BLUEBERRIES
CROP SOLUTIONS SHEET

Biorizon biotech

Blueberry Crop Cycle

The blueberry crop cycle comprises several distinct stages throughout the year, each essential for plant development and fruit production.

The typical annual cycle is described below:

Dormancy (Late Fall to Winter)
After harvest, blueberry plants enter a dormancy period, induced by reduced daylight hours and falling temperatures. During this phase, the plant conserves energy and prepares for the new vegetative cycle.

Bud Swell and Flowering (Early to Mid-Spring)
With rising spring temperatures, buds begin to swell and open. Flower buds, generally located at the tips of the previous year's growth, develop into bell-shaped flowers.

Fruit Development (Late Spring to Early Summer)
Once pollination is complete, flowers evolve into fruit through three main stages: cell division, seed development, and cell expansion. These phases extend over an approximate period of 60 to 90 days, depending on the variety and environmental conditions.

Ripening and Harvest (Mid-Summer)
Blueberries ripen progressively over several weeks, changing from green to blue as they reach their optimal harvest point.

Post-Harvest and Preparation for Dormancy (Late Summer to Fall)
After harvest, plants focus on accumulating energy reserves for the next cycle. New shoots may emerge, and flower bud formation for the following year begins. With decreasing photoperiod, leaves change color and eventually fall, marking the onset of the rest state.

Agronomic Characteristics of the Crop

Scientific name: Vaccinium spp.
Botanical family: Ericaceae
Growth habit: Perennial deciduous shrub
Optimal climate: Prefers temperate climates; requires chill hours for effective dormancy
Soil: Acidic (pH 4.5–5.5), well-drained, and with high organic matter content
Water requirements: High; very sensitive to water stress and waterlogging
Propagation: Primarily by cuttings or in vitro culture
Flowering and pollination: In spring; benefits significantly from bee pollination
Fruit development: Ripens from green to blue over several weeks
Harvest period: Late spring to summer, depending on variety and region
Estimated yield: 5–12 t/ha (depending on cultivar and agronomic management)

Main Phenological Stages

Agricultural Season	Phenological Stage
Late Fall – Winter	Dormancy
Early Spring	Bud Swell and Flowering
Late Spring	Fruit Development
Mid-Summer	Ripening and Harvest
Late Summer – Fall	Post-Harvest and Preparation for Dormancy

Dormancy
(Late Fall to Winter)

Bud break / Early Leaf Growth

Flowering

Fruit Set
(Late Spring)

Fruit Development and Ripening

Post-Harvest / Pruning / Hardening

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MAIN AGRONOMIC PROBLEMS IN BLUEBERRY CULTIVATION

STRESS CAUSED BY PRUNING

CAUSES

Excessive pruning
The excessive removal of wood or foliage in a single intervention can reduce photosynthetic capacity and weaken the plant.

Inadequate timing
Pruning outside the dormancy period (late winter) can disrupt natural growth cycles and cause sap loss or frost damage.

Poor technique
Poorly executed cuts create open wounds that facilitate the entry of pathogens (fungi, bacteria, insects).

Adverse environmental factors
If pruning is followed by stressful conditions (drought, frost, high temperatures), the plant's recovery may be compromised.

Young or weakened plants
Over-pruning immature plants can delay their establishment and reduce initial yields.

CONSEQUENCES

- **Delayed spring growth due to energy diversion towards wound healing**
- **Reduced flowering or fruit set in the following season**
- **Drying of shoots or weak development of new shoots**
- **Increased susceptibility to fungal and bacterial diseases**
- **Leaf chlorosis or leaf drop in severe cases**
- **Decrease in carbohydrate reserves in roots and stems**

BIORIZON SOLUTION FOR STRESS CAUSED BY PRUNING

Stress caused by inadequate pruning can have very negative effects on production, as already mentioned. It is essential to promote plant recovery to avoid growth arrest or even desiccation.

When the plant is subjected to excessive stress, there is an increase in ethylene and abscisic acid (ABA), phytohormones that, although acting as defense mechanisms, cause physiological blockage. In these cases, it is necessary to modify the internal hormonal signal, promoting favorable conditions for growth.

To restore the plant's physiological balance, ALGAFERT is the ideal product. This biotechnological solution provides the plant with a natural and balanced combination of phytohormones, along with polyphenols with antioxidant action and plant amino acids of high biological value.

ALGAFERT should be applied once or twice, either foliarly or via fertigation (foliar application being the most recommended), at a dose of 2-3 L/ha.

