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The story of light

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Years ago Fides held a seminar in a former church building in Amsterdam. During this seminar I talked about Kalanchoe. One of the topics was light and it might be the divine surroundings that inspired me to open this story spontaneously: "and there was light". Of course I don't have to explain that light cannot be missed growing plants.

So what do we talk about then? Well, light can be approached in different ways. The most important is the natural sunlight. This is something you get for free. Next to that you have artificial light, the need for this depends on the crop and season. In the case of Kalanchoe, in order to produce this crop year round, we need artificial light. That is the key focus of this story.

The Long Day period is the main subject in the culture of Kalanchoe in this discussion, where artificial light is involved. A Kalanchoe needs 14 hours of darkness to flower, so in order to keep in vegetative, you need artificial light at least during half the year. To be sure that induction doesn't occur 14 hours of light is necessary. The limit is 18 hours of light, which means the plant needs at least six hours of darkness because it has "to sleep". In our industry there are two possibilities of light, the standard incandescent light bulbs (150 Watt) or the high-pressure lights (assimilation, 450 Watt or higher). Incandescent bulbs will only prevent induction, but high-pressure metal halide bulbs have the ability to stimulate vegetative growth.

So how do we implicate this in the culture? Well, the ideal situation as follows. The simplest is the natural daylength period. Before sunrise and after sunset the Kalanchoe likes a period of rest, or better-said darkness. So if we take an example where we have 10 hours of natural light from 07.00 hours (7 pm - sunrise) till 17.00 hours (5 am - sunset) and we like to have 16 hours of light in total. Four hours of darkness after sunset is best meaning the artificial lighting begins (at 21.00 hours, 9 am) and it stops at 03.00 hours (3 pm). This example can be used for both high-pressure and incandescent bulbs. There is however one exception to this. Many times in the case of using standard lightbulbs the choice is made for cyclic lighting. For Kalanchoe this requires at least 10 minutes per half an hour. The real dark period is then decreased two 2 hours before sunrise and 2 hours after sunset.

Another option is extending the daylength. It is less ideal for Kalanchoe, but it can be used. This means, in the above-mentioned example, that after 17.00 hours (5 pm) the lights are turned on until 23.00 hours (11 pm). After the lights go off 8 hours of darkness follows. To extend the daylength in the early morning is also possible, but is less effective, so we do not really consider this an option.

The second photoperiod involved in Kalanchoe is during the Short Day. More and more in the world, especially in the Northern hemisphere (North Europe), we see growers utilize artificial lighting during this period as well. In all cases this is assimilation light. There is only choice available in this situation. Like it was mentioned earlier, the Kalanchoe needs 14 hours of darkness to induce flowering. This means only 10 hours are left in the day are for light. Of course the natural daylight is the best, but when it is too dark, assimilation lighting helps a lot. (In Northern Europe this means that a typical winterplant is transformed into a spring e.g. early autumn plant, for quality reasons extremely important).

Light can also be negative for the crop, in case of Kalanchoe this is mostly found in the summer season. The intensity of the light can then be too high, which means the crop has to be shaded. If not, symptoms of light toxicity will begin to appear. The first sign is that the leaves begin to shift their colouring towards reddish-brown due to anthocyanin accumulation. The more the sun is giving a chance cause damage the more will begin to occur, even burning of the leaves. Whitewashing a glass or plastic greenhouses is an option, the best option however is using screens. This can be divided into two situations. One is the summerperiod, where depending on the location, screening takes place calculated from high noon. The second period occurs mostly during the early spring when we say goodbye to the dark winterperiod. The first weeks are then crucial for the crop health and the crop should be screened during the morning part of the day.

Important information:

- Standard lightbulbs: 150 Watt lamps, 15 Watt per m² / 10 sq.feet (= 100 lux).
- Cyclic light: at least 10 minutes per half an hour.
- Assimilation light: at least 30 Watt per m², one lamp (400 Watt) on 15 m²/ 160 sq.feet (=2500 lux).
- Distance crop – light: at least 2 metres (6,5 feet).
- Light tolerance in closed blackout system: not above 5 Watt (= 10 lux).
- Screening summer: 55.000 lux (approx. 205 joules per cm²/2,5 sq.inch, or 600 Watt per m²).
- Screening early spring: 45.000 lux (approx. 170 joules per cm², 500 Watt per m²).
- 1 Footcandle = approx. 10 lux.

Option 1

24---1---2---3---4---5---6---7---8---9---10---11---12---13---14---15---16---17---18---19---20---21---22---23---24 hours

xxxxxxx] Sunrise Noon Sunset [xxxxxxxxxxxxx
artificial 4 hours dark natural daylight 4 hours dark artificial

THIS IS THE IDEAL SITUATION: AFTER SUNSET 4 HOURS DARK, BEFORE SUNRISE 4 HOURS DARK. 16 h. Light.

Option 2

24---1---2---3---4---5---6---7---8---9---10---11---12---13---14---15---16---17---18---19---20---21---22---23---24 hours

xxxxxxx] Sunrise Noon Sunset [xxxxxxxxxxxxx
artificial 5 hours dark natural daylight 5 hours dark artificial

SECOND BEST. MINIMUM REQUIREMENT FOR GROWTH: 14 h. light.

Option 3

24---1---2---3---4---5---6---7---8---9---10---11---12---13---14---15---16---17---18---19---20---21---22---23---24 hours

xxxxxxx] Sunrise Noon Sunset [xxxxxxxxxxxxxxx][xxx]
artificial 10 (9) hours dark natural daylight 4 (5) hours artificial

THIRD OPTION. DAY EXTENTION FOR 4, BETTER IS 5 HOURS (OR EVEN MORE - MAX 7 HOURS).

Option 4

24---1---2---3---4---5---6---7---8---9---10---11---12---13---14---15---16---17---18---19---20---21---22---23---24 hours

xxxxxxx] Sunrise Noon Sunset [xxxxxxxxxxx][xxx]
artificial natural daylight artificial 10 (8) hours dark

FOURTH OPTION. EARLY MORNING 2 (3) h. (NO EXTRA GROWTH), DAY EXTENTION 2 (3) h. 10 (8) h. darkness

(No) option 5

24---1---2---3---4---5---6---7---8---9---10---11---12---13---14---15---16---17---18---19---20---21---22---23---24 hours

[xxXxxxxxxxxx] Sunrise Noon Sunset 10 hours darkness
artificial natural daylight

NO OPTION. EARLY MORNING 4 h. NO EXTRA GROWTH, ONLY PREVENTING INDUCTION OF BUDS. A WASTE.