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ENERGY CONTENT, MOISTURE CONTENT AND ENERGY ASSIMILATION EFFICIENCY BY BIRDS AND MAMMALS OF OIL-CONTAINING SEEDS IMPLICATIONS FOR SEED TREATMENT RISK ASSESSMENT



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INTRODUCTION

Energy content, moisture content and energy assimilation efficiency values are essential parameters in the food intake rate calculations and thus exposure risk assessments for birds and mammals. The recently updated European Food and Safety Authority guidance document on birds and mammals risk assessment [1] summarizes these parameters for different food items relevant for birds and mammals. For seed treatments, values for cereal seeds are usually proposed to be used as surrogate for other crop seeds as well. However, oil-containing seeds (e.g. sunflower, oilseed rape) are expected to have a significant higher energy content compared to cereal seeds. This would result in lower food intake rates and thus exposure from consuming such seeds.

METHODS & RESULTS

- Systematic literature search for 9 crops in focus (Table 1), yielding 151 relevant publications.
- Values of energy content (N = 124), moisture content (N = 296) obtained for all 9 crops (Figure 1).
- Values for assimilation efficiency (N = 37) of oil-containing seeds for mammals (N = 13), Galliformes (N = 14) and Passeriformes (N = 10) (Figure 2).

Crop	Scientific name	Family
castor bean	<i>Ricinus communis</i>	Euphorbiaceae
linseed	<i>Linum ussitatissimum</i>	Linaceae
mustard	<i>Sinapis alba</i>	Brassicaceae
oilseed rape	<i>Brassica napus</i>	Brassicaceae
peanut	<i>Arachis hypogaea</i>	Fabaceae
soybean	<i>Glycine max</i>	Fabaceae
sesame	<i>Sesamum indicum</i>	Pedaliaceae
safflower	<i>Carthamus tinctorius</i>	Asteraceae
sunflower	<i>Helianthus annuus</i>	Asteraceae

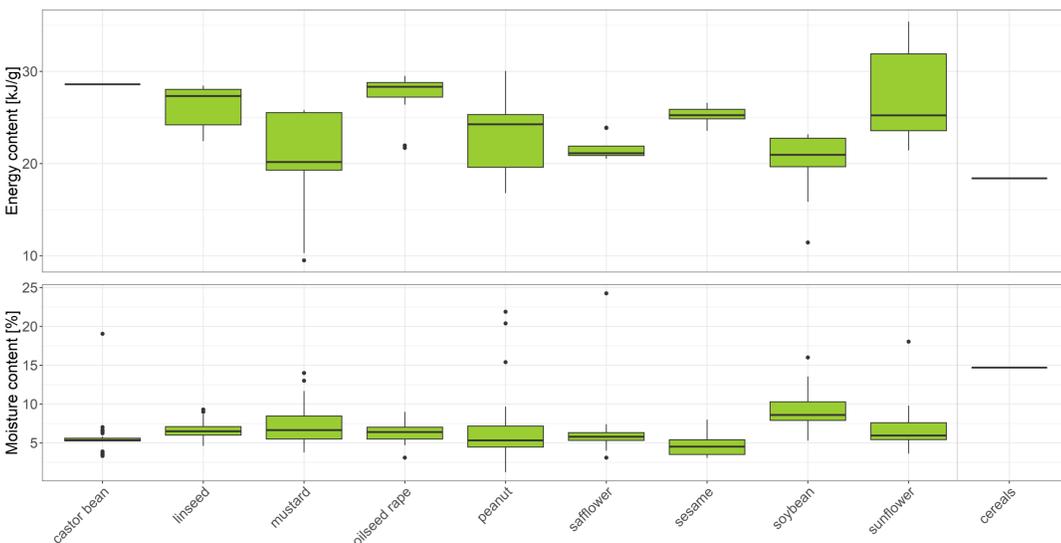


Figure 1. Energy and moisture content of nine oil-containing crops compared to the respective values of cereals as given by [1].

DISCUSSION

Energy content of oil-containing seeds is 32.1 % higher than in cereals, while moisture content is 55.3 % lower than in cereals. Assimilation efficiency of oil-containing seeds in mammals, Galliformes and Passeriformes is slightly lower than of cereals. Food intake rate of oil-containing seeds is between 21.7 % (Galliformes) and 30 % (Passeriformes and mammals) lower than cereals for the same animal group and feeding guild (Table 2). By using values of cereals as surrogate for oil-containing seeds in the risk assessment calculation overestimates the exposure of Mammals, Galliformes and Passeriformes.

Table 1. Oil-containing crops of interest in the EU

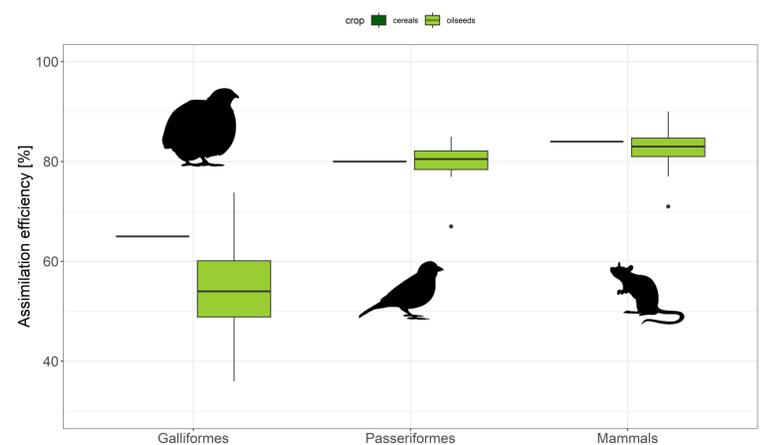


Figure 2. Assimilation efficiency of oil-containing seeds and cereals in different animal groups. Assimilation efficiency for cereals is indicated as it is given by [1].

Table 2. Comparison of FIR/bw between cereals and oil-containing seeds

tier 1 GMS	Body weight (g)	FIR/bw cereal seeds	FIR/bw oil-containing seeds
small granivorous birds (Passeriformes)	16	0.35	0.24
medium granivorous birds (Galliformes)	130	0.14	0.11
small granivorous mammals	6	0.30	0.21
medium granivorous mammals	23	0.20	0.14

CONCLUSIONS

- The use of real values of energy content, moisture content and assimilation efficiency of oil-containing seeds give a more realistic calculation of food intake rate in ecotoxicological risk assessments for birds and mammals.
- We propose to use the energy content of 24.30 kJ/g, the moisture content of 6.57 %, and the assimilation efficiency of 57.54 %, 79.25 % and 82.69 %, for Galliformes, Passeriformes and Mammals, respectively, in future risk assessments for oil-containing seeds.

References

[1] EFSA (European Food Safety Authority), Aagaard A, Berny P, Chaton PF, Antia AL, McVey E, Arena M, Fait G, Ippolito A, Linguadoca A, Sharp R, Theobald A, Brock T (2023). Guidance on the risk assessment for Birds and Mammals. EFSA J; 21(2):7790

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