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Draft Guidance for Plant Regulator Products and Claims, Including Plant Biostimulants

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Interested persons are free to raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to a particular situation.

This is a living document and may be revised periodically. EPA welcomes public input on this document at any time.

Executive Summary:

In recognition of the growing categories of products generally known as plant biostimulants, this document is intended to provide guidance on identifying products and product claims that are considered to be plant regulator products and plant regulator claims by the Agency, thereby subjecting the products to regulation as pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. 136–136y. Examples are provided of both claims that *are* considered plant regulator claims and claims that *are not* considered plant regulator claims. Examples also are included of specific active ingredients having modes of action consistent with the FIFRA definition of a plant growth regulator, and therefore subject to FIFRA registration.

EPA is taking this step since there has been some confusion among industry and States as to how the emerging product area, called plant biostimulants, does or does not trigger FIFRA's plant regulator requirements. Although FIFRA does not define the term plant biostimulants, some products being sold as plant biostimulants may trigger regulation under FIFRA as plant regulators. Other plant biostimulant products will not involve EPA oversight as pesticides since they are excluded from the plant regulator definition under FIFRA section 2(v), or do not fit within the specific FIFRA definition of how a plant regulator functions.

The background section of this document provides examples of plant biostimulant definitions contained in the 2018 Farm Bill and in the 2019 USDA Report to Congress on Plant Biostimulants. None of the aforementioned definitions affect this EPA guidance on plant regulator claims.

This draft guidance document is intended to clarify that products with claims that are considered to be plant regulator claims are subject to regulation as pesticides.

In the first draft of this guidance, released for public comment in March 2019, the Agency sought comments on whether EPA should develop a definition for plant biostimulants, noting that the development of such a definition would require rulemaking. Subsequent to the release of the first draft of the guidance, the USDA submitted a Report to Congress on Plant Biostimulants (December 2019) which provided six options to address plant biostimulant regulation at the Federal and State level. Included in the 2019 USDA Report are two new definitions of plant biostimulants for review by Congress. As a result, EPA does not intend to develop a separate definition of plant biostimulants.

Potentially Affected Entities or Persons

You could be affected by this action if you are a producer or registrant of pesticide products making labeling claims that are considered to be plant regulator claims by the Agency, thereby subjecting the products to regulation under FIFRA as pesticides. The North American Industrial Classification System (NAICS) codes are provided to assist you and others in determining if this guidance might apply to certain entities. The following listing of potentially affected entities is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to

be affected by this action. Other types of entities not listed could also be affected. Potentially affected entities may include, but are not limited to:

- Pesticide and Other Agricultural Chemical Manufacturing (NAICS 32532), e.g., pesticide manufacturers or formulators of pesticide products, pesticide importers or any person or company who seeks to register a pesticide.

- Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing (NAICS 325300), e.g., establishments primarily engaged in manufacturing agricultural chemicals, including nitrogenous and phosphoric fertilizer materials, mixed fertilizers, and agricultural and household pest control chemicals.

Applicable Statute or Regulations

Regulations, issued pursuant to FIFRA, 7 U.S.C. 136–136y, regarding pesticide registration and exemptions from registration are contained in 40 CFR parts 150 through 189. This guidance provides information that is intended to help decision-making related to ensuring compliance with these regulations.

Background

Plant biostimulants (PBS) are an increasingly popular category of products containing naturally-occurring substances and microbes that are used to stimulate plant growth, enhance resistance to plant pests, and reduce abiotic stress. The increasing popularity of PBS arises from their ability to enhance agricultural productivity by stimulating natural processes in the plant and in soil using substances and microbes already present in the environment. PBS can promote greater water and nutrient use efficiency, but are not intended to provide any nutritionally relevant fertilizer benefit to the plant. PBS products are becoming increasingly attractive for use in sustainable agriculture production systems and integrated pest management (IPM) programs, which in turn can reduce the use of irrigation water, as well as agrochemical supplements and fertilizers.

