

Current Position of Biostimulants in Europe, and field trial case studies

Date:2021/12/16

In the European Union there are significant changes in regard to the current as well as the future regulations for biostimulants. One of the key issues is the move from national biostimulant regulations to EU harmonised rules under a fertiliser framework. The new EU fertiliser regulation 2019/1009, which now include biostimulants has brought several and significant changes to the regulations and the definitions. The new regulation will simplify market entry for biostimulant products from 2022 onwards, provided that they are compliant to the new regulation, as there will be harmonised rules and procedures applicable for all EU Member States. It is likely the UK will adopt similar procedures, but this market may be less attractive than the entire block of the European Union, since a single EU application may allow access to a significantly larger market.

According to Regulation 2019/1009 biostimulants are defined as products `stimulating plant nutrition processes` independently of the product's nutrient content with the sole aim of improving one or more of the following characteristics of the plant or the plant rhizosphere:

- (a) nutrient use efficiency,
- (b) tolerance to abiotic stress,
- (c) quality traits,
- (d) availability of confined nutrients in soil or rhizosphere.



Abiotic stress is non-biological stress (for example: deficiencies or excess in water, excess of salt, nutrient deficiencies, temperature fluctuations) as opposed to biotic stress (normally from biological agents of viruses, insects, fungi and similar agents causing disease). However, biotic and abiotic stresses are not independent and normally abiotic stressed plants will be susceptible to disease; therefore general good health and vigor could be expected with the use of biostimulants compared to non-use. It may also be the case if the season has no abiotic nor biotic stresses then we may not see any significant improvements from the use of biostimulants. To have a product approved as a biostimulant it will be essential to demonstrate at least one of the positive traits and probably more than just one. It will also be essential to show, like other efficacy studies on plant health products, performance in a number of field situations where there will be different climatic and geographic conditions and where there may be biotic stresses known to be prevalent. To prove an effect wholly from biostimulants as defined by the regulations will require expertise and knowledge of the local agricultural practices

In addition, a product where there are benefits of stronger plants able to fight disease may trigger a product to have dual action against abiotic and biotic stress, and therefore it is certainly eligible for registration under the plant protection framework as product categories such as ‘elicitor’ or ‘plant activator’. These product categories are already included and covered by Regulation 1107/2009 for Plant Protection Products.

The inclusion of biostimulants into a regulated framework is important, and critical to maintain a position of importance and of value to the current and future markets. The consequences of climate change, i.e. heat, drought and salinity stress or the need to reduce mineral fertiliser inputs, was the basis for inclusion of biostimulants in a harmonised EU-wide regulation. This regulation and legal framework, at least in theory, could achieve the desired effect, namely to make biostimulants more easily available on the market and thus complement farmers’ toolbox to support sustainability and more environmentally friendly agricultural goals to reduce dependency on pesticides and inorganic fertilisers. It should be noted and of relevance, the new fertiliser/biostimulant regulation explicitly allows for ongoing national registration/notification procedures, provided they do not infringe EU standards. Therefore, the new fertiliser regulation is accompanied by another new regulation (Regulation 2019/515) simplifying the mutual recognition procedure for nationally registered products and the free movement of fertiliser/biostimulant products in all EU Member States. In addition to the few examples described above, there are many more regulations and national initiatives influencing the local use of plant protection products and fertiliser/biostimulant product registration and use; and there are more to come at national and community level. Overall, it seems that the process of environmental initiatives and sustainability, long neglected in the EU, significantly gains momentum. These biostimulant regulations are just one in a host of many other initiatives to sustainable agricultural practices.



Case Studies and performance of Biostimulants

It is essential to demonstrate an effect for the claim of biostimulant. There is a sufficient financial reward for AgChem companies for products improving and increasing the desired effect on the crop with the use of biostimulants. It may eventually be important to demonstrate a non-effect and this can be more difficult, to prove a negative is not easy (to prove a non-effect against biotic stress – pesticides normally have to prove an effective positive effect against biotic stress) and thankfully this isn't necessary with the regulation. Therefore for the moment and within the current regulations we can focus on a demonstration of plant performance related to the definitions of biostimulants.

It is clear in the market and regulations that biostimulants must prove their added value before certification. Many of the previous reports on biostimulants promote the value of research programs as evidence of the added value and allow an evaluation of the economic benefits and how to use in practical terms.

