

Study on the labels of selected cat and dog foods from Türkiye

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Abstract: At first look, the label contains details regarding the contents and properties of cat and dog foods. Label information must be added in accordance with national and international legal requirements. The information competence of cat and dog food labelling in Türkiye has not before been analyzed. In this study, the labelling information for 215 chosen cat and dog foods (164 cats and 51 dogs) available in Türkiye has been analyzed through using Turkish national feed legislative and the Federation of the European Pet Food Industry recommendations. It is observed that all food labelling information is compliant with the Turkish feed legislation. In comparison, only 67.1% of cat and 78% of dog diets includes the metabolizable energy value in the package. 60.8% cat foods have website's have, whereas 81.7% dog foods have ones. It is also found that cat and dog food labels completely complied with the Turkish legislation rules. It is obvious that, more information may be valuable for the customers. Information about the recommended amount of food per day is unclear in numerous products, which is an area of improvement. In future studies, the competencies of daily nutrition advice information on labels can be evaluated.

Keywords: Customer enlightenment, FEDIAF, legislation, pet food, regulation.

Türkiye'den seçilmiş kedi ve köpek mamalarının etiketleri üzerine kesitsel bir çalışma

Özet: Etiket bilgileri, ilk bakışta evcil hayvan mamasının içeriği ve özelliklerine ilişkin ayrıntıları içerir. Etiket bilgileri ulusal ve uluslararası gerekliliklere uygun olarak yer almalıdır. Türkiye'de kedi ve köpek mamalarının etiket bilgilerinin yeterliliği daha önce değerlendirilmemiştir. Bu çalışmada, Türkiye'de satışta olan seçilmiş 215 evcil hayvan mamasının (Kedi=164, Köpek=51) etiket bilgileri, Türk Yem Mevzuatı ve Avrupa Evcil Hayvan Maması Endüstrisi Federasyonu tavsiyeleri kullanılarak incelenmiştir. Tüm mamaların etiket bilgilerinin Türk yem mevzuatına uygun olduğu tespit edilmiştir. Buna karşılık, kedi mamalarının sadece %67,1'i ve köpek mamalarının %78'i metabolize olabilir enerji değerini ambalaj üzerinde belirtmiştir. Kedi mamalarının %60,8'i, köpek mamalarının ise %81,7'si internet sitesine sahiptir. Kedi ve köpek maması etiketlerinin Türk yem mevzuat kurallarına tamamen uygun olduğu tespit edilmiştir. Daha fazla bilginin müşteriler için değerli olabileceği açıktır. Günlük önerilen beslenme miktarı birkaç üründe belirsizdir ve bu da iyileştirilmesi gereken bir alandır. Gelecekteki çalışmalarda, etiketlerdeki günlük beslenme önerileri bilgilerinin yeterlilikleri değerlendirilebilir.

Anahtar kelimeler: Evcil hayvan maması, FEDIAF, mevzuat, müşteri bilgilendirilmesi, yönetmelik.

Introduction

Cats and dogs are becoming increasingly popular companion animals in Türkiye. In 2023, the Federation of the European Pet Food Industry (FEDIAF) reported 1.386.000 pet dog and 4.660.000 pet cat population in Türkiye (FEDIAF 2023). In recent years, parallel to the increased interest in having cats and dogs as companion animals, the cat and dog food industry has also grown tremendously. Domestic and imported commercial cat and dog foods are now easily accessible in the Turkish market. In the

meantime, label information is a practical approach to understanding whether foods on the market meet the nutritional needs of cats and dogs. Many caregivers must rely on these labels for information regarding the nutritional adequacy and palatability of the product (Case 2011). Legislation and guidelines accepted by various bodies in each nation govern the ingredients and labelling of the foods. For example, in Türkiye, it is regulated with additional recommendations by the Ministry of Agriculture and Forestry (MoAF); in the USA, by the Association

of American Feed Control Officials (AAFCO) and the US Food and Drug Administration (FDA); and in Europe and the United Kingdom, by FEDIAF and the Regulation of the European Parliament and Council (EC) (EC 767/2009; FEDIAF 2019; FDA 2022; AAFCO 2023). Moreover, Turkish feed legislation has been harmonized with the EU since 2011 (RG 2011). As stated in Annex-1 to the "Regulation on the Placing on the Market and Use of Feeds" set forth by the MoAF in Türkiye, "Provided that the methods of analysis are not changed, the labels for domestic and ornamental animal foods may contain the following statements: protein instead of crude protein, fat content instead of crude oils and fats, inorganic matter instead of crude ash" (RG 2011).

