Request for Proposals – February 2015

Pollinator Partnership – Corn Dust Research Consortium

Call for Research Proposals Related to Reducing Honey Bee Exposure to Dust Emitted During Planting of Treated Corn Seeds

Background

The Pollinator Partnership has formed a Corn Dust Research Consortium (CDRC) to fund, oversee, and advise on four proposed research projects to further our understanding of best management practices for mitigating seed treatment exposure to honey bees during corn planting. The Pollinator Partnership has issued CDRC invitations to stakeholders from crop protection, seed production, farm equipment, corn growing, beekeeping, academic, governmental and conservation organizations.

The Corn Dust Research Consortium is seeking research proposals from North American researchers addressing two specific approaches to the issue.

Research Priorities and Funding

We anticipate funding (from pooled resources of $300,000) proposals that address four questions:

Project 1- Use by Honey Bees of flowering resources in and around cornfields during spring planting, and how this behavior can be effectively managed to reduce exposure to pesticide dust and residues;

Project 2 - The long-term health consequences of exposure of honey bee colonies to dust emitted during planting of neonicotinoid treated corn seeds;

Project 3 – The efficacy of CDRC recommendations in preventing honey bee exposure to corn dust; and

Project 4 - Efficacy of seed lubricant products.

The Consortium will allocate the funding between the four project questions based on the proposals received. Proposals will be considered that address any or all questions. While this RFP lists four possible projects, there is no guarantee that projects in each category will be funded in 2015. Funds must be used within an eight-month period (March 2015 to November 2015) except for Project 2 which may extend to March of 2016 to assess overwintering health of colonies.

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Focused, targeted projects with a high likelihood of providing tangible results that can be applied to best management practices for mitigating seed treatment exposure to honey bees are preferred. Proposals providing valuable extensions of previously funded projects will be considered. Proposals that involve coordinated applications between institutions, multiple geographic locations in North America, replication of or direct analysis of working field conditions and standard planting equipment are preferred. The projects will be funded for one year, with discussion of extensions to be considered at the end of the first year (fall of 2015).

Background and Specifics

The Corn Dust Research Consortium has identified four priority areas for funding. Principal Investigators may apply to address either or both of the proposed projects.

A number of ideas for reducing exposure to planter-emitted dust from treated seeds have been proposed (please see Issue Overview on page 6). These include:

1) development of seed coatings that reduce the amount of toxic dust abraded from the seeds;
2) **removal of flowering plants in or near fields prior to planting to reduce the likelihood bees come in contact with seed dust deposits;**
3) modification of planting equipment to either limit the amount of dust released into the air or direct emitted dust toward the ground so that the potential for off-site drift is reduced;
4) **development and use of seed lubricants that reduce the amount of dust abraded from treated seeds;**
5) confining bees to hives on days when nearby fields are planted or providing a barrier to prevent drift into hives; and
6) using untreated seeds and managing pests in a different way.

The long-term effects of exposure to corn dust during planting on honey bee colonies are also of interest. In some regions of North America, beekeepers have made claims that winter losses are a direct result of exposure to corn dust. Prior CRDC recommendations developed in 2013 and 2014 can be implemented and reviewed to determine if they can work in conjunction with new technologies to reduce risk and bee losses. Additionally, some regions (Ontario in particular) have developed management guidelines and restrictions on product use to promote bee health. An examination of colony health and survival under proposed best management or regulatory scenario can now be researched. Studies following health and survivorship of honey bee colonies from spring, through summer, and throughout the overwintering period would be beneficial in order to determine if management and exposure to corn landscapes can be directly linked to survival and long-term health.

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Proposed Research Projects

While there may be a role for all of these mitigation approaches, an immediate need for research on points 2 and 4 (in bold above) has been identified. Related to these two research areas, the CDRC has identified 4 projects for which it is soliciting proposals. Each of these projects is discussed below.

Project 1: Use by honey bees of flowering resources in and around cornfields during spring planting, and how this behavior can be effectively managed to reduce exposure to pesticide dust and residues.

The first research project is to develop a greater understanding of the use by honey bees of flowering cover crops and weeds in and around cornfields during spring planting season and how this is influenced by vegetation management practices.

The ultimate goal is to develop recommendations for best management practices (BMPs) that growers can follow in order to minimize exposure of forager honey bees to abraded seed coating while maintaining as much forage for honey bees as possible. This may involve a trade-off of promoting presence of these flowering plants at some times and locations and their removal via herbicide applications at other times and locations.

