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Representatives Carolyn W. Partridge, Richard Lawrence, John L. Bartholomew, Daniel Connor, Alyson Eastman, Rodney Graham, Joey Purvis, Harvey Smith, Tristan Toleno, Donal Turner Jr., Teo Zagar, Christopher Pearson, Linda J. Martin, and James McCullough

Vermont House Committee on Agriculture and associated sponsors.

Re: H.236 An act relating to the use of neonicotinoid pesticides

Dear Representatives:

The Vermont apple industry is valued at $20 million annually, with member farmers in nearly all counties. Apple growers rely upon pollination services from commercial beekeepers, and some in fact keep their own bees on-site, so any practices that could harm the vitality of available beehives is of grave concern to growers. Over 20 major insect pests of apples require management during each growing season, and without management, most orchards would produce little to no marketable production in a typical year. Pest management is an evolving science, and Integrated Pest Management (IPM), a holistic system in which economic, horticultural, environmental, and social factors are integrated into an overall pest management strategy, has been the primary principle behind apple pest management since the 1970s and 1980s in Vermont and elsewhere in the U.S. (Kovach & Tette, 1988; MacHardy, 2000; Whalon & Croft, 1984).

IPM is an evolving science, and New England Universities support 13 scientists and outreach professionals who cooperatively provide guidance and recommendations to growers for best practices to implement IPM (Bradshaw, 2013; Clements et al., 2015). Growers are not operating in a vacuum, and in fact receive the best advice available to help implement IPM on their farms. Since passage of the Food Quality Protection Act in 1996, changes in pesticide chemistry have been rapid, as older, more acutely toxic (to mammals and insects, including bees) materials such as carbamates and organophosphates (OPs) have been phased out or replaced by less toxic materials, including the neonicotinoid class of insecticides (Viray, 2009). Reduced risk (compared to OPs, the class of materials first targeted under FQPA) insecticide programs that include neonicotinoids have resulted in up to 88% reduction in the amount of active ingredient used in orchards, and up to an 85% decrease in Environmental Impact Quotient, which is a comparative tool that includes environmental, consumer, and mammalian toxicity and use patterns to compare environmental impact of pesticides (Agnello et al., 2009; Kovach, Petzoldt, Degni, & Tette, 1992).

This decrease in the environmental impact of IPM programs in orchards in part from the inclusion of neonicotinoids in spray programs cannot be understated. Access to a diverse spectrum of pesticide alternatives is critical to managing insecticide resistance in pest populations (Nauen & Denholm, 2005). Modern insecticide chemistries tend to be more species-specific and costly than broad-spectrum OP's, with multiple materials filling a typical spray program where a single OP would suffice in the past (Reddy, 2016). *Loss of an entire class of materials would force growers to rely more heavily on the remaining registered OP's and other broad-spectrum materials, thereby potentially compromising the health of farm workers, consumers, and the environment.*

Recently, neonicotinoid pesticides have been placed under scrutiny because of perceived impacts on pollinators and other non-target insects. Again, the apple industry has much to lose if pollinator services diminish in response to pesticide use, since every fruit they grow and sell requires pollination. Any consideration of increased regulation of neonicotinoids in Vermont however must be science-based, and must use risk management methodology. Substantial research has been conducted and summarized in reviews that show impacts of neonicotinoids on bees in carefully controlled studies (Blacquiere, Smagghe, Van Gestel, & Mommaerts, 2012; Goulson, 2013; Hopwood et al., 2012). It is not surprising that laboratory studies conclude that commercial insecticides are toxic to bees, which are insects. Such evidence however fails to make the case that neonicotinoid insecticides, as a class, cause damage to pollinators in realistic field conditions, at actual use rates, and in each crop system in which they are used.

