

Plant data: Generative & Vegetative growth

Jordan Hydroponic Agriculture and Employment Development Project:

Experiences 2018 - 2019 no. 6-1

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Goals

Plants that spend most energy on leaf growth are called 'vegetative'. Plants that spend most energy in fruit growth are called 'generative'. Vegetative plants don't carry enough fruit to achieve a high production. Generative plants underperform because they have insufficient leaf area to manufacture enough sugars to fill the growing fruit. The yield over a whole year will be highest in plants that have a good balance between young fruit and leaves. You can adjust your climate control, irrigation regime and/or plant management in order to steer your plants in either vegetative or generative direction. In this factsheet the most common measures are presented. Try out measures gradually and observe the result on your plants. Never make sudden changes.

How to identify vegetative/generative

Vegetative plants have thick stems, large, thick and dark green leaves and slow fruit development. Generative plants have thin stems, small, light green leaves and open leaves and faster fruit development. You can see this by looking at your plants, but you can notice vegetative or generative trends earlier by recording crop data weekly. This will help you to take corrective measures in time and prevent very unbalanced plants. For example: if your stem diameter decreases with 0.1 mm per week, you will notice this much later by mere visual checks than by weekly crop recording. On the other side of this fact sheet you can find instructions on how to collect and record crop data.



Figure 1: Identifying vegetative and generative plants. A vegetative plant will become more generative if you increase the average day temperature, decrease the irrigation flow and or nitrate supply, increase the EC, increase the light level and/or lower the humidity.

Irrigation regime

Wet slabs and low EC facilitate easy water uptake and thus steer towards vegetative growth. High EC and low water make for harsh conditions and steer to generative growth.

Table 1 : Irrigation regime measures for plant steering

Irrigation variable	Steering in vegetative direction	Steering in generative direction
Volume of cycle	Small cycles (but many) → wetter substrate	Larger cycles (but fewer) → dryer substrate
Frequency of cycles	More cycles (although small) → wetter substrate	Fewer cycles (although larger) → dryer substrate
Start time in morning	Earlier start → wetter	Later start → dryer
Stop time at night	Later stop → wetter	Earlier stop → dryer
Water content	Higher (wetter substrate)	Lower (dryer substrate)
Water loss overnight	Low (wetter substrate)	Higher (dryer substrate)
EC in substrate	Low	High

Climate control

Harsh hot and dry summer conditions will stimulate generative growth whereas mild spring conditions result in vegetative growth.

Table 2 : Climate control measures for plant steering

Climate variable	Steering in vegetative direction	Steering in generative direction
Temperature	Mild temperatures	High temperatures
Difference between Night/Day T	smaller	Larger difference in T
Speed of change from day to night T	Slow	Fast
RH	High	Low

Plant management

If the above tools can't be used or don't work, the last option is to take direct actions on the plants. Be careful with this measure as it immediately affects the plant balance and it is irreversible.

Table 3 : Plant management measures for plant steering

Plant action	Steering in vegetative direction	Steering in generative direction
Pruning young leaves	no	yes
Trimming trusses	yes	no
Unloading (taking ripe fruits)	yes	no

Plant data: Measurement instructions

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Methods

Plant measurements should be done weekly in order to closely monitor growth and development of your plants.

Set up a test field by clearly numbering and tagging 10 plants in the middle of your greenhouse (this will be most representative). If you are growing in a V system, make sure to pick 5 plants at the shadow side and 5 at the sun side. Clearly mark the test field and instruct your workers to not harvest from these plants. Using a registration form will help you collect the data in a structured way. It is advised these measurements are done by the same person on the same moment each week to avoid unnecessary fluctuations.

Stem growth

Why: Stem growth is an indicator of whether your plant grows as it should. Healthy tomato plants grow about 25-30 cm a week. Slow growth can be caused by too low 24h average temperatures or stress.

How: Stem growth is measured by weekly putting a clearly visible mark on the line that holds the plant on the highest point of the plant. The following week you measure the length between the mark and the top of the plant. After this, you put a new mark at the top of your plant. Tag the plants with a clearly visible sign.



Figure 2: Left: Measuring stem diameter by using a calliper. Right: Measuring leaf length using a measuring rod

Table 4 : Average values for tomato plant growth

Parameter	Average for tomato
Stem growth	25-30 cm / week
Stem diameter	10 mm
Leaf length	30-40 cm

Stem diameter

Why: Stem diameter is an indicator of vegetative/generative growth. Generative plants have thick stems and vegetative plants have thin stems. Healthy heads with leaves are needed to photosynthesize and transport sugars to the fruits.

How: You want to know the stem diameter of the newly adult part of your plant. Usually this will be right under the mark of the last week. Measure in the middle of the first internode under the mark. The stem is oval, so it has a long and a short side. You can randomly measure either the short or the long side. You can also choose to consequently measure only the short or only the long side.

Leaf length

Why: Leaf length can be used to estimate the leaf area/m². Enough leaf area is needed, about 3 m² leaf /m² ground area, to perform successful photosynthesis. If leaves are too small, you might consider leaving more leaves on your plants.

How: Choose an adult leaf right under the mark and measure it from the stem to the tip. You can also choose to always measure the 6th leaf counting from the top.

Fruit load

Why: You want to know the load on your plants and whether this is in balance with your plant growth and development stage. Clearly, strong plants can carry more fruits than weak plants. Similar, if there is more light plants can carry more fruits. If your plant has a too high fruit load you want to consider trimming the trusses. For example, have 4-5 fruits in winter and 5-7 fruits in summer. It all depends on variety too. Cherries may have 14 fruits per truss, because fruits are much smaller.

How: Number the trusses of the plant starting with 1 for the lowest truss and count up approaching the top of the plant and write down the number of fruits per truss.

Concluding remarks

Average numbers for tomato for the different parameters are given in table 4. However, they are different per crop. The most important is that once your plants are in an adult stage, growth and stem diameter become stable. Crop recording is a great tool that helps you see how your plants react but it is not a replacement of visual observations. Keep doing those and check if the data collected matches your observations before taking measures.