Questions of interest include: Are honey bees mainly attracted to certain kinds of flowering weeds and cover crops, and if so, which species and at what floral densities? How important are flowering weeds as a food source to honey bees at the time of year when corn is planted?

Research methods may include trapping pollen at sentinel hives placed in landscapes dominated by cornfields to determine the relative use of bees of different kinds of plants, direct observations of honey bee visits to flowers in and around fields, and surveying corn growers and fields to determine current vegetation management practices. Some existing and potential practices, i.e. removal of flowering plants, may adversely affect native bee communities, an issue not addressed in this RFP.

Project 2 - The long-term health consequences of exposure of honey bee colonies to dust emitted during planting of neonicotinoid treated corn seeds.

In the previous two years of CDRC funded research, honey bee mortality has been examined before, during and after corn planting, but potential long-term effects from exposure to seed treatment dust on colony health have not been assessed. This project may include a study design that assesses honey bee colonies over the course of the corn growing season and through overwintering using established parameters for monitoring colony strength and health. The panel looks to the researchers to propose an efficacious study protocol and structure.

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Project 3 – The efficacy of CDRC recommendations in preventing honey bee exposure to corn dust

Based on earlier research efforts supported by the CDRC, a set of 37 recommendations have been developed to systematically reduce the impact of and exposure to corn dust during planting on honey bees. This RFP is to solicit study proposals directed toward building an integrated approach to implementing dust control measures. The CDRC is looking for studies designed to evaluate the efficacy of previous recommendations and which focus on those efforts likely to provide the greatest incremental reductions in exposure to fugitive dust and which can be readily implemented by growers and beekeepers to reduce adverse impacts to bees.

Project 4: Efficacy of Seed Lubricant Products

The fourth research project is to evaluate the effectiveness of new seed lubricant products in reducing neonicotinoid drift and exposure potential. The project proposes measuring deposition levels of pesticide dust deposited in and around fields when commercially available neonicotinoid-treated corn seed products are planted using new products in comparison to standard lubricants (talc and graphite). Such measurements should be made with a range of planter types and be replicated in several corn-growing regions (e.g., several major corn-growing states or provinces).

As the time frame of this study is short and the planting season is rapidly approaching, BCS or Syngenta field personnel can aid in locating and signing up cooperating corn growers; however, to the extent practicable, Principal Investigators are encouraged to use independently solicited contacts. BCS will provide free of charge to study personnel the new seed lubricant product as well as technical support for its use.

Lubricants should be added to and mixed with the pesticide-treated seeds in the planter hopper per label directions and after mixing, a sample of the seeds should be collected for possible later laboratory analysis of release levels of dust and active ingredient using a Heubach dustmeter.[1] Study personnel will establish sampling locations and devices prior to planting and measure the amount of pesticide active ingredient in dust deposited at sampling stations in and around the field. Stations should be located within and at prescribed distances downwind from each test field.

At each station, samples should be collected at various heights above ground. The order in which the two lubricant types are used and the fields to which they are applied should be determined randomly, and the pneumatic system of the planter should be cleaned of any leftover lubricant powder and seed debris before each of the fields is planted.

[1] Julius Kühn-Institut. 2008. Heubach Method to Determine the Particulate Matter of Maize Seeds Treated with Insecticides. Available on line at: http://www.jki.bund.de/fileadmin/dam_uploads/_A/pdf/Heubach%20Method%20english.pdf

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Collected samples will be analyzed to determine the amount of active ingredient deposited on sampling devices per unit area (i.e., the measurement needs to be able to be converted to µg a.i./m^2). Evaluations of each planter and seed treatment type should be replicated at least three times in each region studied.

For this fourth study, the focus is not on a comparison between lubricants, but rather how far the dust travels and the contamination levels at each distance. This will not be a measurement of exhaust form the manifold, but rather would be a series of sticky plates that will measure distance traveled.

Geographic Scope
The intent is to evaluate factors that can reduce honey bee exposure to corn seed dust in the corn production areas of the U.S. and Canada. Ideally, field investigations should be replicated in multiple locations in these regions to document spatial variability.

Quality Assurance
The research does not need to be conducted in strict compliance with Good Laboratory Practice (GLP) requirements[2], but should be conducted in accordance with the spirit of GLP requirements which include preparation of a written study protocol and standard operating procedures (SOPs) for data collection prior to study initiation, detailed recording and maintenance of raw data, and documentation of any deviations from the protocol or SOPs that occurred.

