

Neonicotinoid Insecticides: Efficacy, Non-target Effects, and Best Management Practices – Questions and Answers

Answers provided by Christian H. Krupke, Ph.D., Professor, Department of Entomology, Purdue University, West Lafayette, IN

Will the presentation and/or slides be posted for later viewing?

The on-demand recording of the webinar and accompanying PDF of the presentation slides will be made available on May 22, 2017. Check the webinar's web page. You'll see a View button when the recording is available, and the files will be located under Related Files.

Will you be addressing NATIVE BEES since in the case of bumble bees, neonics are more toxic? Native bees likely have a far larger role in crop pollination.

We are just beginning some work with native, solitary bees in soybeans but nothing to report at this time with regard to toxicity of neonicotinoids.

Wind speed?

We incorporated wind speed into our analysis of planter dust drift, yes.

Any thoughts on what will happen to our food supply if the honey bees and pollinators become extinct?

I think that would be catastrophic, but I do not believe that it will happen.

Any thoughts on incorporation of these insecticides in the food chain?

We are just scratching the surface of that question now, with some mesocosm experiments using aquatic organisms. It seems that sublethal effects on predators would be important.

Are neonicotinoids carcinogenic to humans?

I don't have any information on human toxicity of these compounds.

Neonicotinoids are these the same or similar chemicals that are in cigarettes?

Similar chemical structure, but far more toxic to insects.

Please speak to any knowledge concentrations in plants located within in-field and edge-of-field herbaceous conservation practices.

This was addressed in the last third of the talk, presented all the data that we have and the full papers are available online. Please see the accompanying pdf of literature posted at the website.

What was the rate on treatment 3 (High rate?)

This was 1.25 mg clothianidin/seed.

How should we gage your finding with other invertebrate insects? Are honey bee more sensitive or generally less sensitive to neonics?

Honey bees are generally more sensitive, but very few aquatic invertebrates have been tested.

Any inter-cropping alternatives to help reduce the impacts on pollinators?

Not any viable ones, given the way we currently plant corn/soybeans and the very high adoption of neonicotinoids in both.

Can you address improvements to the polymers and fluency agents being developed to mitigate dust off ; whether you can see improvements that will lead to safer application as the technologies develop?

We haven't seen, and do not have any shareable data on improved polymers, although I know this work is

underway. The new fluency agents reduce dust movement significantly, but I do not have data on adoption rates. Anecdotally (surveying Indiana farmers at extension events) the adoption is very low. If these fluency agents were mandatory and included for free along with the treated seed, that would help a great deal. But most growers currently see this as paying more money for an inferior product (vs. talc/graphite). As mentioned in the webinar, an easier and less expensive solution is making untreated corn seed an option for purchase.

If we are working on creating good foraging habitat for honey bees, monarch butterflies or other pollinators, what are your thoughts on protective buffer distances? What do we know about residues in flowers as we move away from treated fields?

Unfortunately, we don't know a lot of minimum buffer distances. Other than to say that farther away is better. Water movement is the most difficult to predict and quantify and this will carry neonicotinoids. I presented all our data in flower concentrations in the last third of the talk and it is referenced in the handout (Nature Communications 2016 publication)

It sounds like we need more targeting of the use of these chemicals?

Yes, definitely. Currently there is none. Every corn seed is treated, and there is no justification for this in terms of pest pressure.

Any thoughts on cropping practices to change the pest cycles?

Crop rotation is always the best option. Cover crops are helpful as well.

If farmer results are not very good using Nicotinoid pesticides, why are so many farmers using them?

Two main reasons: 1) Many do not know they are using them or what specifically the seeds are treated with, and 2) the main reason is that there is no neonicotinoid-free option in the vast majority of corn hybrids, so they cannot compare and see for themselves. If they want to plant corn, they will have to use neonicotinoids.

Thank you. Very informative. and useful .

Thank you.

Your pollen dataset could be used by some to suggest that the highest doses of insecticides that the bees are receiving are from the pyrethroids applied by homeowners and municipalities. What would you say about that assertion?

Our data represent only a few sites and one season. For that dataset, it is true that the pyrethroids we found presented the greatest acute toxicity hazard.

Any comparisons of effects of foliar applied pesticides vs. seed treatment- effects on bees

No, we don't have any data for those comparisons. They are applied for different pests and different times of the season so that comparison would not have much utility. Seed treatments are primarily used for below-ground pests, where foliar insecticides would not have any utility and vice versa.

How might neonicotinoids in the soil impact pest populations? Could an argument be made that pest populations are low because of persistence in soils?

Yes, definitely. Unfortunately, without pre-neonicotinoid survey data we are just speculating. But it is logical to assume that many soil insects, including pests, have undergone declines in the past 10-15 years when neonicotinoid use has gone from zero to several pounds/hectare.

Should the neonics and pyrethroids be further restricted by EPA in 2018?

I think there is room for improvement in how these pesticides are regulated and used.

