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Commentary

Comment on Dieter et al. (2014)

Leonard R. Askham, College of Agriculture, Washington State University. P.O. Box 785, Pullman, WA 99163, USA *lraskham@pullman.com*
Michael E. R. Godfrey, 26 Florence Lane, Te Puna, R D 6, Tauranga 3176, New Zealand.

Dieter, et al. (2014) have provided us with a unique opportunity to discuss a basic tenant of bird behavior; that is, if forced to feed on a crop or starve, birds feed on the crop. No amount of repellency will overcome the need to survive. In prior aviary trials, Askham (unpublished data) found that 32 times the recommended label rate of 0.264% methyl anthranilate was required to keep birds from feeding in a no-choice trial after 16 hours of food deprevation. The field tests of Dieter et al. (2014) closely resembles these conditions as evidenced by the fact that Canada geese (*Branta canadensis*) with young, were forced to live on "small, landlocked waterbodies (<75 ha)" having 30 to 100 flightless geese for an average of 0.75 to 2.5 birds per ha. If all of the birds were forced onto the treatment sites, as suggested by the authors, of approximately 1,663 square meters (18.2 m × 91.4 m) with electric fences, 3.3 m^2 to 55.5 m^2 of forge area would have been available per bird. The results are that with a limited amount of forage area, everything would have been consumed, whether or not it were treated with a repellent. It was either that or starve.

Evaluating bird behavior when assessing control strategies in agricultural crops is, as yet, a poorly understood area of research. The old, tried and true techniques of visual assessments used to estimate population movement does not reflect feeding behavior. They may be an indication of feeding behavior, but they cannot be used to quantify that behavior, particularly if or when the food source is altered. Only the direct assessment of the affected food source, whether it is consumed or not, becomes the relevant evaluation point. The use of time-lapse photography, as used in this study, is a good example. The photographs did not document the effect of the repellents on the birds' behavior, but only that the geese were present, not what they were doing. The amount of time spent at either the treated or untreated (reference or control) sites is irrelevant, because there is no documentation of what the birds were doing in that period of time. It adds little to the study.

Two major considerations must be made when assessing bird damage to any crop: pre-assessment and quantifiable damage assessments. This study lacks both. A pre-assessment of any study area, whether it be for feeding assessments or damage control is essential for establishing a quantifiable reference base line. Without it, comparisons with the final results are meaningless. The only quantifiable data that should be considered are the amount of edible food present at any given time within a designated evaluation point. By quantifiable, we mean physical counts, or preferably, oven-dried weights selected within a specified area.

To quantify goose foraging, physical samples of the crop should have been taken prior to and after each trial and compared with that protected with some form of exclusionary mechanism. It is a simple tool developed to assess feeding under natural conditions. Only then can a comparison between what was removed and what would have been present be determined.

Their inference that methyl anthranilate repellent products do not deter crop damage by Canada geese feeding on soybeans cannot be substantiated with their data. The geese had no option but to eat the crop or starve to death, and many may have starved in light of the paucity of data. The geese obviously spent a lot of time on the plots, but there is no indication that they were actively feeding or, in fact, that the treatment actually increased their attraction to the plot. It is much more likely that: (1) they spent more time there looking for food as the amount of crop available decreased; (2) they

spent more time there trying to find food that was least affected by the spray; or (3) they spent more time on the plot because they were reluctant to eat the treated crop; but, as they had no choice, they eventually did eat it (it just took them much longer to do so). These scenarios would also easily explain why they spent "more time" on the plots following the treatments. Goose presence does not automatically confirm goose use.

The text says that the geese spent an average of 104 minutes on the reference plots and 111 minutes on the treated plots. The data illustrated in Figure 4 is in total contradiction to this; they clearly shows that the geese spent far longer on the reference plots. There is total inconsistency between the text and the figure. To add confusion to the blatant flaws in their data presentation, the authors have changed the order that they have illustrated the data between Figures 4 and 5, whose order should be reversed. However, these data are obviously wrong, too, as Figure 5 (Avipel) clearly shows that the geese spent longer on the treated plots than on the reference plots; yet, the authors claim that the geese spent 132 minutes on the reference plots and only 44 minutes on the treated plots

The discussion's overriding conclusion that the MA products are of no use is based on completely invalid science, unsubstantiated by their data as published; the geese had no option but to eat the crop or starve to death. In the Avipel trial, the geese had a completely different plot design and had untreated crop available to them. In the 2012 trial, the geese were free to go to untreated "reference" areas, which they obviously did. In the 2011 trials, the geese had no choice but to eat the treated crop, no matter how aversive it was. These were totally different trials and cannot be compared, and the conclusions reached are fallacies based on extremely poor trial design, invalid data processing, and a lack of even basic understanding of the birds being studied.

In summary, the statement that "we do not recommend using any MA products" and "anthaquinone holds the most promise" for reducing goose damage cannot be substantiated and and should be withdrawn by the authors.

Literature cited

Dieter, C. D., C. S. Warner, and C. Ren. 2014. Evaluation of foliar sprays to reduce crop damage by Canada geese. Human–Wildlife Interactions 8:139–149.