18 May 2015

Chief Scientific Adviser's opinion on the application from the NFU for an emergency authorisation for the use of Neonicotinoid seed treatments on oilseed rape in England.

Background

1. The current restrictions on the use of three of the most potent neonicotinoids - clothianidin, thiamethoxam and imidacloprid – were introduced in 2013 mainly on a precautionary basis pending further investigation of their potential effects upon non-target insect, especially domesticated and wild bees.

2. The evidence base supporting this restriction has been weak but there are indications, based mainly upon laboratory studies, that neonicotinoids could have non-target environmental effects[1]. It remains very unclear whether those effects are important in terms of their extent and severity, and especially about whether they any significant role to play in the dynamics of key insect populations. This is the key test that is needed in order to properly assess whether neonicotinoids cause disproportionate harm to the environment.

3. In general, further research published since the introduction of the EU restrictions has contributed little to answering this key question. However, a single study conducted in Sweden[2] showed no measureable effects on honey bees but did demonstrate negative effects on bumble bees and possibly also solitary bees. This single study had low statistical power and needs to be repeated but it helps to confirm inferred effects suggested by a number of studies that have a less robust design.

4. There are important reasons to be careful about what the scientific literature says about the environmental effects of neonicotinoids. This is because of likely systematic biases in studies, and in the literature as a whole, caused by researchers actively seeking these negative effects without placing equal emphasis on investigating the counter-factual of neutral or even positive effects.

[1] A restatement of the natural science evidence base concerning neonicotinoid insecticides and insect pollinators (H. Charles J. Godfray, Tjeerd Blacquière, Linda M. Field, Rosemary S. Hails, Gillian Petrokofsky, Simon G. Potts, Nigel E. Raine, Adam J. Vanbergen and Angela R. McLean). Proceedings of the Royal Society (http://dx.doi.org/10.1098/rspb.2014.0558)

[2] Seed coating with a neonicotinoid insecticide negatively affects wild bees (Rundlöf et al). Nature (2015) doi:10.1038/nature14420.

5. There are two emerging issues that need to be considered and that mean there may be greater uncertainty around the risks from neonicotinoids than previously thought. These are:

    a. Evidence that honey bees which are used within toxicity testing may be less sensitive to neonicotinoids than some species of wild bees[3]. This questions whether the standard toxicity tests carried out on neonicotinoids to licence their use have sufficient rigour to provide assurance that these chemicals do not have important non-target effects.

    b. Evidence of the extent to which the therapeutic effects of neonicotinoids themselves result in outcomes that are positive when all the positive and negative effects are considered, and when these chemicals are used at commercial scales. There has been insufficient work done to properly assess whether the benefits outweigh the costs. Many of these questions arise because the evidence of how neonicotinoids advantage crops and the growers has not been well constructed and has not, in general, been subjected to open peer review and public scrutiny. The same level of scrutiny and standards need to be applied to the evidence of efficacy as is being applied to that of negative effects on the environment and, at present, this does not appear to be happening.

Documentation relating to the current application

6. The following documents were submitted to me for consideration:

    a. *Response to CRD questions on the application for emergency approval of neonicotinoid based seed treatments.*

    b. *Report on the sampling of commercial winter oilseed rape fields for the presence of turnip yellows virus (TuYV) in spring 2015. N M Adam & D Pop, Bayer CropScience Ltd, Cambridge*

    c. *CRUISER OSR EMERGENCY AUTHORISATION TERM SHEET – 2014*

[3] Differential sensitivity of honey bees and bumble bees to a dietary insecticide (imidacloprid). (Cresswell JE, Page CJ, Uygun MB, Holmbergh M, Li YR, et al.) Zoology (2012) 115: 365-371.

Seed coating with a neonicotinoid insecticide negatively affects wild bees (Rundlöf et al). Nature (2015) doi:10.1038/nature14420.

d. CSFB: The extent of damage investigated. Caroline Nicholls, Research & Knowledge Transfer Manager AHDB Cereals & Oilseeds

I am aware that this is not all of the information available and, in particular, the document produced by Syngenta "*Overview of available data to demonstrate impact of neonicotinoid removal in UK WOSR crop*" and the AHDB/HGCA report "*Assessing the impact of the restrictions on the use of neonicotinoid seed treatments*" (April 2015)[4] were considered by the CRD assessment and provided important information. I was only able to access the second of these documents.

