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February 15, 2022

Ms. Jennifer Teerlink
California Department of Pesticide Regulations (CDPR)
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Sacramento, CA 95812-4015
TreatedSeeds@cdpr.ca.gov

Subject: **Syngenta Comments and Response**

Current Use and Potential Impacts of Pesticide Treated Seeds

Dear Ms. Teerlink:

Per California Notice 2021-15, California hosted a Pesticide Treated Seed workshop on November 15, 2021, and requested public comment and information on the current use and potential impacts of pesticide-treated seeds and to specifically respond to questions attached to the notice.

Seed Treatment Technologies

Seed treatment technologies are an effective way for farmers to protect their seed investment for a strong, healthy start to the growing season. Seed treatments deliver a targeted and precise shield for seeds that protect them from the insects and diseases that exist in the soil during those early developmental stages. This protection helps to ensure that the plant has a greater opportunity to grow a strong root system, which is the foundation of a healthy, productive plant. Seed treatments are a critical component in sustainability and integrated pest management (IPM), while enabling growers to control some of their most challenging pests and diseases and reduce the likelihood of resistance.

Over decades of use, the agriculture industry has developed and advanced new technologies to improve the treated seed process, reducing overall pesticide load to only milligrams of active ingredient per individual seed. Seed treatments therefore may reduce the environmental impact by decreasing the number and dose of spray applications of agrichemical products and lessening exposures to off-target species, including pollinators and other beneficial insects.

In addition, the agriculture industry has implemented national stewardship programs which instruct farmers on Best Management Practices (BMPs) for using treated seed, facilitating safe and effective use with minimal impact to workers and the environment. (https://growingmatters.org/besure)

For additional, detailed analysis of the benefits of seed treatments, Syngenta encourages CDPR to review a Crop Life Foundation paper entitled, “The Role of Seed Treatment in Modern US Crop Production; A review of Benefits” (2013) and attached for your convenience. It also contains an excellent synopsis of seed treatment technologies, rationale describing why they have been readily adopted by growers, and several case studies for various crops that are routinely treated, including several in California.

Further, attached please find comments provided jointly by CropLife America, American Seed Trade Association and Biological Products Industry Alliance to the U.S. Environmental Protection Agency in response to the Petition submitted by various groups challenging EPA's application of the treated article exemption to pesticide-treated seed (Docket ID No. EPA-HQ-OPP-2018-0805, 83 Fed. Reg. 66260 (Dec. 26, 2018)). While it includes additional benefits information, it also describes the regulatory framework related to treated seed in detail.

California Seed Treatment Practices

In California the use of seed treatment is an important component of CDPR's efforts in promoting lower risk pest management while having significant benefits for California agriculture. These include agronomic benefits as well as environmental benefits.

In California agriculture, growers, as well as seed companies, breeder/producers, and seed retailers can choose from a wide variety of untreated seed, or seed treated with specific pesticides and pesticide combinations. Seed treatment applications are made by seed companies, breeder/producers, retailers, as well by seed treatment technology providers that add value by conditioning, priming, pelleting, encrusting, or film coating seeds. Treated seed reaches the market either by "downstream" to retailers, or back "upstream" to the seed companies for direct sales to growers. Not all of the seed treated in California is planted in the state and may be shipped to other states or internationally. Additionally, seeds treated in other states by technology providers may be shipped into California for planting.

Syngenta believes that CDPR's presentation on November 15, 2021, included seed treatment information that needs clarification. For example, it is not clear whether California Department of Food and Agriculture (CDFA) seed data or other sources referenced on slide 38 were used to support the point that the "Majority of seed treatment products are not registered in the state of California." CDPR should be aware that many products are registered with the US EPA and not marketed in California. However, it is Syngenta's practice to obtain a California registration for our seed treatment active ingredients on crops planted in California. The presentation also presented slides from Drs. Krupke and Goulson that presents an incomplete picture of the environmental fate and impact of seed treatment. CDPR conducts an estimate of potential mass contribution of neonicotinoids from lettuce seed treatment on the Central Coast. While intended to represent a "worst case", even the low representation of neonicotinoid treated lettuce seed in the CDFA seed monitoring data give an indication of this does not give a complete picture of all seed treatment uses in California. Lastly, on slide 39, point #2 is confusing. It states that diquat-dibromide is a seed treatment applied to ponds. Syngenta is not aware of any EPA approved herbicide seed treatments.