The 2018 Farm Bill and the 2019 USDA Report to Congress on Plant Biostimulants include various definitions for PBS:

> **2018 Farm Bill[1]:** For purposes of a report Congress directed USDA to prepare, ‘‘plant biostimulant’’ is considered a substance or micro-organism that, when applied to seeds, plants, or the rhizosphere, stimulates natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield.
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> **2019 USDA Report Alternative Definition 1[2]**: A plant biostimulant is a naturally-occurring substance, its synthetically derived equivalent, or a microbe that is used for the

[1] Agriculture Improvement Act of 2018, Section 10111 (https://www.congress.gov/bill/115th-congress/house-bill/2).
[2] USDA Report to President and Congress on Plant Biostimulants, December 2019.

purpose of stimulating natural processes in plants or in the soil in order to, among other things: improve nutrient and/or water use efficiency by plants, help plants tolerate abiotic stress, or improve characteristics of the soil as a medium for plant growth. The characteristics may be physical, chemical, and/or biological. The plant biostimulant may be used either by itself or in combination with other substances or microbes for this purpose.

2019 USDA Report Alternative Definition 2[2]: A plant biostimulant is a substance(s), microorganism(s), or mixtures thereof, that, when applied to seeds, plants, the rhizosphere, soil or other growth media, act to support a plant's natural nutrition processes independently of the biostimulant's nutrient content. The plant biostimulant thereby improves nutrient availability, uptake or use efficiency, tolerance to abiotic stress, and consequent growth, development, quality or yield.

There currently is no applicable regulatory definition of PBS in FIFRA or any other federal statute.

In developing this guidance, EPA considered whether a PBS product, as understood by EPA, physiologically influences the growth and development of plants in such a way as to be considered a plant regulator under FIFRA, thereby triggering regulation as a pesticide. FIFRA section 2(u) includes plant regulators, defoliants, desiccants, and nitrogen stabilizers in its definition of a pesticide, so they are subject to federal registration as pesticides under FIFRA. In addition, FIFRA section 2(v) both defines plant regulator and explains which substances are excluded from the definition (See Appendix A). Based on the plant regulator definition contained in FIFRA section 2(v), many PBS products and substances may be excluded or exempt from regulation under FIFRA depending upon their intended uses as plant nutrients (e.g., fertilizers), plant inoculants, soil amendments, and vitamin-hormone products (see Tables 1a-1c and Table 2). A key consideration is what claims are being made for products, which is the focus of this guidance. The Agency, however, when evaluating whether a product is a pesticide, considers not only the claims being made for the product, but also, among other things, product composition.

Pesticide Products Required to be Registered

Pesticide products that must be registered are described in 40 CFR 152.15. With some exceptions (e.g., 40 CFR 152.10, 152.20, 152.25, and 152.30) a person may not distribute or sell a pesticide product that is not registered under FIFRA. A pesticide is any substance (or mixture of substances) intended for a pesticidal purpose, i.e., use for the purpose of preventing, destroying, repelling, or mitigating any pest or use as a plant regulator, defoliant, or desiccant. A substance is considered to be intended for a pesticidal purpose, and thus to be a pesticide requiring registration, if:

(a) The person who distributes or sells the substance claims, states, or implies (by labeling or otherwise):

(1) That the substance (either by itself or in combination with any other substance) can or should be used as a pesticide; or
(2) That the substance consists of or contains an active ingredient and that it can be used to manufacture a pesticide; or

(b) The substance consists of or contains one or more active ingredients and has no significant commercially valuable use as distributed or sold other than (1) use for pesticidal purpose (by itself or in combination with any other substance), (2) use for manufacture of a pesticide; or

(c) The person who distributes or sells the substance has actual or constructive knowledge that the substance will be used, or is intended to be used, for a pesticidal purpose. *See* 40 CFR 152.15

The Agency historically has had a claims-based approach to pesticide regulation, but emphasizes that the term "claims-based" does not mean "claims-only based." As the Agency has explained, "…the term "pesticide product" will be used to describe a particular pesticide in the form in which it is (or will be) registered and marketed, including the product's composition, packaging and labeling." (49 FR 37917, September 26, 1984.) The Agency has always considered the composition of a product, as well as its associated claims, when making a regulatory determination, which is reflected in 40 CFR 152.15.

Products That Are Not Pesticides Because They Are Excluded by Regulation from the Definition of a Plant Regulator as specified in FIFRA Section 2(v):

- **Plant nutrients and trace elements:** Plant nutrients and trace elements, which can be considered as falling under the umbrella term "fertilizers," are described in EPA's FIFRA regulations as "plant nutrient product[s] consisting of one or more macronutrients, or micronutrient trace elements necessary to normal growth of plants and in a form readily useable by plants" [40 CFR 152.6(g)(1)].