All commercial according to foods sold in Europe and the United Kingdom include a range of information on the label in compliance with the FEDIAF and the implementation requirements of the EC Regulation. According to FEDIAF recommendations, the daily intake amount should be arranged the pet's life stage, size, and lifestyle (FEDIAF 2020). In order to achieve this, informative label information plays a crucial role.

A few research has focused on these labels of cat and dog foods. In a Brazilian study, which analyzed the labels of 64 complete kibbles for dogs and cats, all of these labels were non-compliant with at least one of the national statutory standards. (De Souza et al. 2013). Nonetheless, there are standards defined at the national and international levels to assure food safety and customer information on the labels; however, previous studies have revealed that compliance with the regulations was insufficient. (De Souza et al. 2013; Gosper et al. 2016; Burdett et al. 2018).

There is a scarcity of research on the food labelling in Türkiye. These food's labels sold in Türkiye are assumed to be accurate and easy for the consumers to understand and being also in compliance with Turkish Feed legislation and international recommendations. The purpose of this study is to determine whether the labelling of selected the foods available in the Turkish market complies with the national regulations and the FEDIAF recommendations.

Material and Method

The study focused on the cat and dog foods manufactured in Türkiye (domestic) and imported foods. These foods were purchased from markets, veterinary clinics, and pet shops in the Marmara region

between June 2023 and May 2024. A total of 215 food samples (64 cats and 51 dogs) were collected. Product name, assigned period, flavor, segment, origin (domestic-imported), website address, whether there is a nutritional recommendation, nutrients [crude protein (CP), crude fat (CF), crude ash (CA), crude fiber (CFib), carbohydrate (CHD), moisture (MOIST), metabolizable energy (ME) Kcal/Kg] data were recorded. Then, the foods were classified as adult, puppy, or sterile, as well as premium, market, or pet shop food, based on their availability in markets, pet shops, or veterinary clinics, as well as their labeling data. Both the presence of ME information on the website and conformity of the website's content information with the label have been controlled. In the classification of food ingredients, the first meat type is accepted as the primary ingredient. Foods containing chicken, turkey, and duck were classified as "poultry"; foods containing trout, anchovy, tuna, sardine, prawns, salmon, herring, anchovy, and cod as "fish"; and foods containing lamb, veal, pig, and beef as "red meat". Descriptive statistics (percentages, means, and standard deviations) were calculated and reported using Microsoft Excel. Differences between groups were assessed using the Chi square test, and if necessary, the Fisher's exact test was used, with a significance level of 0.05.

Results

In this study, a total of 148 dry and 16 wet cat foods and 43 dry and 8 wet dog foods have been examined. When the foods were classified according to age terms, a total of 132 adult foods [61.39% (132/215)], include 82.4% of the adult dog foods (42/51) and 54.90% of the adult cat foods (90/164); 18.13% of the puppy foods (39/215), contains 17.6% of the puppy foods (9/51) and 18.3% of the kitten foods (30/164); and 26.8% of the sterilized cat foods (44/164) have been determined. More detailed information can be found in Table 1.

All labels have complied with the mandatory packaging and content provisions of the Turkish regulations. The labels have contained no assertions that can deceive or mislead consumers. While 67.1% of cat foods (110/164) have lacked ME information on the labels, this incidence was 78.00% for dog foods (78/51). In line with this information, the rate of ME value on food website addresses was 62.2% for cat foods (102/164) and 82.4% for dog foods (42/51) ($p=0.14$). More information on the period, flavor, segment, origin, website, nutrition information, ME on the website, CP in label, CF in label, car-

bohydrate in label, ash in label, fiber in label, moisture in label, and ME in label can be found in Table 1.

Except for one Turkish-manufactured wet dog food, all the other food labels have included moisture values. CP values have been found to be lower than the FEDIAF suggested value in 1.90% of dog foods (1/51), and crude fat values have been lower than the FEDIAF suggested value in 7.8% of dog (4/51) and 1.21% of cat (2/164) foods (Table 2-3).

