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# The case for neonicotinoids in pelleted sugar beet seeds

## Introduction

Within the context of the current debate on neonicotinoids, CIBE wishes to explain with the present note that the use of neonicotinoid-treated beet seed pellets is a good agricultural practice in sustainable sugar beet growing.

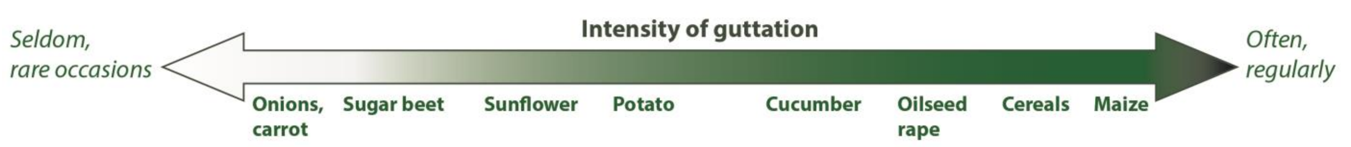
## 1. Neonicotinoid seed treatment in sugar beet does not endanger non-target organisms (including pollinators) and the environment

**Sugar beet is not attractive to pollinators** since it does not flower/produce pollen during the growing period used for sugar production.

The **release of neonicotinoids** to the environment **via guttation or harvest residues** is **very low** because:

- sugar beet is a **low guttation crop** with few and small droplets, and only at high humidity level (>90%); due to this comparative rareness of crop guttation in sugar beet (see illustration below), exposure to neonicotinoids from guttation seems to be unlikely because guttation droplets from sugar beet are unlikely to serve as a preferred source for e.g. water foraging bees;

**Classification of the intensity of guttation of various plants based on several greenhouse and field studies**



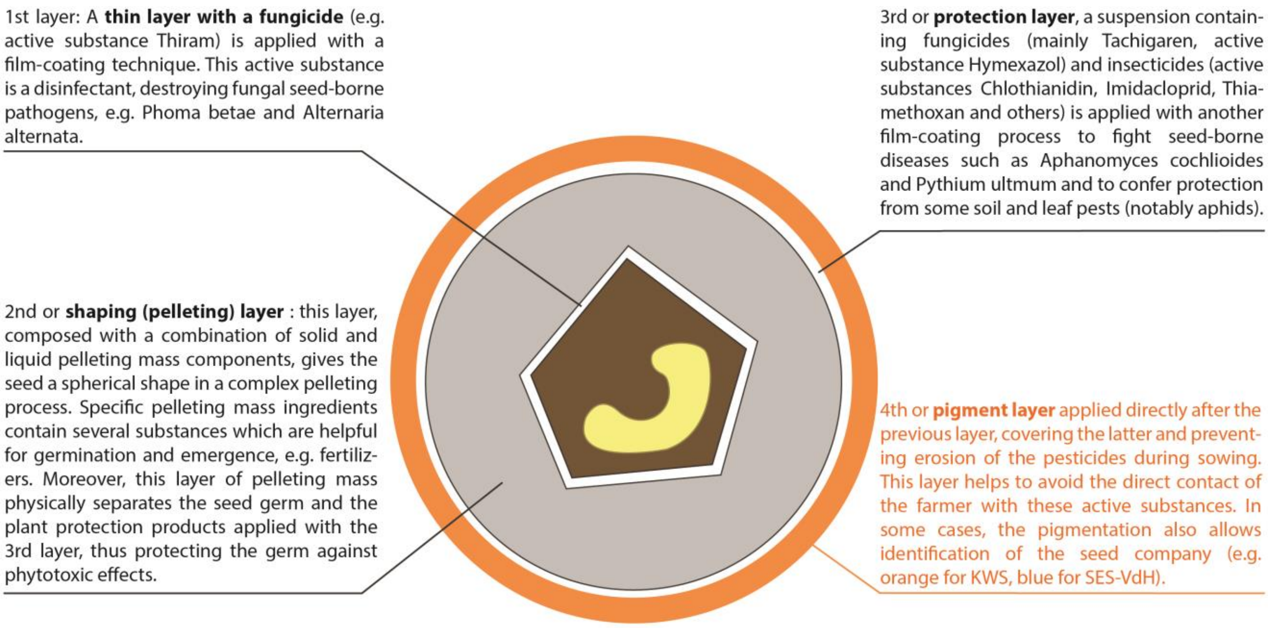

Source: Joachimsmeier et al, 2012. Frequency and intensity of guttation events in different crops in Germany

- neonicotinoids and their metabolites occur in **very low concentrations** in the soil after harvest. This low concentration, combined with the fact that practically no flowering plants are found in a beet field during the early stage of crop development (EFSA Peer reviews of the pesticide risk assessment for the active substances imidacloprid & clothianidin, November 2016) and especially after harvest, makes it less likely that non-target organisms in general and pollinators in particular risk being exposed to neonicotinoids (Baker et al 2002).

**Exposure of non-target organisms to neonicotinoids in sugar beet seed treatments at sowing is unlikely**: both seed pelleting procedure and drilling technique (mostly mechanical, causing far less dust drift than pneumatic drilling) conform to highest technical standards in terms of abrasion and drift of insecticides.

During sowing operations, beet seed are covered with about 2 to 2.5 cm of soil during placement of seed in the seedbed to avoid pellets being left on the surface. Hence, **the risk of the seed being spotted and eaten by birds is negligible**.