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MAIN AGRONOMIC PROBLEMS IN BLUEBERRY CULTIVATION

LACK OF GROWTH OF NEW ROOTS AFTER PRUNING

The lack of new root development after pruning may be due to very limited auxin generation, which prevents root induction. If we understand that under these circumstances the plant presents a high concentration of ethylene and abscisic acid, and low levels of auxins, the growth of new roots becomes practically impossible.

If we want to solve this problem and restore the plant's ability to regenerate its root system, we must provide the appropriate induction signal, ensuring not only the activation of root growth but also the supply of necessary nutrients. In this context, calcium becomes a key element that must be applied.

CONSEQUENCES

Activation of new root development and improved efficiency in the plant's use of nutrients and water.

EXCESSIVE APICAL VEGETATIVE GROWTH

To promote controlled and balanced vegetative growth, it is essential to understand what the plant needs during this period. Plants require hormonal balance to express their full genetic potential, but they also need adequate climatic conditions, optimal soil fertility (nutrient availability and microbiological activity), water availability, and protection against pests and diseases.

Excessive vegetative growth favors the development of branches and leaves, but not flowers or fruits. It is necessary to stimulate and induce reproductive buds that generate flowers from the top to the base of the stem. Under conditions of excess nitrogen in the fertilization program or in environmental situations with adequate temperatures but low solar radiation, the plant's hormonal system becomes unbalanced, producing large amounts of gibberellins and auxins, which favors vegetative growth and the absence of reproductive buds.

To resolve this problem, it is necessary to re-establish the plant's hormonal balance by reducing the production of gibberellins and auxins, and increasing the presence of cytokinins.

Faced with this situation, Biorizon Biotech recommends working in parallel with two strategies: one for controlling vegetative growth and another for inducing reproductive buds.

BIORIZON SOLUTION FOR LACK OF NEW ROOT GROWTH AFTER PRUNING

We suggest applications of ROOT BEST every 7 to 15 days (5-10 L/ha), and to ensure we implement the correct signal for root induction, during the first two applications we recommend a combination with BIOPOWER (1 L/ha), as there is strong synergy between both products.

BIORIZON SOLUTION FOR EXCESSIVE APICAL VEGETATIVE GROWTH

We will apply BIORIZON FINAL foliarly at a rate of 2L/ha with the aim of mobilizing sugars from the leaves to the roots, fruits, and reproductive buds, moving them away from the vegetative growth tips. This product represents an effective solution for diverting sugars from vegetative tissues and thus slowing their growth.

We will apply BIOFAT foliarly at a rate of 2L/ha to promote bud differentiation into reproductive structures and flower formation. Cell division, favored by the presence of natural cytokinins produced by microalgae, along with polyphenols and amino acids involved in the formation of new floral tissues, will be key for buds to enter the reproductive phase.

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MAIN CROP PROBLEMS FOR BLUEBERRY PRODUCERS

LACK OF VEGETATIVE GROWTH AND SUGAR PRODUCTION

The lack of vegetative growth in blueberries when plants do not develop vigorous stems, leaves, or foliage structure can be due to multiple, often combined, factors. The most common causes are described below:

Poor or incomplete root system

Weak or irregular growth after dormancy can limit initial vegetative development. Causes include:

- Poor quality soils.
- Latency not fully overcome.
- Planting in cold or excessively wet soils, which delays vegetative growth.

Nutritional deficiencies

- Nitrogen (N) deficiency is the most common and directly affects foliage development.
- Phosphorus (P) deficiency can slow root growth and limit nutrient uptake.
- Micronutrient imbalances (especially zinc or manganese) can alter enzymatic activity and photosynthesis.

Water stress

- Drought reduces leaf expansion and shoot elongation.
- Waterlogging suffocates roots, preventing nutrient uptake and slowing growth.
- Irrigation errors (excess or deficit) are particularly detrimental in early stages.

Soil problems

- Compaction limits root penetration and gas exchange.
- Poor drainage or low organic matter content negatively affect root function and microbial activity.
- Low soil temperatures slow growth, even if vegetative structures emerge.

Environmental stress

- Frost damage.
- High temperatures in early stages (above 30 °C) can inhibit vegetative development.
- Hail or wind can physically damage young plants.

Herbicide damage or chemical residues

- Drift from applications from nearby fields or misuse can cause phytotoxic effects.

Consequences

A poor canopy → lower photosynthesis → reduction in yield and fruit size.
Plants become more exposed to thermal stress, competition with weeds, and disease attack.