When all cat and dog foods have been analyzed, it was found that 81.7% (134/164) of cat foods

and 60.8% (31/51) of dog foods have label information on their official websites ($p=0.002$). In terms of finding of nutritional information, 78.7% of cat food (129/164), 58.8% of dog food (30/51) ($p=0.05$), while 79.6% of imported (82/103) and 68.8% (77/112) of Turkish manufactured food ($p=0.08$) had feeding recommendation. 37.8% of cat (62/164) and 17.6% of dog (9/51) foods were founded to have ME information on their websites ($p=0.01$), while 49.5% of imported (51/103) and 17.9% of Turkish manufactured (20/112) foods had ME information on their websites ($p<0.001$).

Table 1. Characteristics of the imported and Turkish manufactured (TR) feeds included in the study.

Parameters		Cat				Dog			
		Imported		TR		Imported		TR	
		n	%	n	%	n	%	n	%
Period	Kitten	19	21.3	11	14.7	3	21.4	6	16.2
	Adult	43	48.3	47	62.7	11	78.6	31	83.8
	Sterilized	27	30.3	17	22.7				
Flavour	Fish	29	32.6	31	41.3	5	35.7	13	35.1
	Red meat	11	12.4	15	20.00	6	42.90	20	54.1
	Poultry	49	55.1	29	38.7	3	21.4	4	10.8
Segment	Market	6	6.7	14	18.7	2	14.3	2	5.4
	Petshop	38	42.7	40	53.3	1	7.1	22	59.5
	Premium	45	50.6	21	28.00	11	78.6	13	35.1
Origin	Imported	74	83.1	74	98.7	7	50.00	36	97.3
	TR	15	16.90	1	1.3	7	50.00	1	2.7
Website	No	15	16.90	15	20.00	9	64.3	11	29.7
	Yes	74	83.1	60	80.00	5	35.7	26	70.3
Nutrition information	No	13	14.6	22	29.3	8	57.1	13	35.1
	Yes	76	85.4	53	70.7	6	42.90	24	64.90
ME on the website	No	41	46.1	61	81.3	11	78.6	31	83.8
	Yes	48	53.90	14	18.7	3	21.4	6	16.2
CP in label	Yes	89	100	75	100	14	100	37	100
CF in label	Yes	89	100	75	100	14	100	37	100
CHD in label	No	89	100	75	100	14	100	37	100
Ash in label	Yes	89	100	75	100	14	100	37	100
Fiber in label	Yes	89	100	75	100	14	100	37	100
Moisture in label	No	51	57.3	60	80.00	7	50.00	27	75.00
	Yes	38	42.7	15	20.00	7	50.00	9	25.00
ME in label	No	50	56.2	60	80.00	9	64.3	30	83.3
	Yes	39	43.8	15	20.00	5	35.7	6	16.7

Abbreviations: ME: metabolizable energy, CP: crude protein, CF: crude fat, CHD: carbohydrate

Table 2. Nutritional label information of the imported and Turkish manufactured (TR) dry feeds included in the study.

Parameter	Cat				Dog			
	Imported		TR		Imported		TR	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Crude Protein (%)	36.69	4.95	32.45	3.96	23.54	8.48	24.61	4.61
Crude Fat (%)	15.41	4.01	13.69	3.39	13.51	5.34	12.58	3.55
Carbohydrate (%)	28.87	7.10	34.97	6.35	34.69	14.98	42.95	7.53
Crude Ash (%)	7.73	1.06	7.86	1.50	6.34	2.28	8.07	0.94
Crude Fiber (%)	3.68	2.20	3.23	0.97	2.99	1.64	3.43	0.88
Moisture (%)	7.93	1.13	7.92	0.40	18.93	28.04	8.36	0.76
ME (kcal/1000g)	3870.20	285.57	3984.27	170.67	2786.00	1736.54	3838.83	214.17

Abbreviations: SD: standard deviation, kcal: kilocalories, g: gram

Table 3. Nutritional label information of the imported and Turkish manufactured (TR) wet feeds included in the study.