In California, there are 25 seed treatment products registered. For reference, a list of Syngenta products is provided in Table 1, and an example of seed treatment pesticide combinations, used in Vegetables (Farmore) are listed in Table 2. As CDFA seed sampling data suggests, there is a range of seed treatment practices within each crop. As reflected by the diversity of California crops and farming practices when it comes to choosing an appropriate seed treatment, one size certainly does not fit all and needs to be matched to pest and disease problems. As an example, for a single crop in the Central Coast vegetable production, there is a diversity of agronomic practices including irrigation methods, bed width, use of transplants, pesticide application methods and seed treatments. It is difficult to draw conclusions of the seed treatment market for commodity crops grown in the Midwest relative to the farming and cropping practices in California. It is important that CDPR utilizes California specific information when determining seed practices.

Table 1. Syngenta seed treatment products and active ingredients

Year Introduced	Brand	Indication	Active Ingredient
1979	Concep	Seed Safener	Fluxofenim
1982	Apron	Fungicide	Mefenoxam
1993	Maxim	Fungicide	Fludioxonil
1994	Dividend	Fungicide	Difenconazole
1996	Dynasty	Fungicide	Azoxystrobin
1997	Cruiser	Insecticide	Thiamethoxam
2006	Avicta	Nematicide	Abamectin
2012	Vibrance	Fungicide	Sedaxane
2013	Clariva	Nematicide	Pasteuria nishizawae
2016	Fortenza	Insecticide	Cyantraniliprole
2017	Plenaris	Fungicide	Oxathiapiprolin
2019	Saltro	Fungicide	Pydiflumetofen
2020	Vayantis	Fungicide	Picarbutrazox[1]

[1]Active ingredient not currently registered in California

Table 2. Syngenta seed treatment brands and active ingredients (Farmore)

Brand	Indication	Products
F300	Fungicide	Apron XL, Maxim 4 FS, Dynasty
F400	Fungicide	Apron XL, Maxim 4 FS, Dynasty, Mertect 340F
FI400 Leafy, Brassica, Onion	Fungicide, Insecticide	Apron XL, Maxim 4 FS, Dynasty, Cruiser 70WS
FI400 Cucurbits	Fungicide, Insecticide	Apron XL, Maxim 4 FS, Dynasty, Cruiser 5FS
FI500 Classic	Fungicide, Insecticide	Apron XL, Maxim 4 FS, Dynasty, Cruiser 70WS, Regard[1]
FI500 New	Fungicide, Insecticide	Apron XL, Maxim 4 FS, Dynasty, Cruiser 70 WS, Trigard OMC[2]
OI100	Insecticide	Regard[1]

[1]Registered by Syngenta and Licensed from Corteva Agrosciences (EPA100-1400 and EPA100-1621)
[2]Registered by Syngenta and Licensed from ADAMA (EPA100-790)

Syngenta encourages CDPR to identify options to build its understanding of seed treatment practices. This can be done through non-regulatory means and in partnership with California Department of Food and Agriculture. As the structure of the marketplace reflects, seed treatment is varied and specifically tailored to agronomic circumstances. As such many areas are difficult to answer precisely in a short time frame. Syngenta encourages continued engagement with stakeholders to develop this information.

Seed Treatment Risk Assessments

Lower Exposure to Aquatic Organisms

Pesticide application made to the seeds prior to planting results in a reduction in chemical application rates on a per unit area basis (Pimentel, 2002), offers protection of the seed from insects and diseases (White & Hoppin, 2004), enables precise placement of pesticide in the root zone and reduces the magnitude of drift onto non-target entities (Pimentel, 2002; Taylor & Harman, 1990). The development of mechanisms to minimize abrasion of seeding coats and/or dust drift dust during planting (Farmers for Monarchs, 2020) further limits bystander and unintended environmental exposure.

The magnitude and relative transport of pesticides off-target is driven by many factors. These may include land/surface characteristics, soil properties, rainfall intensity and amount, physical and chemical properties of the chemical. The type (ground or aerial sprays) and method (seed treatment, drench, in-furrow, broadcast) of introduction to the environment also play a key role and factor heavily into risk evaluations.

Of the many chemical application methods, seed treatment uses generally result in lower environmental exposure. This has to do with the precision placement of the seed during sowing. While in operation, disk openers on planters open a furrow to a depth that is controlled by gauge wheels. After which, individual seeds are placed into the open furrow. Seed firming devices then press the uncovered seed to the base of the furrow to ensure soil/seed contact[1]. Immediately following placement in the furrow, closing wheels cover the seed with soil previously moved out of the furrow by the disk openers (Murray, Tullberg, & Basnet, 2006). This precision placement below the soil surface limits the interaction with overlying surface water or runoff and the dissolved residues available for runoff decreases exponentially with depth. Figure 1 shows the mass fraction available for runoff based on depth (Young & Fry, 2019) and in part, illustrates why exposure from treated seeds planted below the soil surface would result in relative residues in surface water.