- **Plant inoculants:** Plant inoculants are "…product[s] consisting of microorganisms to be applied to the plant or soil for the purpose of enhancing the availability or uptake of plant nutrients through the root system" [40 CFR 152.6(g)(2)].

- **Soil amendments:** Soil amendments (which include soil additives and soil conditioners) are "…product[s] containing a substance or substances intended for the purpose of improving soil characteristics favorable for plant growth" [40 CFR 152.6(g)(3)].

- **Vitamin-hormone products:** Under FIFRA section 2(v), "the term 'plant regulator' shall not be required to include any of such of those nutrient mixtures or soil amendments as are commonly known as vitamin-hormone horticultural products, intended for improvement, maintenance, survival, health, and propagation of plants, and as are not for pest destruction and are nontoxic, nonpoisonous in the undiluted packaged

concentration." Per 40 CFR 152.6(f), "vitamin hormone products" are further described as follows: "A product consisting of a mixture of plant hormones, plant nutrients, inoculants, or soil amendments is not a "plant regulator" under Section 2(v) of FIFRA, provided it meets the following criteria:

(1) The product, in the undiluted package concentration at which it is distributed or sold, meets the criteria… for Toxicity Category III or IV; and
(2) The product is not intended for use on food crop sites, and is labeled accordingly."

Claim Examples

Tables 1a through 1c list examples of product claims generally considered "non-pesticidal" (i.e. non-plant regulator claims) by the Agency that are specifically associated with the exclusions described in 40 CFR 152.6(f) & (g). Examples of non-pesticidal claims were developed from:

- Claims found on product labels and other informational media for commercially-available products used as fertilizers, plant inoculants, and soil amendments;
- Discussions with stakeholders in industry and State regulatory bodies, and
- Discussions across EPA program offices and regional offices.

The examples contained in the following tables are not comprehensive lists and may include other synonymous terms. Claims are listed for each currently defined exclusion from the plant regulator definition, except for vitamin-hormone products. Plant regulator claims may be made for vitamin-hormone products when they meet both criteria for exclusion from the plant regulator definition, as specified under 40 CFR 152.6(f)(1) & (2). When claims for increased or decreased growth, yield, germination, maturation, etc. are consequent to intended uses of products or substances as plant nutrients (fertilizers), plant inoculants, soil amendments, and/or as other non-pesticidal uses, such products and substances may be excluded from regulation under FIFRA in the absence of any plant regulator claims. The example claims listed in Tables 1a through 1c are specifically tied to the exclusions from the FIFRA definition of a plant regulator and are worded as such. When such claims for accelerating or retarding the rate of growth, or maturation, the behavior of plants, or the produce thereof are made without qualification or reference to a specific exclusion, such claims are and will continue to be considered plant regulator claims.

Table 1a: Examples of Plant Nutrition-based Claims (macronutrient and micronutrient trace elements necessary for normal growth of plants and in a form readily useable by plants when applied to seeds, plants, the rhizosphere, soil or other growth media) [1]
• Avoids/corrects/prevents nutrition-based/nutrient deficiency-based plant disorders (e.g., including, but not limited to: blossom end rot, chlorosis, necrosis, discoloration, stunting, etc.) • Improves soil/foliar/seed nutrient conditions for better overall plant mass

- Improves soil/foliar/seed nutrient conditions for better plant/crop size/yield
- Improves/supports asymbiotic/symbiotic microbial associations with plant roots and rhizosphere
- Improves soil/seed nutrient conditions for root growth
- Optimizes soil/foliar/seed nutrient conditions for plant growth
- Optimizes soil/seed nutrient conditions for seed germination
- Optimizes conditions for tolerance of/resistance to abiotic stress

[1] The examples contained in this table are not comprehensive and other claims may include other synonymous terms and phrases.

Table 1b: Examples of Plant Inoculant-based Claims
(enhance availability/uptake of plant nutrients through root system) [1]

- Enhance/improve/support beneficial microbes in/on rhizosphere/soil microbiome/foliage/seeds
- Increases overall plant mass by improved nutrient uptake
- Increases/improves/optimizes conditions for tolerance of/resistance to abiotic stress by improved nutrition
- Improve/increase/support biodegradation of organic matter
- Improve/increase/support availability/release of bound nutrients from the soil
- Improve nutrient/water transport/uptake/efficiency by plants/foliage/roots/seeds
- Improve/support mycorrhizal/rhizobial association/symbiosis with plant roots/seeds
- Improve/support nodulation
- Improves [inorganic nutrient/trace element][2] solubilization/availability for improved uptake
- Reduces [inorganic nutrient/trace element][2] loss to the environment
- Reduces/protects against abiotic stress by improved nutrient/water uptake/availability

1 The examples contained in this table are not comprehensive and other claims may include other synonymous terms and phrases.

