The EU Moratorium on Neonicotinoids:

Have the Consequences for Honey Bees Been Overstated?

By John Hoar, Spray Liaison, Hampshire BKA

Three years after the EU imposed a restriction on the use of neonicotinoids, John Hoar examines its impacts.

From 1 December 2013, the European Commission restricted the use of neonicotinoid insecticides as seed treatment on bee-attractive plants, one such plant being oilseed rape. Neonicotinoid seed treatments were introduced on oilseed rape in 2000 and in 2014, 76% was sown with treated seed.

Insecticide seed treatment provides protection from the time of sowing to the emerging seedlings, at the time of crop establishment when they are most vulnerable to pest damage. The main pests are the cabbage stem flea beetle (CSFB) and the peach-potato aphid. The period of protection usually last a number of weeks. Seed treatment may in itself be sufficient; if not it may reduce the number of subsequent required foliar sprays (Expert Committee on Pesticides, 2015).[1]

The reason for the moratorium is that neonicotinoids are absorbed into a plant and can find their way into nectar and pollen when the crop is flowering. There is ongoing research to determine the residues in oilseed rape flowers and their effects on bees and bee colonies.[2]

The 2013–2014 season passed as before, because farmers were able to sow autumn oilseed rape with neonicotinoid treated seed before 1 December 2013. Harvests in 2015 and 2016 were grown from seed without neonicotinoids.

Table 1. Average number of insecticide spray rounds on UK oilseed rape

Year	Insecticide
2000	1.3
2002	1.5
2004	1.8
2006	1.9
2008	2.0
2010	1.8
2012	2.2
2014	2.4

Preceding the moratorium, the BBKA expressed concern about the possible consequences. A press release (5 April 2013) stated: "*Perhaps more importantly, the BBKA does not wish to see any action taken that may in itself cause damage to pollinators for example by the inevitable re-adoption by farmers of older superseded and more hazardous chemical agents being re-employed in crop protection.*"

Carreck & Ratnieks[3] described a scenario whereby: "*Denied neonicotinoid seed dressings, farmers who grow oilseed rape will resume frequent insecticide spraying as occurred ten years ago. Under the moratorium, it is likely that oilseed rape will be sprayed with synthetic pyrethroids*". As if to confirm the scenario envisaged before the moratorium, recent BBKA statements include: "*The EU moratorium on the use of three neonicotinoids on bee-attracting crops has obliged farmers to return to spraying.*" (*BBKA News*, June 2016, p218) and: "*It's ironic that the ban on neonicotinoid pesticides has meant that farmers have had to revert to older chemical formulas which are sprayed.*"(Press release, 12 September 2016).

In summary, the BBKA position before the moratorium was concern that farmers might employ older more hazardous chemicals with synthetic pyrethroids being used on oilseed rape. It has issued recent statements that farmers had reverted to spraying older chemicals. Yet, since December 2013 there has been no Wildlife Incident Investigation Scheme (WIIS) case of honey bee mortality involving bee-attractive crops and authorised insecticides.[4] Therefore, it is reasonable to ask whether these predicted consequences of the moratorium have been overstated. The conclusions I have arrived at are based on an overview of the insecticides used on oilseed rape before and during the moratorium.

Pesticide use on oilseed rape 2000–2014

Pesticide usage on oilseed rape was extracted from the biennial Fera *Pesticide Usage Survey Reports for Arable Crops*. The reports quantify pesticide usage by weight, area and trends over time.

Table 1 lists the average number of insecticide spray applications on oilseed rape, showing an increase since 2000. In particular, insecticide sprays increased even as neonicotinoid seed treatments were rolled out between 2000 and 2014. Table 2 shows the percentage of oilseed rape sown in autumn and spring, almost all of which is autumn sown. Table 3 shows the percentage of oilseed rape treated with insecticide sprays and seed treatment. It is evident that the majority received both seed treatment and spray. Some crops received no insecticide at all, or only a spray or only seed treatment, but the majority received both.

Fera survey reports record the monthly application of pesticides. For autumn-sown oilseed rape occurs between September and the following August. Since 2002, approximately half of spray insecticides have been applied to oilseed rape in autumn and the remainder during spring.

The active substances most used in insecticide sprays are the synthetic pyrethroids, accounting for 97% of oilseed rape by area in 2014. Since 2004, the five most common active substances used have been lambda-cyhalothrin, cypermethrin,

Table 2. Percentage of oilseed rape crop sown in autumn and spring

Year	Autumn	Spring
2000	89%	11%
2002	93%	7%
2004	85%	15%
2006	96%	4%
2008	97%	3%
2010	97%	3%
2012	98%	2%
2014	98%	2%

tau-fluvalinate, alpha-cypermethrin and zeta-cypermethrin. Table 4 shows the average proportion of full-label rate for the five pyrethroids, from which an increase can be observed over time.

As noted above, neonicotinoid seed treatment protects the crop during the first 6-8 weeks of seedling establishment and this might reduce the subsequent number of required foliar sprays. However, in respect of oilseed rape, Budge *et al* (2015) noted that the reduction in foliar insecticide sprays occurred only in the autumn and not when oilseed rape was flowering.[5]

In summary, since neonicotinoids were introduced in 2000, the majority of oilseed rape has received both insecticide seed treatment and foliar spray in the autumn and spring. However, seed treatment provides plant protection during crop establishment, which may reduce the need for autumn sprays, but not in spring when oilseed rape is flowering.

