Neonicotinoids

Title	**Sorption mechanisms of neonicotinoids on biochars and the impact of deashing treatments on biochar structure and neonicotinoids sorption.**
Author Name	Zhang P [1], Sun H [2], Ren C [1], Min L [1], Zhang H [1]
Journal Name	Environmental Pollution
Year	2018
Volume and Issue	Volume 234
Pages	Pages 812-820
Abstracts	To elucidate the sorption affinity of *biochars* for *neonicotinoid* pesticides and the influence of *biochar* structure on sorption mechanisms therein, 24 *biochar* samples were obtained by *pyrolyzing* maize straw and pig manure at *pyrolyzing* temperatures (PTs) of 200–700 °C and by further *deashing* them using acids, and the sorption of three typical *neonicotinoids, imidacloprid, clothianidin* and *thiacloprid* on untreated and *acid-deashed biochars* were evaluated. All the biochar samples could efficiently adsorb the three *neonicotinoids* and multiple mechanisms were involved in sorption. With the increasing PTs, hydrophobic partition sorption increased, but had a declined contribution to the total sorption as revealed by a dual-mode model. Besides hydrophobic partition, specific interactions like *cation-π* electron donor acceptor (EDA) interactions (only for *protonated* IMI and CLO) and hydrogen bond and contributed much to the sorption on low-PT (≤500 °C) *biochars*, while the sorption on those high-PT (>500 °C) *biochars* mainly depended on pore-filling strengthened by *cation-π* and p/π-π EDA interactions. *Thiacloprid* showed stronger sorption on untreated *biochars* compared to *imidacloprid* and *clothianidin*, due to its greater ability to form hydrogen bond and hydrophobic interactions. *Acid-deashing* treatments increased the relative percentage contents of organic carbon, bulk O, *aromaticity* and O-containing functional groups, surface area and pore volume of *biochars*. The ash can bind *neonicotinoids* by specific interactions but played a negative role in the whole sorption on high-PT *biochars* by covering the inner sorption sites of organic moieties and blocking the *micropores* in *biochars*. The results acquired in the present study will help us to get deep insight in the comprehensive sorption mechanisms of polar pesticides on *biochar* and the effects of *biochar* structure.
Keywords	Biochar; Deashing treatment; Neonicotinoids; Sorption

Title	**A case for comprehensive analyses demonstrated by evaluating the yield benefits of neonicotinoid seed treatment in maize (Zea mays L.)**
Author Name	Alejandro I, Del Pozo-Valdivia, Dominic D.Reisig, Consuelo Arellano, Ron W.Heiniger
Journal Name	Crop Protection
Year	2018
Volume and Issue	Volume 114
Abstracts	With increased scrutiny of the neonicotinoid class of chemistry and its negative impact on the pollinator community, ecological cost/benefit analyses of agronomic crops that use these insecticides are increasingly important. This study initially sought to address the question of yield benefit due to neonicotinoid seed treatment in maize (Zea mays L.), using North Carolina yield contest data from 2002 to 2006, the time period from initial neonicotinoid seed treatment adoption to nearly ubiquitous adoption. However, we recognized that several agronomic practices, including planting date, hybrid selection, and fertilization, could affect the yield of this crop; moreover, they could be collinear with one another and the analysis could be skewed by early adopters of new technology. Hence, we used all available data to compare among traditional approaches and a data-mining approach for analyzing the impact of neonicotinoid seed treatment on maize yield. At-planting insecticide treatment was not an important predictor of maize yield. When analyzed using the traditional approach (T-test), yields were significantly higher for fields planted with neonicotinoid treated seed compared to seed without neonicotinoid; however, data-mining approach (Decision tree analysis) that took into account other factors contributing to yield did not identify seed treatments as important. The contrast in these results highlights the need for future carefully designed studies that target to minimize inter- and intra-site variation; and include measurements of additional factors that may influence yield, such as seeding rate, tillage, and herbicide applications, as input variables that are largely lacking in current approaches on the subject.
Keywords	Agronomic practice; Clothianidin; Corn; Decision tree analysis; Imidacloprid; PROC GLMSELECT; SAS enterprise miner work station; Thiamethoxam