Parameter	Cat			Dog		
	Imported		TR	Imported		TR
	Mean	SD	Mean	Mean	SD	Mean
Crude Protein (%)	11.56	1.88	18.00	9.03	1.91	7.00
Crude Fat (%)	3.13	1.47	1.90	5.23	2.20	3.00
Carbohydrate (%)	1.86	0.67	1.10	3.47	1.35	4.60
Crude Ash (%)	1.86	0.68	1.70	2.83	0.42	3.0
Crude Fiber (%)	0.40	0.27	0.30	0.30	0.17	0.40
Moisture (%)	81.19	2.91	77.00	79.14	2.73	82.0
ME kcal/1000g	1121.00			1140.00	8.49	

Abbreviations: SD: standard deviation, kcal: kilocalories, g: gram

Table 4. The study's food labels were evaluated in accordance with Turkish feed standards and FEDIAF recommendation

Subject	Article No. A: MoAF (RG 2011) B: FEDIAF (FEDIAF 2019)	Percentage
	Mandatory specific labeling	
Label information is presented clearly, visibly, and indelible.	A. 28155 RG/2011 Section four Article 13 (1) (2) B. R. 767/2009, Article 14. 1) 2)	100% of cat and dog foods.
i. Food's intended function and target species ii. Shortest storage life iii. Approval, batch, or serial numbers iv. Net weight or volume v. Name and address of food operator vi. Contact phone number for further information	i. A. 28155 RG/2011 Section Four Article 16 (1) a) b) B. R. 767/2009, Art. 17.1(a), R. 767/2009 Annex II, Article 3b ii. A. 28155 RG/2011 Section Four Article 16 (1) c) (1-2-3) B. R. 767/2009, Art. 17. 1(d), Annex II.2 R. 178/2002, Art. 15 (2) iii. A. 28155 RG/2011 Section Four Article 14 (1) c) ç) B. R. 767/2009, Art. 15 (d) section 4, Art. 3. (2) (r), Art. 15 (c), Art. 24, Annex V.2 iv. A. 28155 RG/2011 Section Four Article 14 (1) d) B. R. 767/2009, Art. 15 (e) v. A. 28155 RG/2011 Section Four Article 14 (1) b) B. R. 767/2009, Article. 15 (b) vi. A. 28155 RG/2011 Section Four Article 18 (1) B. R. 767/2009, Art. 19 (a) (b), Annex VII, I, 6	100% of cat and dog foods.

i. Declaration of analytical components ii. The name and weight percentage of the highlighted food ingredient. iii. Food ingredients, with their exact names in descending order of weight.	i. A. 28155 RG/2011 Annex-7 Section Two 1) B. R. 767/2009, Annex II.5 (Synonyms) ii. A. 28155 RG/2011 Section Four Article 16 d) 1) B. R. 767/2009, Art. 17.2 (a). iii. A. 28155 RG/2011 Section Four Article 16 3) d) B.R. 767/2009, Art. 17.1(e)	100% of cat and dog foods.
FEDIAF recommendations		
General labeling rules- General labelling rules and daily nutrition guidelines.	B. R. 767/2009, Annex II 4.	Cat food 78.8% (129/164) Dog food 58.8% (30/51)
Technical conditions- include moisture content declaration.	A. 28155 RG/2011 Annex-1 6. B. R. 767/2009, Art. 15 (g) & Annex I.6	Cat food 32.3% (53/164) Dog food 32.0% (16/51)
Labeling of nutrient components- energy and protein values declaration	A. 28155 RG/2011 Annex-7 Section Two 3) B. R. 767/2009, Annex VII.II.3 CEN standard 16967:2017	Cat food %32.9 (54/164) Dog food %22 (11/51)
Feed additive- Declaration for feed additives, including amino acids, vitamins, and trace minerals.	A. 28155 RG/2011 Annex 6 Section Two 2) B. R. 767/2009, Annex VIII.I. Final section	%100 of cat and dog foods.

Abbreviations: R: Regulation, Art: article, CEN: European Committee for Standardization

Discussion

The nutritional adequacy of the food is vital for the companion animal lives. Labelling is one of the most significant aspects of understanding the food specifications. Because there has been no previous research on cat and dog food labelling rules in Türkiye, the findings of this study are intended to shed light on the current state of labels. In a prior Brazilian study, 12.5% of the label information was not viewable because it was in different positions of the packaging (De Souza et al. 2013). On the other hand, a similar study was previously conducted for human food packages in Türkiye. Dikmen and Pekcan (2013) founded that 13% of the human food packages had no label information. In this study all packages have visible labels. Label information must be visible and legible in order to provide customers with accurate information.

