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Office of Pesticide Programs
Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460-0001
glyphosateRegReview@epa.gov

Re: Glyphosate Case 0178, EPA-HQ-OPP-2009-0361

Dear Dana Friedman,

We appreciate the opportunity to comment upon the human health and ecological risks of glyphosate. EPA's current risk assessment processes inappropriately focus on perceived benefits of the pesticides perceived intended uses; it largely ignores damage to the environments' non-target organisms up to and including humans.

Based on expanding understanding of the un-anticipated negative effects of gyphosphate, its formulated products, and the multiple other pesticides that it is commonly mixed with, Pollinator Stewardship Council is requesting EPA rescind the registration of glyphosate.

Pesticides are misbranded if the label "approves or recommends" a mixture with another pesticide which causes unreasonable risk or; "when used according to commonly accepted application practices," they cause unreasonable risk to humans or the environment. Glyphospahte is mis-branded for both reasons.

EPA's registration process and risk assessment of glyphosate is focused upon the benefits of pesticides to control target "weeds" to crops. This process excludes the benefits of non-target organisms to ecosystem balance. However, products are misbranded if when used according to

the federally mandated pesticide label they cause unreasonable risk to humans or the environment.

Glyphosate (N-Phosphonomethyl glycine) is "the most widely used herbicide in the United States." About 100 million pounds are applied to U.S. farms and lawns every year, according to the EPA." (Gammon, 2009) First registered for use in the U.S. in 1974, more than 750 products contain glyphosate for the "control of broadleaf weeds and grasses in: hay/pasture, soybeans, field corn; ornamentals, lawns, turf, forest plantings, greenhouses, and rights-of-way." (USGS, 2003)

> *"As a phloem mobile chemical, glyphosate from foliar, stem, or root uptake is systemic in plants where it accumulates in flower and reproductive parts, root and shoot tips, and legume nodules (Huber, 2010; Johal and Huber, 2009). Much of the glyphosate will remain in the plant and it can accumulate over years in perennial plants such as alfalfa, vine, fruit, and nut crops and environmental perennial species. It is an active mineral chelator in the treated plant for as many as 8 to 15 days after application before becoming sequestered in flower parts, other meristematic tissues, or soil. As little as 12 gm/acre (1/40th of herbicidal rate and well below the general 12-16 % drift rate) inhibits root uptake and translocation of Fe, Mn, Zn and other nutrients so that plants exposed to glyphosate directly or through drift in air or water have lower nutrient content (Bellaloui et al, 2009, 2011; Bott et al, 2008, 2011; Cakmak et al, 2009; Eker et al, 2006; Huber, 2010, 2012; Zobiole et al 2012)."* (Huber, 2011)

A 2005 review of a twenty-two year farming study by David Pimentel of Cornell University found organic farming produced the same corn and soybean yields as conventional farming. (Pimentel, 2005)

> *"Organic farming approaches for these crops not only use an average of 30 percent less fossil energy but also conserve more water in the soil, induce less erosion, maintain soil quality and conserve biological resources than conventional farming does, Pimentel added."*

The published study, **Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems,** "compared soil fungi activity, crop yields, energy efficiency,

costs, organic matter changes over time, nitrogen accumulation and nitrate leaching across organic and conventional agricultural systems." (Pimentel, 2005) The study found:

- Soil carbon in the organic systems increased by 15-28 percent, equal to removing 3500 pounds of carbon dioxide per hectare out of the air;
- In drought years (1988-1998), "corn yields in the legume-based system were 22 percent higher than yields in the conventional system;"
- "The soil nitrogen levels in the organic farming systems increased 8-15 percent;"
- "Organic farming reduced local and regional groundwater pollution by not applying agricultural chemicals;"
- "Conventional and organic corn, soybeans, and wheat showed no significant differences in yield;"
- "Data showed that in the organic systems, percolation was enhanced and water runoff decreased;"
- Organic matter did not increase in conventional systems, further confirming reduced erosion in conventional farming;
- No-till corn has several costs, including increased pesticide and nitrogen fertilizer use; more weeds, insects, slugs, and voles.

