

WHITE PAPER – BIOSTIMULANTS IN THE UK

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INTRODUCTION

Background

Interest in biostimulants has been increasing partly due to the reduced availability of pesticides in the UK market as well as increased disease resistance in some crops. Accordingly, The Andersons Centre has undertaken research on the UK biostimulants market to ascertain some of the main drivers and challenges which are summarised in this white paper.

Objectives

This study has three key objectives which are:

1. Determine the extent to which biostimulants are recommended in the UK market.
2. Identify the main strengths and weaknesses of biostimulants currently being offered to UK farmers.
3. Clarify what are the main purchasing criteria when deciding whether to use biostimulants.

Product Definitions

For the purposes of this study, The Andersons Centre has followed the definitions contained in a study on biostimulants completed in 2012 on behalf of the European Commission¹. This study defined plant biostimulants as follows:

Plant Biostimulants

“Plant biostimulants are substances and materials, with the exception of nutrients and pesticides, which, when applied to plants, seeds or growing substrates in scientific formulations, have the capacity to modify physiological processes of plants in a way that provides potential benefits to growth, development and/or stress response.”

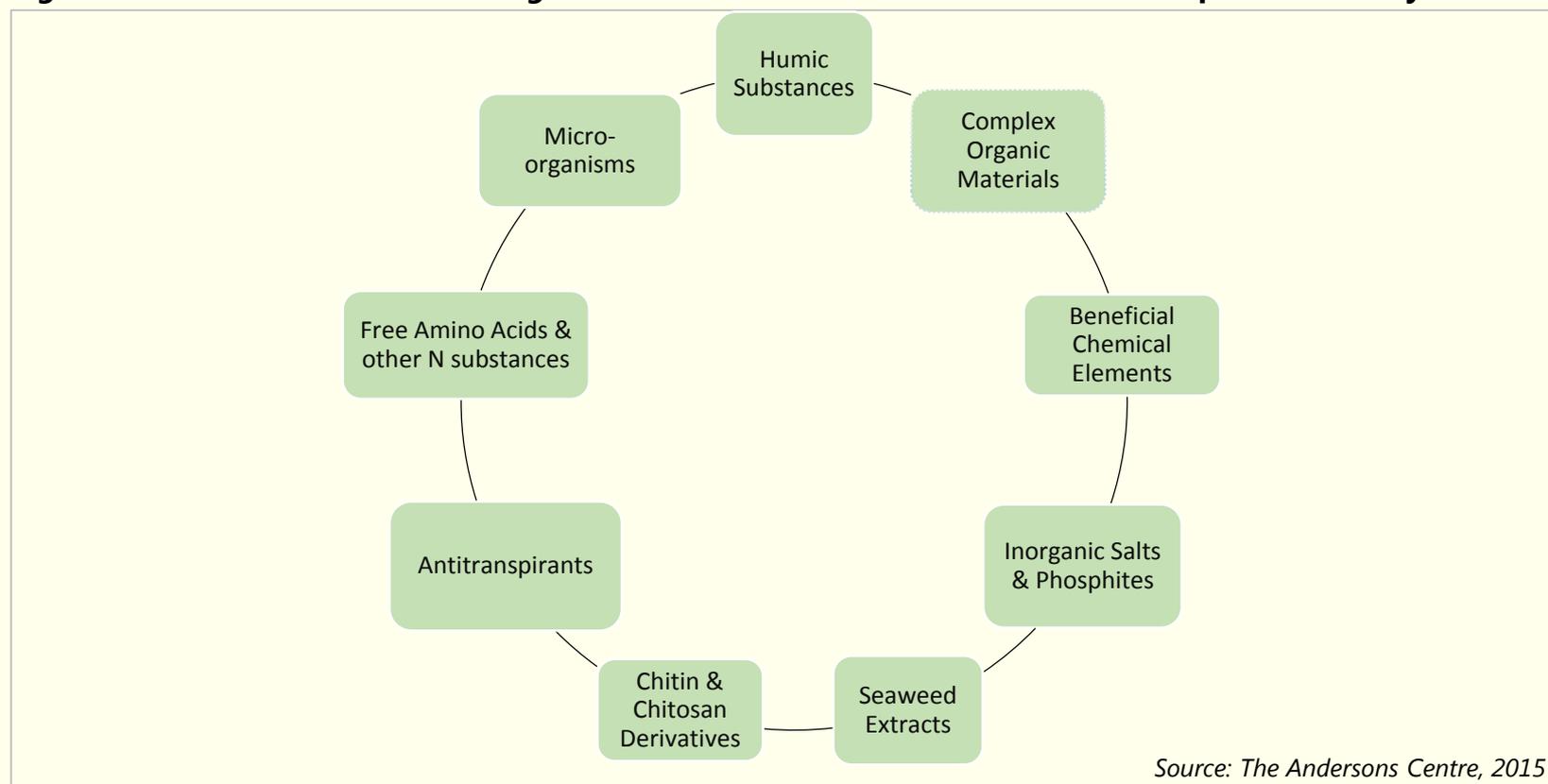
The EU Commission study also defined eight sub-categories of biostimulant which are included in Appendix I. Whilst micro-organisms were not included as a separate category of biostimulant, they have been included within the scope of this study. The term “plant conditioners” is proposed by the EU Commission study as a synonym for biostimulants, which gives account of the capacity of biostimulants to enhance nutrition efficiency and/or stress response.

