ABSTRACT

The doctoral thesis entitled ”Research regarding the quality and hygiene of dry pet food” has an original character by applying new analyzing methods and techniques, by determining and appreciating various compounds from dry pet food and by appreciating the palatability of the final product.

The thesis in structured in two parts and has a number of 207 pages.

The first part, bibliographical study, has 45 pages and contains two chapters dealing with the quality and hygiene of dry pet food concerning the age, physiological state and use and the other one dealing with data regarding the general and specific manufacturing technology of dry pet food.

The second part, of personal contributions, contains 8 chapters and has 116 pages.

The presented data are sustained by 4 tables and 2 figures in the part of bibliographical study and 42 tables and 41 figures in the second part, of personal contributions. Bibliographical list has a number of 215 titles from national and international literature, specific food safety legislation and standards of some research methods. In this doctoral thesis are found personal data published in International Symposium organized by the Faculty of Veterinary Medicine Iași.

This theme has been chosen because there are few published data regarding the manufacturing condition of dry pet food and is considered that it utmost necessary to investigate the nutritive and hygiene quality of industrial made dry pet food.

This study completes and correlates the data regarding the quality and hygiene of pet food.

Recent research has developed some food products that adopt the concept of positive nutrition. In the same time large manufacturers of pet food invest millions of euros in the field of research that tries not only to improve the health and longevity of pets but also to maintain a high standard of hygiene.

In this study has been tried to highlight some organoleptic aspects of various assortments of dry food produced for pet animal consumption.

It has also been tried to assess physicochemical aspects of dry food compounds, physicochemical aspects regarding the hygiene of pet food (physicochemical pollutants and contaminants) and some microbiological aspects.

Investigations have tried to reveal if the industrial dry pet food maintains its organoleptic, physicochemical and bacteriological characteristics throughout the study.

As materials have been used 6 (six) assortments of dry food for dogs and 6 (six) assortments of dry food for cats. From each assortment have been taken six samples of 5000 g and have been stored in plastic containers. Three containers were closed and three were open.

Research has been made on 72 samples, 36 samples of dry dog food (18 stored in closed containers and 18 stored in open containers) and 36 samples of dry cat food (18 stored in closed containers and 18 stored in open containers).

To fulfill the proposed research the study aimed to investigate organoleptic characteristics of dry pet food, to determine the main compounds found in dry pet food, to determine the freshness of products and also to make bacteriological and microbiological investigations.

All investigations have been made in Veterinary Laboratory and Food Safety Direction Bacău, based on methods and standards developed by the Health Veterinary and Food Safety National Agency (A.N.S.V.S.A.) and by the Romanian Standardization Association (ASRO).

Organoleptic investigations tried to investigate the aspect, color, shape, smell and texture of the grain from dry pet food. Organoleptic investigations have been made under natural light for three times throughout the study and tried to appreciate if dry pet food can be categorized as fresh, relatively fresh and altered.

As concern the nutritional analyzes of main compounds of dry pet food analyzes to determine the percentage of protein, fat, water, minerals and vitamins have been made.

Organoleptic investigations have been made on various assortments of dry pet food belonging to different manufacturers, generically named Manufacturer 1 – 12 (dog) and five assortments of dry cat food, generically named Manufacturer 1 – 5 (cat).

It has been observed that the hardness, texture and shape of grain plays a major role in teeth brushing, knowing that dental plaque, teeth problems are among the first disorders of pets. Every color of the grain has a special meaning: BROWN or RED – meat; YELLOW – vegetables and grain; GREEN – vegetables; WHITE – rice and calcium.

Physicochemical investigations of dry pet food tried to show if industrial pet food maintains its physicochemical characteristics over the storage period.

It also tried to reveal if throughout the study have been changed in percentage or quantity the following compounds: humidity, gross protein, fat, minerals, vitamins, fibers and additives, choosing those assortments of dry pet food that are most common in pet-shops and

pharmacies in our country.

Low variations of protein percentage in dry pet food stored in both open and closed containers shows that long periods of time, temperature variations and atmospheric humidity does not change the quantity of proteins, only qualitative changes can be observed.

Throughout the study the humidity percentage have decreased with 0,1 - 0,2 % for some assortments stored in open containers, and for other assortments stored in closed containers the humidity percentage decreased with 0,05 – 0,07 %.