What are the wind speeds for these areas, i.e. Indiana vs Montana?

I don't have any data to address that, sorry.

What about buffer width recommendations for "capturing" or "filtering" dust exposed to neonicotinoids?

We only went out to 100 m and still found outbound particles. So the minimum is at least that far – having said that, it may be that planting drift is a relatively minor component of exposure and pollen/nectar/water are the greater sources of chronic exposure.

Can insecticide come off the seed, be absorbed by the roots, and end up in the crop anyhow?

Some does, yes. But the vast majority does not. Our 2017 study (Alford and Krupke, PLoSOne) showed that very little of what is added onto the seed is ever recovered from the plant.

If there are no safe zones for bees, why aren't there more bee kills reported?

There are many possible reasons for this. Our data show that the possibility for kills exist in many areas, but cannot predict if they will happen. Because disorientation is a symptom of exposure to these pesticides, many foragers may not return to the hive and are never recovered outside it. The colony is also very good at keeping up with mortality by carrying dead and dying bees away. Only a sudden and severe event will result in piles of dead bees and it is possible (maybe likely) that most pesticide poisonings associated with planting treated seed don't meet that mark. That doesn't mean there is no risk to colony health, and it obviously does not include any sublethal effects that might be important.

Are any of the studies showing low pest pressure on manured corn ground?

I do not know of any such studies.

DEET/POOLS/PEOPLE...Please repeat your comments on that.

We found DEET, the main ingredient in most mosquito repellents, in every sample of pollen in this study. Our hypothesis (untested) about where/how the honey bees acquire it is in contact with areas where people have been bathing and DEET washes off, such as public pools. But we do not know for sure.

I am not in the Midwest, and was not aware the 'naked' seed is not available to corn growers. Can you provide some background on why this is the situation in Indiana?

I don't have a good answer why this is the case. I believe this is the case across the Corn Belt though, and not just Indiana. Minnesota may be leading the change on this front. Growers that I have spoken with that have requested non-neonicotinoid treated corn seed are told that it is not available or not available in the hybrids they want. Our data show that the insect pressure levels do not merit the levels used.

What work is ongoing to relate concentrations of the different compounds encountered to the measure of pesticide toxicity? That is, to normalize this data with regards to toxicity.

This is covered in detail in the publication (Long and Krupke, 2016) that is referenced in the handout.

From an NRCS planning perspective, should we be considering these seeds treatments when we use WINPST? If so, how do we translate the application rates to oz. per acre?

I am not sure what the WINPST acronym refers to.

When testing the pollen in the meadow, non-treated corn and treated corn areas, was the neo-nic amount found ever above the lethal rate for honeybees?

No, it was always well below the acute toxicity. Because they are eating it, feeding it to larvae etc., chronic exposure is more of a concern here.

What is impact of neonics on beneficial insects?

There is a growing literature base on this question, and a lot of the recent work has documented negative effects, as with most insecticides. Carabid beetles and minute pirate bug populations, in particular, are negatively effected in field crop systems.

Are farmers treating the neonicotinoids like a vaccine then? If the pests come back because of untreated seed use will they be worse?

Interesting one... historically, most of these soil pests were at low levels anyway. They were not ever key pests

of these crops. In fact, they are not corn/soybean specialists and were often present in those fields due to other factors (converting from pasture, use of manure etc.). There is no reason to expect that they would be more troublesome if neonicotinoids went away, especially since our soybean and (especially) corn varieties and genetics are far superior and more competitive than they were in the 80's and 90's when these pests were thought to be more abundant.

What is the effect of neonicotinoids on soil microbes?

Unknown at present, this is an area that is just starting to get some research attention.

With all the chemicals in bee pollen, what's the risk to human health from eating honey?

I don't have any information or expertise with regard to effects on humans.

What about human health effects and bioaccumulation of these compounds since they are present in drinking water?

I don't have any information or expertise with regard to effects on humans.

Might the low population of existing pest be due to the high concentration of the chemicals in the soil?

Yes, definitely a possibility. See my answer above for more detail.

The Xerces Society is very concerned about these chemicals. Any thoughts?

They should be concerned and neonicotinoids should get a great deal of scrutiny. The use rates are very high, and climbing. This is unprecedented in terms of pest management, we have not used compounds with these characteristics (water solubility, broad toxicity) on such large areas and without a pest threat justification in the past.

If planter dust is minimized through cover crop residues and no-till will the threat be minimized as well?

Crop residues and soil dust are only a minor contributor to the pesticide dust issue. The planters themselves are the major source of neonicotinoid-contaminated dust.

Great stuff!!!!Thanks

Thank you.

Great presentation!

Thank you.

I would like more seminars on pesticides and water pollution, surface and groundwater PLEASE!!

Good suggestion, thanks.

Thank you for a very interesting presentation!

Thank you.

Fantastic presentation! Thank you for bringing this to us.

Thank you.