Journal of Veterinary Science & Animal Husbandry
Volume 8 | Issue 2
ISSN: 2348-9790

Research Article Open Access

Effect of the Seasons on the Change of Morphological, Histo-Cytological and Hormonal Parameters of the Thyroid Gland in Cattle in Algeria

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Citation: Rahmoun DE, Fares MA, Gherissi DE, Lieshchova M (2020) Effect of the Seasons on the Change of Morphological, Histo-Cytological and Hormonal Parameters of the Thyroid Gland in Cattle in Algeria. J Vet Sci Ani Husb 8(2): 203

Received Date: December 18, 2020 Accepted Date: December 28, 2020 Published Date: December 30, 2020

Abstract

This study was carried out to study the peculiarities of the topography, the macrostructure and the analysis of the structural and functional organization patterns of the parenchyma of the thyroid gland of dairy cows (local breed from the Souk Ahras region, Algeria). A complex of macroscopic and histological techniques was used, as well as immunohistochemical staining of thyroid gland sections to identify localization characteristics of thyrocyte populations in the parenchyma. The macroscopic data was highly variable, including the length, width and thickness of the gland, which appear to be greatly increased during the winter period. The parenchyma was characterized by a spongy-like structure in the form of a set of partially concave lobules, surrounded by a framework of connective tissue are represented by a capsule and a trabecular formation in the form of septa, the lobular structure is positioned from diffusely containing follicles rich in thyrocytes and bases by a complex of blood vessels. The amount of thyrocytes strongly depended on the time of the season. The structure of the parenchyma of the thyroid glands of cows was not absolutely unique, as in other species of mammals, subdivided into specialized cell areas that are connected to follicles. The histometric characteristics of the follicles show that there is a secretion activity of the very important hormones of T3 (tri- iodothyronine) and T4 (tetra-iodothyronine) during the summer period, has been proved by the results carried out by ELISA of the assay of these hormones.

Keywords: Dairy cows; ELISA; Follicles; Parenchyma; Hormones; Thyrocytes; Thyroid

Introduction

The study of endocrine glands is of great interest in relation to the critical importance of hormones in the integration of all animal body systems as well as their great structural and functional lability in response to endogenous and exogenous effects (Choksi et al. 2003) [1]. The study of the anatomy, physiology and biochemistry of the thyroid gland has steadily increased due to the fact that thyroid disease has moved into the category of medical and social problems all over the world according to reports. authors (Santoro et al. 2016) [2].

Researchers pay a lot of attention to the morphology of the organ which has been well studied in various animal species (Igbokwe. 2020) [3], the ontogenetic characteristics of the thyroid gland of vertebrate animals are studied and give special attention to histogenesis evolution of the organ with the absence of a comparative analysis of the structure of the thyroid gland in various animal species (Domazet-Lošo et al. 2010) [4].

The thyroid structure, reddish-brown in colour, is found on the first cartilage of the trachea on the ventral side, reaching the larynx with the cranial end, two lateral lobes separated by a connecting fibrous isthmus may be indistinct in dogs (Rajathi. 2019) [5], in birds, it is found in the thoracic cavity, the two lobes of which are located near the syrinx, next to the carotid artery near the origin of the vertebral artery (Sinha et al. 2016) [6]. The authors (Casmir et al. 2015) [7], described that in cattle, the lateral lobes are well developed, the isthmus is narrow. The lateral lobes are smoother, the isthmus is poorly developed, so data from (Karakas et al. 2009) [8] shows that the pig has a large isthmus.

The physiology of the thyroid gland has been cited by researchers (Kirsten, 2000) [9], in animals consists by the action of thyroid hormones are the only organic iodine compounds in the body. Thyroxine (T4) is the main secretory product of the normal thyroid gland. However, the gland also secretes T3 and other iodine-containing metabolites like T4 according to the researchers (Clarke et al. 2011) [10], T3 is approximately 3 to 5 times more potent than T 4. A loose connective tissue capsule envelops the parenchyma which contains the parenchyma.