[2] For example, N, P, K, Mg, Ca, S, Fe, B, Zn, and/or other inorganic nutrients.

Table 1c: Examples of Soil Amendment-based Claims
(intended for the purpose of improving soil characteristics favorable for plant growth) [1, 2]

- Aids/supports/helps/enhances/optimizes soil conditions for greater shoot/root/seed mass
- Buffers/changes soil pH
- Changes cation exchange capacity (CEC)
- Helps condition the soil for improved plant performance
- Increases/improves/optimizes soil conditions for increased plant vigor
- Increases/improves/optimizes conditions for tolerance of/resistance to abiotic stress
- Improves/increases water/nutrient availability/use efficiency/processing/retention
- Improves/increases soil/water nutrient retention/holding capacity/permeability

- Provides/supplies organic matter
- Reduces leaching
- Reduces soil compaction
- Supports beneficial microbes/augments activity and function of beneficial microbes

[1] Soil amendments may include microbes intended for improving soil characteristics favorable for plant growth.
[2] The examples contained in this table are not comprehensive and other claims may include other synonymous terms and phrases.

Generic Product Claims for Products Not Covered by the Exclusions in the FIFRA Section 2(v) Definition of a Plant Regulator.

The Agency recognizes that the exclusions from the definition of a plant regulator, as listed under FIFRA section 2(v), may not cover all current or proposed product applications or use sites for plant biostimulants. Table 2 provides examples of generic product label claims generally considered "non-pesticidal" (i.e., non-plant regulator claims) by the Agency. These claims are not associated with any particular regulatory exclusion or product application/use site. The examples contained in Table 2 are not comprehensive and other claims may include other synonymous terms or phrases.

Table 2. Examples of Generic Product Claims Generally Considered by the Agency to be "Non-pesticidal" [1, 2]

- Alleviates/avoids/corrects/prevents nutrition-based/nutrient deficiency-based plant disorders
- Enhances/aids/supports/helps/improves abiotic stress tolerance
- Enhances/aids/supports/helps microbial populations
- Improves/aids/supports/helps/enhances conversion of applied nutrients to plant available forms
- Improves efficiency of applied fertilizers
- Improves nutrient uptake via natural chelating/complexing agents
- Improves/aids/supports/helps/enhances conditions for better plant establishment
- Improves overall plant nutrition
- Increases plant nutrient assimilation efficiency
- Aids/supports/helps/enhances/improves tolerance of and/or resistance to abiotic stress
- Increased tolerance to sodium (Na) [3]
- Optimizes nutrient use efficiency
- Protects plants/leaves from burning with over-application of foliar nutrients (and burning effects of salt)
- Recovers crops affected by stress due to inefficient management
- Reduces lodging
- Supports nutrient uptake
- Supports/aids/helps nutrient uptake to prevent, mitigate, or correct a specific plant nutrient disorder

[1] Product claims may not state or imply that a plant biostimulant product, through physiological action, accelerates or retards the rate of growth, accelerates or retards the rate of maturation, or otherwise alters the behavior of plants or the quality of the produce thereof.
[2] The examples contained in this table are not comprehensive and other claims may include other synonymous terms or phrases.
[3] Or any other substance present at levels detrimental to plant/root growth. (should this be in the table, rather than footnote)?

Plant Regulators and Product Claims

In determining what natural substances are considered plant regulators, and what may constitute a plant regulator claim on a product label, the mode of action of the substance(s) and associated label claim(s) must be congruent with the intent of the plant regulator definition. Based solely on the FIFRA section 2(v) "plant regulator" definition, a naturally occurring substance would be considered a "plant regulator," and a product label claim would be considered a "plant regulator claim" if:

> The substance or mixture of substances, through physiological action:
>
> 1. Accelerates or retards the rate of plant growth;
>
> 2. Accelerates or retards the rate of plant maturation;
>
> 3. Or otherwise alters the behavior of plants or the produce thereof; and
>
> if the substance or mixture of substances does not fall under one of the exclusion categories listed in 40 CFR 152.6(f) & (g) as vitamin-hormone products, plant nutrients, plant inoculants or soil amendments; or under 40 CFR 152.8(a) as a fertilizer.