One recent review found that a preponderance of the literature on impacts of neonicotinoids on bees is based on *in-vitro* lab research, is limited to a small number of neonicotinoid compounds used in the agricultural sector, and on limited crop uses, most often seed treatment of field crops (Lundin, Rundlöf, Smith, Fries, & Bommarco, 2015). Complicating this, many lab-based European studies upon which a ban on neonicotinoids was justified in Europe in 2013 overestimate actual field residue levels and overstate harm (Carreck & Ratnieks, 2014). In response to *in-vitro* studies that report negative impacts on pollinators, numerous field-level studies, including multi-year case-controlled studies, in Europe and North America have been conducted, and negative impacts on bees observed in the laboratory were not seen in the field (M.-P. Chauzat et al., 2009; M.-P. Chauzat et al., 2010; M. P. Chauzat et al., 2011; Cutler & Scott-Dupree, 2007; Genersch et al., 2010; Pilling, Campbell, Coulson, Ruddle, & Tornier, 2013; Thompson et al., 2013). Therefore, legislators must be wary of developing regulation based on reports from laboratory studies.

Colony Collapse Disorder (CCD) is a serious condition experienced by many migratory beekeepers in the United States beginning around 2008, with some areas reporting losses of 90% of managed beehives (Ratnieks & Carreck, 2010). No single cause of CCD has been found in worldwide studies, but habitat loss, disease, exotic parasites, and pesticides are suggested factors in hive decline (Brown & Paxton, 2009). While some governments, notably France and Germany, banned use of neonicotinoid pesticides to address CCD, these bans have not reduced the problem, nor were neonicotinoids conclusively linked as a causal agent (M. Chauzat et al., 2009). The 2013 Europe-wide ban on neonicotinoids resulted in substantial crop losses from pest damage without improving bee health (Field, 2015). The bottom line is that the public can be convinced that pesticides are bad, even if the evidence is shaky, and neonicotinoids were an easy target when the CCD issue peaked.

Of more importance to the policy debate in Vermont is that managed pollinators are healthy in this state. In 2008, after reports of the problem had been surfacing in popular media, accompanied by warnings of a collapse in our food system, the Vermont Agency of Agriculture stated, "There still have not been any documented cases of Colony Collapse Disorder (CCD) identified in Vermont. Losses nationwide of colonies to CCD have been reported to be as bad or worse than last year. This was especially true in the many thousands of colonies that were in California for the winter's almond pollination season (Parise, 2008)." In the United States, stressing of hives from extended and intense migration and pollination schedules appears to be a primary factor in hive decline. Most Vermont beekeepers maintain their hives without the stresses of cross-country shipping to follow the crop cycle. Vermont Beekeeper's Association President Bill Mares indicated in January 2010 that "colony collapse disorder has not appeared in Vermont" (Breed, 2010).

Pesticides are typically regulated at the federal level by the U.S. Environmental Protection Agency (EPA) under the Federal Insecticide, Fungicide, and Rodenticide Act and other associated programs. In light of concerns over impact on pollinators by the use of neonicotinoid pesticides, EPA has instituted a Pollinator Protection Plan (http://www.epa.gov/pollinator-protection) under which review of present and future insecticide registrations is managed. Peer-reviewed risk assessment protocols have been developed and are published in a 275-page guidance document (EPA, 2012). The scientific review of insecticide effects and neonicotinoids in particular is thus being completed, and an outright ban on neonicotinoid uses in Vermont would preempt this review process and lead to the de-registering of materials that may likely have passed review. This process is not being delayed; the first initial review of a neonicotinoid was released on January 6, 2016 (EPA, 2016), and remaining neonicotinoid reviews will be released within the next year. In its review of the neonicotinoid imidachloprid, EPA established clear levels of residue in pollen and plant sap at which bee harm occurs, and only found two crop uses, cotton and citrus, where residues are likely to be above this level. It is important to note that seed treatment of field crops, which is the most common use of neonicotinoids in Vermont, was not identified as a significant risk to pollinators. The restriction of crop uses, timing, and rates based on sound methodology such as that currently being undertaken by U.S. EPA is the proper way to manage pesticide registration in Vermont and elsewhere in the U.S. to ensure that scientific risk assessment and not public perception is the basis for allowing or restricting crop protection materials.

