

agronomic special report

Fertigation, the source of balanced growth

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Open field fertigation consists of providing water and mineral elements to plants on a regular basis, in limited and calculated quantities. Through its supply of water and minerals located near the roots of the plants via an injection system in the drip irrigation tubing, fertigation makes it possible to obtain great efficiency in the use of water and fertilizers (notably by a reduction in leaching). Fertigation is the most efficient method for producing more with less. Fertigation helps to maintain regular and balanced plant growth, allowing the plant to maximize its full genetic potential. Fertigation involves a fertilizer injection program. The program's mandate is to monitor and support the evolution of each growth stage of horticultural crops produced in open field.

Soil analysis and basic fertilization

Beforehand, a soil sample is necessary. The resulting analysis report, in addition to the possibility of correcting the soil pH with a liming agent, makes it possible to prescribe a preplant granular fertilizer formulation.

This granular fertilizer input aims to balance the mineral elements in order to minimize the antagonisms that may arise between potassium, magnesium and calcium in the soil which could affect the smooth running of the fertigation program.

Table 1.

Desired ratios between Ca, Mg and K cations

Ratio	Targeted value
Ca / Mg	2 to 9
Mg / K	2 to 10
(Ca+Mg) / K	15 to 30

This granular fertilizer input also aims to provide 30% of the minerals that the produced crop needs in N, P₂O₅ and K₂O as established by the fertilization reference guide from the *Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)*.

To this end, each field thus has its own granular fertilizer prescription.

The fertigation programs in this document essentially target soils whose cation exchange capacity (C.E.C.) does not exceed 15.

Salinity and pH of the solution

One needs not worry about the salt contents (Ca⁺⁺, Mg⁺⁺, SO₄⁻, HCO₃⁻, Na⁺, Cl⁻, Fe, B, F, K⁺, NO₃⁻) of the solution and the impact of these elements on the crop. Unlike fertigation in a greenhouse, in pots, bins, bags or troughs, open field fertigation, through the soil's buffering power and rainfalls that occur throughout the production season, it is not necessary to be preoccupied by the solution's salt contents and its impact on the crop.

In open field fertigation, the impact of water and solution pH on the availability of nutrients is not a factor that is likely to affect the crop and the smooth running of the program.

Fertigation, the source of balanced growth *continued*



Foliar analysis

Foliar analyses are required to monitor the crops' nutritional evolution and the alignment of fertigation programs with the needs of the plants.

Carried out on a regular basis, foliar analysis reports make it possible to adjust fertigation programs, either by increasing the quantity of a program-specific fertilizer to be injected and/or to carry out foliar spraying of a particular fertilizer.

Fertigation products

The fertigation products provided by Agro-100 are true solutions (not solubles or suspensions). Therefore, they are easy to inject and do not present any risks of clogging.

Agro-100 liquid solutions do not only contain simple mineral elements. Agro-100 liquid fertigation fertilizers contain biostimulants that stimulate absorption by the roots of minerals injected into the rhizosphere and optimize their transport within the plant.

This complex mixture also helps to improve soil structure, stimulate beneficial microbial activity in the soil, balance the soil's carbon/oxygen ratio in order to make the root area more active and thus increase the availability of nutrients.

The approach of a program adapted to all horticultural crops

The program proposed here intends to be easy to understand and simple to apply. Through its approach, this type of program leaves the initiative to the producer or advisor to decide on the fertilizing interventions to take or not based on their experience of the field or the evolution of the crop... this within a framework of directives prescribed by the fertigation program.

It offers flexibility in adapting to current climatic and crop growing conditions.

The program is based on a basic diet that consists **of a weekly injection of two fertilizers**, namely Quattro Combo and Quattro 9-0-3.

At all times, and according to good judgement, the program directives allow the producer or advisor the possibility to intervene during the program in order to:

- ① **enhance vegetative development**
(Quattro 19-0-0);
- ① **increase root development**
(Quattro 0-20-20);
- ① **trigger or amplify flowering**
(Quattro 0-20-20);
- ① **intensify ripening or tuber formation**
(Quattro 1-5-20);
- ① **compensate for the lack of calcium during periods of heat waves or active growth**
(Calstik® C₁₂).