The goal is to publish papers in peer-reviewed journals in order to advance the understanding of the issue broadly and transparently. We encourage budgets to provide for photographic/videographic records of the study as it is being conducted as a means to demonstrate the methods and to communicate results to wide-ranging audiences, from practical advice for producers and beekeepers, to economic analysis for agribusiness, to reproducible science for the research community, and to general interest for the broader public.

Research Constraints and Reporting
So that results are representative of real-world corn planting scenarios, **field work should be conducted mainly during the spring corn planting season (April-May) except for Project 2 which will continue until March 2016.** In addition to conclusions and analysis, a copy of the original raw datasets will be made available for researchers to use in the future. Reports from both projects are needed by end of November 2015 in order to be incorporated into recommendations communicated to beekeepers and corn growers for the 2016 planting season. Such recommendations may need to be provisional pending additional research during the 2015 and 2016 planting seasons.

[2] CFR. 2015. Code of Federal Regulations Title 40 (Protection of Environment), Part 160 (Good Laboratory Practice Standards). Available on line at: http://www.gpo.gov/fdsys/granule/CFR-1999-title40-vol16/CFR-1999-title40-vol16-part160

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Project Oversight

The Corn Dust Research Consortium has been formed to review proposals and oversee the project execution, including review and comment on study protocols, draft reports and presentation materials prior to their execution and public release. Final decisions on technical interpretation of the study findings and content of study reports, publications and presentations will be made by study personnel. The role of the Corn Dust Research Consortium on these matters will be advisory only. The Corn Dust Research Consortium intends to include at least one representative from each primary sponsoring organization (industry, beekeeping, academia, government, and conservation). The CDRC will also seek input on project selection, review, and recommendation development from regulatory agencies, including the US Environmental Protection Agency (EPA) and the Canadian Pest Management Regulatory Agency (PMRA).

Proposal Requirements

1) Cover page including:
    a. Project or projects the proposal will address (Project 1, Project 2, Project 3, Project 4 or a combination.)
    b. Contact information including email(s), physical mailing address, and telephone number(s).
2) A 2-page (maximum) project description for each project proposal being submitted with sufficient background and description of methods to ascertain the importance and feasibility of the studies. Please use Arial, 12-pt font, single-spaced, with page numbers. References are not included in this page limit. If the proposal combines the two projects, the limit would be 8 pages.
3) Detailed budget that includes funds for the Principal Investigator and a research timeline by month (approximately March 2015 to November 2015 or in the case of Project 2, March 2016). CDRC funding can only be used for direct project costs and cannot be used to cover overhead costs.
4) 2-page CV of the principal investigator(s).
5) Please include funding details if the proposal is under consideration by other funding organizations.

Submission

Email your proposal packet as a single PDF file to Kelly Rourke (kr@pollinator.org) **by 3PM PDT on Friday, March 20, 2015.**

Please identify the email subject line and the PDF attachment using **"Project #, PI Last Name, First Name."**

Funding Decisions

The proposals will be evaluated by members of the Corn Dust Research Consortium Advisory panel, and **funding decisions will be made by Monday, March 30, 2015.**

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Issue Overview

Seeds of several major crops, such as corn and soybeans, are frequently sold with a pesticide coating that protects germinating and seedling plants from a variety of pests and diseases. These seed dressings provide early-season control of plant diseases and pests and help ensure that farmers receive a good return on their investment when they purchase high-yield varieties of hybrid seeds.

Applying the chemical directly to the seed (*i.e*., coating the seed) in many cases eliminates the need for early-season foliar pesticide spraying, and significantly reduces the loading of agrochemicals to cropland and the potential for contamination of adjacent land and water. While sticking agents are used to keep pesticide treatments adhered to the seed, mechanical abrasion (*i.e*., seeds rubbing against metal surfaces and each other) inside planters causes some of the chemical treatment to come off the seeds in the form of fine dust particles. The extent to which this occurs depends on multiple factors including the type of seed, the nature of sticking agents, the weather, and the type of planter.

Seed lubricant powders such as talc and graphite that are commonly added to facilitate an even flow of seeds through large pneumatic planters will increase the total amount of dust inside the planter and can serve as a carrier for dusts generated by the abrasion of treated seed coatings (referred to as “fugitive dust”. Modern pneumatic planters, which use air pressure to precisely deliver seeds to the seed furrow, may exhaust this dust into the air, and the emitted particles may in turn be carried some distance downwind.