Same as for the humidity percentage, fats lose throughout the study up to 0,2 % for samples stored in closed containers and up to 0,5 % for samples stored in open containers.

Cellulose level from dry pet food does not change in quantity throughout the study because it does not have the ability to interact with atmospheric humidity and other external factors.

It can be seen that small variations of 0,5 % appear for almost all assortments of dry cat food for protein content after have been made three sets of analyzes.

It can be also observed that throughout the study, the humidity level of dry cat food have decreased for some assortments stored in open containers with more than 1 % and for those assortments stored in closed containers these changes could not be observed, the decrease in humidity level being of 0,20 – 0,30 %.

Fat level loses throughout the study up to 0,2 % for assortments stored in closed containers and up to 0,5 % for assortments stored in open containers.

Have not been seen major changes throughout the study for the fiber level, only small changes appearing for samples stored both in open and closed containers.

The analyzes made throughout the study have not highlighted any major changes for Calcium, Phosphorus, vitamin A and E showing that external factors, quantitative and qualitative changes of other compound does not influence nutritional additives.

In order to appreciate the freshness of dry pet food investigation were made to determine NH_3 and H_2S. These investigations are made not only on grain – qualitative reactions but also by precise quantitative determinations.

In industrial dry pet food (dog and cat) can be determined important amounts of *heavy metals*, that can get there by many ways that include: as raw material, with auxiliary ingredients, by water that is used for manufacturing or after corrosion processes of machinery or containers.

Some metals and their compounds that are found in dry pet food and are over the admitted limit, getting in the animal body can produce vital functions disorders, many of these

substances starting to exercise their harmful action only after they have cumulated in the organism in a sufficient amount.

The method used to determine the degree of radioactive contamination is spectrometry of gamma low resolution with NaI (sodium iodine) detector (crystal).

Physicochemical investigations for the determination of dry pet food contaminants have been made by three sets of analyzes, these analyzes not showing the exceeding of the maximum admitted limits.

Of great importance to appreciate and set the hygiene of dry pet food are microbiological investigations. Microbiological examination of dry pet food tried to:

- Determine the presence of pathogen and conditionally pathogen germs within the samples;
- Appreciate the freshness of dry pet food;
- Appreciate the degree of development for the alteration non-pathogen flora that is done by direct bacteriologic examination and counting of smear germs;
- Set the degree of superficial pollution of dry pet food by determining N.T.G./g of grain;
- Determine the number and quantity of mycotoxins by immune assays Elisa.

The study revealed that for dry food stored over 6 months in open containers has been observed the infestation with mites (*Carpoglyphus lactis)* or insects (*Tribolium castaneum and Ephestia figulilella)*. All these species are involved in atopic dermatitis and food allergies. The values of N.T.G./ g have been between 34-41 for dry dog food and between 25-33 for the samples of dry food for cats. Regarding the presence of ochratoxin A and zearalenone the quantities obtained after mycotoxicological analyzes reported normal values both for dry dog food samples (6,33 – 9,34 for Ochratoxin A and 3,11 – 7,32 for Zearalenone) and for samples of dry food for cats (4,98 – 8,53 for Ochratoxin A and 3,78 – 5,45 for Zearalenone). Taking into account the carnivores predilection for renal disorders and ochratoxin A predilection for renal tissue, there is a certain need for studies regarding the determination of maximum admitted limits of ochratoxin for carnivores, which can be lower that that of the food for human consumption. The study also revealed that there are deviations for most manufacturers from product brochures (and hence to the nutritional requirements) in the basic nutrients: protein and fat. Thus, for dog food has been found a reduction of 1 - 5 % in protein content and from 4 to 12,5 % of fat content (and up to 50% compared with prospect). In cat food has been found an increase in protein content from 1.5 to 7 % in most varieties or contrary a decrease by 9% in protein content (Producer 6, assortment Junior) and in fat content by 8 -

9% in most varieties.

As general recommandations, the conducted study stated that the storage of dry pet food must not be done in open containers for longer periods than one or two days because the following changes can occur: loss of palatability produced by the loss of flavours; foreign flavours from other products; development of contamination microflora after one year of storage. Also the introduction of new way of storage for dry ped food in the specific veterinary normatives in closed containers is mandatory. The study recommends the introduction of legal regulations on pet food quality control by veterinary authorities and consumer protection and also regulations concerning manufacturer's obligation to comply with the prospects in relation to their nutritional requirements.