

Plant balance: 'vegetative' or 'generative'

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The art of growing a greenhouse crop such as tomato or capsicum is to make the plants produce as much fruit as possible. The plant can only do this by producing a fair amount of leaves, stems and roots too. How can we get the plants to produce mostly fruit, without wasting a lot of energy on inedible material? This article explains the meaning of 'vegetative' and 'generative' plant types. The next article will be about steering plants to achieve plant balance.

Plant balance

If we know what we want to achieve with our greenhouse crop, we can steer the conditions to achieve our goal. What we want is a good balanced production over the whole season. We don't want a short-term success of a high yield and then being left with a worn-out crop for the rest of the season.

For a decade now, growers are using a wonderful method based on 'reading' the balance of the plants and applying corrections when required. The grower assesses if the plants are in balance, or whether they are 'too vegetative' or the opposite 'too generative'. Plants that develop too generatively can be pushed into vegetative direction, and vice-versa. If left uncorrected, the plants will become completely out of balance, and the later production will suffer. Balanced crops are the best performers and achieve the best results over a whole season.

Unstable surroundings

Keeping the plants in balance is easy when the surroundings are stable. But in a greenhouse there are many de-stabilising factors. Seasonal changes in day-length and maximum light level have a great impact. Short-term sharp fluctuations of sunlight change everything: leaf temperature, pore opening, transpiration, water uptake, photosynthesis, etc. The plants themselves change from small seedlings to large fruit-bearing plants. Every week, day and minute the conditions in a greenhouse are different. Hence maintaining a balanced plant growth is a juggling act. The reward is getting the best possible production over a whole season.

'Vegetative' and 'generative'

To see if a plant is 'vegetative' or 'generative' requires a good eye and some training. We have to look at the top of the plant, especially the head, as this shows how the plant is growing at present. Lower down the plant we can see how the plant has grown in previous weeks or months.

'Vegetative' and 'generative' are mostly used for tomatoes and capsicums. It is easier to see in tomatoes than in capsicums. It does not apply to crops that don't produce flowers or fruit, such as lettuce.

Some varieties tend to be more vegetative types, whereas other varieties may have a tendency to the generative side. Also plant stage and season play a role. Young plants are naturally vegetative and mature plants in the middle of summer tend to be generative.

Hence the plant characteristics should be seen in relation to variety, season, plant stage, given conditions, previous conditions, etc. If plants are 'too generative' or 'too vegetative' for what the grower wants at that point in time, then a correction should be applied.

What is 'vegetative'?

Very vegetative plants are characterised by a strong head. Very vegetative plants don't have a lot of growing fruit, and therefore they put most of their assimilates (sugars) into the growing 'green parts' such as the head, top of the stem, young leaves and new flowers.

Very vegetative tomato plants have (at the top!) a thick stem that is sometimes oval rather than round, and a long distance from the head to the highest flowering truss. A very obvious characteristic is that the truss stem stands quite upright, close to the plant stem. The truss stems may look vigorous (not weak at all, as expected), because the truss stem is a sort of 'green part'.

Capsicum plants are harder to assess. The thing to watch is the plant head. This can best be seen from above, which is hard to do in tall plants. Capsicum plants that are very vegetative have a thick head full of large leaves that form nearly a closed circle. So in a very vegetative capsicum plant, the head is big and bushy, and the flowers are more or less hidden in the leaves. An obvious characteristic of a vegetative capsicum plant is strong length growth.

What is 'generative'?

Plants that are 'not strongly vegetative' are called 'generative', but the symptoms can be less clear. More generative plants are characterised by limited growth of the green parts and hence a thin and weak head.

In generative tomatoes, the truss stem is fairly small and bended down. In other words the truss stem is not standing upright parallel to the main stem, as in vegetative crop.

In generative capsicum plants, the leaves in the head are relatively small, the head is fairly open and hence the flowers are relatively visible. Generative capsicum plants don't grow a lot in height; in fact, they can be standing still.

Generative plants often have a lot of growing fruit that attract a lot of assimilates, which causes that the head misses out. However, the number of growing fruit present on the plant is not necessarily a good criterion for being generative. Mature fruit are lower in the plant, and are a result of what happened some weeks or months ago. Apart from fruit load, also other factors influence whether the plants are generative or in balance or vegetative, as can be seen from the head.

Capsicum

In capsicum, we often see periods of leaf growth alternating with periods of fruit growth. We also see fruit being harvested in flushes, especially in the first months. This is natural and nearly inevitable in capsicum, and is related to plant balance. Plants with a high fruit load (= with many growing fruit) will need most of their assimilates for feeding the fruit. After all, a growing fruit is a strong 'sink' (= absorber of assimilates). Hence, little food is left for the head. The head becomes weak and thin, with new leaves and flowers staying small. The length growth will slow down or even come to a stand-still, and the plant looks generative.

Once the fruit are being harvested, the fruit load gradually declines, and more assimilates become available for the head. The head will become stronger and the plants will now grow rapidly. The plant tends now more to the vegetative side. Gradually the flowers will set to fruit, and once they start growing, the head will get less assimilates and plants grow only slowly. After harvesting the second flush of capsicum fruit, the plants will resume growing again. Usually after the second flush, the 'cycling' will disappear. Plant growth and harvest will settle in a more constant pattern.

Cucumber

Cucumber responds similarly. Periods of high radiation boost the growth and flowering rate. When the flowers start to develop into young fruit, and subsequently start to grow, they need the major part of assimilates. Hence, the plant head and shoots receive less assimilates, resulting in less and smaller leaves. Small leaves cannot produce enough assimilates to feed all the young fruit. Hence, a number of the young fruit will abort prematurely, which restores the plant balance. The cycle in cucumber is much shorter than in capsicum, and an out-of-balance plant will correct itself quite easily.

Crop recording

How do we know if a crop is vegetative or generative? It is not always black-and-white. If a grower sees only one crop (his/her own) s/he may not notice that it slowly drifts towards vegetative or generative. Moreover, how a plant looks depends on variety, plant stage, season, etc. So how do we know what the plants are like, and in which direction we need to correct them? The best way is to accurately measure some plants and write the data down. A very good method is using '*crop recording*' of some sort. This is usually done by measuring ten plants, and putting the data in a computer based system. Other data to be recorded are production, greenhouse conditions, irrigation, etc. Such a system produces tables and graphs, and shows tendencies. You will see on your computer screen or on a print-out whether the head is getting thinner or thicker; fruit set is increasing or decreasing; length growth is sufficient for the given conditions, etc. Growers who are using such systems learn to 'read' their plants and also how to steer them.

Vegetative and generative characteristics in tomatoes and capsicum.

TOMATOES		
plant characteristic	very vegetative	very generative
stem	thick and often oval	thin and round
position of flowering truss	far from top	close to top
truss stem	upright, truss stem is nearly parallel to plant stem	fairly tilted as well as bended
flower colour	pale yellow	dark yellow
leaves	big, stretched	small

CAPSICUM		
plant characteristic	very vegetative	very generative
head (viewed from the top)	closed, full with big leaves	open, with small leaves
flowers (depending on variety)	strong, big, more upwards	smaller, downwards
length growth	more	less