Title	**Sorption, desorption and degradation of neonicotinoids in four agricultural soils and their effects on soil microorganisms**
Author Name	PengZhang, ChaoRen, HongwenSun&LujuanMin
Journal Name	Science of The Total Environment
Year	2018
Volume and Issue	615
Pages	Pages 59-69
Abstracts	In this study, the sorption, desorption and degradation of three *neonicotinoids, imidacloprid (IMI), clothianidin (CLO)* and *thiacloprid (THI),* and their effects on microorganisms in four different agricultural soils were systematically evaluated. The sorption of *neonicotinoids* on the soils was generally low with distribution coefficients (Kd) up to 16.2 L/kg at Ce of 0.05 mg/L following the order THI > IMI ≈ CLO, and the sorption were mainly influenced by the soil organic carbon content. The percentage degradation rates of the pesticides in different soils ranged from 25.4% to 80.9%, all following the order THI > IMI ≈ CLO. All the three *neonicotinoids* degraded much faster under non-sterilized conditions than sterilized conditions, indicating considerable contribution of biodegradation. The total degradation or biodegradation of *neonicotinoids* was the fastest in the soil with the highest organic carbon content, and the *neonicotinoids'* bioavailability was not the primary influencing factor due to their weak sorption. The chemical degradation was mainly affected by pH and cation exchange capacity. The degradation of *neonicotinoids* occurred mainly via nitrate reduction, *cyano* hydrolysis and *chloropyridinyldechlorination*. High-throughput sequencing data showed that the microbial community structure and abundance changed greatly in *neonicotinoid-spiked* soils as compared to the control, which might influence their degradation pathways. Some microbe families associated with the biodegradation of *neoniconoids* were found, which were all belonging to Proteobacteria and *Actinobacteria*. The degradation of *neoniconoids* influenced the soil nitrifying process. The present study provides valuable information for comprehensively understanding the fate of *neonicotinoids* in soils.
Keywords	Neonicotinoids; Sorption; Desorption; Degradation; Degradation pathways; Soil microorganism community

Title	Toxicity of neonicotinoids used in melon culture towards Apismellifera L.
Author Name	WhalamysLourenço de Araújo, MaurícioSekiguchi de Godoy, Patrício Borges Maracajá, Wesley Adson Costa Coelho, Bárbara Karine de Albuquerque Silva5, Adrian José Molina Rugama and Elton Lucio de Araújo and Jacinto de Luna Batista
Journal Name	African Journal of Agricultural Research
Year	2017
Volume and Issue	12,14
Pages	1204-1208
Abstracts	The cultivation of melon *(Cucumismelo L.)* is of great importance to the Brazilian economy, especially the semiarid regions of the Northeast region. Damage caused by pests have hindered the production, requiring that control measures be adopted, among them applications of chemical insecticides, including *neonicotinoids.* Studies have shown collateral damage to beneficial insects such as bees, important pollinators for 90% of angiosperms, especially melon. The objective of this study was to evaluate the toxicity on melon crops of *neonicotinoids* used to control pests related to honeybee, *Apismellifera L.* Bioassays were performed in the laboratory. The mortality of specimens over time when contaminated with the products *thiamethoxam, midaclopride* and *acetamiprid* (two commercial products by different companies) was evaluated. The exposure of bees to the compounds was performed by food ingestion (sugar candy) contaminated with the lowest and highest doses recommended by the manufacturers. Regardless of the dose, all insecticides were toxic, decreasing up to 11 days the useful life of bees as compared to the control (water + sugar candy), which survived 18 days on average.
Keywords	Contamination; pollinators; bees; Cucumis melo L.