In pelleted beet seed, the insecticide **is not on the surface but underneath the outermost layer of the beet seed pellet.** This outside layer has a **high seed coating quality** with a very **high resistance of treated seeds to abrasion** (seed batches of sugar beet generally contain very small amounts of dust, Nuyttens et al, 2013) and thus a **low risk for dust emission** (see also illustration below).




Source: "Structure of pelleted KWS Sugar Beet Seed" & Kockelmann et al, 2010. "Seed production and processing"

Furthermore, the residual effect of the neonicotinoid seed treatment begins to end around 90 days after sowing; after this period of protection from pests in the early developmental stages of sugar beet, it is normal to observe considerable insect life in beet fields, be it crop pests (such as black aphids) as well as non-target organisms such as ladybirds, hover flies (*Syrphidae*) and green lacewings (*Chrysopidae*), whose larvae contribute effectively to the reduction of black aphid colonies. A study performed by Baker et.al. in 2001 showed that the insecticides applied as **seed treatments to the sugar beet have little or no effect on non-target invertebrates within the soil environment**. There were no significant effects on earthworms, acarians or collembola in soil cores, nor were there significant effect on carabids, staphylinids, spiders or collembola in pitfall traps.

**The principal argument to include neonic-treated sugar beet seed in the extended ban on neonicotinoids** is that a **risk to bees has been identified or cannot be excluded as regards residue in soil and succeeding crops**. These may take up the neonic residue from the sugar beet crop and thus present a risk to bees. Thus, EFSA's peer reviews of the pesticide risk assessments of the neonic active substances imidacloprid and clothianidin published in November 2016 concluded that for **all field uses considered in a succeeding crop scenario, a high risk was identified or could at least not be excluded**.
However, in order to pose a serious risk to pollinating insects, including bees, the succeeding crop:

- has to encounter sufficient residue of neonicotinoid in the soil once it has germinated and started to grow;
- has to take up sufficient amount of neonicotinoid residues from the soil so as to have an adverse on insects trying to feed on it or trying to pollinate it;
- has to flower at some stage during its crop cycle to attract pollinators;
- must have flowers which are attractive to bees.

The residues identified in succeeding crops are generally lower than reported residues from direct seed treated crops. Even in the direct seed treated crop, the effect of the neonicotinoid active substance is limited in time:

The **residue of neonic seed treatment in the sugar beet itself** has reached such **low levels** at **around 90 days after sowing** that it is **no longer effective against insect pests** (for example black aphids, caterpillars) attacking the beet **from late June** onwards.

It follows from this that the **neonicotinoid residue in the seed pellet which was not taken up by the beet seedling and therefore released into the soil** and thus in principle available for uptake by the roots of the growing sugar beet, is also **no longer present in significant quantity to control insect pests attacking the beet from late June** onwards.

**By the time the sugar beet are harvested** (usually from September through to December, i.e. **at least two and a half months after the neonicotinoid residue in soil and crop has ceased to be effective against insect pests**), **residue of neonicotinoids from seed treatment in sugar beet will be even lower**.

**By the time the crop succeeding sugar beet in the rotation is sown**, which would be after the harvesting of sugar beet at the earliest (and thus **well over two and a half months after the neonic residue has ceased to be effective against insect pests** attacking the beet) **residue of neonicotinoids from seed treatment in sugar beet would be even lower still**.

**By the time bees are likely to visit the succeeding crop** (be it a flowering crop or not) in the spring/summer following the beet harvest, **9 to 12 months will have passed since** late June of the preceding crop year, when **the residue of neonicotinoid from sugar beet seed treatment had ceased to be effective against insect pests attacking the beet**.

**In most crop rotations including sugar beet** (above 85% in for example Germany, in many countries above 90%), **sugar beet are followed by cereals** (regarded by most scientists as not a bee attractive crop) as the first succeeding crop. Other crops following sugar beet in the rotation include potatoes (a crop possibly visited by bees), maize (bee attractive crop), and (less frequently) other root crops, pulses and oil seeds, which may include bee attractive crops, may follow. Where oilseed rape is grown in the same rotation with sugar beet, it is usually grown one or two years before sugar beet and practically never constitutes the crop succeeding sugar beet, (winter oilseed rape needing to be sown around mid-August, well before sugar beet are harvested).

While it cannot be completely excluded that flowering succeeding crops form part of the crop rotation with sugar beet, they are

- very unlikely to be the dominant rotational crop and
- even more unlikely to be the first crop succeeding sugar beet.

Existing data show that **neonicotinoid residues in soil and guttation water of succeeding crops, whether they succeed sugar beet or other neonicotinoid seed-treated crops, constitute a very low risk for bees (see Section A below).**

**A. Studies of neonicotinoid residues in succeeding crops**

**For example, residues of imidacloprid and its metabolites** imidacloprid-5-hydroxy and imidacloprid-olefin (Ythier, 2014) as well as of **clothianidin and its metabolites** thiazolylnitroguanidine and thiazolylmethylurea (Jarratt, 2014) were determined in bee relevant matrices (e.g. in guttation, pollen and nectar) collected from untreated flowering crops cultivated as succeeding crops after *inter alia* sugar beet.