¹ Pr. P. du Jardin (2012), *“The Science of Plant Biostimulants – A Bibliographic Analysis”*, European Commission (Contract 30-CE0455515/00-96).

INTRODUCTION

Based on the definitions provided above and in Appendix I, Figure 1 provides a graphical illustration of the various sub-categories contained within the scope of biostimulants in this study. Meanwhile, Figure 2 depicts how biostimulants are positioned in the context of plant nutrients (fertilisers) and pesticides. It also attempts to illustrate that there is some overlap between what constitutes biostimulants and what constitutes pesticides for example. The Andersons Centre understands that discussions are underway at a European level to clarify the regulatory framework for biostimulant products which will formalise their position in the EU market.

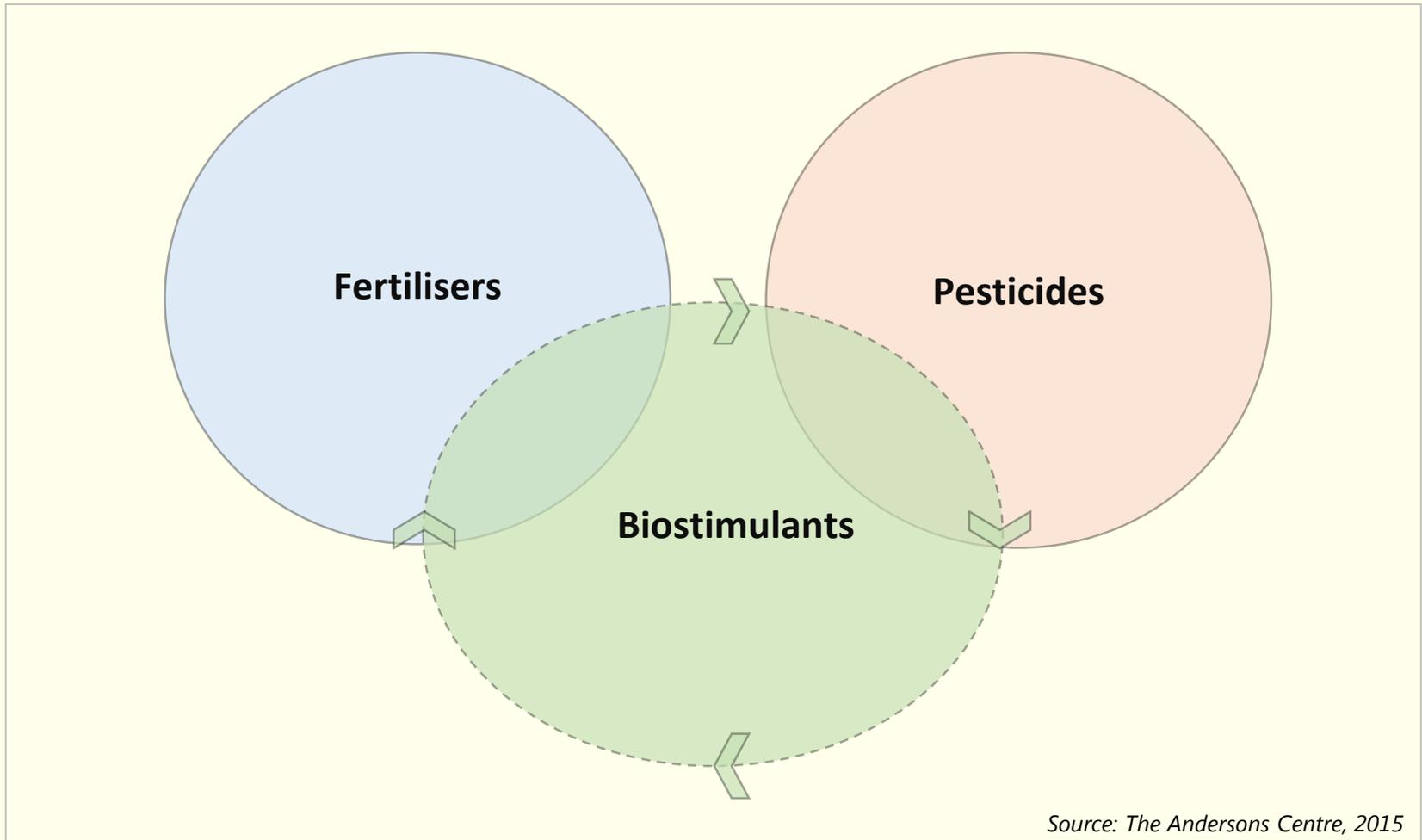
Figure 1 – Overview of the Sub-Categories of Biostimulants included within the Scope of this Study



Source: The Andersons Centre, 2015

INTRODUCTION

Figure 2.2 – Biostimulants' Positioning versus Fertilisers and Pesticides



Source: The Andersons Centre, 2015

METHODOLOGY

Summary

- The methodology underlying the research service combines primary and secondary research to provide a composite analysis of the UK Biostimulants' market. Secondary sources have provided the historical context for the analysis of trends through a range of trade sources, journals company reports, industry association literature and governmental reports.
- The development of the report has relied on a balance of industry opinion from biostimulant suppliers, agricultural merchants and agronomists, distributors, retail buyers, public sector representatives and regulatory advisors where possible. In the discussions with industry sources, the research has aimed to develop a consensus of opinion on a range of issues to support our findings.

Secondary Research

- Secondary research generally refers to the collection of information already in the public domain. The aim of the desk research process is to establish what the existing body of knowledge is, including market data, industry news, and other expert commentator opinion, to track the development of markets over time. Moreover, it offers a chance to review the existing range of opinion on key issues and informs our perspective in reaching preliminary judgements when evaluating the findings of any primary research.
- Sources included are company annual reports, business and financial press, independent analysts' reports, company product brochures and other sales and technical literature, trade press and industry journals, publications by professional industry and market associations, national and international governmental organizations such as DEFRA and the European Commission.

METHODOLOGY

Primary Research

- Interviews were conducted with a variety of industry participants to provide a fair balance and reflection of industry opinion, with the aim of achieving a reliable consensus from the various market participants. The interviews were conducted by telephone in a semi-structured format.
- For this study, more than 25 interviews were conducted with key suppliers and other industry experts (typically technical directors, chief agronomists and senior marketing/sales managers) from across the UK supply chain.
- These discussions focused on identifying the types of biostimulants supplied to market, the main crops that biostimulants are used on, product availability throughout the UK, and the key benefits and challenges associated with biostimulants usage.
- This input has also been supplemented by additional interviews with variety of public sector organisations and regulatory advisors.

