Request for Proposals – January 2014

Pollinator Partnership – Corn Dust Research Consortium
2014 Research
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 two 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 first year of research is complete and the report has been released (http://www.pollinator.org/PDFs/CDRCfinalreport2013.pdf). For the second year, the Corn Dust Research Consortium is seeking research proposals from North American researchers to continue to address the two identified research questions concerning honey bee's exposure during planting to dust from seeds treated with pesticides.

Research Priorities and Funding

We anticipate funding up to 4 proposals (from pooled resources of $320,000) that address one or both of two initiatives: **Project 1- Use by Honey Bees of Flowering Resources In and Around Cornfields, and Project 2 - Efficacy of Seed Lubricant Products.**

The Consortium will allocate the funding between the two project questions based on the proposals received. Proposals will be considered that address either or both questions. Funds must be used within an eight-month period (March 2014 to November 2014). 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 by CDRC or others will be considered. Proposals that involve replication of or direct analysis of working field conditions and standard planting equipment and procedures are preferred. The projects will be funded for one year, with discussion of extensions to be considered in the fall of 2014.

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Background and Specifics

The Corn Dust Research Consortium has identified two 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) **management of flowering plants in fields prior to planting and management of drift during planting to reduce the likelihood that bees will 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, and
6) using untreated seeds and managing pests in a different way.

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.

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.

In 2013, three separate research teams, funded by the CDRC, worked 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 report of their preliminary findings and provisional recommendations is found beginning on page 16 at: http://www.pollinator.org/PDFs/CDRCfinalreport2013.pdf

The ultimate goal for the CDRC is to develop recommendations for best management practices that growers can follow in order to minimize exposure of forager honey bees to seed dust 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.

The CDRC anticipates that the research methods will replicate methods used in the first year's research which include trapping pollen at sentinel hives placed in landscapes dominated by cornfields to determine the relative use by bees of different kinds of

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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: Efficacy of Seed Lubricant Products

The second research project is to evaluate the effectiveness of a new seed lubricant product that has been developed by Bayer CropScience. The CDRC is looking to reproduce initial work conducted at the University of Guelph in 2013. The project proposes measuring deposition levels of pesticide dust in and around fields when commercially available neonicotinoid-treated corn seed products are planted using this new seed lubricant product in comparison to standard lubricants (talc and graphite). Such measurements should be made with a range of negative pressure pneumatic planter types 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 the new seed lubricant product as well as technical support for its use free of charge to study personnel.

Each cooperating grower would plant two fields with the same planter, seed type and seed treatment. On one field the standard lubricant (talc and/or graphite) for the planter type would be used, while the new BCS lubricant product would be used on the other field. 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 dust and active ingredient using a Heubach dustmeter. Study personnel will establish study locations and sampling 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.

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. Principal Investigators will be

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encouraged to confer with the 2013 PI and with the CDRC to discuss study design elements that have proven successful in previous studies.

Geographic Scope
The intent is to evaluate factors that can reduce honey bee exposure to corn seed dust in the US Midwest and all North American corn production areas and in the main corn growing areas of Canada. Ideally, field investigations should be replicated in multiple locations in these regions.

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

The goal is to produce peer-reviewed published papers to advance the understanding of the issue broadly and transparently. We encourage budgets to provide for photographic/videographic capture 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).** In addition to conclusions and analysis, a copy of original datasets will be made available for researchers to use in the future. Reports from both projects are needed by end of November 2014 in order to be incorporated into recommendations communicated to beekeepers and corn growers for the 2015 planting season. Such recommendations may need to be provisional pending additional research during the 2014 and 2015 planting seasons.

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; however, it is important for the CDRC to confer with the PI and to examine and understand all processes and results. 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 from

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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 or both.)
    b. Contact information including e-mail(s), physical mailing address, and telephone number(s).
2) A 4-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 2014 to November 2014).
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

E-mail your proposal packet as a single PDF file to Jennifer Tsang (jt@pollinator.org) **by 3PM PDT on Monday, March 3, 2014.**

Please identify the e-mail subject line and the PDF attachment using **"Project (1 and/or 2), 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 Friday, March 14, 2014.**

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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.

Putting the chemical on 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 seed coatings 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.

Seed lubricant powders such as talc and graphite that are commonly added to facilitate an even flow of seeds through the planter will increase the total amount of dust inside the planter. 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. 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.

Greater potential for exposure of bees seems likely from dust particles deposited on flowers that may be present along the perimeter of fields or even within the fields themselves in some cases (e.g., no-till fields containing flowering weeds or a cover crop). Dust particles on flowers may be available to visiting bees for a period of days over a broad area inside and downwind of planted fields. When bees visit these flowers, the particles may become attached to their body hairs and be transported back to the hive in the same way that natural pollen grains are. Whether such exposures result in adverse effects is probably a function of (1) the chemical load of the dust deposits, (2) the intrinsic toxicity of the chemical, (3) the frequency that forager bees

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visit dusted flowers and (4) the degree to which dust particles act like pollen grains in their size, electrostatic activity, etc.

That this exposure scenario could be of sufficient magnitude to cause toxic effects was demonstrated by a large bee kill incident in 2008 in southern Germany that was caused by a combination of poor adherence of a neonicotinoid insecticide treatment to corn seeds and the close proximity of corn fields being planted to blooming, bee-attractive crops such as oil-seed rape (Pistorius et al. 2009). 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.

A previous study by Krupke et al. (2012), partially funded by a P2 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 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.

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 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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