

# Granivorous birds - Exposure reduction by de-husking behaviour

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Granivorous birds of the families Passeridae (sparrows), Fringillidae (finches) and Emberizidae (buntings) are known to de-husk seeds prior to consumption. De-husking is an inherited behavioral trait of these species groups. A specialised beak structure allows the birds to crack seeds and discard the husk (i.e. **de-husking**) before swallowing the kernel – this was described in detail already by Ziswiler (1965).

According to the current Guidance Document for risk assessment for birds and mammals (EFSA, 2009), seed-eating birds are considered in exposure scenarios for seed treatments and for foliar spray applications (exposure to contaminated weed seeds). Regardless of the application form, the bulk of plant protection product residues is located on the outside of the seed – the husk. Thus, the removal of the seed husk prior to ingestion (de-husking) leads to a considerable reduction of the exposure.

In order to estimate the exposure realistically, it is essential to quantify the extent and efficiency of the de-husking behaviour.

## Dehusking in mammals is efficient but variable

In recent studies on small granivorous mammals the extent and efficiency of de-husking was analysed regarding different species and different type of crop seeds (DEFRA 2010; Brühl et al. 2011).

- It was shown that de-husking significantly reduced the exposure.
- However, the observed reduction of exposure varied considerably between different seeds types due to the inherent flexibility in mammalian de-husking behaviour, which depends also on environmental influences (e.g. feeding pressure, predation, competition).



**Cracking seed husk by Carduelinae (Finch family) with specifically evolved beak to de-husk seeds**

**A** cracking seed husk by moving lower mandible for- and backwards - lateral view

**B** process of de-husking by moving mandibles from right to left and vice versa including use of the tongue – frontal view (adapted from Ziswiler 1965)



Corn bunting (*Emberiza calandra*)



Greenfinch (*Carduelis chloris*)



House sparrow (*Passer domesticus*)

Despite the fact that de-husking of seeds it is an inherited behavioural trait in granivorous passerines only few studies exist on de-husking of seeds in an agricultural context (Prosser, 1999). Similar, only few studies present data on the efficiency of the de-husking and the resulting lower residue uptake (Avery et al., 1997). Studies on the exposure reduction for European granivorous birds in laboratory trials will significantly improve risk assessments for granivorous birds. They provide specific de-husking factors to be used as refinement tool in higher tier risk assessments.

We propose here a simple study design aiming to quantify exposure reduction by de-husking that is feasible for different crop and weed seeds.

## Proposed Study Design



**Test animals:** Experiments should be conducted with the relevant bird species in question. Information which species is relevant for a particular use or scenario can be obtained from field studies, scientific literature and/or guidance documents.

**Test diet:** Relevant crop seeds in case of seed treatments. Weed seeds in case of foliar applications. In general, diet fed to test birds should reflect as close as possible the natural food taken in the field.

**Setup:** Seeds coated with blank formulation or substitute (e.g. marker pigment). The remaining seed husks (on the bottom of cages) can be collected and analysed for residue amount. Separately the faeces can be collected to quantify excreted residues within the faeces. Cages will be wrapped with a gaze to ensure that husk material falling out of the cages will be collected too (see picture left).

**Results:** Comparison between amount of residues on seed husk and total amount of residues on seeds allow to conclude on the extent of de-husking and exposure reduction – For further information please contact RIFCON GmbH

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