BIORIZON SOLUTION FOR LACK OF VEGETATIVE GROWTH AND SUGAR PRODUCTION

To help and stimulate vegetative growth, it is essential to understand what the plant requires during this period. Plants need hormonal balance to express their full genetic potential, but they also need adequate climatic conditions, optimal soil fertility (nutrient availability and microbiological activity), available water, and protection against pests and diseases.

Based on this information, Biorizon Biotech recommends working in parallel with two strategies:

Root development to improve nutrient and water use efficiency:

When irrigation is available, apply ROOT BEST every 15 days (5–10 L/ha). For the first two applications, it is recommended to combine with BIOPOWER at 0.5L/ha, as there is strong synergy between both products.

When irrigation is not available, it is recommended to perform 2 foliar applications of BIOPOWER at a rate of 1 L/ha.

Vegetative growth and development to increase photosynthesis:

Application of ALGAFERT via foliar spray at a rate of 1L/ha, with the aim of balancing the plant's hormonal system and providing high-value biostimulant molecules such as polyphenols, vitamins, amino acids, and polysaccharides. This application can be enhanced by adding 1 L/ha of PHOTOPOWER, which ensures stimulation of sugar production by reinforcing the photosynthetic process.

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MAIN AGRONOMIC PROBLEMS FOR BLUEBERRY PRODUCERS

DEFICIENT AND HETEROGENEOUS FLOWERING AND FRUIT SET

Flowering is a highly demanding stage, as it represents the plant's reproductive phase, and requires both adequate hormonal signaling and the availability of essential nutrients.

When either of these two key factors is not in optimal condition, the reproductive stage (flowering and fruit set) is negatively affected, leading to a loss of productive potential.

There are multiple causes that can destabilize the plant's hormonal system just when the reproductive phase should begin.

Excess nitrogen in the soil, warm temperatures combined with low solar radiation, as well as excess or scarcity of irrigation water, among other negative factors, can alter this balance.

All these factors shift the hormonal balance away from cytokinin dominance, the absence of which hinders the differentiation of reproductive buds.

On the other hand, deficiency or insufficient levels of calcium, boron, zinc, phosphorus, among others, will reduce both the quantity and quality of flowers and pollen.

When the levels of these nutrients are very low, clear deficiencies can manifest, resulting in the loss of flowers and fruits after fruit set.

BIORIZON SOLUTION FOR DEFICIENT AND HETEROGENEOUS FLOWERING AND FRUIT SET

Biorizon Biotech has developed a solution based on all this nutritional and physiological knowledge, providing plants with the essential nutrients, natural hormonal signaling, and bio-stimulation necessary for this purpose.

BIORIZON COMPLEX via foliar spray at a rate of 2–3 L/ha, applied at the beginning of bud swelling and opening, with the aim of promoting homogeneous flowering and high quality in flowers and pollen.

BIOFIX via foliar spray at a rate of 2–3 L/ha, in one or two applications during the flowering stage, to ensure high levels of calcium and boron in plant tissues.

BIOFAT 600 via foliar spray at a rate of 2 L/ha during flowering, to induce the appropriate signaling for cell division. The greater the cell division during the flowering and fruit set stages, the greater the potential caliber of our blueberries.

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MAIN AGRONOMIC PROBLEMS IN BLUEBERRY CULTIVATION

INCREASE IN FRUIT SIZE AND SUGAR CONTENT

Filling young fruits represents a great challenge for growers. Achieving homogeneous berry growth and reaching optimal commercial size is fundamental. The more efficient this process is, the greater the profitability for the farmer.

From a nutritional standpoint, it is essential to ensure that the plant receives adequate amounts of calcium, boron, and potassium.

Likewise, it is necessary to sustain photosynthesis during the filling period, as it is the main source of carbohydrates required for complete fruit development.

BIORIZON SOLUTION TO INCREASE FRUIT SIZE AND SUGARS CONTENT

Biorizon Biotech has developed a solution based on all this nutritional and physiological knowledge, providing plants with essential nutrients, natural hormonal signaling, and the necessary biostimulation to achieve this objective.

Foliar application:

BIORIZON FINAL at a rate of 2 L/ha, with the aim of inducing the appropriate signaling to mobilize sugars from the leaves to the fruits. This product should be applied close to harvest time, especially in late varieties and when a single harvest is desired.

KOLOR NEUTRO as a source of potassium, a key element in increasing carbohydrate production. It is applied at doses of 2-5 L/ha throughout the entire fruit filling stage. It can be mixed with BIORIZON FINAL.