Before the Vermont legislature acts to remove an important pest management tool for farmers, they must clearly show that harm to pollinators from the use of neonicotinoids exists in field studies, that these materials have a proven impact on the problem, and that the proposed solution will solve the problem while minimizing unintended hams to the farmers affected. All pesticides, including neonicotinoids, are evaluated by US EPA with impacts on use registrations continually changing to reflect modern science. Questions surrounding bee health have put a focus on material safety to bees with resulting research conducted, and to date, EPA has not chosen to further restrict neonicotinoids. Before the Vermont Legislature acts on this issue they must prove with science that such an action is warranted.

Sincerely,

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References cited:

Agnello, A., Atanassov, A., Bergh, J., Biddinger, D., Gut, L., Haas, M., . . . Kime, L. (2009). Reduced-risk pest management programs for eastern US apple and peach orchards: a 4-year regional project. *American Entomologist, 55*(3), 184.

Blacquiere, T., Smagghe, G., Van Gestel, C. A., & Mommaerts, V. (2012). Neonicotinoids in bees: a review on concentrations, side-effects and risk assessment. *Ecotoxicology, 21*(4), 973-992.

Bradshaw, T. (2013). Strategic Planning for the Vermont Apple Industry: Planning for Success in the 21st Century. Retrieved from http://www.uvm.edu/~orchard/2013VermontAppleIndustryStrategicPlan.pdf

Breed, M. M. (2010, January 21, 2010). The Vermont Buzz: At Least 9000 Bee Hives Community News. *The Herald of Randolph (VT)*
Retrieved from http://rherald.our-hometown.com/news/2010-01-21/Community_News/The_Vermont_Buzz_At_Least_9000_Bee_Hives_001.html

Brown, M., & Paxton, R. (2009). The conservation of bees: a global perspective. *Apidologie, 40*(3), 410-416.

Carreck, N. L., & Ratnieks, F. L. (2014). The dose makes the poison: have "field realistic" rates of exposure of bees to neonicotinoid insecticides been overestimated in laboratory studies? *Journal of Apicultural Research, 53*(5), 607-614.

Chauzat, M.-P., Carpentier, P., Martel, A.-C., Bougeard, S., Cougoule, N., Porta, P., . . . Faucon, J.-P. (2009). Influence of pesticide residues on honey bee (Hymenoptera: Apidae) colony health in France. *Environmental Entomology, 38*(3), 514-523.

Chauzat, M.-P., Martel, A.-C., Zeggane, S., Drajnudel, P., Schurr, F., Clément, M.-C., . . . Faucon, J.-P. (2010). A case control study and a survey on mortalities of honey bee colonies (Apis mellifera) in France during the winter of 2005–6. *Journal of Apicultural Research, 49*(1), 40-51.

Chauzat, M., Carpentier, P., Martel, A., Bougeard, S., Cougoule, N., Porta, P., . . . Faucon, J. (2009). Influence of Pesticide Residues on Honey Bee (Hymenoptera: Apidae) Colony Health in France. *Environmental Entomology, 38*(3), 514-523.

Chauzat, M. P., Martel, A. C., Cougoule, N., Porta, P., Lachaize, J., Zeggane, S., . . . Faucon, J. P. (2011). An assessment of honeybee colony matrices, Apis mellifera (Hymenoptera: Apidae) to monitor pesticide presence in continental France. *Environmental Toxicology and Chemistry, 30*(1), 103-111.

Clements, J., Autio, W. R., Bradshaw, T. L., Concklin, M., Cooley, D. R., Faubert, H. H., . . . Moran, R. (Eds.). (2015). *2015 New England Tree Fruit Management Guide*: USDA Cooperative Extension Service,Universities of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

Cutler, G. C., & Scott-Dupree, C. D. (2007). Exposure to clothianidin seed-treated canola has no long-term impact on honey bees. *Journal of Economic Entomology, 100*(3), 765-772.