Bees may potentially contact seed dust particles when the planter-emitted dust is airborne (*i.e*., if bees fly through the exhaust plume of a planter), or after deposition on vegetation or other surfaces. Previous studies in Europe have produced conflicting data regarding the relative importance of these two exposure scenarios. Studies in Germany (Pistorius *et al*. 2009) and in Italy (Sgolastra *et al*. 2012) identified dust deposition on flowers as the important route of toxic exposure of honey bees to corn seed dust. Other studies in Italy (Marzaro *et al*. 2011; Giorolami *et al*. 2012; Tapparo *et al*. 2012) found that toxic effects did not generally occur from bees visiting “dusted” flowers, but sometimes occurred when bees flew through the airborne emissions of a pneumatic corn planter. Research in the U.S. by Krupke *et al*. 2012 also demonstrated that fugitive dust as a potential route of exposure to bees. The opportunity for a significant number of forager bees from a hive to fly through planter exhaust plumes would appear to be limited in actual practice because the planting machinery is in constant motion, and there is no reason to suspect that bees would preferentially fly through this airspace as they were trained to do in the experiments conducted by the Italian research team.

In 2008 an incident involving large number of bee colonies in southern Germany was attributed to a combination of poor adherence of a neonicotinoid insecticide treatment to corn seeds, dry/windy conditions, and the close proximity of corn fields being planted to blooming, bee-attractive crops such as oil-seed rape (Pistorius et al. 2009). This incident indicated that fugitive dust can represent a route of exposure that can result in

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adverse on bees foraging in close proximity to recently planted fields. Follow-up research (Georgiadis *et al*. 2012) identified threshold levels for toxic effects on honey bees for the insecticide involved when it is applied as a dust to bee-attractive flowers inside bee tunnels.

There are several differences between agricultural practices in North America and Europe that may influence exposure to bees to dust of treated seeds. In the U.S., seed lubricant powders such as talc and graphite are frequently added to corn seeds to improve consistency of planting and sticking agents are routinely used to better ensure adherence of pesticides to the seed.

Another difference is the prevalence of no-till or minimum-tillage practices in the U.S. In such fields, flowering weeds such as dandelions and wild mustard may be present during planting not only in the non-cultivated land around the field, but also in the field itself. Similarly, US growers sometimes plant corn into fields containing a cover crop such as clover that is attractive to bees.

The study by Krupke *et al*. 2012, partially funded by a Pollinator Partnership-sponsored North American Pollinator Protection Campaign (NAPPC) Honey Bee Health Task Force grant, showed that these lubricant powders become contaminated with abraded particles from the treated seeds and suggested that emissions of these materials either during planting or during cleaning of pneumatic equipment can pose a hazard to bees. This has triggered the development of a new seed lubricant product designed to lower such emissions that will be available in the 2013 planting season for field testing.

The extent to which bee-attractive flowering plants are present in and around fields at the time of planting may be an important factor influencing the likelihood that forager bees will be exposed to planter-emitted dust. This further suggests that these exposures might be reduced by application of burn-down herbicides prior to planting. However, up until planting time these plants may provide a benefit to farmers (*e.g*., by replenishing soil nutrients, decreasing soil erosion, etc.) as well as to bees and other animals. A better understanding of the abundance of flowering weeds in and around corn fields at planting time, their use by honey bees, and resulting honey bee exposure levels to seed treatment dust is needed to develop optimal recommendations for corn growers.

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Literature Cited

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Provisional recommendations from 2013

A simple, "silver bullet" solution is not the result of these data. The CDRC provisional recommendations are based on small sample sizes and data from one year, and therefore all provisional recommendations require further testing in the coming year. However, the original CDRC goal was to be as helpful as possible in influencing the behaviors of all stakeholders with respect to the 2014 growing season; therefore, some practical solutions from the research are highlighted.

Several steps will need to be taken to achieve a reduction in exposure of honey bees to neonicotinoids used to treat seeds. Contributions are needed from every sector involved in this problem – from farmers, beekeepers, pesticide and lubricant manufacturers, equipment manufacturers, seed dealers, government agencies and regulators, extension agents, agricultural and commodity organizations, and agricultural media. The provisional recommendations in bold are identified as having come directly from the results of the CDRC study. Other recommendations are supported by work outside the CDRC research program. All recommendations have been vetted with the members of the CDRC; however, within the group there is general agreement that the provisional recommendations are, as stated earlier, based on very limited data. They are presented as a part of a building block approach that will need to be tried and tested, monitored and adaptively managed.