Insecticide use during the moratorium

Neonicotinoid seed treatment provides for reduction of damage by flea beetles and control of aphids during the early stages of crop establishment. The most readily available alternatives to neonicotinoid seed treatment for the control of cabbage stem flea beetle (CSFB) are pyrethroid spray treatments.[6]

In 2015, impact assessments on the neonicotinoid moratorium were conducted

Table 3. Percentage UK oilseed rape treated with insecticide spray and neonicotinoid seed treatment

Year	Spray	Seed
2000	74.2%	<1%
2002	79.8%	36%
2004	83.0%	63%
2006	85.0%	68%
2008	87.5%	64%
2010	81.7%	78%
2012	86.9%	65%
2014	83.1%	76%

on oilseed rape in England and Scotland. Scott and Bilsborrow (2015) carried out a survey of 205 farms in England and found that 82% of farmers used insecticides against CSFB attacks (actual or predicted), with an average crop being sprayed twice.[6] They estimated that in England, the quantity of insecticide active substance used in autumn 2014 was 2.5 times higher than in 2012. The insecticide active substances sprayed by area were pyrethroids (87%), pyridine (11%) and neonicotinoids (3%). Cypermethrin and lambda-cyhalothrin accounted for 80% of pyrethroids used.

Hughes *et al* (2015) surveyed 96 farms in Scotland and found that in autumn 2014, 61% of farmers used insecticides against CSFB attacks, an average of 0.71 sprays per farmer. In 2013 by comparison, 47% of farmers applied an autumn insecticide spray, an average of 0.48 sprays per farmer.[7] Overall, the average number of autumn insecticide sprays increased by nearly 50% between 2013 and 2014, although some sprays in 2014 were precautionary. Pyrethroids accounted for 94% of insecticide active substances sprayed by area. These included lambda-cyhalothrin (32%), cypermethrin (31%), zeta-cypermethrin (21%), alpha-cypermethrin (4%) and tau-fluvalinate (3%).

In summary, the main changes resulting from the moratorium on seed treatment were additional spray(s) in the autumn, the majority being the pyrethroids.

Table 4. Average proportion of full-label rate of the main pyrethroid insecticides

Year	Lambda-cyhalothrin	Cypermethrin	Tau-fluvalinate	Alpha-cypermethrin	Zeta-cypermethrin
2002	0.73	0.64	n/a	0.61	1.02
2004	0.89	0.59	0.74	0.60	1.02
2006	0.83	0.57	0.85	0.61	0.99
2008	0.86	0.63	0.87	0.57	0.95
2010	0.84	0.67	0.88	0.58	0.98
2012	0.85	0.66	0.91	0.57	0.99
2014	0.87	0.84	0.96	0.99	0.97

Conclusions

There is a perception that neonicotinoid seed treatment replaced insecticide sprays on oilseed rape, such that the moratorium obliged farmers to return to spraying. As Tables 1 and 3 show, before the moratorium the average oilseed rape crop received both seed treatment and insecticide spray.

While it is correct that as a result of the moratorium, autumn sprays increased compared with 2012 (England) and 2013 (Scotland), this should also be seen in the context of increasing insecticide sprays since the introduction of neonicotinoid seed treatment in 2000. The claim that farmers sprayed more frequently in the early 2000s is not borne out by Fera data.

The forecast that farmers would use pyrethroids has been confirmed by the impact assessment surveys in 2015. Concern that older, more hazardous chemicals might be used has not. The pyrethroids identified have been in use for many years, while organophosphates were withdrawn from use on oilseed rape in October 2000. An important point is that replacement sprays are applied in the autumn, not when oilseed rape is flowering and honey bees are foraging. Finally, it is of reassurance that there have been no WIIS cases involving bee-attractive crops and authorised insecticide sprays since the moratorium commenced. So overall, it is reasonable to conclude that the EU moratorium on using neonicotinoid seed treatments on oilseed rape has so far not increased the risk to honey bees.

References

1. Expert Committee on Pesticides. *Emergency authorisation of Cruiser OSR and Modesto on oilseed rape*, 2015.
2. Drijfhout F. Neonicotinoids. *BeeCraft* May 2015; pp7–10.
3. Carreck N and Ratnieks F. Will neonicotinoid moratorium save the bees? *Research Fortnight* 2013; 425: 20–22.
4. http://www.hse.gov.uk/pesticides/topics/reducing-environmental-impact/wildlife/wiis-quarterly-reports
5. Budge G *et al.* (2015) Evidence for pollinator cost and farming benefits of neonicotinoid seed coatings on oilseed rape. *Scientific Reports* 2015; available at www.nature.com
6. Scott C, Bilsborrow P. *An interim impact assessment of the neonicotinoid seed treatment ban on oilseed rape production in England.* Newcastle University; 2015.
7. Hughes J *et al. Survey of Scottish winter oilseed rape cultivation 2014/15: Impact of neonicotinoid seed treatment restrictions.* Science and Advice for Scottish Agriculture (SASA); 2016.