Histological studies carried out by the researchers (Diatroptov et al. 2017) [11], cite that at high magnification, the wall of follicles consists of a layer of epithelial cells located on the basement membrane. Epithelial cells are cubic, prismatic and flat in shape with very low activity according to the authors (Yaglova et al. 2017) [12]. The cavity of each follicle is filled with a colloid of red color according to the results of studies made by (Yousef et al. 2016) [13], on the other hand, they mention that the cells of the follicular wall are often adjacent to the outside the follicle which are the follicular thyrocytes, which produce thyroid hormones.

The thyroid gland from a comparative anatomical morphological and functional aspect of cows in a comparative anatomical study of the thyroid in domestic animals showed the effect of iodine deficiency on the macro and micromorphology of the thyroid in cattle (Miller et al. 1969) [14], emphasis on the peculiarities of its blood supply and the morpho-functional characterization linked to the lactation-related of cows (Ma et al. 2016) [15].

The impact of seasons on the anatomical and histological structure of the thyroid glands in animals has been carried out by a few authors (Cruz et al. 2019) [16], this research has not been carried out on ruminants, of which our research will be based on investigations on the change of macro and microscopic morphological parameters of the thyroid glands as well as T3 and T4 hormones in the region of Souk Ahras in Algeria.

Materials and Methods

The study was carried out on clinically healthy thyroid glands of dairy producing cows, 05 years old, (local breed from the Souk Ahras region, Algeria), weighing between 360 and 466 kg. The work was carried out in four stages depending on the season of the year and this to see the influence of the climate and the living conditions of the feeding animal on the change in the morphological, histological and biochemical characteristics of the thyroid gland of These animals, not treated preventively, underwent an ante-mortem examination at the level of the slaughterhouse. Blood samples were taken for the determination of T3 and T4, before the slaughter of the animals at the level of the jugular vein, were made at the slaughterhouse, keep in dry tubes and send to the private medical analysis laboratory for the serum determination of T3 and T4 by the ELISA technique, cited by the authors (Islam et al. 2011) [17]. After slaughter, the collection of thyroid glands was carried out after anatomical dissection of the animals. During the sample, the anatomo-topographic characteristics of the thyroid glands were determined. The weight of the absolute organs adjusted using an electronic scale "Tehniprot-WTW", up to 0.002 mg. Likewise, the relative mass of the thyroid glands to the body mass of the animal was calculated. The measurements (length, width and thickness) of each thyroid gland were determined using a caliper with a division value of 1 mm thick.