1. **Imidacloprid residue studies in France:**

**Studies conducted in France in 2014 on fields with a history of imidacloprid use**, and as such with natural aged soil residues of this active substance, showed that:

| | |
|---|---|
| **Before cultivation of untreated crops** | **Residues of imidacloprid in soil** ranged between 35 and 59 µg/kg dry *soil*; |
| **In guttation drops collected from untreated maize** | **Imidacloprid residue** ranged between less than the limit of detection (LOD) of 0.3 µg/L and 5.7 µg/L (and thus **several orders of magnitude below neonicotinoid values measured in guttation droplets from seed treated maize**), while **residues of imidacloprid metabolites** were below the limit of quantification (LOQ) of 1 µg/L and, in the case of the metabolite imidacloprid-olefine, even below the LOD of 0.3 µg/L. |
| **In maize pollen** | **Imidacloprid residue** ranged from below the LOD of 0.2 µg/kg) to 2.5 µg/kg, but was in all but one sample below 1 µg/kg and in at least 17 out of 27 samples below the LOQ of 0.6 µg/kg), while **residues of imidacloprid metabolites were below the LOD of 0.3 µg/kg.** |

| | |
|---|---|
| **Analysis of *Phacelia* pollen and nectar** | Revealed **generally low residue levels**, with:<br>• **imidacloprid residues in pollen mostly** (in 25 samples out of 27) **below the LOQ** of 0.6 µg/kg;<br>• **imidacloprid residues in nectar** ranging from below the LOQ of < 0.3 µg/kg) to 3.5 µg/kg, but with 26 out of 27 samples containing residues < 0.5 µg/kg;<br>• **residues of imidacloprid metabolites** in **pollen and nectar below the LOQ** of 1 µg/kg and in the case of nectar always below the LOD of 0.3 µg/kg. |
| **Analysis of oilseed rape (OSR) pollen and nectar** | Revealed **generally low residue levels**, with:<br>• **imidacloprid residues** ranging from below the LOQ of 0.6 to 1.3 µg/kg **in pollen** and from below the LOQ of 0.3 µg/kg to 0.7 µg/kg **in nectar**;<br>• **residues of imidacloprid metabolites** in **pollen & nectar always below the LOD** of 0.3 µg/kg. |

**2. Clothianidin residue studies in the UK:**

**Studies conducted in the UK in 2014 on fields with a history of clothianidin use** and as such with natural aged soil residues of this active substance, showing that:

| | |
|---|---|
| **<u>Before cultivation of untreated crops</u>** | **Residues of clothianidin in soil** ranged between 16 and 80 µg/kg dry soil. |
| **In guttation drops collected from untreated maize** | **Clothianidin residue ranged** between below the LOD of 0.3 µg/L and 43.0 µg/L, while **residues of clothianidin metabolites ranged between below LOD of 0.3 µg/L** and 1.9 µg/L. |
| **In maize pollen** | **Clothianidin residue** ranged from below the LOQ of 0.6 µg/kg to 1.5 µg/kg, while **residues of clothianidin metabolites** were **always below the LOD** of 0.3 µg/kg. |
| **In *Phacelia* pollen** | **Clothianidin residue** ranged from below the LOQ of 0.6 µg/kg to 1.5 µg/kg, while **residues of clothianidin metabolites** were mostly below the LOD of 0.3 µg/kg and always below the LOQ of 1 µg/kg. |
| **In *Phacelia* nectar** | **Clothianidin residue** ranged from below the LOQ of 0.1 µg/kg to the LOQ of 0.3 µg/kg, while **residues of clothianidin metabolites** were always below the LOD of 0.3 µg/kg. |

Furthermore, the issue of neonicotinoid residue in soil and crops following sugar beet continues to be investigated (see Section B below).

**B. Overview of ongoing residue/succeeding crop studies**

**1. 'Soil Residue' Study (DE):**

'Ad hoc' assessment of soil residues on ca. 50 sites, non-GLP (good laboratory practice). In 2017, soil concentrations were measured in 50 field soils in Germany where thiamethoxam-treated sugar beets had been grown in 2016. The mean thiamethoxam soil residue one year after sowing (Spring 2017) was 2.3 µg/kg, ranging from non-detectable to 7.7 µg/kg.

***Summary of thiamethoxam and CGA322704 soil residues following planting of thiamethoxam treated sugar beet in spring 2016***

| ***TMX product*** | **Results** | **Soil residues (µg/kg) April 2017** | | **Soil residues (µg/kg) July 2017** | |
|---|---|---|---|---|---|
| | | **Thiamethoxam** | **CGA322704** | **Thiamethoxam** | **CGA322704** |
| *Cruiser Force (actual application rates 54-72g a.s./ha)* | Mean[a] | 2.3 | 3.5 | 1.7 | 5.2 |
| | SD | 1.9 | 1.8 | 2.2 | 2.8 |
| | COV | 83.7% | 53.0% | 130.4% | 53.2% |
| | Maximum | 7.7 | 8.7 | 13.6 | 11.3 |
| | Minimum | <LOD | 0.54 | <LOD | <LOD |

*TMX = thiamethoxam; a.s. = active substance; SD = standard deviation; COV = coefficient of variance; LOD = Limit of Detection; LOQ = Limit of Quantification*

*Thiamethoxam LOQ = 1.0 µg/kg ; LOD = 0.3 µg/kg*

*CGA322704 LOQ = 0.1 µg/kg; LOD = 0.03 µg/kg*

*[a] Including all samples (n=50); <LOD considered as 0; <LOQ considered as ½ LOQ*

*Source: Evaluation of the risk from succeeding crops of thiamethoxam treated sugar beet seeds to honey bees, Syngenta note on thiamethoxam sugar beet seed treatment, 3rd October 2017*

2. **'Monitoring' study (DE & AT):**

'Ad hoc' assessment of soil, pollen & nectar residues on 3 sites, GLP

- Mix of bee-attractive surrogate succeeding crops (Oilseed rape -OSR-, *Phacelia*, potato, maize) which are planted into fields which previously had treated sugar beet the previous season.