Table 3 lists examples of plant regulator product claims that are consistent with the FIFRA Section 2(v) plant regulator definition. Thus, products making such claims must be registered with the Agency. Table 3 is not a comprehensive list and other claims may include other synonymous terms and phrases.

Table 3. Examples of Claims that are Considered by the Agency to be Plant Growth Regulator Claims that Trigger Regulation Under FIFRA as a Pesticide [1, 2]

Examples of: Accelerates or retards rate of plant growth:

- Enhances/promotes/stimulates fruit growth & development
- Enhances/promotes/stimulates plant growth & development
- Enhance/inhibit development
- Promote stem elongation
- Root/shoot stimulator
- Inhibits/promotes sprouting
- Controls suckering
- Stimulates cell division, cell differentiation & cell enlargement
- Alters/improves plant/tree shape/structure

Examples of: Accelerates or retards rate of [plant] maturation:

- Accelerates/controls/delays abscission/development/ripening/senescence
- Induce/promote/retard/suppress flowering
- Induce/promote/retard/suppress bud break
- Induce/promote/retard/suppress seed germination

Examples of: Alters the produce thereof:

- Enhances/promotes crop/fruit/produce color/development/quality/shape
- Enhances/promotes fruit growth & development
- Fruit and nut thinner/sizer

[1] Not a comprehensive list and other claims may include other synonymous terms and phrases.

[2] All of the above are examples of "altered behavior" of plants via the physiological action of plant regulators. It is understood that many of the claims in this table can be made for non-plant regulators (e.g., fertilizers). When such claims for accelerating or retarding the rate of growth, or maturation, the behavior of plants, or the produce thereof are made without qualification or reference to a specific exclusion from the FIFRA plant regulator definition, such claims will be considered to be plant regulator claims.

Substances that have no other use than as plant regulators or pesticides.

The Agency has registered numerous products that contain plant regulator active ingredients having modes of action that trigger regulation as pesticides under FIFRA. Some of these active ingredients are "traditional" plant hormones that act as growth promoters, such as auxins, cytokinins, gibberellins; and other hormones that act as growth inhibitors, such as ethylene and abscisic acid (Gaspar et al., 1996). These substances are generally recognized to have no other significant commercially valuable use, either alone or in combination with other substances, other than use as plant regulators (i.e., as pesticides). Substances that may be included in this category are discussed below. The Agency recognizes that ongoing research may identify new plant regulator substances that are not currently known to the scientific community.

Corn Glutens: Corn glutens, also known as corn gluten meal (CGM), consist mainly of zein and gluten (mixture of water-insoluble proteins that occurs in most cereal grains); and to a lesser degree, fat and fiber. The active ingredient is a by-product of the wet milling of corn for starch or as a by-product during the conversion of the starch in whole or various fractions of dry milled corn to corn syrups (U S. EPA, 2003). CGM is intended for use as a pre-emergent weed control to prevent the normal development of roots from sprouting weed seeds, but without damaging plants with mature root systems (Bingaman ad Christians, 1995). It allows seedling shoots to emerge, but inhibits development of the emerging root, and after a period of water stress, the seedlings wilt and die because they do not have an adequate root system. The non-toxic mode of action is attributed to the presence of five dipeptides that have been identified in hydrolysates of CGM: glutaminyl-glutamine, alaninyl-asparagine, alaninylglutamine, glycinyl-alanine, and alaninyl-alanine (Liu and Christians, 1994). As a plant regulator active ingredient, CGM is intended for residential non-food use on lawns to prevent emergence of grassy and broad-leaved weeds. The substance is common in many food/feed products and in dietary supplements for humans and animals. The active components are found in corn kernels.

L-Glutamic Acid (LGA) and *gamma*-Aminobutyric Acid (GABA): LGA is one of the major amino acids in plant and animal proteins; GABA is a non-protein amino acid that also is widely distributed in plants and animals. Enzymes in plants and animals convert LGA to GABA, and both active ingredients are involved in many physiological functions. Both substances are registered for plant regulator use to increase yield and quality of certain fruits, vegetables, tree nuts, peanuts, grains, animal feed crops, lawn and turf grasses, and ornamentals (U.S. EPA, 2014). They also are registered for use to prevent powdery mildew on grapes, and suppress certain other crop diseases. GABA has been shown to accumulate in plants under stress (Ramesh et al., 2015) and acts as a signaling molecule that reduces plant growth in response to unfavorable environmental conditions. This activity is similar to responses that are mediated by ethylene, to which its activity may be linked (Kinnersely and Turano, 2000). Therefore, both LGA (which is enzymatically converted to GABA) and GABA can be considered to be hormone-like plant growth inhibitors, in addition to their uses in the control of plant pathogens.