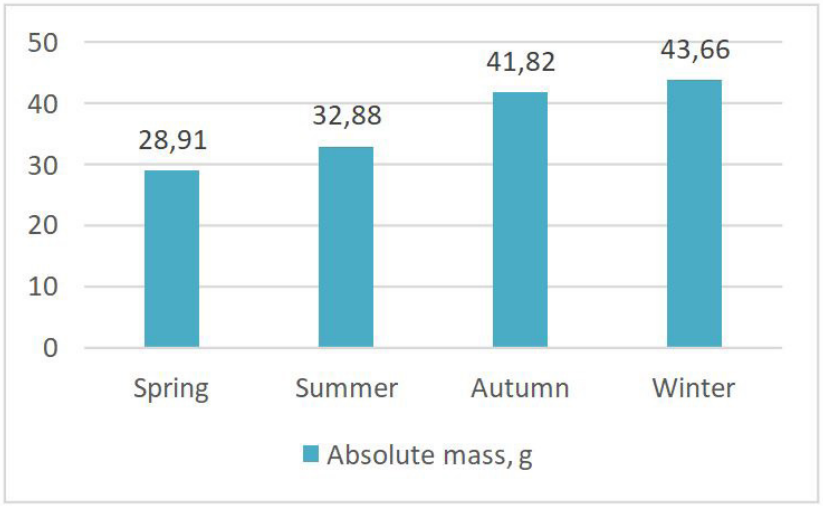
Histological studies were performed in the histopathology and clinical cytopathology laboratory of the Institute of Veterinary Sciences of Taoura University of Souk Ahras. Algeria. Thyroid glands dissected from the right half of the body (n = 5), were washed with tap water and fixed with 10% formalin for 10 to 14 days, thereafter, dehydration with ethanol in increasing concentrations, followed by a substitution of xylene and paraffin. With a microtome, 5 µm serial thin sections were prepared. Hematoxylin and eosin staining were performed according to the technique cited by the author (Ozawa et al. 2020) [18]. For the localization of the functional areas of the thyroid glands (capsule, septae, follicles in the parenchyma of the organs, we used an impregnation technique on frozen sections with silver nitrate according to the author (Alturkistani et al. 2015) [19], by serial passage through tanks of silver nitrate and potassium permanganate at declining concentration, which provides a clear visualization of the corresponding parts of the architectonic structure characteristic of the reticular fibers of this organ. Detection of areas of thyrocyte localization in functional areas of the parenchyma of the thyroid glands is performed by immunohistochemistry. Thyrocyte localization was performed using an anti-CD-56 label. The sections were incubated with PBS for 10 minutes at 20 oC. Appropriate dilutions of purified monoclonal antibodies were placed on the sections for 20 minutes, after washing and incubating with PBS for 5 minutes, the anti-CD-56 antibody was placed on the 20-micron thick sections. After a PBS wash, the sections were incubated for 20 minutes with avidin conjugated with peroxidase. After a PBS wash, the sections were incubated with 0.5 C: 3,3- diaminobenzidine in 0.01 / H_2O_2 in PBS before mounting.

Data collection was carried out on PC, determination of histological features was performed using an MBS-10 ocular and stereo microscope. Photos were taken with an OLYMPUS OM D E M5 camera. The statistical results are obtained after the total calculation according to the law S of (Avtondilov et al. 1972) [20], of the different compartments of the thyroid glands, the interpretations of the statistical results were made by the R system.

Results

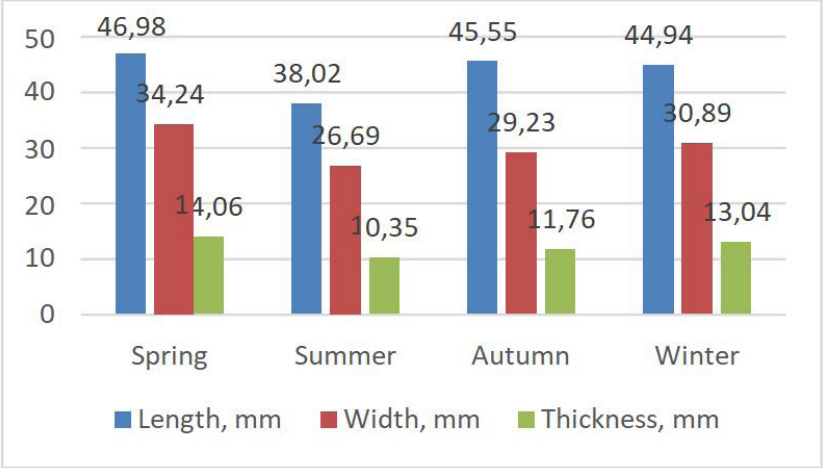
At the slaughterhouse, inspecting the carcasses of hung cattle, we found that the thyroid gland is located just adjacent to the lateral surface of the trachea and caudally to the larynx, a triangular shaped piece, shiny, red-brown in color, composed of two lobes connected by a broad and thin fibrous isthmus which has a vascular aspect, surrounded by a layer of fat giving the whole an aspect of the letter H, the right lobe larger than the left. A bifurcation in the middle gives a shape of lark's pyramid which arises from the left lobe, this part and very inconstant, of coloring varies from yellowish pink to light yellow, so we noticed that it has a soft consistency, with a more or less mamillated surface.