Study Limitations

- This is a short study that has primarily focused in addressing the research objectives listed above. Whilst this study has captured the opinions of most of the major companies operating in the UK supply chain, including several influential agronomists, it is important to point out that these opinions are not necessarily representative of the industry generally nor all of the agronomists within individual companies (as they have been known to have differing opinions on a range of issues).
- Therefore, the insights presented in this study should be viewed as preliminary only and would benefit from further validation.

KEY FINDINGS

1. Determine the extent to which biostimulants are recommended in the UK market

- This study found that there are a wide array of biostimulants being used in the UK, however some categories (e.g. phosphites and seaweed extracts) are more established than others (e.g. microbial biostimulants).
- Biostimulants tend to be most frequently used on higher value crops such as top-fruit, vegetables and potatoes, however there is some evidence to suggest that they are being considered for other broad acre crops (e.g. winter cereals and oilseed rape) although usage remains limited.
- There was a general consensus amongst experts that growers' interest in biostimulants has been increasing but a number of participants reported that they still needed to be convinced on the merits of using specific types of biostimulants.
- Several participants also reported that the regulatory position of some types of biostimulants is not sufficiently clear and that this needs to be addressed before their usage becomes mainstream. That said, most experts expressed the view that biostimulants will become increasingly prominent in the coming years, especially as key active ingredients are lost.

2. Identify the main strengths and weaknesses of biostimulants currently being offered to UK farmers.

- Table 1 provides a summary of the main strengths and weaknesses of biostimulants generally. As alluded to above, several participants reported that the regulatory position of some types of biostimulants is not sufficiently clear and that this needs to be addressed before their usage becomes mainstream.

KEY FINDINGS

Table 1 – Biostimulants – Perceived Strengths and Weaknesses Overview

Perceived Strengths	Perceived Weaknesses
Some products (e.g. phosphites) can be used in the tank mix in conjunction with other products which makes application easier.	Tend to be relatively expensive (with the exception of some seaweed products) and that sometimes it can be difficult to justify them being added to the tank mix. Perceived as being cost prohibitive in the context of cereals.
Biostimulants tend to be most prevalent in the higher value crops (fruit and veg) where their reputation is strongest.	Perception that some biostimulant products remain unproven and that there are several somewhat dubious suppliers in the market. This has tainted the reputation of biostimulants generally.
Perceived as offering new options to farmers in the context of reduced availability of fungicides. Most participants interviewed in this study have opined that biostimulants have a future in UK agriculture.	Regulatory uncertainties surrounding some products have prohibited their uptake.
Some products are Soil Association accredited which enables them to be sold to organic farmers.	Several agronomists have stated that they are unconvinced by the science that suppliers are presenting. Independent research in a UK context was cited by some agronomists as necessary.
A number of participants claimed that biostimulants have shown better resistance and recovery from hydric stress thus improving plant quality as well as yields. Claims of better root development, especially around the plant transplanting stages for vegetables was also cited as a strength.	Some agronomists pointed out that there can be significant variability in the same product and that the contents packaged today for instance could be significantly different from the material packaged in 3 months' time in some instances.
Biostimulants are cited as being particularly useful at promoting plant growth and health during the establishment phase of crops (e.g. beans and fruit). They are also cited as offering potential in terms of minimising moisture and nutrient losses in light soils particularly, thus making more nutrients available to the crops.	There is also a perceived limited shelf life associated with some biostimulants. This causes issues for on-farm storage and stock control.
Some claimed that seaweed extracts for example are naturally high in potassium and that this helps in tackling potassium-deficient soils.	Some market participants have a limited knowledge of biostimulants and are therefore poorly positioned to explain their potential benefits.

KEY FINDINGS

3. Clarify what are the main purchasing criteria when deciding whether to use biostimulants.

- Based on the interviews undertaken in this study, below is a summary of the criteria most frequently cited when deciding whether to use biostimulants.

Table 2 – Biostimulants – Overview of Key Purchasing Criteria

Independent evidence-based trials – trials conducted by independent organisations are deemed by most agronomists to be essential if biostimulant products are to be treated seriously as a mainstream product.