On three field sites located across Germany and Austria where thiamethoxam treated sugar beet were planted in spring 2016, untreated succeeding crops (spring oilseed rape, maize, potato and *Phacelia*, represent a range of flowering succeeding crops likely to be in rotation with sugar beet were grown in 2017. Prior to sowing these untreated succeeding crops, soil samples were collected for residue analysis. During flowering, soil, pollen and nectar samples were collected for residue analysis. The first data available for oilseed rape (OSR), maize and *Phacelia* are presented in the table below. The final report will be available in March 2018.

***Summary of thiamethoxam pollen and nectar residues in sugar beet succeeding crops***
***Reference: Syngenta on-going study***

| TMX product in seed treatment | Crops | Application rate (g.a.s./ha) | Location | Crop succeeding sugar beet in 2017 | Maximum pollen/nectar residues (µg/kg) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Thiamethoxam | | CGA 322704 | |
| | | | | | Nectar | Pollen | Nectar | Pollen |
| Cruiser Force | Treated sugar beet sown in spring 2016, followed by an untreated flowering crop sown in spring 2017 | 75 | Groß-Umstadt, Germany | OSR | <LOQ | <LOQ | <LOQ | 1.5 |
| | | | | Maize | n.r. | <LOQ | n.r. | 2.5 |
| | | | | *Phacelia* | <LOQ | <LOQ | <LOQ | 6.3 |
| Cruiser Force | | 54 | Bergen, Germany | OSR | 0.55 | <LOQ | <LOQ | <LOQ |
| | | | | Maize | n.r. | 2.6 | n.r. | 2.6 |
| | | | | *Phacelia* | <LOQ | <LOQ | <LOQ | <LOQ |
| Cruiser 600 FS | | 60 | Remisbreite, Austria | OSR | n.d. | n.d. | n.d. | n.d. |
| | | | | Maize | n.r. | 2.5 | n.r. | <LOQ |
| | | | | *Phacelia* | <LOQ | <LOQ | <LOQ | <LOQ |

*TMX = thiamethoxam; OSR: Oilseed rape; LOQ = Limit of Quantification; n.a. = not relevant (maize does not produce nectar); n.d. = not determined: plants were not viable due to dry weather conditions*
*Thiamethoxam LOQ =1.0 µg/kg (pollen); 0.5 µg/kg (nectar)*
*CGA322704 LOQ = 1.0 µg/kg (pollen and nectar)*
*Source: Evaluation of the risk from succeeding crops of thiamethoxam treated sugar beet seeds to honey bees, Syngenta note on thiamethoxam sugar beet seed treatment, 9th November 2017*

**Thiamethoxam residues in nectar and pollen were very low in the untreated oilseed rape following planting of treated sugar beet the previous year**. Residues in nectar ranged from <LOQ (0.5 µg/kg) to 0.55 µg/kg, while pollen residues were all <LOQ (1.0 µg/kg). The 90th percentile thiamethoxam residue value in nectar is 0.25 µg/kg (assuming the <LOQ values are equal to half the LOQ). Maize pollen residues were also very low and ranged from <LOQ (1.0 µg/kg) to 2.6 µg/kg. The 90th percentile residue value in pollen is 0.74 µg/kg. Thiamethoxam residues in nectar and pollen of *Phacelia* were all <LOQ (1.0 µg/kg for pollen and 0.5 µg/kg for nectar).

**CGA322704 residues were also very low**, with pollen residues ranging from <LOQ (1.0 µg/kg) to 1.5 µg/kg, while nectar residues were all <LOQ (1.0 µg/kg). The 90th percentile CGA322704 residue value in pollen is 1.43 µg/kg (assuming the <LOQ values are equal to half the LOQ). Maize pollen residues were again low and ranged from <LOQ (1.0 µg/kg) to 2.6 µg/kg. The 90th percentile residue value in pollen is 1.8 µg/kg. CGA322704 residues were < LOQ (1.0 µg/kg) in all of the *Phacelia* nectar samples, and in all but one *Phacelia* pollen sample. The 90th percentile CGA322704 residue values are therefore <LOQ (1.0 µg/kg) for pollen and nectar.