7. The current system for growing winter OSR has been developed under the assumption that chemical pest controls are widely available. This means that it would be reasonable to predict widespread damage to crops should these chemicals be withdrawn from use. However, the application comes at a time when the crop has not yet been harvested so judgements about the end point costs in terms of both yield and profit cannot be made.

8. The evidence submitted in these documents comes in a form that makes it difficult to judge whether the evidence of negative effects is robust. For example, it is not possible to know whether presence of turnip yellow virus, which was the measured variable in the survey provided by Bayer, actually equates to disease presence, let alone a disproportionate negative effect upon yield. There is very little information, other than some broad statements, to support the claim that this will have an effect upon yield. There appears to be a general presumption throughout these documents that (i) any yield reduction caused by disease is disproportionate and requires treatment, and (ii) treatment will have sufficient impact to remedy the problem. Overall, the case supporting these presumptions is not well constructed. Even following up on the little literature that is referenced failed to help me. For example, a referenced document (Stevens et al 2008) in the survey of turnip yellow virus presence was unavailable in the on-line scientific literature. The "overview" provided by Sygenta and referred to in paragraph 6 is also not publically available.

9. Perhaps the most interesting result in the turnip yellow virus survey was the comparison between Neonicotinoid treated and untreated sites (Table 3) but the sample size is so small and the description of the methods so sketchy that it would not be appropriate to draw any conclusions for this information.

10. The NFU submission makes almost no effort to link its assertions to verifiable, published evidence or provide appropriate, balanced interpretation of the

[4] Assessing the impact of the restrictions on the use of neonicotinoid seed treatments (Nicholls, C) (2105). HGCA, Agriculture and Horticulture Development Board, Project Report No. 541.

evidence. The following examples illustrate these issues. Cases in the document are not limited to these illustrations:

"*It is generally recognized that early sown crops in mild autumns are the ones most vulnerable to damaging attacks by CSFB*" – This is anecdotal.

"*Larval damage however was historically regarded as the most serious threat to crop yields, with 5 larvae per plant equating to a yield loss of 0.34 t / ha.*" – No reference has been provided to a quality-controlled publication to support this statement.

"*Work carried out at Brooms Barn for HGCA shows that early infection (September / early October) has the greatest effect on crop yield.*" – No reference has been provided to a quality-controlled publication.

In section 2.2.2 there is cross-reference to the paper from Adam and Pop about turnip yellow virus including a diagram together with an estimated yield loss that does not appear within the Adam and Pop paper. There is no explanation as to how this diagram has been derived.

"*Stevens et al, 2008, reported that in 4 trials where TuYV ranged from 21%-100%, the yield penalty in untreated crops was 12% in comparison to crops treated with Modesto (clothianidin + beta-cyfluthrin).*" Apart from the difficulty there was in sourcing the paper by Stevens et al (2008), there is no assessment of whether a yield penalty of this level in trials would be lost within the normal variability in yield associated with operations at commercial scales.

11. The evidence from crop monitoring of an increase in flea beetle presence in crops is notionally a cause for concern. But no case is constructed to examine what the cause or consequence of this might be. There is a presumption that the reader will know the functional relationship between yield loss and flea beetle presence. No information is given to show that such an increase is actually likely to be a problem for farmers and of whether this is a significant additional risk when all other risks are accounted for. The HGCA study[5], although quite limited in terms of the quality of the evidence provided did not provide a convincing case for any relationship. The accompanying slides[6] provided a much more useful picture and a personal visit by me to Suffolk in May showed considerable areas of distressed winter OSR crops and numerous fields in which growers had partly re-seeded the fields with a different crop. However, it is not possible to know the

[5] Assessing the impact of the restrictions on the use of neonicotinoid seed treatments (Nicholls, C) (2105). HGCA, Agriculture and Horticulture Development Board, Project Report No. 541.

