

Advice on new research investigating the effect of adding long chain polyunsaturated acids (LC-PUFAs) to the diet of a lepidopteran insect

Advice of the Advisory Committee on Releases to the Environment (ACRE) to the Secretary of State under S.124 of the Environmental Protection Act 1990

Summary

1. A recently published article by Hixson et al (2016)¹ describes new experimental data on the effect of adding increasing amounts of LC-PUFAs to the diets of laboratory-grown larval stages of cabbage white butterflies (*Pieris rapae*). The authors conclude that the presence of LC-PUFAs in the diets of the larval stages of these insects may alter adult mass and wing morphology.
2. ACRE have been requested to provide advice on the implications of this study, in light of its recent analysis of the environmental risk assessment of an application to grow genetically modified Camelina plants designed to express LC-PUFAs in their seeds.
3. Whilst the data described in Hixson et al (2016) are relevant and of interest for this particular case, ACRE sees no reason to change its original advice² on the Camelina field trial at Rothamsted Research.

Background

4. The long chain polyunsaturated fatty acids (LC-PUFAs) eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are not present naturally in the agroecosystem and the effects of their consumption by terrestrial insects aren't known. The work by Hixson et al (2016) represents the first study to investigate this, and describes experiments designed to look at the effects of adding EPA and DHA to the diet of the cultured larvae of cabbage white butterfly under laboratory conditions.

¹ <http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0152264>

² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/302572/ACRE_advice_FINAL.pdf

5. At its last meeting on 23rd March 2016, ACRE carried out a detailed review of the environmental risk assessment of the field trial, and concluded “that the risks to human health and the environment associated with this proposed release are extremely low” The advice also included a number of suggested measures to minimise the potential spread of pollen and seed from the genetically modified plants.
6. The information presented in Hixson et al (2016), demonstrates that the presence of LC-PUFAs EPA and DHA in the diet of insects may have a deleterious effect on their growth and development under laboratory conditions.
7. However, it is important to note that the risk of harm resulting from changes in the biochemical profile of crop plants in agriculture is a function of, among other variables, exposure and dose. In other words, the quantity of any harmful compound that may be present plus the level of exposure to the crop that phytophagous insects are likely to experience.
8. The small scale of the Camelina field trial means that the levels of exposure to phytophagous insects will be relatively low. In this case, the expression of the additional genes is under the control of seed specific promoters, so the levels of exposure for leaf-feeders will be negligible. Whilst potential dosage levels will clearly be higher in the seeds, exposure of seed feeders is likely to be very low due to the size of the trial.