Agro-100 offers six fertigation products

Fertilizers	Composition in %	Density kg/L
Quattro Combo	N _{tot} 0.32% + P ₂ O ₅ 0.01% + S 1.72% + B 1.72% + Cu 0.06% + Fe 0.8% + Mn 1.25% + Mo 0.06% + Zn 1.04%	1.10
Quattro 9-0-3	NO ₃ 9% + K ₂ O 3% + Ca 6% + Mg 3%	1.49
Quattro 0-20-20	P ₂ O ₅ 20% + K ₂ O 20%	1.44
Quattro 19-0-0	NO ₃ 9.5% + NH ₄ 9.5%	1.26
Quattro 1-5-20	NH ₄ 1% + P ₂ O ₅ 5% + K ₂ O 20%	1.25
Calstik® C ₁₂	Ca 12% + Mg 0.45%	1.34

(See table 2 on the next page)

Fertigation, the source of balanced growth *continued*



Table 2.
Fertigation program for all crops

Basic diet Growth under normal weather conditions Quattro Combo Quattro 9-0-3 + 6% Ca	Quantity to be applied EVERY 7 DAYS (L/ha)	Approximate total quantity FOR THE ENTIRE SEASON (L/ha) (season of 12 weeks)
If needed To enhance vegetative development > Basic diet PLUS the following product	MAXIMUM quantity to be applied TWICE A WEEK (L/ha)	Approximate total quantity FOR 3 WEEKS (L/ha)
+ Quattro 19-0-0	20 litres/application	120
If needed To increase root development/tuber formation/ bulbing or to trigger/amplify flowering > Basic diet PLUS the following product	MAXIMUM quantity to be applied TWICE A WEEK (L/ha)	Approximate total quantity FOR 3 WEEKS (L/ha)
+ Quattro 0-20-20	10 litres/application	60
If needed To intensify ripening or tuber formation > Basic diet PLUS the following product	MAXIMUM quantity to be applied ONCE A WEEK (L/ha)	Approximate total quantity FOR 3 WEEKS (L/ha)
+ Quattro 1-5-20	15 litres/application	45
If needed To compensate for the lack of calcium during periods of heat waves or active growth > Basic diet PLUS the following product	MAXIMUM quantity to be applied TWICE A WEEK (L/ha)	Approximate total quantity FOR 3 WEEKS (L/ha)
+ Calstik C₁₂	10 litres/application	60
<p>If necessary, fertigate after irrigation. Do not mix pure products together. Injection of a mixture of 200 litres per product per hectare for a maximum of 15 minutes per injection. 10 minutes of water between each injection of products except for Quattro Combo and Quattro 9-0-3. Start the program 2 weeks after planting or after the spring revival of perennial crops. A preplant granular fertilizer application is required. For more information, consult your representative or agronomic advisor.</p>		

Fertigation, the source of balanced growth *continued*



The approach of a program adapted to a particular horticultural crop

This type of program defines the type and quantity of fertilizer to be injected; **these vary depending on the crop's current stage of growth, the type of crop that is grown and the category of soil supporting the crop (C.E.C. of 15 and less).**

For a given crop, the program supports the plant at each growth stage. By splitting and dosing the fertilizer inputs, this makes it possible to avoid the undesirable effects of massive fertilizer inputs causing excess vegetative growth or physiological activity likely to harm yields and in getting a quality crop (see table 3).

Table 3.
Programs by type of crop

Crop	Quantity of products to be injected per week, in litres/hectare						Quantity of products to be injected per week, in litres/hectare						
	VEGETATIVE GROWTH PHASE						PRODUCTION PHASE (L/ha)						
	Number of weeks						Number of weeks						
	Quattro Combo	Quattro 9-0-3	Quattro 19-0-0	Quattro 0-20-20	Quattro 1-5-20	Calstik	Quattro Combo	Quattro 9-0-3	Quattro 19-0-0	Quattro 0-20-20	Quattro 1-5-20	Calstik	
Blueberry	9	1	14	2	6	—	—	—	—	—	—	—	
Cucurbits	7	1	18	11	11	—	7	1	14	7	—	14	10
Strawberry	5	2	15	11	10	—	12	2	10	8	—	8	5
Day-neutral strawberry (33,000 plants/ha)	6	2	19	15	13	—	8	2	32	11	—	10	5
Raspberry	8	2	30	8	10	—	8	2	30	4	—	10	5
Raspberry bush, everbearing varieties	8	2	30	16	10	—	8	2	30	4	—	10	5
Hop	8	1	11	4	6	—	6	1	4	2	—	11	—
Sweet pepper	7	1	11	4	1	—	7	1	10	—	—	2	10
Tomato	7	1	11	3	4	—	7	1	4	4	—	14	10

Recommendations based on the MAPAQ grids and on tests carried out by Agro-100 since 2014.

Feel free to contact us to discuss your needs:
we are confident that we will find productive solutions to them.

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