Title	Dual Effects of N-NitroguanidineNeonicotinoids On Plants
Author Name	Georgieva M., B. Tsenov& A. Dimitrova
Journal Name	Genetics and Plant Physiology
Year	2016
Volume and Issue	7(3–4)
Pages	107–120
Abstracts	During the last decades of the 20th century, the use of insecticides in agriculture for harmful pest control became crucial. Insecticide studies have produced a diverse range of new products with a specific mode of action. However, the increased use of these chemical compounds in agriculture raises public debate because of the risk of spreading potentially damaging substances in the environment. The general use of *neonicotinoid* insecticides in agriculture and the presence of their residues in the environment can lead to soil contamination and toxicity that can cause adverse effects on non-target organisms, mainly invertebrates and plants of various ecosystems. The dual (beneficial and toxic) effects of *neonicotinoids* are already recognized but knowledge regarding some aspects of their impact on plants deserves attention. This article presents a short overview of the literature considering N-*nitroguanidine neonicotinoids* and their effects on plant physiology and genetics.
Keywords	Insecticide; N-nitroguanidine neonicotinoids; plants, toxicity.

Title	**Evidence for the effects of neonicotinoids used in arable crop production on non-target organisms and concentrations of residues in relevant matrices: a systematic map protocol**
Author Name	Katy L. James, Nicola P. Randall, Keith F. A. Walters, Neal R. Haddaway and Magnus Land
Journal Name	Environmental Evidence
Year	2016
Volume and Issue	5:22
Abstracts	*Neonicotinoid* insecticides (NNIs) have been routinely used in arable crop protection since their development in the early 1990s. These insecticides have been subject to the same registration procedures as other groups of pesticides, thus meet the same environmental hazard standards as all crop protection products. However, during the last 10 years the debate regarding their possible detrimental impact on non-target organisms, particularly pollinators, has become increasingly contentious and widely debated. Against this background, legislators and politicians in some countries, have been faced with a need to make decisions on the future registration of some or all of this class of insecticides, based on published evidence that in some areas is incomplete or limited in extent. This has created much concern in agricultural communities that consider that the withdrawal of these insecticides is likely to have significant negative economic, socio-economic and environmental consequences.
Keywords	Imidacloprid; Clothianidin; Thiamethoxam; Acetamiprid; Thiacloprid; Dinotefuran; Non-target organism; Exposure; Effects

Title	**Size matters: Significant negative relationship between mature plant mass and residual neonicotinoid levels in seed-treated oilseed rape and maize crops**
Author Name	Nicholas J.Balfour,NormanL.Carreck, HéloïseE.Blanchard, Francis L.W. and Ratnieksa
Journal Name	Agriculture, Ecosystems & Environment
Year	2016
Volume and Issue	Volume 215
Abstracts	*Neonicotinoid* insecticides have been under scrutiny in recent years due to their potential to harm bees. The European Union recently imposed a two year moratorium (2014–2015) on their application as a seed-treatment for certain bee-attractive crops. In this study we investigated the effect of mature plant size on residual *neonicotinoid* concentration in two widely grown, bee-attractive crops: oilseed rape (*Brassica napus*) and maize (*Zea mays*). Plants were collected from four commercial farms in Sussex, United Kingdom, three growing oilseed rape and *one maize*. All were grown from seeds treated with the *neonicotinoidthiamethoxam*. For both crops there was a significant negative relationship between mature plant mass and residual *neonicotinoid (thiamethoxam and its metabolite clothianidin)* concentrations ($p < 0.001$). Concentrations in plant tissues roughly halved with a four-fold increase in plant weight. These results indicate that agronomic practices that result in larger mature plants might have the potential to reduce the exposure of bees to neonicotinoid contamination of pollen and nectar.
Keywords	Honey bees; Non-target Species; Agronomy; Non-lethal Toxicity; Neonicotinoids