Homobrassinolide and other brassinosteroids: Brassinosteroids are a class of plant polyhydroxysteroids that are ubiquitous in the plant kingdom. These compounds, when applied to plants, improve their quality and yield and also are known for having stress-protective properties [i.e., cold, heat, salt, and heavy metal exposure (U.S. EPA, 2008a) (Kandelinskaya, 2007). Brassinosteroids are recognized to be plant hormones that are essential for proper plant growth, development, and cell differentiation. The activity elicited by brassinosteroids is similar to that of other plant growth promoting hormones, and they appear to counteract the effects of stress-induced abscisic acid and ethylene (Planas-Riverola et al., 2019)

Lysophosphatidylethanolamine (LPE): LPE is a naturally occurring phospholipid that acts to stimulate fruit ripening, delay senescence of foliage, and improve shelf-life and quality of postharvest fruits (Cowan et al., 2006; Ozgen et al., 2015). LPE appears to have cytokinin-like activity and acts as an inhibitor of phospholipase D, an enzyme involved with lipid degradation in plant cell membranes (Ryu et al., 1997).

1-Octanol: This substance was originally registered in 1964 and was considered to be a plant regulator due to its intended use as a chemical pinching agent to control sucker shoots of tobacco (U.S. EPA, 2007). This was a claims-only approach that did not consider the actual mode of action. More recently it has been intended as a control of potato sprouts in storage. However, its mode of action as a dissolver of the waxy cuticle of young tobacco sucker shoots and potato sprout causing dehydration and death, would now be considered herbicidal. Regardless of whether 1-octanol is considered a plant regulator or an herbicide, it is still considered a pesticide by the Agency.

Sodium o-nitrophenolate, sodium p-nitrophenolate, and sodium guaiacolate: Three naturally-occurring nitrophenolates that are similar to one another in structure, mode of action and effects on the target plants. When applied as a mixture to plants, these three nitrophenolates are rapidly converted to nitro- and amine-forms of phenolic compounds that are naturally found in plants (U.S. EPA, 2008b). The specific mode of action is unclear, but studies strongly suggest that the observed effects on growth and yield are related to the effects of the nitrophenolate mixture on auxin, cytokinin, and gibberellin physiology in plants (Banful and Attivor, 2017; Djanaguiraman et al., 2005; Haroun et al., 2011).

Substances that may have plant regulator and non-plant regulator activity.

There are numerous substances with additional modes of action, not considered to be plant regulator modes of action that may include, but are not limited to: the alleviation of abiotic stressors (e.g., temperature and water stress); increased water and nutrient use efficiency and/or uptake; increased availability of inorganic nutrients in the soil to plant roots and seeds; increased absorption of inorganic nutrients applied to plant foliage; and changes to the biotic and abiotic characteristics of soils making them a better medium for plant growth. A discussion of these substances, currently or formerly registered by the Agency, is below:

Complex Polymeric Polyhydroxy Acids (CPPAs) and Humic Acids (HAs): These substances are mixtures of organic acids that elicit auxin-like responses in plants. CPPAs are derived from naturally occurring organic matter (NOM) in soils and/or ground and surface waters (U. S. EPA, 2013). NOM is ubiquitous in soil and water. It is formed as a result of the decomposition of plants, animals, and microbial materials in soil and water, and is comprised of a variety of humic substances and may also contain other products of decomposition such as tannins. CPPAs are currently obtained from two sources: one is aqueous and another processed from a geological material known as leonardite. CPPAs are registered as plant regulators and some of the plant regulator activity likely is due to the presence of humic substances (Fernandez-Escobar et al., 1996). HAs [defined as alkaline extracts of humic substances that precipitate at <pH 2) are derived from humic substances and also have been associated with auxin-like responses in plants (Canellas and Olivares, 2014; Canellas et al., 2015; Mora et al., 2010; Piccolo et al., 1992; and Trevisan et al., 2011); they are a subset of the components found in CPPAs. In the natural environment, the plant foliage is not typically exposed to CPPAs, humic substances, and HAs. Therefore, when applied to the foliage of plants, CPPAs and HAs likely would have no other

significant commercially valuable use, either alone or in combination with other substances, except for use as a plant regulator (i.e., as a pesticide).