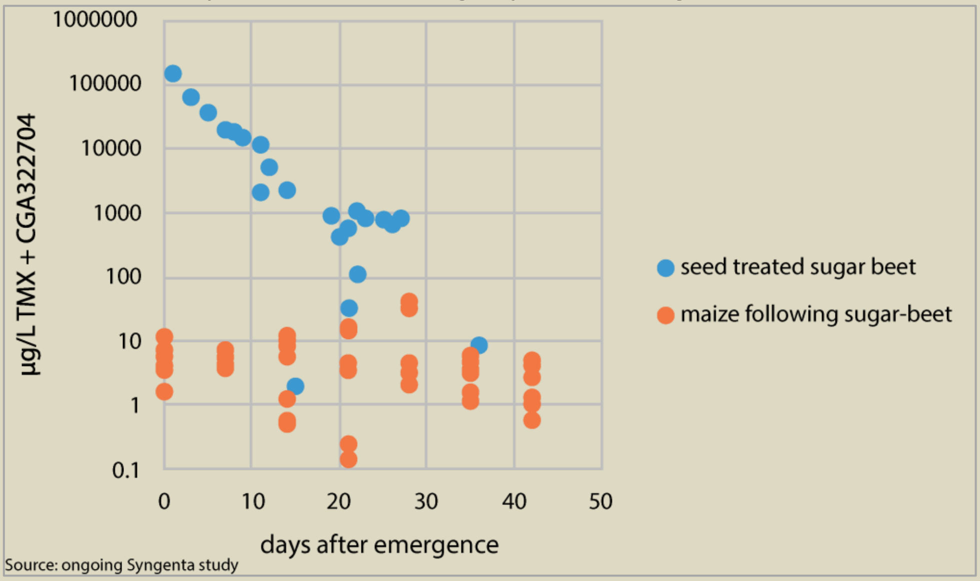
In summary, a maximum thiamethoxam residue of 0.55 µg/kg was detected in nectar (OSR) and 2.6 µg/kg in pollen (maize); a maximum CGA322704 residue of 6.3 µg/kg was detected in pollen (Phacelia) while all residues in nectar were non-quantifiable (<LOQ). Therefore, the maximum total residues for thiamethoxam + CGA322704 are 1.05 µg/kg (0.55 (TMX) + 0.5 (CGA322704) µg/kg) in nectar and 8.9 µg/kg in pollen.
These values are below the no observed effect concentrations of 10 to 20 µg/kg for bees, previously agreed by EFSA to be relevant for colony assessment (IfZ, 2017).

3. **Guttation study (DE & AT):**

Residues in guttation fluid of succeeding crops are lower than those in guttation fluid of treated crops. Therefore, the risk to bees from guttation in succeeding crops is expected to be low. This was confirmed in the most recent studies where maize was grown after treated sugar beet. Thiamethoxam-treated sugar beet seeds were sown in three field sites across Germany and Austria in spring 2016. In spring 2017, untreated succeeding crops were sown (spring oilseed rape, maize, potato and *Phacelia*), representing a range of flowering succeeding crops. As far as guttation is concerned, maize is a more than suitable proxy for cereals. Indeed, maize is a crop in which the frequency, duration and intensity of guttation is more pronounced than in other crops. Guttation samples from maize were also collected for residue analysis. The first data are presented below, further data are expected in early 2018 and a final report will be available in March 2018.

The data from the studies on treated sugar beet and those on untreated maize grown as a succeeding crop are shown in the figure below. The **residues in maize are very low** (**4 orders of magnitude lower than the peak residues in sugar beet guttation fluid**). Based on the maize guttation data, a bee would have to consume (not collect) 0.4 - 0.5ml guttation fluid per day to reach the LD50 or 10-day LC50 (4-5 times its bodyweight); it would need to consume 2.5 times its bodyweight in guttation fluid to exceed the 10-day NOEC (level at which no mortality is observed). It is worth recalling that the frequency, duration and intensity of guttation is more pronounced in maize than in other crops. Thus, the results obtained are a "worst-case" scenario, from which it can be inferred that the risk to bees from guttation from cereals succeeding sugar beet (the most frequent scenario in a rotation with sugar beet) can be expected to be even lower.

***Comparison of thiamethoxam + CGA322704 residues in guttation fluid sampled from sugar beet grown from thiamethoxam-treated seed with those in guttation fluid sampled from maize planted as a succeeding crop to treated sugar-beet***



Source: ongoing Syngenta study

4. **'Standard Exposure' study (DE, PL, AT, UK, IT):**

'Full control' assessment of soil, pollen & nectar residues on 8 sites, to GLP, where seed-treated sugar beet is grown and then followed directly after harvest by non-treated succeeding crops.
- Mix of bee-attractive surrogate succeeding crops (OSR, Phacelia, potato, maize)
- Report available in spring 2019
- Provide broad geographic spread of residue data in relevant bee attractive matrices

5. **Study of residue in soil of crops succeeding sugar beet in Spain** (commissioned by the autonomous community of Castile and Léon):

Results of analyses of soil samples taken in autumn 2017 from 6 fields where cereals were grown in 2017 following sugar beet in 2016 showed that all neonicotinoid residues detected were below the level of quantification (10 µg/kg).

So far, these results for flowering and non-flowering succeeding crops do not indicate a high risk for pollinators. Given the numerous dilution effects (degradation processes of active substance in soil and plant, soil tillage, number of years (at least two, in most cases 3 to 5) between sugar beet in crop rotation) as well as the fact that in most cases the crop succeeding sugar beet is not a flowering (i.e. pollinator attractive) crop, a risk to pollinators can be considered negligible.

Finally, there is considerable uncertainty regarding the risk assessments on the basis of which EFSA had concluded that for all field uses considered in a succeeding crop scenario, a high risk was identified or could at least not be excluded. In fact, it would appear that these risk assessments:

- were based on the single worst-case residue value recorded in the submitted succeeding crop studies;

- did not consider whether flowering crops occur in crop rotations with sugar beet;
- did not consider to what extent flowering crops occur in crop rotations with sugar beet;
- did not consider to what extent a flowering crop is the first crop succeeding sugar beet in a crop rotation;
- apparently define cereals as “bee attractive”, despite this definition being defined by EFSA themselves as “controversial evidence” and certainly not corresponding to the vast majority of scientific opinion, including recent publications by the United States Department of Agriculture (USDA) and the Dutch Board for the Authorisation of Plant Protection Products and Biocides (Ctgb).