The study of the mass of the organs revealed to us a variation of the very clear data, the maximum value of the absolute mass of the thyroids was during the winter period, equal to 43.66 g while the minimum value was 28.91 g in the spring period, for the summer season, the summer value of 32.88 g and in autumn, it was 41.82 g, (Graph 1).

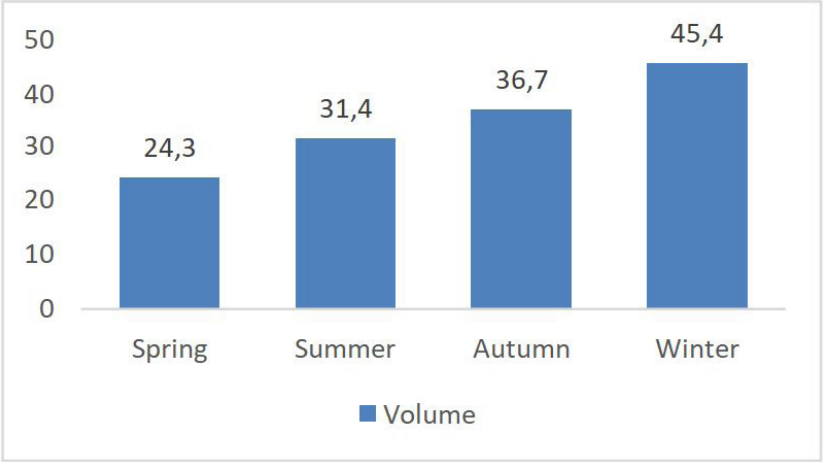


Graph 1: Index of changes in the mass parameters of certain thyroid glands in cows depending on the season, g

The results of the morphometric study of the thyroid glands, also the data were very significant according to the seasons, the maximum length of the thyroid glands was noticed in the winter period which is equal to 45.94 mm with a width of 30.89 mm and a thickness of 13.04 mm, for the minimum value of the length of the thyroids, it was found in the spring period and it is 29.98 mm, the width of which was 18.24 mm and 8.06 mm as thickness. Regarding the summer season, the length values that we found equal to 29.98 mm with a width of 18.24 mm and a thickness of 8.06 mm, in autumn, the length of the thyroid glands was 44.55 mm whose width equals 29.23 mm with a thickness of 11.76 mm, (Graph 2).



Graph 2: Index of change in morphometric parameters of certain thyroid glands in cows depending on the season, mm



Graph 3: Index of changes in the volume parameters of certain thyroid glands in cows depending on the season, mm^3

Concerning the study of the volume of the thyroid glands, it was found that the maximum value was in winter period which is equal to 45.4 mm^3, while the minimum value was found in spring period of 24.3 mm^3, in summer, the volume value was 31.4 mm3, while in autumn, it was 36.7 mm3 (Graph 3).

The examination of the histological results after staining with hematoxylin and eosin of the histological sections of the thyroid glands of cows, revealed to us that the thyroid is lobulated, composed of follicles located in a stroma of vascularized connective tissue rich in fenestrated blood capillaries, dividing the parenchyma by septae which was clearly visible. It has also been distinguished that the follicles have a spherical shape and composed of a wall formed of simple epithelial tissue which rests on a basal lamina and comprises follicular cells which are bathed in an amorphous, pasty and yellowish content, the follicular cells (or thyrocytes) of basal pole which rests on the basal lamina of the follicle, their apical pole presents microvilli projecting into the colloid and their lateral faces are joined to those of the adjacent follicular cells by junction complexes, (Figure 1).