EPA. (2012). *White Paper in Support of Proposed Risk Management Process for Bees*. Washington, DC: US EPA.

EPA. (2016). *Imidacloprid Registration Review*. (EPA-HQ-OPP-2008-0844). Washington, DC Retrieved from http://www.regulations.gov/#!docketBrowser;rpp=25;so=DESC;sb=postedDate;po=0;dct=SR;D=EPA-HQ-OPP-2008-0844.

Field, L. M. (2015). Unseen dangers of inappropriate legislation in agriculture. *Food and Energy Security, 4*(1), 1-2.
Genersch, E., Von Der OHE, W., Kaatz, H., Schroeder, A., Otten, C., Büchler, R., . . . Gisder, S. (2010). The German bee monitoring project: a long term study to understand periodically high winter losses of honey bee colonies. *Apidologie, 41*(3), 332-352.
Goulson, D. (2013). Review: An overview of the environmental risks posed by neonicotinoid insecticides. *Journal of Applied Ecology, 50*(4), 977-987.
Hopwood, J., Vaughan, M., Shepherd, M., Biddinger, D., Mader, E., Black, S. H., & Mazzacano, C. (2012). Are Neonicotinoids Killing Bees? *A review of research into the effects of neonicotinoid insecticides on bees, with recommendations for action. Xerces Society for Invertebrate Conservation, USA*.
Kovach, J., Petzoldt, C., Degni, J., & Tette, J. (1992). A method to measure the environmental impact of pesticides. *New York's Food and Life Sci. Bull., 139*.
Kovach, J., & Tette, J. (1988). A survey of the use of IPM by New York apple producers. *Agriculture, Ecosystems & Environment, 20*(2), 101-108.
Lundin, O., Rundlöf, M., Smith, H. G., Fries, I., & Bommarco, R. (2015). Neonicotinoid insecticides and their impacts on bees: a systematic review of research approaches and identification of knowledge gaps. *PloS one, 10*(8), e0136928.
MacHardy, W. (2000). Current status of IPM in apple orchards. *Crop Protection, 19*(8-10), 801-806.
Nauen, R., & Denholm, I. (2005). Resistance of insect pests to neonicotinoid insecticides: current status and future prospects. *Archives of Insect Biochemistry and Physiology, 58*(4), 200-215.
Parise, S. (2008, May 23, 2008). Spring Update on Vermont's Honey Bees. *Agriview*, p. 12. Retrieved from http://www.vermontagriculture.com/Agriview/2008/5-23-2008Agriview.pdf
Pilling, E., Campbell, P., Coulson, M., Ruddle, N., & Tornier, I. (2013). A four-year field program investigating long-term effects of repeated exposure of honey bee colonies to flowering crops treated with thiamethoxam.
Ratnieks, F., & Carreck, N. (2010). Clarity on Honey Bee Collapse? *Science, 327*(5962), 152.
Reddy, P. P. (2016). Selective Pesticides in IPM *Sustainable Crop Protection under Protected Cultivation* (pp. 121-131): Springer.
Thompson, H., Harrington, P., Wilkins, W., Pietravalle, S., Sweet, D., & Jones, A. (2013). Effects of neonicotinoid seed treatments on bumble bee colonies under field conditions. *See http://www. fera. co. uk/ccss/documents/defraBumbleBeeReportPS2371V4a. pdf*.
Viray, F. (2009). *Changes in pesticide use and dietary risk in the USA since the passage of the Food Quality Protection Act (FQPA) in 1996.* (Ph.D.), Michigan State University. Retrieved from http://gradworks.umi.com/33/81/3381421.html
Whalon, M., & Croft, B. (1984). Apple IPM implementation in North America. *Annual Review of Entomology, 29*(1), 435-470.