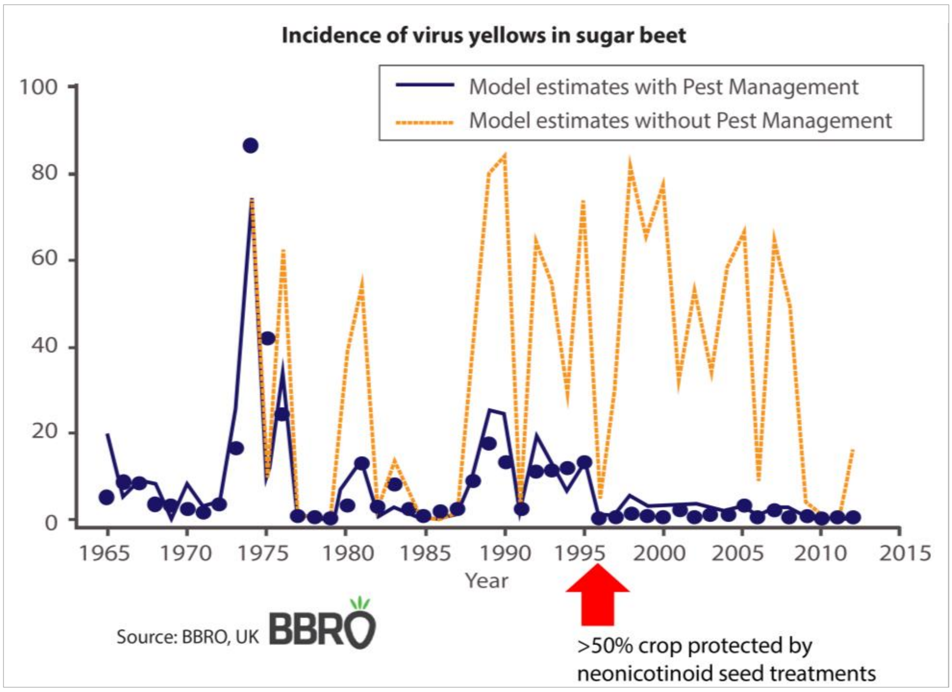
The new Conclusions of the EFSA impact assessments, published on 28th February 2018, essentially repeat the previous conclusions as regards risks to bees in the succeeding crop scenario for sugar beet, with essentially the same data gap (assuming a bee attractive succeeding crop, rather than a succeeding crop which is not attractive to bees, such as cereals, which account for over 90% of the crops succeeding sugar beet in the rotation).

Furthermore, validated methods for acute oral and contact Tier 1 studies on bumble bees, as well as validated methods for chronic oral toxicity tests for honey bees, which confirm the reliability and reproducibility of testing methods, were only adopted by OECD in October 2017.

2. **Neonicotinoid seed treatment protects the sugar beet crop from up to 15 different pests and associated diseases they may transmit and has a low environmental impact compared to post-emergence spraying**

**Effectiveness against beet yellows viruses (BYV, BChV and BMYV[1])**

Beet yellows viruses are beet diseases transmitted by aphids. Historically and in the absence of effective insecticides, it was responsible for the principal yield losses in beet cultivation. Nowadays this disease is controlled through the use of neonicotinoids which allows the control of aphids for up to 14 weeks post drilling until the plants reach the 12 leaf stage and the development of mature plant resistance to aphids (the virus vectors) (see also illustration below).




Modelling virus yellows in sugar beet, Qi et al, 2004

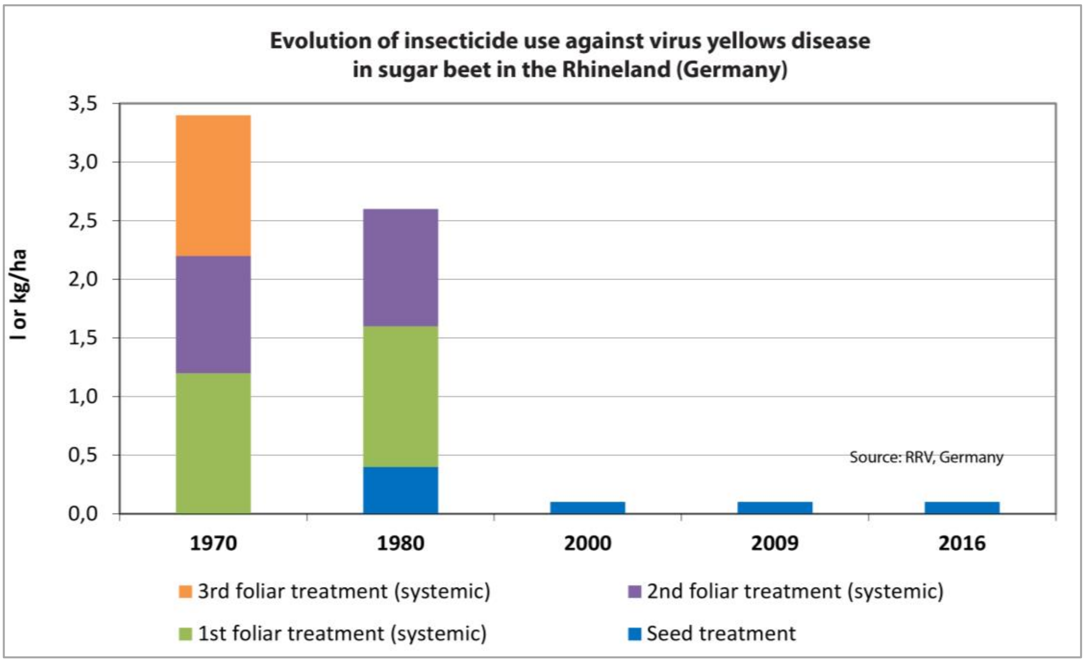
**Protection of the developing seedling**