Agronomists' belief in the products – agronomists have on UK farmers and if a biostimulant product is to be successfully launched, then convincing them is crucial.

Potential return on investment – whilst price will always be important within an agricultural context, this study suggests that being able to demonstrate a superior return on investment (i.e. increased yield and/or reduced costs) is even more critical.

Products correctly registered – this has been highlighted as a concern throughout this study and for biostimulants to be successful in the long term, it is important that the market has confidence that they are correctly registered.

Supports plant quality and limits plant stress – this is after all the core reason why biostimulants are being developed in the first place and is closely linked with criteria 1 to 3 above.

CONCLUDING REMARKS

- **Other purchasing criteria** – in addition to the key purchasing criteria outlined above, other criteria which are also considered to be of importance in the context of biostimulants include brand reputation, shelf life, salesforce product knowledge and product consistency.
- **Interest in biostimulants is increasing** – there was a broad consensus amongst the market experts we have spoken with that there is increasing interest in biostimulants as farmers and agronomists seek alternatives to fungicides in a more restrictive regulatory environment. Nearly all participants agreed that the increased interest in biostimulants looks set to continue into the future.
- **General perception of biostimulants is mixed** – interest in biostimulants has been growing, but the overall perception is varied. A number of influential experts commented that they are yet to be convinced by the scientific evidence. Such concerns have affected the reputation of biostimulants as a whole, according to some agronomists. That said, perceptions appear to be changing and there is an increased openness to use biostimulants and this is likely to increase into the future.
- **Regulatory concerns are restricting uptake** – a key conclusion of this study is that the regulatory position of some types of biostimulants is not sufficiently clear and that this needs to be addressed before their usage becomes mainstream.

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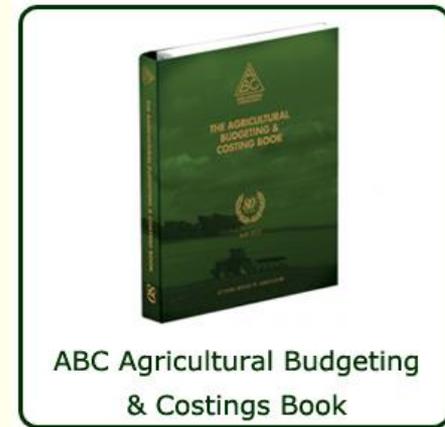
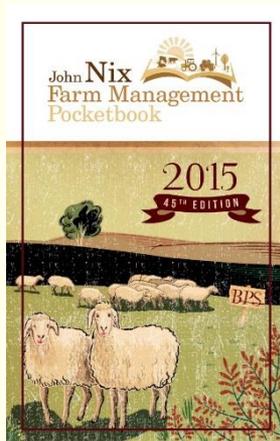
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- 1. July Budget - Minimum wage and BIT changes 1
- 2. Strengthening Swine: A661 Previews - Currency movement hits agriculture 2
- 3. Welsh Agriculture BPS Final - For 2015 to 2017 and Infrastructure Previews 2
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- 8. Research: University - Consultation and start change case records 4
- 9. Other News - Agricultural Statistics, Polish milk, French support package, bear venture funding success 4

II. ARABLE

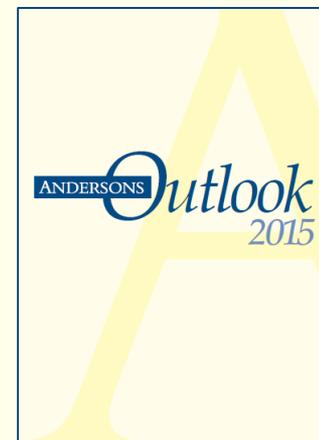
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Minor important items are highlighted in Red

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 - Bespoke market and industry analysis

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APPENDIX I

Product Definitions – Biostimulant Sub-Categories

1. Humic Substances

Humic substances (HS) are natural substances belonging to the soil organic matter and resulting from the decomposition of dead cell materials and from the metabolic activity of soil microbes using these substrates. HS are collections of heterogeneous compounds, originally classified according to their molecular weights and solubility into humins, humic acids and fulvic acids, but with loosely defined boundaries and complex molecular constituents.