Drip irrigation:
(when possible or available)

PLENTY at a rate of 5 L/ha every 15 days, starting from the beginning of the fruit filling stage. This product provides nitrate-free potassium and nourishes the root system to maintain its growth activity, which favors the healthy development of the aerial part.

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MAIN AGRONOMIC PROBLEMS IN BLUEBERRY CULTIVATION

POST-HARVEST TREATMENTS - PREPARATION FOR DORMANCY

(Late summer until leaf fall)

The productive potential of the crop is defined during the moments of floral induction and differentiation, which take place between mid-october and mid-december.

In addition to managing any stress situation that may compromise floral differentiation after induction, the accumulation of reserves in the form of nitrogen (with arginine being one of the most efficient storage compounds), starch, phosphorus, or potassium is particularly important. These reserves will sustain growth and development at the beginning of spring, when root activity is minimal, allowing for a homogeneous exit from the dormancy phase.

The practical implication of the above is that an adequate and homogeneous start to the season will have a positive impact on floral synchronization and, therefore, on fruit set (effective pollination period), in addition to favoring fruit retention and size potential.

For this reason, monitoring winter cold (both in quantity and quality), combined with the use of products that stimulate uniform development of floral and vegetative buds, will be essential as an initial campaign strategy.

- **Arginine: Amino acid with a low C/N ratio, making it an excellent compound for storing organic nitrogen. Therefore, analyzing its content in roots and buds is an indicator of the nitrogen load the plant possesses to: maintain bud activity during winter dormancy and act as an energy source during sprouting, when root activity is scarce or null.**
- **Starch: Storage polysaccharide that accumulates in structures such as buds.**
- **Potassium: Fundamental element for sugar mobilization and the development of various metabolic processes. Its accumulation rate in storage structures is high and relevant.**
- **Phosphorus: Essential element in the plant's metabolic development.**

After harvest, plants focus their activity on energy accumulation for the next cycle. As daylight hours decrease, leaves change color and eventually fall, signaling the proximity of the dormancy phase.

To efficiently increase resource storage, it will be key to maintain minimal root system activity and induce the transfer of photoassimilates from vegetative organs, mainly leaves, to storage organs (roots and buds).

BIORIZON SOLUTION FOR TREATMENTS POST-HARVEST - PREPARATION FOR DORMANCY

Biorizon Biotech has developed a solution based on all this nutritional and physiological knowledge, providing plants with essential nutrients, natural hormonal signaling, and the necessary biostimulation for this purpose.

Foliar application:

BIORIZON CONTROL at a rate of 3–5 L/ha, with the aim of inducing the appropriate signaling to mobilize sugars from the leaves to the roots and buds. This product should be applied during floral induction and after harvest, close to the potential leaf fall time (30–40 days prior).

Drip irrigation (when possible or available):

PLENTY at a rate of 5 L/ha every 15 days, starting from the beginning of the fruit filling stage. This product provides nitrate-free potassium and nourishes the root system to maintain its growth activity, which favors healthy development of the aerial part.

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MAIN AGRONOMIC PROBLEMS IN BLUEBERRY CULTIVATION

IMPROVEMENT OF PLANT HEALTH AND IMMUNE SYSTEM

Blueberries face a considerable number of phytopathological threats, and the first line of defense against these diseases is their own immune system.

Currently, farmers have fewer and fewer active ingredients to combat these diseases, while consumers demand safer and healthier production.

Plants have defense mechanisms against pathogens, but it is necessary to improve two key factors to facilitate an effective response:

Reduction of plant stress, as high ethylene levels can hinder the immune system's response and activation.

Strengthening of defensive metabolisms, optimizing their internal biochemical pathways.

Blueberries are particularly vulnerable to a wide range of diseases caused by fungi, bacteria, viruses, and nematodes, which can affect different phenological stages, impacting both yield and fruit quality.

Among the most severe diseases that growers currently face are powdery mildew and blueberry rust, for which control tools are increasingly limited.

BIORIZON SOLUTION TO IMPROVE PLANT HEALTH AND IMMUNE SYSTEM

Biorizon Biotech has been developing a specific solution for this need over the past few years, and thanks to the properties of one of our microalgae hydrolysates containing significant amounts of defensive phytohormones such as salicylic acid, jasmonates, and natural defense peptides, we can recommend strengthening the blueberry immune system by applying ALGADEFENSE at a rate of 1.5 L/ha every 2 weeks, either via foliar spray or drip irrigation.

These treatments will contribute to reducing the presence of diseases in the crop, thereby decreasing the need for chemical phytosanitary treatments.

BIORIZON SOLUTIONS FOR BLUEBERRY CULTIVATION