

COMPARISON OF ACID-INSOLUBLE ASH AND TOTAL FECAL COLLECTION AS METHODS FOR EVALUATING DIGESTIBILITY IN DOGS

MERCEDES CABRERA PÉREZ - FINAL DEGREE PROJECT - JANUARY 2025

INTRODUCTION

The standard method for digestibility studies is total fecal collection (TFC), but it requires knowing the exact amount of food consumed by the animal and collecting all excreted feces. Alternatively, the use of digestibility markers (internal or external) has been investigated. Internal markers, such as acid-insoluble ash (AIA), are naturally present in the diet (Alvarenga et al. 2019).

OBJECTIVE

To evaluate whether the digestibility results obtained through the determination of acid-insoluble ash (AIA) are comparable to those obtained through total fecal collection (TFC).

MATERIALS AND METHODS

Experimental design

Two diets (table 2) were tested during two consecutive experimental periods with two groups of five individuals each (table 1).

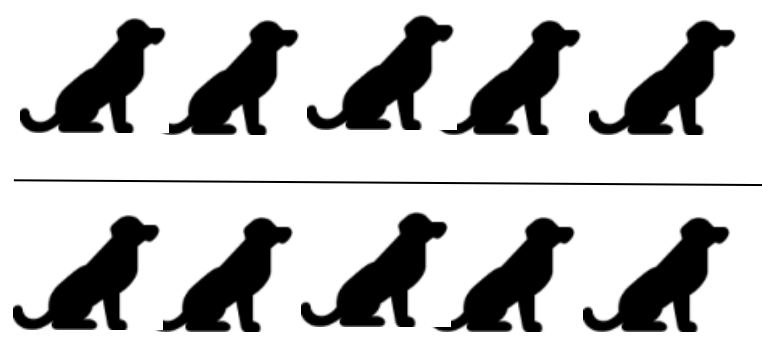


Table 1. Experimental periods.

Group	WEEK 1	WEEK 2	WEEK 3	WEEK 4
1	Adaptation diet A	Sampling diet A	Adaptation diet B	Sampling diet B
2	Adaptation diet B	Sampling diet B	Adaptation diet A	Sampling diet A

Determination of acid-insoluble ashes

Gravimetric determination after incineration of the sample and hydrochloric acid treatment of ashes.

Table 2. Analyzed chemical composition of diets A and B.

	DIET	
	A	B
Dry matter (%)	92,45	93,20
Crude protein (%)	25,50	28,00
Crude fat (%)	13,20	8,98
Crude fiber (%)	3,66	10,36
Ash (%)	6,23	6,55
Acid-insoluble ash (%)	0,19	0,26
Gross energy (kcal/100g DM)	462,9	447,0

Calculations

TFC

Digestibility = (Intake (g/d) - Excretion (g/d) / Intake (g/d)) x 100

AIA

Digestibility = (1 - (% NE x % ID) / (% NC x % IF)) x 100

NC: Nutrient consumed
NE: Nutrient excreted
ID: Indicator in the diet
IF: Indicator in the feces

Statistical analysis

Paired T-test (R) and correlations (Excel).