For broadcast application to soil and foliage, the available mass residues on or closer to the soil surface are expected to be higher than for applications placed at a depth deeper in the soil profile. Consequently, pesticide residues in runoff and/erosion following broadcast sprays to soil and foliar are expected to result in higher than environmental exposure concentrations in surface water bodies.

The 2016 ecological risk assessment for Metalaxyl and Mefenoxam (EPA-HQ-OPP-2009-0863-0025) reported that risk conclusion for aquatic species were based on foliar and ground spray applications due to low environmental exposure potential. Similarly, according to the preliminary aquatic risk assessment (EPA-HQ-OPP-2011-0581-0093), the likelihood for adverse effects from thiamethoxam

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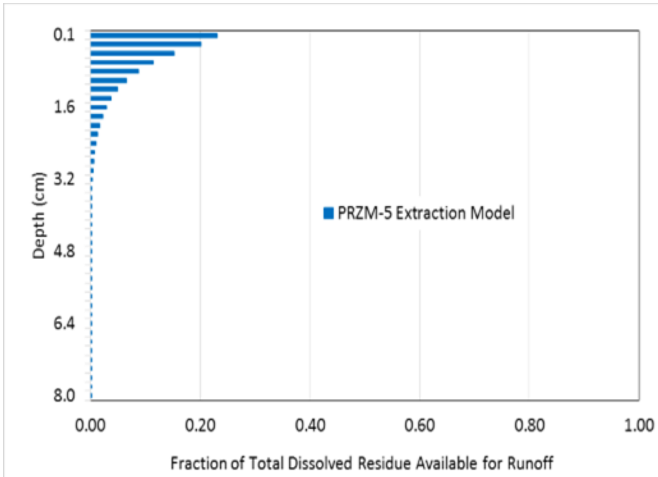
[1] https://www.youtube.com/watch?time_continue=168&v=XebeXoHOI_0

seed treatment uses was shown to be low. These findings are common throughout the registration review process in which seed treatment uses do not drive the exposure and risk conclusions.

Figure 1. Mass distribution in soil profile using EPA's PRZM5 runoff uptake model (Young & Fry, 2019)



Lower Exposure to Pollinators

Seed treatment uses of fungicides and insecticides pose lower risk to pollinators compared to soil and foliar uses, especially those with systemic properties. Residue levels of thiamethoxam and its primary degradate CGA322704 (clothianidin) in pollen and nectar from seed treatment uses on cotton, cucumber and soybean can be one to two orders of magnitude lower compared to residue levels from foliar and soil uses on these crops (Table 3). Although abraded seed dust emitted from pneumatic planters is a potential route of exposure, this is being addressed with best management practices and improved seed coatings and planting equipment designed to reduce dust abrasion and emission, respectively (US EPA and DPR 2016).

Table 3. Mean concentrations of thiamethoxam + CGA322704 (clothianidin) in pollen and nectar.

Crop	Use	Pollen (ppb)	Nectar (ppb)	Reference
Cotton	Seed treatment	<0.5	0.52[a]	Oakes et al. (2017)
	Foliar	6.31	68.08[a]	
Cucumber	Seed treatment	<0.2	<0.2	Dively and Kamel (2012)
	Foliar	606.80	175.9	Lange (2015)
	Soil	7.80	10.8	Hampton (2013)
Soybean	Seed treatment	2.48[b]	1.3	Lange and Rice (2015)
	Foliar	16.56[b]	2.07	Lange (2017)

[a] Extra floral nectar
[b] Anthers sampled as surrogate for pollen

Lower Risk to Aquatic and Terrestrial Organisms

Insecticides and fungicides are the two main pesticide classes used as seed treatments. Excluding neonicotinoids, Syngenta has twelve active ingredients (AIs) that are used as seed treatments in addition to other application methods (i.e., foliar, soil drench etc.). In review of US EPA's most recent ecological risk assessments for these AIs, when applied as seed treatments, there were equivalent or fewer taxa (i.e., birds, mammals, fish, etc.) identified as potentially at risk compared to other application methods (Table 4) demonstrating the improved safety of this application method.

Table 4. Comparison of the number of taxa identified as having potential for risk from seed treatment uses with other conventional uses for Syngenta active ingredients based on US EPA ecological risk assessments.