However, as applied to the soil or seeds (whether alone, or as a component of CPPAs) HAs have additional modes of action that would not be considered to be plant regulator activity by the Agency. These non-plant regulator modes of action may include, but are not limited to: increased antioxidant activity in plants, reduced leaching and loss of nitrogen; buffering of the soil solution to improve nutrient uptake and efficiency; changes in soil cation exchange capacity; and promotion of beneficial soil microbe activity (Canellas et al., 2015; Filho et al., 2020).

Seaweed extracts (SWE): Derived from diverse species of seaweed, SWE have been well documented to have plant regulator activity with the capacity to have direct physiological effects on growth, yield, maturation, and produce quality (Briceno-Dominguez et al., 2014; Di Filippo-Herrera et al., 2018; review by Shukla et al., 2019) with the bioactivity of such extracts being dependent on the method of extraction [e.g., water-based, acid hydrolysis, alkaline hydrolysis, microwave and/or ultrasound-assisted, and super-critical fluid and/or pressurized-liquid extraction (review by Shukla et al., 2019)]. Most extracts are derived from the brown seaweed *Ascophyllum nodosum*, although bioactive extracts also are derived from many other seaweed species including, but not limited to: *Durvillaea potatorum* (Mattner et al., 2018), *Ecklonia maxima* (Stirk and Tarnkowski, 2014), *Ganoderma boninense* (Aziz et al., 2019), Macrocystis pyrifera (Briceno-Dominguez et al., 2014), and *Osmundea pinnatifida* (Silva et al., 2018). A comprehensive review of the literature (Battacharyya et al., 2015; Craigle, 2011; Stirk and Novak, 2003; Shukla et al. 2019; and Stirk et al., 2014) demonstrates that the presence phytohormones and other phytohormone-like plant growth substances (i.e., naturally-occurring plant regulators) present in seaweed extracts are responsible for the observed plant regulator activity and plant growth responses. It is the combined bioactivity of all the plant regulator substances present in a particular extract, that act additively and/or synergistically to elicit the observed plant growth effects.

Regulatory approaches for substances and products that have multiple plant regulator and non-plant regulator modes of action.

The Agency recognizes that CPPA, humic acids, seaweed extracts and other PBS products may possess multiple modes of action that are occurring simultaneously when applied to plant foliage, roots, seeds, other propagules, and to the soil. The Agency also recognizes that not all uses of PBS may be intended for plant regulator or other pest control purposes. If it can be demonstrated that a particular product has the activity claimed on the product label (and any other informational media) and does not make any plant regulator or pest control claims on the product label (and any other informational media) it may be excluded from FIFRA regulation. Pursuant to 40 CFR 152.15(b), the Agency will consider whether a substance "has no significant commercially valuable use" other than as a pesticide, when considering whether the substance (or product) is a pesticide. If it can be demonstrated that the substances contained in such products may have significant commercially valuable uses other than as plant regulators (i.e., pesticides), they may be excluded from regulation under FIFRA in the absence of any plant

regulator claims (see examples in Table 3) and in the absence of any other pesticidal claims (e.g., anti-plant pathogen claims). Review of such "multiple use" products may be conducted by the Agency under PRIA Code M009.

For example, if a product containing seaweed extracts or humic acids is intended for use in alleviating abiotic stress (e.g., extreme temperature, drought/salt stress) on plants, or for stimulating increased nutrient assimilation from the soil, is labeled using product claim examples (Tables 1a-c and 2), and can provide product performance data supporting such product claims, the product may be excluded from regulation under FIFRA.

Conventional chemical plant regulators (synthetically-derived substances and their analogs that do not occur in nature) are not included in this guidance nor are plant-incorporated protectants as described at 40 CFR 174. If a conventional chemical plant regulator is contained within a PBS product, the product likely would be considered a conventional chemical pesticide by the Agency and would be subject to registration under FIFRA. Novel substances may be present in plant biostimulant products that were not present in the original plant source material, but were formed as a result of the extraction methods and/or post-extraction processing (Shukla, et al. 2019). Novel substances that may be present in plant biostimulant products as a result of extraction and/or post-extraction procedures will require further scrutiny under FIFRA by the Agency to determine if they have the potential for pest control and/or plant regulator activity.