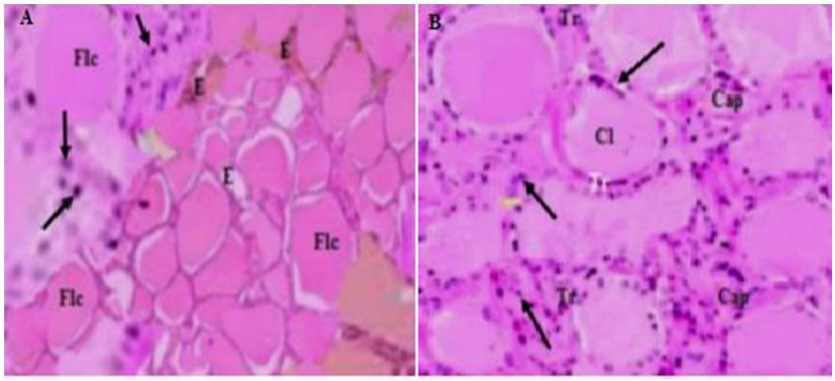
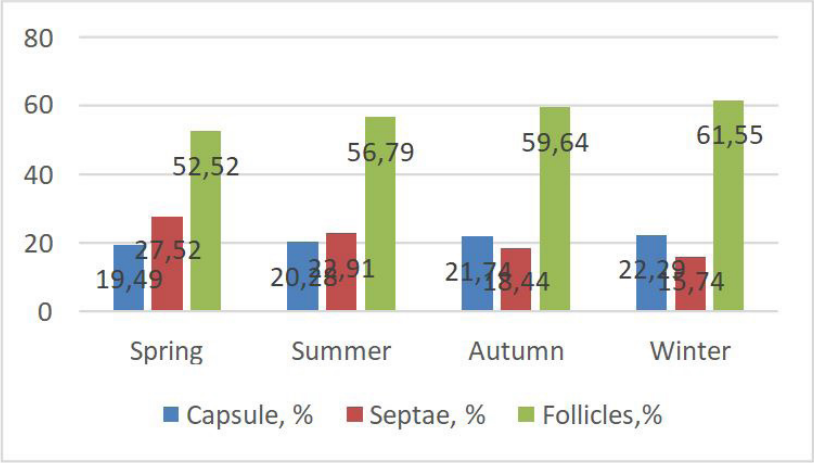


Figure 1: Histological section of cow thyroid gland, hematoxylin and eosin staining, magnification X 40 A. histological section of bovine thyroid gland from the summer season. B. histological section of bovine thyroid gland from the winter season. Flc- follicles, E-Interfollicular area, Cl-colloid, thyrocytes presented by arrows

On the other hand, it has been observed that the basal pole of thyrocytes rests on the basal lamina of the follicle, their apical pole presents microvilli projecting into the colloid, and their lateral faces are united with those of the adjacent follicular cells by complexes gap type junctional. The follicles have a voluminous appearance which compares with those of cows, on the other hand the colloid is of low-density volume and the thyrocytes, are located against the basal lamina of the follicles and had no contact with the colloid.

