Checklist behaviour pH in organic substrates

With this checklist you will gain insight into how the pH behaves in an organic substrate in a culture situation and why it possibly deviates from the expected value.
It is especially described which factors influence the pH.

By completing the checklist it becomes clear how the properties of a mixture and the various factors in the culture influence the pH. Then it can be considered in which way you could possibly adjust the pH.

If for example the pH in a culture is decreasing – or it is expected on the basis of the properties of the mixture and the culture factors that it will decrease – then you could try to change the factors that decrease the pH. But you could also use a pH increasing factor. In this way pH changes can be decreased and/or reversed.

To get a good picture of the pH and EC (and furthermore of the nutrient level) in a culture it is commonly recommended that a grower in the growth season, regularly carries out a 1:1,5 vv analysis. The general recommendation is to carry out an analysis at least once every four weeks.

Based on a good history, the effects of various factors in the culture on the pH can be distinguished better and based on that data you can redirect well-founded.

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– See for the questions and explanation pages 3-5 –

Properties of the delivered substrate mixture

	Parameter	Effect	Assessment
1	Start pH	pH delivered substrate ……. point higher/lower than the desired pH	
2	Change EC during the cultivation	Responsible for ……. point pH decrease	
3	pH buffering	Normal / moderately / small	

Factors that influence the pH in the culture

	Parameter	Effect	Assessment
4	Crop stage	No effect on pH / pH decreasing effect	
5	Ammonium/nitrate in culture fertilization	pH decreasing / pH neutral / pH increasing	
6	Specific fertilization	pH decreasing / pH increasing / pH fluctuation	
7	Bicarbonate in irrigation water	No effect on pH / little effect on pH	
8	Watering system and/or rainfall	No effect on pH / pH decreasing effect	
9	Other aspects and agreed steps (to fill out by yourself):		

Questions for the checklist with explanation

1. pH and EC of the delivered soil and the desired values

(in 1:1,5 vv extraction)

	pH	
Delivered potting soil		
Desired pH/pH in the culture		
Difference		**Copy calculated difference in the checklist**

2. Is there effect of an EC change?

(in 1:1,5 vv extraction)

If the EC in the culture is higher than that of the delivered substrate, then this can lead to a pH decrease. Insert the EC values of the delivered soil and the (desired) EC in the culture in the table. Read the value of the pH decrease associated with the EC's and fill this out in the second column. Then calculate the difference in pH decrease. Copy this value in the collective list.

EC in organic substrate (mS/cm in 1:1,5 vv extract)	pH decrease by EC
0,2	-0,3
0,3	-0,4
0,4	-0,5
0,5	-0,6
0,6	-0,7
0,7	-0,7
0,8	-0,8
0,9	-0,8
1,0	-0,8
1,1	-0,8
1,2	-0,9
1,3	-0,9
1,4	-0,9
1,5	-0,9

	EC value	pH decrease from table associated with the EC value
Delivered soil		
EC in the culture		
Difference in pH decrease = pH decrease by EC increase **List in the collective list**		

3. Does the substrate contain other raw materials than peat?

In which content?

The pH buffer of an organic substrate actually restrains the change of pH which arises by influence factors in the culture (see item 4-8). A grower usually is used to a certain degree of pH buffering. When other raw materials than peat are used in a substrate then this can lower the pH, through which pH changes are less buffered. As a result, the pH can change quicker.

100% peat	The pH buffer is 'normal', there is in general a strong buffering of pH change.	'normal'
25%-50% non-peat	The pH buffer can be less big than normal, the buffering of pH change moderately as a result.	'moderately'
More than 50% non-peat	The pH buffer can be much less big than normal, the buffering of pH change is low as a result.	'small'

4. Is the crop vegetative or generative?

A crop that develops flowers and/or fruit abundantly, will take up extra potassium. The pH will decrease because of this. Dependent on the way of fertilization (4) the pH can decrease little until very much.

Vegetative	The crop won't excessively take up potassium.	**0**
Generative	The crop will take up extra potassium.	**-**

5. What is the ammonium/nitrate-proportion in the culture fertilization?

It concerns here the nutrient solution and/or the storage fertilization (under which among others coated fertilizers).

For most cultures on organic substrates a proportion of 10/90 is kept for ammonium/nitrate. In general the fertilization will influence the pH if this proportion is deviated from. The normal values for various cultures can be found in the Dutch Fertilisation Guide 'Bemestingsadviesbasis'. If you acidify irrigation water with nitric acid, take the amount of nitrate that you give extra into consideration.

Straver, N. e.a., 1999. Bemestingsadviesbasis Potplanten. Proefstation voor Bloemisterij en Glasgroente (now WUR-Glastuinbouw, Bleiswijk), ISSN 1387-2427. OPEN SOURCE ; download via http://edepot.wur.nl/218456

Aendekerk, Th.G.L., 1996. Bemestingsadviesbasis Boomkwekerijgewassen. Boomteelt Praktijkonderzoek, Boskoop, ISBN 90-802469-3-x.

Less than 10% of the nitrogen in mmol is ammonium.	The nitrogen fertilization has a pH increasing effect.	**+**

10% of the nitrogen in mmol is ammonium.	The nitrogen fertilizations doesn't influence the pH.	**0**
More than 10% of the nitrogen in mmol is ammonium.	The nitrogen has a pH decreasing effect.	**-**

6. Specific fertilization?

Organic fertilizer	At an organic fertilizer the pH can strongly rise in first instance and then decrease strongly by nitrification. An excess of ammonium or nitrate because of these processes can also cause a big change of pH by plant uptake. In general, the pH will rise strongly in the first weeks till round 6,5 and then decrease till the start pH of the mixture.	**+ / 0 / -**
Other fertilizers?	Think, for example, of urea and trace element fertilizers with lime.	

7. Is irrigated with water rich in bicarbonate?

When acidified, what is than the final bicarbonate content?

0-1 mmol bicarbonate in irrigation water	Little to no effect on pH.	**0**
1-3 mmol bicarbonate in irrigation water	Some effect on pH present.	**+**

8. Watering system and rainfall

The way of watering and rain especially effects the issue whether or not flushing of nutrients. At flushing relatively many anions disappear from the root environment. In this way the pH can decrease, especially because possibly relatively more ammonium is absorbed.

Overhead irrigation	Possible flushing of elements, especially during intensive overhead irrigation.	**-**
Precipitation	Possible flushing of elements, especially during heavy rainfall.	**-**
Drippers	Possibly flushing of elements takes place, as soon as drain is realised.	**-**

9. Other aspects

Consider thoroughly whether there may be other factors that can affect the pH. Think, for example, of what a grower adds himself to potting soil or irrigation water, such as (biological) preparations.