2. Complex Organic Materials

Complex organic materials are obtained from composts, manure, sewage sludge extracts, agro-industrial and urban waste products. They can be applied on soils and on plants, with the aim to increase soil organic matter, to improve the physico-chemical characteristics of soils, to provide macro- and micro-nutrients, to promote rhizobacterial activity, nutrient cycling and nutrient use efficiency, to control soil-borne pathogens, to enhance the degradation of pesticide residues and of xenobiotics. The promotion of plant growth and of crop yield in defined conditions of use explains why the term biostimulants is used to refer to these organic materials.

Seaweed extracts and amino-acid preparations, though they could also be defined as complex organic materials, are treated separately.

3. Beneficial Chemical Elements

These are chemical elements that promote growth and may be essential to particular taxa but are not required by all plants. The five main beneficial elements are Aluminium (Al), Cobalt (Co), Sodium (Na), Selenium (Se) and Silicon (Si). The definition of beneficial chemical elements is not limited to their chemical natures, but must also refer to the special contexts where the positive effects on plant growth and stress response may be observed.

Source: Pr. P. du Jardin (2012), "The Science of Plant Biostimulants – A Bibliographic Analysis", European Commission (Contract 30-CE0455515/00-96).

APPENDIX I

4. Inorganic Salts, including Phosphites

This term encompasses many organic salts, including phosphites and phosphates, but also bicarbonates, sulphates, nitrates, provide protection against fungi, and may involve direct fungicidal action or indirect protection by stimulating plant defences. Their action on the physiology of the plant, on stress response and on yield explains why these inorganic compounds are sometimes referred to as biostimulants.

The term phosphite is used to refer to the salts of phosphorous acid (HP_3PO_3) whilst phosphite esters are designated as phosphonates, which include ethyl- and methyl phosphonates. In practice, the term phosphite is sometimes used for designating both phosphite salts and phosphite esters. They are clearly distinct from phosphates, which are the salts of phosphoric acid (HP_3PO_4) and constitute the main sources of Phosphorus (P) used by plant nutrition. P fertilisers used in agriculture are phosphates.

5. Seaweed Extracts

Seaweeds constitute a vast group of species which are classified into different phylums, including brown, red and green microalgae. Molecular systematics has demonstrated their early divergence in the evolution of photosynthetic organisms. They should be regarded as separate taxonomic entities and this should be borne in mind when attempting a general description of their biochemical and functional characteristics. Seaweed extracts are used as biofertilisers, soil conditioners and biostimulants.

6. Chitin and Chitosan Derivatives

Chitin and its deacetylated forms, chitosan, are bioactive polymers from which many derivatives are produced by hydrolysis and chemical modification, for increasing their water solubility and bioactivity. They can be collectively referred to as chitooligosaccharides.

Source: Pr. P. du Jardin (2012), "The Science of Plant Biostimulants – A Bibliographic Analysis", European Commission (Contract 30-CE0455515/00-96).

APPENDIX I

7. Antitranspirants

This is a term which has been coined to indicate the overall effect on the plant, the chemical compounds and underlying mechanisms can be, and in fact are, very diverse. Some of the compounds have physical effects at the surface and/or within the plant organs, others are regulators of the leaves openings diffusing water vapour, called stomata.

8. Free Amino Acids and Other N-containing Substances

Organic nitrogenous compounds include free amino acids (or protein and non-protein origins), peptides (or protein and non-protein origins), polyamines, betaines and related substances. These molecules belong to different and non-plant metabolisms and should be treated on a case-by-case basis. When applied to plants they are mostly used as foliar applications, but soil applications and seed coating also exist with some of them.

Source: Pr. P. du Jardin (2012), "The Science of Plant Biostimulants – A Bibliographic Analysis", European Commission (Contract 30-CE0455515/00-96).

CONTACT INFORMATION

Thank you for reading this White Paper.

Any questions or comments, please ask.

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