In the aforementioned investigation, 12.5% of the labels (8/64) were misclassified based on the type of foods required by the Brazilian Feed legislation (De Souza et al. 2013). In this investigation, all foods were accurately classified according to the Turkish legislation. Providing the right type of food is critical for the pet's appropriate and balanced nourishment. Storage conditions and consumption time are important for the safe consumption of the food. De Souza et al. (2013) reported in his study that all of the labels contained storage conditions,

but in 17% of the samples, the storage period was not given in exact dates, but they provided as the consumption period. In this study, it was found that the storage conditions and expiration dates of all foods were in accordance with the regulation and FEDIAF guidelines.

The rate of ME values on the labels and website of both cat and dog foods is below 40%. It is thought that the most important reason for this may be that the declaration of ME value on the label is optional in national and international feed regulations and guidelines. However, it has been stated that to have ME information on the label plays a critical role in understanding calorie information and influencing cat and dog foods purchasing decisions (Schleicher et al. 2019).

There is no obligation for food companies to have a website. Previous studies did not evaluate the website information on the package. Therefore, it is not possible to compare this study's website information findings to the previous studies. However necessary information that is not on the labels can be published on the websites and quickly accessed via QR codes. It is thought that this is a feature that can be easily added to the packages by the feed manufacturers.

Very few studies has only reviewed the conformity of cat and dog food label information with leg-

islation (De Souza et al. 2013; Holda et al. 2014). Furthermore, there are certain studies where chemical analyses were performed and the results and label information compliance were reviewed with AAFCO, FEDIAF, and NRC recommendations (Carciofi et al. 2006; Akinrinmade and Akinrinde 2011; Gosper et al. 2016; Davies et al. 2017; Burdett et al. 2018; Stercova et al. 2022). Both studies indicated the necessity for a revision and audit of the label regulation of cat and dog foods.

De Souza et al. (2013) founded that 47% of the food had false words and graphics on the benefits of food or animal health confidence. Holda et al. (2014) examined the label compliance of feeds before (2011) and after (2013) the EU legislation came into force. It was reported that the rate of misinformation on food in 2013 decreased, but the rate of misleading information remained the same for dog food, while the rate for cat food increased from 22% to 29% and the assessment of the compliance of label information with the EU regulations revealed an unsatisfactory level of accuracy (Holda et al. 2014). In this study, no food labels were found to contain false information. Misleading labels might lead to misconceptions among owners. All feed packages have contained a clear and legible description of the mandatory labelling information in this study. In the study by De Souza et al. (2013) 37.5% of the food (17/64) did not meet this criteria.

The low moisture content of dry cat and dog foods is important as it inhibits the growth of most organisms (Case 2011). All dry foods with a moisture value above 7% in our study have a moisture value on the label in accordance with the relevant regulation. In one dog wet food did not have a moisture value on the label. It would be suggested to have moisture value in all foods.

In this study, it was observed that CP in one adult imported dry, in four adult domestic dog foods, and CF in one imported kitten and one domestic adult cat food to be below the recommended minimum reference value of FEDIAF (2020). Previously, Stercova et al. (2022) reported one dry dog food with a CP value below the FEDIAF minimum reference values.

Ingredients were determined to be insufficiently detailed. Few foods have detailed ingredient lists. Olivry and Muller (2018) found that mislabeling was extremely common in "limited" ingredient foods used in elimination diets for food allergy detection, which would be a challenge for animals on elimination diets. More detailed information is

recommended, particularly for prescription foods. It is believed that presenting information in compliance with both Turkish and international norms will boost the worldwide competitiveness of Turkish feed products in the international level. Similarly, it is accepted that updating the current cat and dog food labelling system is important for the expansion of the cat and dog food sector in South Korea (Sung-Ho and So-Young 2023).

This study has some limitations. The study was conducted at a certain period and products. The results may not be representative of the entire Turkish market.

Conclusion

All cat and dog foods assessed met Turkish regulations. In addition, adhering to FEDIAF recommendations can boost Turkish feed producers' worldwide competitiveness. Consumers should be well-informed about the labelling of cat and dog foods. ME levels may be further investigated in future studies, as well as daily feeding recommendations. Stakeholders undertaking feed production research and legal authorities should provide good labelling practice guidelines for Turkish pet food manufacturers.

Ethics committee permission: Ethics committee approval is not required for this research.

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