Glyphosate's impact upon bee health

The study, *Effects of sublethal doses of glyphosate on honeybee navigation* suggests honey bees, exposed to levels of glyphosate commonly found in agricultural settings impaired the cognitive capacities needed to retrieve and integrate spatial information for a successful return to the hive. "Honey bee navigation is affected by ingesting traces of the most widely used herbicide worldwide, with potential long-term negative consequences for colony foraging success."(Balbuena, 2015)

During foraging, honey bees will encounter pesticides as floral tissue contaminants. "Whereas some ubiquitous phytochemicals in bee foods up-regulate detoxification and immunity genes, thereby benefiting nestmates, many agrochemical pesticides adversely affect bee health even at sublethal levels." (Liao, 2015) Researchers tested "two herbicides (atrazine and glyphosate) and three fungicides (boscalid, chlorothalonil, and prochloraz)." (Liao, 2015) "Of pesticides eliciting a response, bees displayed a preference at specific concentrations for glyphosate and chlorothalonil. This paradoxical preference may account for the frequency with which these pesticides occur as hive contaminants and suggests that they present a greater risk factor for honey bee health than previously suspected." (Liao, 2015)

"*Effects of field-realistic doses of glyphosate on honey bee appetitive behavior*" studied the effects of field-realistic doses of Glyphosate (GLY) on honey bees exposed chronically or acutely to the herbicide. The study "found a reduced sensitivity to sucrose and learning performance for the groups chronically exposed to GLY concentrations within the range of recommended doses, additionally elemental learning and short-term memory retention decreased significantly." (Herbert, 2014) "Non-elemental associative learning was also impaired by an

acute exposure to GLY traces. Altogether, these results imply that GLY at concentrations found in agro-ecosystems as a result of standard spraying can reduce sensitivity to nectar reward and impair associative learning in honeybees. . . . we speculate that successful forager bees could become a source of constant inflow of nectar with GLY traces that could then be distributed among nestmates, stored in the hive and have long-term negative consequences on colony performance." (Herbert, 2014)

> *"Glyphosate is indiscriminately applied throughout the bee foraging period and is in significant amounts in air, water, and many plant parts frequented by bees. Although not highly volatile, it becomes airborne as drift and on particulate matter with significant levels detected in rain and ground water (USGS, 2012). It is highly water soluble and a common contaminate found in surface water from drift, run-off, or direct application to water for aquatic weed control. It is systemic and persistent in plants with as much as 80% accumulating in meristematic plant tissues such as flowers and buds frequented by bees and is found in honey collected by bees from contaminated flowers. The extensive cultivation of the many glyphosate-tolerant plants has permitted the application of glyphosate before, during, after, and throughout the foraging period of bees to greatly expand the environmental and plant exposure of bees to this organic phosphonate chemical."* (Huber, 2011)

Reduces Pollinator Forage

If we are to address two of the four honey bee health concerns-pesticides and poor forage (pests and pathogens being the other two) we must address the use of glyphosate upon loss of bee forage. Across the United States, "pollinator habitat is disappearing at rates usually reserved for descriptions of Amazon rain forest deforestation. This is most striking in the Midwest where more than 36,000 square miles of wetlands and prairie—an area larger than Indiana—has been converted to cropland since 2008." (Keim, 2014)

Glyphosate must be part of the discussion to support and improve over-all pollinator health. Research has shown crop yields increase with native pollinators, and honey bee health is improved when diverse forage is available while pollinating a crop. Blueberries in New Jersey can see an increase in gross revenues of $112 per acre if one acre of vacant land is available to native pollinators. When blueberries were pollinated by more than one species of bees there was an increase of $311 worth of yield per acre in North Carolina.(Iyer, 2014) A variety of crops see yield increases when wild pollinators and their habitat are near crops from 81% crop yield increase for squash to 10% increase in watermelons.

