect differences in both temperature and day-length.

Juvenile phase - A pause to grow

Orchids do not usually flower on their seedling growths. Like all other plants, orchids must reach a certain stage of maturity before they are sensitive to the stimulus that will turn on their flowering mechanism. In other words, an orchid must go through a juvenile phase before it reaches a size where it is 'ripe to flower'. The length of the juvenile phase is different between genera and even between seedlings from the same pod. Good culture, including an adequate fertiliser program, can shorten the length of the juvenile phase. However, the genes of each individual plant probably control the minimum length of this phase and no amount of jiggery-pokery by us will decrease it below this minimum length.

Stages of flower development

A vegetative shoot consists of a stem and attached leaves. A flowering shoot consists of a stem and the attached bracts, sepals, petals and reproductive organs of the flower. In fact, a flowering shoot is just a highly modified vegetative shoot. The bracts (small green leaf-like growths which occur on the flower stem), sepals, petals and reproductive organs are modified leaves. Both the vegetative shoot and flowering shoot arise from bud primordia which are identical as far as we can tell. Thus a bud primordium may give rise to either a vegetative shoot or a flowering shoot.

To produce an inflorescence, a plant passes through three stages:

1. The <u>induction stage</u> where a "flowering hormone" is induced in the leaves of the plant and passed to the bud primordium where flowers will develop;

2. The initiation stage where the "flowering hormone" initiates the development of a flowering shoot instead of a vegetative shoot at the bud primordium;

3. The development stage where the flowering shoot develops flower buds and the stem lengthens and the flowers open.

Whether each stage is carried through to the next depends on the environment. Too high or too low a temperature, lack of water or nutrients, too much nitrogen, or not enough sunlight may cause any stage to be aborted. Each stage has its own set of favourable environmental conditions, and those that are favourable for the induction stage can be completely unfavourable for the development stage.

Photoperiodic and thermoperiodic plants must be subjected to a specific number of inductive cycles for flowering to occur. Induction by such cycles is often an all-or-nothing response.

Thermoperiodism: How temperature affects flower induction

When temperature affects the induction and initiation stages, it is usually a low temperature that is required. In general, Cymbidiums, Dendrobiums, Phalaenopsis and Paphipediliums have no photoperiodic response and flowering is induced when they have received a certain number of nights with temperatures below a critical temperature. The critical temperature is different between genera and may be different even between species and hybrids within genera. *Phalaenopsis* usually flower after 2-5 weeks of 10-17°C nights and 20-27°C days. *Paphiopedilum* usually flower after 2-3 weeks of night temperatures below about 13°C. In phalaenanthe and softcane *Dendrobium* species, the critical temperature is about 13°C.

In Cymbidiums, the situation is more complex. Some reports suggest that initiation occurs after three months of night temperatures below 13°C, while others suggest that the critical temperature maybe 8°C. However, other experiments show that initiation will occur when the minimum temperature does not fall below 25°C. The common feature in all these experiments was that flowers were initiated when there was a differential of about 10°C between the day and night temperatures, and that this differential must occur when the developing bulb is just beginning to mature.

Photoperiodism: How day-length affects flower induction

On the basis of their response to day-length (in actual fact, plants measure the length of the period of dark rather than light), orchids can be divided into three groups:

1. Short-day plants which require days shorter than a critical maximum number of hours of sunlight. In general, short-days favoured flowering in *Cattleya* species (except *Cattleya purpurata* that may be a long-day plant), and phalaenanthe Dendrobiums, and some species of *Bulbophyllum*.
2. Long-day plants which flower when the days are longer than a critical minimum number of hours of sunlight. Examples of long-day plants include some species of *Aerangis* and *Miltonia*.
3. *Day-lengtrh-neutral* plants which flower in any day-length. Examples of this group includes some species of *Bulbophyllum*, *Liparis* and *Malaxis*.

Interactions between Photoperiodism and Thermoperiodism

Many species show modification of their photoperiodic or day-length responses by temperature. The favourable effect of short days on flowering in many species may be altered by high night temperatures. Thus, flowering is favoured by short-days in *Cattleya gaskelliana*, *Cattleya warscewiczii*, and *Cattleya mossiae* when night temperatures were less than 13ºC, but when night temperatures were 18ºC or more, flowering was considerably reduced and delayed, or entirely prevented regardless of day length. With *Cattleya labiata*, flowering may be delayed at 13ºC, considerably reduced at 16-18ºC, and prevented at 18-21ºC even in day-lengths that normally induce flowering.

The seasonality of flowering is more noticeable in species than in hybrids where man has attempted to extend the flowering time of a genus by mixing the genes from species with slightly or very different flowering responses. Nevertheless, the flowering of hybrids is still controlled by the genes inherited from their species parents, and their flowering response can be related to the effects of Photoperiodism and Thermoperiodism. Furthermore, flower induction in hybrids is not caused by altering the N:P:K ratio of applied fertilisers, nor by the use of Blossom Boosters.

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References

In preparing this dialogue, I have relied heavily on the following references, and readers interested in a comprehensive coverage on flowering in orchids, and the effects of photoperiodism and thermoperiodism on flowering in many orchid species and hybrids are directed to them:

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