

Use of spatial ecology to assess exposure of red-legged partridges to pesticide-treated seeds
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Ingestion of pesticide-treated seed is one of the sources by which the use of Plant Protection Products (PPP) may affect granivorous birds. In fact, this exposure scenario is the main cause of wildlife incidences associated with approved uses of PPP. Experimental studies have evidenced a significant toxicity to red-legged partridges fed only with insecticide- or fungicide-treated seeds. However, no concluding information on exposure chances in the field exists. Captive partridges tend to avoid pesticide-treated seeds, but unpredictability of food location limits their ability to distinguish between treated and untreated seeds. In pesticide risk assessment, the proportion of contaminated food in the diet is extrapolated from the percentage of time (PT) the bird spends in treated fields, obviating the fact that habitat selection patterns depend on the activity, and the feeding habitat choice may not necessarily correlate to overall habitat choice. In order to determine the chances of exposure of red-legged partridges to pesticide-treated seeds in the field, we tracked 13 individuals using GPS loggers that recorded five to eight daily positions during the sowing season of cereals in central Spain. We identified fields with available treated seed and evaluated their frequency of use by partridges. 29.7% of all locations during the sowing season occurred in fields with treated seeds. Considering only locations between sunrise and sunset hours, when partridges may be feeding, this percentage increased to 32.7%. This evidenced the uncertainty associated with the PT approach and raised the need of refining the spatial analysis. With this purpose, we calculated the Kernel function of the home range of each animal and assigned a Kernel value to each location. Assuming that locations further away from the home range centroid (i.e. those with lower Kernel values) would have higher chances of not being casual (i.e. of being actively selected), Kernel values would be indirect indicators of habitat choice. Fields with available seeds had the lowest average Kernel values (262.6), ranging the rest of considered habitats from 296.3 in orchards to 367.9 in gardens. These results suggest that partridges would select fields with presence of sowing seeds as feeding habitats, and thereby using PT to characterize the exposure of partridges to treated seeds would lead to an underestimation of risks.

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