Active Ingredient	Class	Number of Taxa[a] Affected by Seed Treatment	Number of Taxa Affected by Other Users[b]
Abamectin	Insecticide	6	6
Acibenzolar	Fungicide	1	3
Azoxystrobin	Fungicide	3	6
Cyromazine	Insecticide	3	3
Difenoconazole	Fungicide	6	8
Fludioxonil	Fungicide	0	7
Mancozeb	Fungicide	6	7
Mefenoxam	Fungicide	0	2
Oxathiapiprolin	Fungicide	0	1
Picarbutrazox	Fungicide	0	0
Pydiflumetofen	Fungicide	0	0
Cyantraniliprole	Insecticide	4	5

[a] Taxa: Birds, mammals, honey bees, terrestrial plants, freshwater and estuarine/marine fish, freshwater and estuarine/marine invertebrates and aquatic plants/algae.
[b] Other uses include soil drench, soil in-furrow, chemigation and/or foliar applications

CDPR assessed the potential risk of foliar and soil neonicotinoid uses to pollinators (CDPR 2018). Although California DPR did not assess neonicotinoid seed treatment uses, reference was made to the US EPA assessments (US EPA and DPR, 2016; US EPA 2017a; US EPA 2017b) which determined low risk to honey-bee colonies based on low residue levels in pollen and nectar from these uses (CDPR 2018).

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Impact of Pesticide Treated Seeds Questions

The peer-review literature heavily focuses on environmental impacts from neonicotinoid-treated seeds. Is there information focused on other active ingredients utilized in pesticide-treated seeds?

A screening-level literature search using Medline and CAB abstracts was conducted with the following search parameters aimed at capturing seed treatment-related publications relative to environmental fate and ecotoxicology.

Set #	Search terms
1	mefenoxam OR fludioxonil OR sedaxane OR abamectin OR azoxystrobin OR difenoconazole OR pesticid* OR insecticid* OR fungicid*
2	seed treatment* OR seed dressing* OR seed coating* OR (treatment* ADJ3 seeds) OR (dressing* ADJ3 seeds) OR (coating* ADJ3 seeds)
3	ecotoxic* OR environment* impact* OR toxicit* OR risk* OR exposure* OR contamination* OR drift OR water
4	wildlife OR bird* OR fish* or non-target
5	English language and 2011-current

The search returned 1345 results with 1113 unique titles. Results were further filtered from the initial search parameters to exclude neonicotinoid specific studies and any that were deemed nonrelevant such as abstracts from scientific conferences, resulting in 172 publications. Of these 172 publications, 128 were focused on the efficacy of seed treatments and innovative technologies/methods to improve the quality of seed treatments. This resulted in a relatively small data set of 44 publications related specifically to environmental impacts (both exposure and effects) of seed treatment AIs (See Appendix 1, Table 1). More specifically, publication topics included deposition and transport of dust from seed treatment planting, movement and leaching of AIs through soil, systemic uptake of AIs in plants, consumption of treated seeds by birds and mammals, and non-target invertebrate effects from impacted soil and/or plant tissues. Even though neonicotinoid specific studies were excluded, many of the remaining 44 publications contained a neonicotinoid as a chemical of interest. Syngenta only conducted a cursory review of the titles and abstracts and does not endorse or refute the scientific credibility or reliability of the information obtained through this literature search.

What is the runoff potential for pesticide-treated seeds associated with different commodities?

In principle, commodities sown with high density seeding rates on the soil surface or near the soil surface will be more readily available for transport via excess precipitation (runoff). Within the risk assessment and regulatory modeling frameworks, residues are mathematically defined as having decreasing availability with depth under the rationale that the degree of mixing between soil-pore water and rainfall or excess precipitation is diminished as a result of obstructions in the soil structure (Bailey, Swank Jr, & Nicholson, 1974; Suárez, 2005). Therefore, concerning mitigation of runoff to surface waters, planting depth along with other best management practices should factor into the relative magnitude of pesticides moving off-field.

Runoff potential is also influenced by chemical-specific properties. An active ingredient entering soil and soil pore water will likely undergo various transformation processes that may facilitate degradation, limit bioavailability, or impact dilution.

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Syngenta appreciates the opportunity to provide comments on this important issue. We appreciate the department’s willingness to engage with us and other registrants in a science-based dialogue about the benefits that these seed treatments practices provide. The use of pesticide treated seeds is critical for many California-grown crops and we look forward to continuing to engage with CDPR, CDFA, commodity groups, and other California stakeholders on non-regulatory options to better understand the potential impacts of pesticide treated seeds.

Please contact me at (336) 632-6055 or tammy.tyler@syngenta.com for questions or clarification of our comments.

Sincerely,

Tammy Tyler, PhD
Senior Regulatory Manager

CC: Ms. Julie Henderson, Director of CDPR