The **systemic uptake of neonicotinoids** in plants leads to sufficient protection of all parts of the plant against many harmful arthropod pests (not only the peach potato aphid *Myzus persicae* and the early migrations of black

[1] BYV = Beet Yellow Virus; BChV = Beet Chlorosis Virus; BMYV = Beet Mild Yellow Virus

bean aphid *Aphis fabae*, but also e.g. *Atomaria* flies, *Blaniulus* millipedes, *Scutigerella symphyla* centipedes, *Agriotes* larvae, leatherjackets (partial control), *Collembola* springtails, *Pegomyia* flies, flea beetles, leaf beetles, thrips, *Lygus* bugs) during critical stages of crop growth (up to 12 weeks after sowing), which is the reason for their widespread use in seed treatments.

The **amount** of neonicotinoid active substance in a seed treatment per hectare is very **low** (between 30 and 90 g per unit of 100 000 beet seeds, with sowing rates ranging between 1.1 and 1.2 units/ha), with the percentage of area treated in a given field being much lower compared to foliar whole area applications (sprays). Some beet area in France, Belgium, and especially the Netherlands is not sown with neonicotinoid treated seed, but this is comparatively low (Hauer et al, 2016). Adopting the neonicotinoid-treated beet seed has allowed a reduction of insecticide application per hectare by over 95% (see illustration below).




The introduction of neonicotinoid seed treatment has allowed:

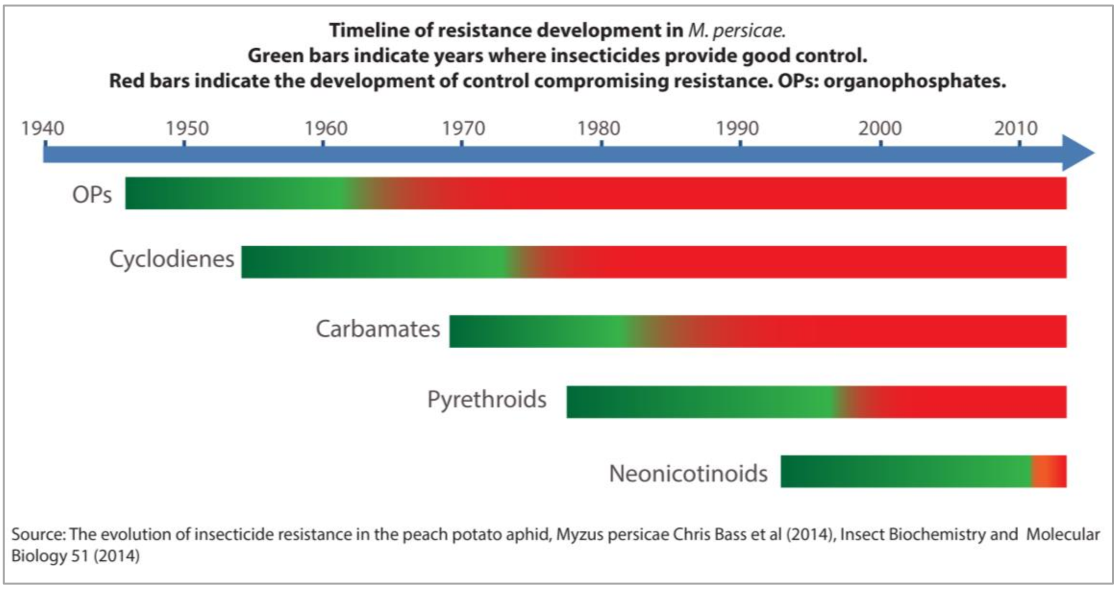
- **phasing out** the comparatively less efficient **carbamate seed treatments**, which allowed only moderate control of soil pests and did not control foliar pests appearing later in the growing season;
- **phasing out additional insecticide applications in furrow at sowing** (with quantities of active substance of 600 to 1 000 g/ha) to supplement the carbamate seed treatments;
- **strongly decreasing insecticide applications** against aphids or other foliar pests from May to July (now needs to be used on < 10% of beet area in Germany, < 5% in Belgium, the Netherlands, Denmark & Sweden, a certain % of these treatments being due to other foliar pests but a certain other % due to the need to control aphids in fields not sown with neonicotinoid treated beet seed, Hauer et al, 2016). Those strongly decreased insecticide applications also affected non-target organisms in the beet field.

**The advantages of using neonicotinoid beet seed treatment as opposed to returning to repeated foliar insecticide treatments or resorting to treatments which have not yet been tested** include:

- a much **lower risk of exposure** for humans and the environment, as well as for neutral, useful or pollinating insects.
- using **less active ingredients per hectare**,
- avoiding using active substances which have not undergone thorough scientific research as to their efficacy in sugar beet;
- thus avoiding resorting to less efficient treatments.

