

ITC Dosing Pumps

Fertigation equipment for blueberries

Originally published in INFO Berries 2019

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Fertigation for blueberries is one of the techniques requiring higher accuracy because of the needs of this crop. In this article, we will look over the key points for efficient organic fertigation of a blueberry crop, as well as the proposals to deal with the complexity involved.

The combination of relatively high nutritional requirements with the low tolerance to salinity and low volume explored by the roots require continuous dosing to comply with the fertilising units required without saturating the soil with salts. The solution lies in the distribution of fertilisation in the maximum time: the higher the water fertigation volume is continent of nutrients, the lower salinity will be induced. Therefore, it is necessary to take advantage of every chance to organically irrigate and reduce to a minimum the supply of water without fertilisers. In those cases where salt needs to be washed ensuring a fraction of drainage, due to the characteristics of original water or soil analysis, a pre-fertigation without fertilisation can be established.

Once the fertigation strategy has been decided, the application control is a key to ensuring that the planned formula is accurately transferred to the fertigation solution. The time dosing through accurate flow dosing systems requires the calculation of the volume, translated into programming time, for every sector. In this system, water lots with and without fertiliser are produced in a same



Controller 3000 by ITC

irrigation operation, increasing the salinity of the lot containing the nutrient and making it less accessible to the crop. This disadvantage can be solved through the dosing proportional to the instant flow, and the control of EC electric conductivity.

Dosing proportional to the instant flow measured by a high-frequency flowmeter ensures the exact concentration of each nutrient accurately. Equipment such as the ITC CONTROLLER 3000 allows proportionality setpoints to be defined with 0,001% precision on the fertigation flow, independent for each one of up to 6 different stock solutions. This precision is combined with that offered by piston dosing-units with micrometric and electronic adjustment through a frequency inverter. Dosed flows and volumes are completely independent from pressure, water speed, density and viscosity of the dosed products in agriculture, and can be adjusted to a very wide range (DOSTEC-AC with automatic range from 1 to 100%)



Dostec AC by ITC

High sensitivity to salinity, therefore it is not recommended to use solid fertilisers applied on the soil.

Management of conductivity dosing is also possible, but its adjustment is not as quick as in the case of proportionality. Usually, type-PI controls are used, which need some time to reach the required value. This adjustment works, in a reasonably correct manner, with organic fertigation systems based on dosing pump with frequency inverter which enable the injection of continuous flows but shows deficiencies in the organic fertigation systems based on the injection of intermittent volumes compromising the reach of the setpoint. This problem is solved with the PIQ algorithms developed by ITC, as, due to the immediate adjustment of the dosing unit, the setpoint is reached in a few seconds. With this system, accuracy of 0.05 mS is maintained, even though sudden and important changes to the flow or pressure are produced, because the equipment incorporates these parameters to its calculation anticipating to its effect on the readings in the controlled parameters


ITC recommends managing proportionality, because when it is necessary to dose low fertilising concentrations, the full scale of proportionality is much wider than that of conductivity. Indeed, small differ-

SPECIFIC CHARACTERISTICS OF BLUEBERRY NUTRITIONS

- High sensitivity to salinity, therefore, it is not recommended to use solid fertilisers applied on the soil.
- Development of the root in low depth and with few root hairs. As the volume of the explored soil is low, it conditions the type of irrigation, which should be of high frequency.
- They prefer acid soils with much OM (organic matter).
- Optimum pH around 5.5
- Appetence for NH₄⁺ in blueberry crop, possibly associated to optimum crop pH, which, in this way, favours the keeping of nitrogen.
- Different needs depending on the crop phenological state, the various proportions between nutrients should be adjusted to them.
- High concentration of N should be avoided to have no problems due to excess vigour and higher sensitivity against plagues, as it may directly affect the quality of fruits.
- P favours crops with low root development such as blueberries. Setting a low PH and continuous dosing helps minimise losses by immobilisation.
- Balance and minimum concentration of cations such as K, Ca, Mg is necessary.
- Excess K produces fruit cracking and deficiencies in Mg and Ca, but its lack reduces the harvest as it limits the fruit growth. Ca has a main role in the fruit firmness and its preservation after harvesting. This element is immobile in the plant. Therefore, it may not be missing during the entire fruit development, and, particularly, during the first days from the fruit setting. During the growth phase of the



Blueberry cultivation, courtesy Magdalena Torres, ADESVA

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fruit, enough supply of K should be ensured, of which excess during the setting process was not wanted as it is Ca antagonist.