The commercial field trial operations are essential, with the quality standards to collect the evidence, and report the value and benefits of biostimulants. In addition, the field trials need to be conducted in the geographic and climatic zones for future use. Typically these should follow efficacy trials in Europe related to the 3 climatic zones previously reported in AgroPages by this author.

The experience of Veltia is presented here based on practical trials on vegetables, fruiting-vegetables and fruits under protected and field conditions.

The common objectives for the assessment of biostimulants are:

- The impact on
 - o the crop stage and/or the vegetative production
 - o the yield
 - o harvest quality

- Practical matters related to:
 - o dose rate response of the test item
 - o timing of application
 - o future crops
- A market comparison between
 - o test item and standard products
 - o different methods of application (ie drip and/or drench) of the test item

Typical Assessments used for all crops are:

- Visual:
 - o plant color
 - o plant vigor
 - o plant height
 - o number of flowers
 - o number of unripe and ripe fruits
- Specific:
 - o chlorophyll content (SPAD)
 - o stomatal conductance (porometer)
- Harvest:
 - o yield consecutive (marketable and non-marketable):
 - o number of fruits and weight per harvest (at least 4 harvests requested as a minimum)
 - o size and diameter of fruits
 - o weight of roots
- Quality:
 - o peel firmness
 - o brix value (laboratory analysis on fruits)
 - o split between quality categories (scale 0-3 or 0-5)
- Taint:
 - o tested on fresh or processed products (for example olive oil and tomato pastes and not the raw agricultural product)

All of the above must be assessed in a rigorous mathematical and statistical methods for comparison, and provide meaningful assessments of the use and benefits.



There are 4 case studies presented here:

1.TOMATO & CUCUMBER

This is the standard protocol to be used as a baseline for most crops

1. Visual assessment:
 - a. color and vigor,
 - b. general health
2. Height of the plant
3. Number of flowers
4. Chlorophyll content
5. Determination of analytical parameter in leaves:
 - a. pH,
 - b. Nitrate,
 - c. Calcium,
 - d. Potassium,
 - e. Salt,
 - f. Sodium
6. Yield (marketable and non-marketable)
 - a. number of fruits/tree and fruits/ha
 - b. weight of all harvested fruits
7. Root measurement
 - a. weight of root,
 - b. root length,
 - c. root volume
8. Weight of aerial parts of the plant.

2.OILSEED RAPE (OSR):

1. Phytotoxicity:
 - a. percentage of total leaf area affected by chlorosis and necrosis,
 - b. other symptom or plot differences observed
2. Vigor
3. Biomass total weight
4. Number of branches
5. Number of pods per plant
6. Number of seeds per pod

In addition other factors specific to OSR can be included:

- Biomass sampling (fresh weight)
- Biomass sampling (dry weight)
- Number of first order branches on a sample of 20 plants per plot
- Number of pods per plant on a sample of 10 plants per plot
- Number of seeds per pod on a sample of 200 pods per plot
- Number of grains per plant
- Gross weight of grain per plot
- Percentage of moisture of grain

3.CLEMENTINE:

In addition to the standard protocols there can be measures of quality items for consecutive years

1. Height and width of tree
2. Phytotoxicity
3. Number of fallen fruits per tree
4. Harvested fruit weight (kg) on 3 trees/plot
 - a. number of harvested fruits/tree on 3 trees/plot
 - b. -fruit grading on 200 fruits/plot
5. Following year - flower production as a percentage relative to the untreated control

Trial results:

- from an overall point of view, a visual comparison between treated and untreated
- visible efficacy of test product(s) compared to the reference samples
- earlier appearance of quality traits
- early appearance of quality traits as a result of specific modes of applications

4.PEARS:

A measure of effects of biostimulant. Product applied as label and the assessment against a control for:

1 Phytotoxicity -

- a) as a percentage of total leaf area affected by chlorosis and necrosis.
- b) other symptom or plot differences observed using a scale appropriate to symptom

2 Crop vigor

Other factors to be measured number of:

- Flowers
- Fruits
- fruit setting
- Fruit colour
- Fruit weight
- Yield

In summary

The new regulations ultimately make biostimulants an attractive market if the supplier can produce evidence and register as a biostimulant. However if there are claims of biostimulant then there are items that must be proven. It is essential to prove the claims of efficacy and in the appropriate climates.



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