### 3. There is currently no sustainable alternative to neonicotinoid seed treatment

Neonicotinoids in seed treatments can hardly be replaced as a control measure for the most damaging pest *Myzus persicae* since **many aphid populations are resistant to organophosphates** (which ceased to provide good control of *Myzus persicae* some 40 years ago), **carbamates** (most of which are no longer authorised anyway) and **pyrethroids** (whose efficacy currently ranges from 0 to 20%). The timeline below illustrates the development of resistance in *M. persicae* to different groups of insecticides. Resistance to neonicotinoids has so far not occurred in sugar beet cultivation[2].




The control of aphids in sugar beet by spraying during the vegetation period (without neonicotinoids in seed treatments) is difficult because:

- the damage threshold to combat *M. persicae* is very low and, since spotting the green wingless aphids in the crop takes time, there is a lag before treatment is applied, which may be too late to prevent the crop from being infected with beet yellows (the benefit of the seed treatments is that they will provide protection for up to 12-14 weeks and will kill aphids immediately, limiting the spread of virus yellows);
- insecticide sprays during the vegetation period will not kill every aphid because these are typically hidden under leaves. Thus, spraying per se is not as efficient in controlling aphids as seed treatments with neonicotinoids.

This current lack of sustainable alternatives to neonicotinoid seed treatment in sugar beet has been confirmed by **A - The report** "**Neonicotinoids in European agriculture: Main applications, main crops and scope for alternatives**" published by CLM Research and Advice (an independent consultancy working in the field of sustainable farming and food and rural development) in September 2017, which concluded that for the main pests in sugar beet (flea beetle, pygmy mangold beetle, beet leaf miner, aphids, wireworms, leather jackets, springtails and thrips):

- **no non-chemical alternatives are currently available**,
- **chemical alternatives are available but these pose a high risk for pollinators** and **have a high environmental impact**, not least because most of them are applied as spray and therefore more likely to directly affect non-target organisms (including the pests' natural enemies);

**B – The ANSES** (French Agency for Food, Environmental and Occupational Health & Safety) **intermediate opinion on the assessment weighing the risks and benefits of preparations based on neonicotinoids and their chemical & non-chemical alternatives**, published 9th March 2018, which concludes that:

- there are **no sufficiently effective & operational non-chemical alternatives against aphids & flies**;
- the **sole chemical alternatives are foliar applications** (which, apart from having a **far greater environmental impac**t, are **more difficult to position over time** and therefore **more uncertain in terms of efficacy**).

[2] According to the research paper from which the figure below has been quoted, *M. persicae* resistance to neonicotinoids is currently restricted to peach growing regions (where orchards are sprayed) in southern France, Spain and Italy. The same paper also notes that despite reliance on neonicotinoids, particularly for certain crops, which must over many years have exerted strong selection for resistance, it took 20 years for resistance to emerge (R81T mutation in the nAChR b1 subunit) that was sufficiently potent to result in control failure.

## 4. Estimating the economic consequences if neonicotinoid seed treatment in sugar beet were banned

The neonic beet seed treatment protects the plant during its first 12 weeks of growth, when it is most exposed to harmful insect pests, in particular – but not only - sucking insects (mainly green aphids Myzus *persicae*) which are vectors of the disease virus yellows in sugar beet. Recent farm trials carried out in France during this beet season 2017 (when beet was sown without neonic seed treatment), confirmed intense virus yellows in this first year without effective protection against the vectors of the disease, and thus a rapid spread of the virus in the event of a general ban neonics. According to work carried out by the French Beet Research Institute ITB, it is estimated that stopping the use of neonicotinoids in beet seed treatment would lead to an average **national yield loss of 12%** compared to the current level (around 10.5 t/ha). However, **in the regions which are particularly vulnerable to virus yellows epidemics due to mild winters** (Normandy and by extrapolation all EU regions close to the sea) and their favorable consequences for large aphid populations during in the early stages of beet growth, **yield losses can be up to 50% in the most affected plots**.

In other countries/regions, yield losses due to BYV alone in the absence of effective protection may be considerably higher (e.g. in Austria between 10 and 20%, in Belgium between 20 and 40%, in the Netherlands from 5 to 20% on 40 to 50% of beet area, in the UK up to 49%).
There is clearly to date no sustainable alternative to neonics in the effective control of aphids (as well as other insect pest, during the early stages of crop growth. The existing foliar insecticide treatments (pyrethroids and carbamates) would not contain the spread of the virus since the aphids are already highly resistant (over 80% of the population) to these substances. A study carried out by ANSES (French Agency for Food, Environmental and Occupational Health & Safety) in 2014 on 6 populations of *M. persicae* in oilseed rape showed that **all individuals are susceptible to neonicotinoids**, while **a very large majority of them had a double resistance to pyrethroids and carbamates**, casting a very serious doubt on the efficacy of these families of insecticides.

Moreover, the resulting increased instability in yield will endanger the efficiency of the whole sugar value chain. The ban of neonicotinoid seed treatment would thus jeopardize an entire sector that contributes positively to the EU agri-food and bioeconomy.

## 5. Conclusion

As explained above, there is no justification for banning the use of neonicotinoids seed treatment in sugar beet growing because of environmental concerns. The risk of non-target organisms coming into contact with neonicotinoids from treated beet seed pellets is very low, firstly because the active substance is inside the beet pellet rather than on its surface and secondly because the sugar beet crop is not much in contact with non-target organisms, notably pollinators.

We therefore consider the use of neonicotinoids in pelleted sugar beet seeds the safest and most efficient way to protect individual plants of the sugar beet crop from areal pest (aphids etc…) and soil pests. Furthermore, we consider the current use of seed treatment in sugar beet to be safe and very low risk to non-target organisms, including pollinators.

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