Paperwork Burden

This guidance does not create paperwork burdens that require additional approval by OMB under the PRA, 44 U.S.C. 3501 *et seq*. The information collection activities associated with pesticide registration are already approved by OMB under OMB Control No. 2070-0060. The corresponding information collection request (ICR) document is entitled "Application for New and Amended Pesticide Registration" (EPA ICR No. 0277.16).

Potential Costs

The Agency anticipates that this guidance may reduce confusion, in the regulated community, EPA, and other State or Federal regulatory agencies, as to whether specific products are or are not subject to registration as a pesticide under FIFRA. Reducing uncertainty may reduce costs in the time and effort to bring a product to market; in some situations, uncertainty could deter firms from developing products. Regulatory clarity provided by this guidance could also increase costs for those producing PBS, when EPA considers a plant regulator under FIFRA. To the extent this guidance improves the understanding as to which products will likely need to be registered and which products may not need to be registered, the effort firms expend to determine the appropriate regulatory path is reduced. If a PBS is determined to be a plant growth regulator under FIFRA, the firm will bear the costs of registration, but if it is not considered a plant growth regulator, the firm does not need to seek EPA approval under FIFRA. Similarly, clarifying the meaning of terms on products may reduce the effort EPA and other State or Federal regulatory agencies spend to determine whether a product needs to have an EPA registration number.

The clarity provided by this guidance may, in some situations, provide more tangible benefits. Firms may be able to bring products to market more quickly if they do not have to spend time and effort to determine and confirm the appropriate regulatory path. Firms may also avoid product label redesign and reprinting costs because they will have examples of the appropriate terms used to describe plant growth regulators and terms used to describe plant biostimulants before they reach the market. In the extreme, firms may avoid having to pull product from the market due to confusion over the appropriate regulatory category.

Monetary cost savings are likely to be small. State and regional enforcement offices occasionally seek guidance from the Agency as to whether a product on the market should be registered, given the claims associated with the product. In general, these issues are resolved quickly and without substantial resources. As the number and type of biostimulant products increases, however, the potential for regulatory uncertainty to hamper the market also increases. This guidance should help to reduce confusion.

Conclusion

This document is intended to provide guidance on identifying products and claims, including those for plant biostimulants, that are considered to be pesticidal in nature (i.e., plant regulator products and claims), thereby subjecting the products to regulation under FIFRA as pesticides. The Agency is seeking public comment on this draft guidance. The guidance does not propose the development of any new definitions for plant biostimulants, nor does it propose any changes to FIFRA or the Code of Federal Regulations.

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APPENDIX A: Federal Plant Regulator Definition and Exclusions

Plant regulators are defined in FIFRA section 2(v)], as "any substance or mixture of substances intended, through physiological action, for accelerating or retarding the rate of growth or rate of maturation, or for otherwise altering the behavior of plants or the produce thereof."

Excluded from the plant regulator definition are those products that are "Products intended to aid the growth of desirable plants" including: (1) plant nutrients, trace elements, nutritional chemicals, (2) plant inoculants, (3) soil amendments; and vitamin-hormones [40 CFR 152.6(g)].

For purposes of this document:

Plant nutrients are "products consisting of one or more macronutrients, or micronutrient trace elements necessary to normal growth of plants and in a form readily useable by plants" [40 CFR156.6(g)(1)];

Plant inoculants are "products consisting of microorganisms to be applied to the plant or soil for the purpose of enhancing the availability or uptake of plant nutrients through the root system" [40 CFR 152.6(g)(2)];

Soil amendments (which would include soil additives and soil conditioners) are "products containing a substance or substances intended for the purpose of improving soil characteristics favorable for plant growth" [40 CFR 152.6(g)(3)]; and

Vitamin-hormone products are: "A product consisting of a mixture of plant hormones, plant nutrients, inoculants, or soil amendments is not a 'plant regulator' under section 2(v) of FIFRA, provided it meets the following criteria:

> (1) The product, in the undiluted package concentration at which it is distributed or sold, meets the criteria of 156.62 of this chapter for Toxicity Category III or IV; and
>
> (2) The product is not intended for use on food crop sites, and is labeled accordingly."

[40 CFR 152.6(f)(1)(2)]