[6] CSFB: The extent of damage investigated. Caroline Nicholls, Research & Knowledge Transfer Manager AHDB Cereals & Oilseeds

extent to which this differs from the normal range of crop failure when pesticides were available.

12. The analysis in the NFU statement of risk of flea beetle crop damage is superficial. There are semi-quantitative descriptions of the distribution of timing of drilling and the risks associated with this variable but these are quite limited in terms of how they have been grounded in actual data. There was no assessment of how risk reduction practices, e.g. associated with delaying drilling, could mitigate the effects of flea beetle infestation and what the magnitude of this effect might be relative to the use of chemical treatments.

13. There are undoubtedly a complex set of options available to farmers for treating the main pests associated with growing winter OSR. I was not confident that the NFU paper had examined these options. The paper has been constructed as an advocacy document and, therefore, needs to be partially discounted in terms of the evidence it presents. It is not a balanced assessment that draws towards a conclusion that there is a case for use of the pesticides when assessed against any alternatives. There is little evidence of innovative thinking.

14. The definitions involving “under threat” and “at risk” and also the assessments made against these definitions were confusing. When section 3.1.3 refers to “*The levels of CSFB larvae in the current crop is testament to this*”, one has to presume this is referencing the graph showing crop monitoring data, although no specific linkage is made between this statement and the data. It is very unclear how the threat/risk categories in the subsequent table (section 3.2) have been derived. In the table, the data do not all make sense. The column associated with “Damage by flea beetle” is impossible to interpret based upon the scant description provided and the column showing presence of flea beetle larvae uses a relative classification scheme without defining the scheme.

15. The stewardship scheme has some significant weaknesses. It does not make clear who will be held accountable for the use of pesticides and on what the basis would be for accountability. The proposal states that “*effective stewardship schemes for both products were in place during approval period without any incident*”. It would be useful to know what control methods have been in place to show the level of assurance that could be attributed to this statement. The document goes on to state that “*both companies have control of where the product is supplied to and the conditions by which the seed is treated and sold on but not how and where it is sown by the growers*”. Since the way in which these chemicals are applied at point of use by growers is critical to both the level of risk to crops and the environment, any effective stewardship scheme would need to consider where accountability lies at each step in the supply chain, and how this is monitored, all the way to the point of use.

Conclusion

16. Since the current system for growing winter OSR has been developed under the assumption that chemical pest controls are widely available there is likely to be a *prima facie* case for the use of neonicotinoids to control infestations on winter OSR crops in England. However, the documentation presented here falls considerably short of what should be needed to have confidence that any Emergency Authorisation is based upon appropriate consideration of risk. Neither the data that has been gathered (and that was available to me) nor the presentation of the case have appropriate levels of robustness. The stewardship scheme also falls short of providing assurance that the chemicals would be used to deal with the highest risk problems.

17. This is especially unfortunate because there are likely to be specific instances whether there is a real need for application of crops with neonicotinoids. I have seen for myself what I believe are the effects of pests on winter OSR crops in Suffolk. Growers that can demonstrate that they have adopted low risk behaviours (e.g. in terms of choice of variety, time of drilling etc) but have still encountered demonstrable (i.e. evidence-based) severe pest problems are likely to be in greatest need for chemicals issued under Emergency Authorisation. This is most likely to satisfy the need for such an authorisation to be ‘limited and controlled’.

18. There is a need for a more systematic approach to data collection and risk assessment than has been illustrated to date. It would be practical, for example, individual growers could use their own data to derive an individual risk score based on pre-formed methods and for this to be auditable. Chemicals could be supplied based upon this risk score. Including this information in a central database would allow the development of the knowledge needed to make better risk-based decisions in future thus allowing continuous improvement in the methods used to focus chemical use in locations where there is greatest need. However, even in the presence of such an assessment it would probably be appropriate for ministers to satisfy themselves that applicants had implemented reasonable measures to reduce their risk score before any application for use of neonicotinoids was granted.

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