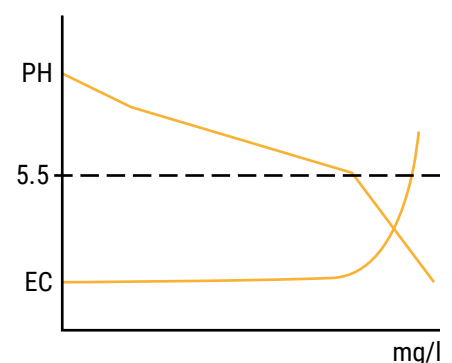
HOW SHOULD THE FERTIGATION EQUIPMENT FOR BLUEBERRY CULTIVATION BE?

- Flexibility for changing formulation (both in balances and concentrations)
- Wide range of flows from a same equipment
- Accurate pH adjustment producing stable readings, matching the setpoint, even when requesting a very low pH in fluctuating and low flows
- Accuracy in dosing low proportions of fertilisers that is not altered by the setting of low pH.

ences in proportion do not significantly affect (accuracy 0.05mS) the reading in EC.

A phenomenon that is not usually considered in the EC management is the H⁺ concentration effect on this parameter. In the usual work pH, about 6.5 for most crops, this effect is not observed.

However, in 5.5 pH, the hydrogen ion is highly active increasing EC, because it is the lightest soluble load existing in the Nature. This phenomenon reduces the usefulness of EC as a system to control fertigation in crops needing low pH, such as blueberries. If, however, it is used, an accurate and stable pH control will be needed to avoid error (acidification would produce a decrease in the fertiliser applied by the system to compensate its higher activity). This phenomenon should also be considered when salinity of the fertigation solution needs to be inferred from the conductivity reading. The appropriate reading of a low pH sample should include the previous neutralisation of the sample in order to determine the salinity. The logical conclusion from this observation is that proportional dosing, or with volumetric control, is better for this crop.



WATER CONTROLLER 3000 equipment enables the application of different balances, and concentrations adapted to each sector and time, therefore adapting to the precise nutrition of multiple varieties and phenological developments. On the other hand, the possibility to carry out up to 15 different fertigation starts (up to 50 fertigation programs for each one), adding a total of 750 daily starts, meets the



Plant pot blueberries cultivation

requirements of a type of crop that needs a high number of fertigation cycles because of the low volume of the soil.

The optimum work pH, around 5.5, requires an accurate adjusting system. In fertigation solutions, the main factor affecting the water acidity or pH is the concentration of bicarbonates. As pH is a logarithmic scale, it means that decreasing one point involves having an H⁺ concentration ten times lower, therefore, to decrease 0.1 points we need 100 times lower volume when pH is around 5.5 than when pH is 7.5. On the other hand, the concentration of present bicarbonate and buffering capacity under 5.5 is so small that in-line adjustments should be carried out carefully if you do not want to decrease too much or go into instability. It is essential not to exceed acidification as Aluminium solubilization may produce toxicity, which stresses the need of accuracy in this control.

WATER CONTROLLER 3000 equipment allows for in-line precise pH adjustment adapting to the changes to the network flow without moving from the setpoint, because of the pH adjustment type PIQ, which constantly monitors the fertigation flow and anticipates to the changes to the acid dosing

PROPOSAL OF ITC EQUIPMENT FOR BLUEBERRIES

- WATER CONTROLLER 3000 6-24 or higher
- DOSTEC-AC independent dosing units for fertilisers (dimensions recommended for this crop 1 per thousand per each stock solution, from 2 to 5 stock solutions)
- DOSITEC dosing units for Ph control in flows lower than 40m³/h; and of DOSTEC-AC in higher flows.



Water Controller 3000 by ITC