Title	**Neonicotinoid seed treatment products – Occurrence and relevance of guttation for honeybee colonies**
Author Name	Alexander Nikolakis, Juergen Keppler, Mark Miles, Ralf Schoening
Journal Name	JKI open journal system
Year	2015
Abstracts	Carbon sequestration — the process of moderating global climate change by removing carbon dioxide from the atmosphere and storing it in long-term mineral, organic, and oceanic reservoirs — is an important ecosystem service provided by protected natural areas. One type of carbon sequestration that has received attention in recent years is vegetative carbon sequestration, which is the sequestration provided through plant growth. While a number of countries have developed estimates of their national vegetative carbon sequestration capacity, no estimate exists for the National Park Service (NPS) administered areas, 85% of which are vegetated. This paper addresses that knowledge gap. Using federally created , peer-reviewed work on carbon sequestration rates based on a 5-year baseline period (2001-2005) of observed data, NPS boundary data, and landcover types, the study calculates the current tonnage and economic value of vegetative carbon sequestration services on all NPS units located in the continental U.S. Average projected sequestration amounts for the period 2006-2050 are also provided based on modeled data. Using conservative assumptions, we find that at present average annual carbon sequestration on NPS lands amounts to 17.5 million metric tons of CO2, valued at $707 million dollars using the current federal interagency working group social cost of carbon damage price of $40.45/metric ton. In the future years through 2050, absent any changes in land management (such as invasive species removal or fire management) carbon sequestration is predicted to fall by 31% to an average of 12.0 million metric tons of CO2 sequestered annually, due to factors such as a warming climate, invasive species, and increased fire hazards. Given the benefits to society of avoiding this future loss in carbon sequestration, funding for management actions for the National Park Service may be economically justifiable in order to mitigate this decline, although further research is needed to better understand how specific NPS practices can maintain current carbon sequestration levels. Guttation is a natural botanical phenomenon and describes the active excretion of liquid water (guttation fluid) by some vascular plants in form of droplets on the tips of leaves or on leaf edges. Guttation fluid may contain neonicotinoid residues after plant uptake from seed treatments. To clarify the relevance of the guttation fluid as a water source for honey bee colonies and to assess potential associated risks under conditions of agronomic practice, various studies were performed in key broad acre crops such as maize, sugar beet, potato (in-furrow application), winter barley and oilseed rape by placing honeybee colonies adjacent to freshly emerged fields for several weeks and by following up potential lethal and sub-lethal effects, as well as potential effects on colony performance.
Keywords	Pesticide; honey bee; guttation

Title	Management of Cabbage Aphid, Brevicoryne brassicae L. on Canola Crop Using Neonicotinoids Seed Treatment and Salicylic Acid
Author Name	M. F. Mahmoud, M. A. M. Osman
Journal Name	JKI open journal system
Year	2015
Abstracts	Cabbage aphid, Brevicoryne brassicae L. is one of the most important pests on canola worldwide and in Egypt. Field experiments were conducted in the Faculty of Agriculture Farm, Suez Canal University, Ismailia Governorate during 2012/13 and 2013/14 seasons. The efficacy of neonicotinoids seed treatment and spraying salicylic acid (SA) alone or in combination against B. brassicae and their impact on canola yield were investigated. Results showed that canola seeds treated with Gaucho 70% WS, Cruiser70% WS and Actara 25% WG were not effective for managing of B. brassicae in the late of growing season from 15th week to 21st week. However, SA application showed significant difference in reduction of infestation compared to control. Data revealed that seed treatment with neonicotinoid insecticides followed by foliar application with SA was associated with enhanced resistance against B. brassicae. Moreover, results showed relatively increase in seed yield/plant (g) and yield/fed. (kg) in this treatment than neonicotinoid insecticides seed treatment alone, or SA alone and control.
Keywords	Early plant growth; Germination; Insecticide; Soybean