"U.S. Geological Survey (USGS) scientists report that glyphosate, known commercially by many trade names, and its degradation product AMPA (aminomethyl phosphonic acid) are transported off-site from agricultural and urban sources and occur widely in the environment." The study summarized the "results of 3,732 environmental samples collected between 2001 and 2010 from 38 states." (USGS, 2014) " . . . the results indicate that glyphosate and AMPA frequently add to the chronic low-level exposures to mixtures of pesticides and pesticide degradation products that plants and animals experience in a wide range of ecosystems in the United States." (USGS, 2014) "Glyphosate was detected in more than 50 percent of soil and

sediment samples, and water samples from ditches and drains, precipitation, large rivers, and streams. Glyphosate was detected in less than 40 percent of water samples from lakes, ponds, wetlands. . . . AMPA was detected in more than 80 percent of wastewater treatment plant samples; while glyphosate was detected in only about 10 percent of those samples." (USGS, 2014) The researchers stated the AMPA and glyphosate "detection frequency, median concentrations" (USGS, 2014) increased during the last four years of the study. Many studies continually show "the occurrence of herbicides in streams, the degradates of the herbicide were more common than the parent compound." (USGS, 2014)

Schutte, et.al. examined "*Herbicide resistance and biodiversity: agronomic and environmental aspects of genetically modified herbicide-resistant plants*". Their conclusion includes an overall reduction in pesticide use.

> *"Farmland biodiversity is an important characteristic when assessing sustainability of agricultural practices and is of major international concern. Scientific data indicate that agricultural intensification and pesticide use are among the main drivers of biodiversity loss. The analysed data and experiences do not support statements that herbicide-resistant crops provide consistently better yields than conventional crops or reduce herbicide amounts. They rather show that the adoption of herbicide-resistant crops impacts agronomy, agricultural practice, and weed management and contributes to biodiversity loss in several ways:*
>
> *(i)* *many studies show that glyphosate-based herbicides, which were commonly regarded as less harmful, are toxic to a range of aquatic organisms and adversely affect the soil and intestinal microflora and plant disease resistance; the increased use of 2,4-D or dicamba, linked to new herbicide-resistant crops, causes special concerns.*
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> (ii) *The adoption of herbicide-resistant crops has reduced crop rotation and favoured weed management that is solely based on the use of herbicides.*
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> (iii) *Continuous herbicide resistance cropping and the intensive use of glyphosate over the last 20 years have led to the appearance of at least 34 glyphosate-resistant weed species worldwide. Although recommended for many years, farmers did not counter resistance development in weeds by integrated weed management, but continued to rely on herbicides as sole measure. Despite occurrence of widespread resistance in weeds to other herbicides, industry rather develops transgenic crops with additional herbicide resistance genes.*
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> (iv) *Agricultural management based on broad-spectrum herbicides as in herbicide-resistant crops further decreases diversity and abundance of wild plants and impacts arthropod fauna and other farmland animals.*
>
> *Taken together, adverse impacts of herbicide-resistant crops on biodiversity, when widely adopted, should be expected and are indeed very hard to avoid. For that reason, and in order to comply with international agreements to protect and enhance biodiversity, agriculture needs to focus on practices that*

are more environmentally friendly, including an overall reduction in pesticide use."

Summary

The pervasiveness of glyphosate must be examined as to its cumulative impact. Honey bees have been experiencing the cumulative impact of low levels of pesticides that individually cause immediate illness or death. The impact of glyphosate is evident to beekeepers in the loss of diverse bee forage through the eradication of pollinator habitat, as well glyphosate interacting with the myriad of other insecticides, fungicides, adjuvants, surfactants, and "other ingredients" found in the 16,0000 other approved pesticides in use.

Research shows glyphosate is harmful to beneficial bacteria, mammals, beneficial insects, and pollinator forage. EPA must reassess the risk of this pesticide as 44 years of glyphosate research has unequivocally determined that its approved use is causing harm to human health and the environment. Based on expanding understanding of the un-anticipated negative effects of gyphosphate, its formulated products, and the multiple other pesticides that it is commonly mixed with, we are requesting EPA rescind the registration of glyphosate.

Sincerely,

Bret Adee, Board President

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