Farmers

- **Use drift-reducing lubricants during planting to reduce dust. This recommendation comes with a caveat; though the CDRC tests showed that when the BFA lubricant was used, total dust and net pesticide load in exhaust emissions were reduced when compared to the use of conventional lubricants, the concentration of pesticide in the exhausted dust appeared to be higher in these tests. This result may be inconsistent with other tests of BFA elsewhere. Further research is needed to determine the extent to which Bayer's new lubricant consistently reduces net emission of dust-borne pesticide during planting of treated seed.**
- **Follow all precautions to reduce dust and drift, especially with respect to wind and weather conditions during corn planting. As stewards of the land, farmers play a significant role in the health of pollinators by reducing drift during corn planting. All research sites showed that this year during the corn planting window (approximately two weeks) honey bees foraged primarily on the pollen of woody shrubs and trees including apples, crab apples, hawthorns, maples and/or willow. These are important foraging sources to honey bees, particularly when sufficiently distant from the planting area to be unaffected by dust but within the foraging range of the honey bee. Bee-attractive woody pollen sources are particularly vulnerable to drift of pesticides in exhausted dust when corn is planted within 50 meters of such forage.**
- Control herbaceous flowers blooming in fields to be planted with corn. This action provides modest benefits to honey bees. Although pesticide residues were detected on cover plants (predominantly dandelions) within seeded fields, the study demonstrated that honey bees did not forage heavily on these plants, but tended to forage on trees and shrubs.
- Minimize unnecessary use of seed treatment insecticides. Use them only when needed, such as where historic pest infestations are above threshold or high risk factors for pest pressure have been anticipated or determined.
- Follow the principles of Integrated Pest Management.

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- Communicate with beekeepers to ensure that they are aware of planting timing and can take appropriate precautions to protect colonies.

Beekeepers

- **Protect supplemental food and water from drift dust.**
- **Position hives away from areas where drift of corn dust can settle on herbaceous or woody plants during planting. Prevailing wind direction and wind speed may be helpful indicators for placement.**
- Supplement the hive with food to suppress the need for foraging during corn planting, and provide clean water to reduce the need for bees to seek water from sources in and adjacent to corn fields. However, this recommendation is made with the awareness that bees will often seek out any natural pollen before artificial sources.
- Communicate with producers when you have hives in the area.
- Label hives with your contact information.
- Check hives regularly and report incidents.

Pesticide and lubricant manufacturers

- **Work to reduce movement of corn dust (e.g., improved sticking agents, improved fluency agency).**
- **Work to keep all the insecticide on the seed until the seeds are in the ground (e.g., polymer seed coatings).**
- **Work to reduce abrasion potential of treated seed coatings.**
- Ensure the lowest effective labeled rate of neonicotinoid treatment is applied to the seed.
- Offer untreated (fungicide only) seed options.
- Reach out to farmers, and help make them aware of the situation and of the importance of farmers implementing recommended actions to reduce bee exposure.

Equipment manufacturers

- **Ensure that equipment users understand the importance of bee protections and the value of using lower-drift lubricants.**
- Provide mechanical means to reduce the movement of dust from fan exhaust during planting using equipment design principles and verification methods established in internationally recognized standards (ref. ISO 17962 under development).

Seed dealers

- **Support bee health by providing outreach to producers to make wise seed choices and to follow best seed planting practices.**
- Offer untreated seeds as an option for farmers.

Provincial, state and federal government agencies and regulators

- Provide financial and instructional support for maintaining trees and shrubs outside drift areas for bee forage available during planting season.
- Provide guidance for the reduction of attractive herbaceous forage in corn fields.
- Fully fund governmental provisions to ensure that pollinator forage supports can increase and be sustained.
- Encourage application of the lowest effective labeled rate of neonicotinoid treatment on the seed.
- Ensure that both insecticide-treated and fungicide-only seeds are available
- Ensure that IPM practice information is available to the producer.

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- Provide a responsive structure for bee-incident reporting. Ensure that incident report procedures are adequately funded and operate in a timely fashion commensurate with the urgency of this situation for honey bees and beekeepers.
- Ensure that seed bag labeling is clear and that growers are aware of the potential risk posed by planter dust.
- Dedicate transportation corridor and rights-of-way plantings to the establishment of pollinator roadsides for habitat.
- Reach out to farmers, and help make them aware of the situation and of the importance of farmers implementing recommended actions to reduce bee exposure.

Extension agents, agricultural and commodity organizations, and agricultural media

- Ensure that IPM practice information is available to the producer.
- Educate the beekeeper in practices that will safeguard bees.
- Educate beekeepers on bee-incident reporting.
- Educate so that label directions are clearly understood.
- Help agricultural producers, seed dealers and other stakeholders become aware of the situation and encourage them to adopt recommendations from this report to reduce bee exposure.

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