RESULTS

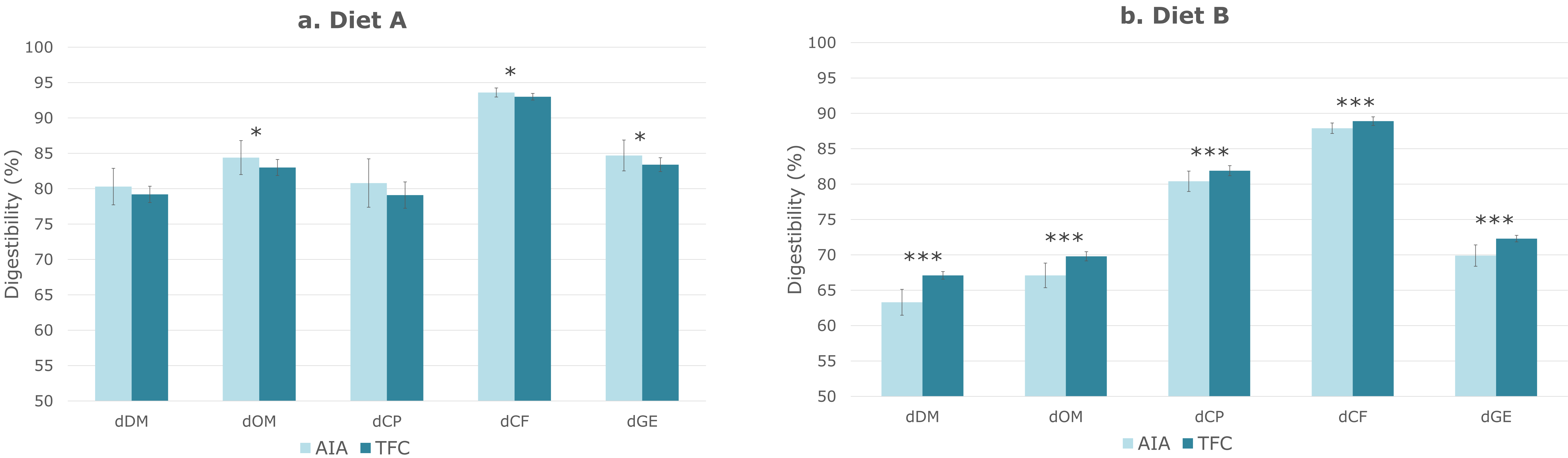


Figure 1. Apparent digestibility of the diets. A comparative bar graph showing the digestibility values (%) for dry matter (DM), organic matter (OM), crude protein (CP), crude fat (CF) and energy (E), obtained for diet A (a) and diet B (b), determined using the AIA method and the TFC method. Statistical significance: p < 0.001 (***) very highly significant; p < 0.01 (**) highly significant; p < 0.05 (*) significant; p ≥ 0.05 not significant.

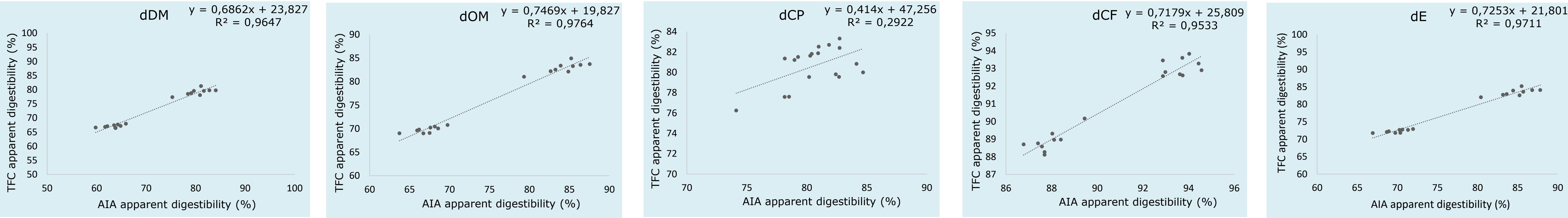


Figure 2. Relationship between apparent digestibility using the AIA method and the TFC method for dry matter (DM), organic matter (OM), crude protein (CP), crude fat (CF), and energy (E), represented through scatter plots, regression lines, and coefficients of determination.

CONCLUSIONS

- The use of AIA as an internal digestibility marker to assess the digestibility of extruded diets in dogs appears to be a potential alternative to the TFC method.
- The AIA method has certain limitations, including a higher coefficient of variation in the determinations and some discrepancies with the reference method, which could be attributed to differences in diet composition.
- The study's limitations included the analysis being restricted to only two diets. Therefore, it would be advisable to expand the study by including a greater number of diets with varied compositions and increasing the number of individuals evaluated to analyse the potential impact of diet composition. Additionally, it would be interesting to study supplementation with exogenous AIA to determine whether it increases the reliability of the technique. Finally, improving control during the boiling stage could help reduce variability in the results caused by potential occasional sample losses.

REFERENCES

Alvarenga IC, Aldrich CG, Ou Z. 2019. Comparison of four digestibility markers to estimate fecal output of dogs. J Anim Sci. 97(3):1036–1041. doi:10.1093/jas/skz020.