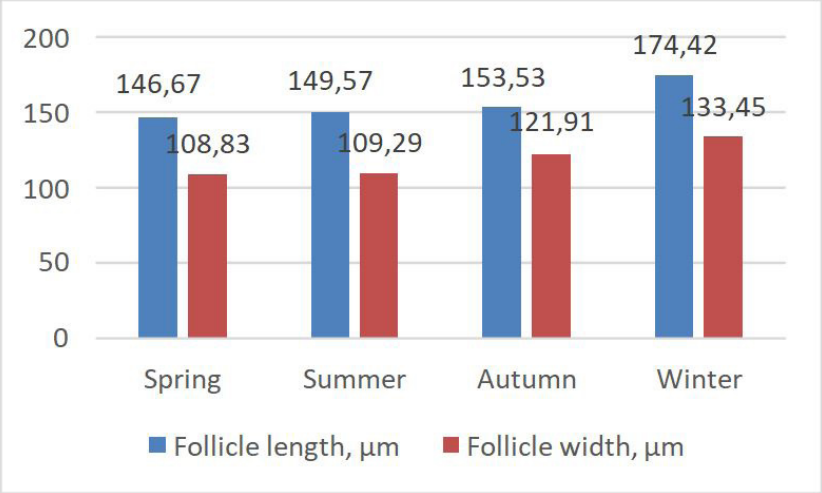
In cows, it has been observed that a gelatinous mass rich in fat has been found at the bottom of the parenchyma of the thyroid gland. In general, the thyroid gland in cattle that has been observed is surrounded by a connective capsule organized in two layers, one fibrous external and the other looser internal, which emits connective partitions dividing the parenchyma into lobules. It has been noticed that in the lobules, the glandular parenchyma consists of follicles (thyroid vesicles) with some inter follicular elements, in the connective, the thyroid follicle which represents the morpho- functional unit of the thyroid composed of a wall and a central cavity containing the dense homogeneous or granular colloid, the follicular wall consists of an epithelial base resting on a basal lamina. The epithelial cells are of two types, follicular (thyrocytes), which constitute the main cells of the follicle with two poles: one in contact with the colloid, the other basal in contact with the capillaries. From an ultra-structural X100 magnification point of view, the thyrocytes are cubic or prismatic, with an apical pole showing a few microvilli, the basal pole showing membrane folds reflecting an exchange activity with blood capillaries. The cytoplasm, basophilic, with a granular reticulum. A possible difficulty in not visualizing the para follicular cells (C) is due to the concentration of hematoxylin which was not adequate for staining.



Graph 4: Seasonal change in tissue composition of some thyroid glands in cows, %

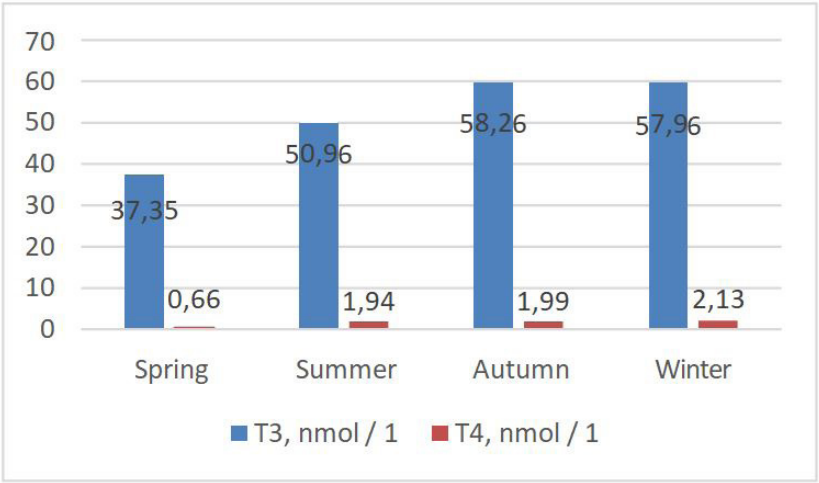
The statistical study of the histological structure of the thyroid glands of the cows of the summer season showed the percentage of the capsule of 19.49%, the septae show a sum of 27.52% and the follicles with a percentage of 52;52%, while in winter, the sum of the capsule of the thyroid glands was 22.29% with a percentage of 15.74% occupied by the septae and 61.55% for the follicles, concerning the season of the summer, the percentage of the capsule was 20.28% while the septae presented a sum of 22.91% with a value of 56.79% for the follicles. In the autumn the data was 21.74% as value for the capsule, a percentage of 18.44% for the septae and a sum of 59.64% was found for the follicles, (Graph 4).

Histomorphometry of the follicles revealed to us that the maximum length was found in the thyroid glands in the winter season of 174.42 µm with a width of 133.45 µm while the minimum sum of the width was found in the spring season thyroid glands of 149.67 µm with a width of 108.83 µm. Regarding the thyroid glands of the autumn season, the follicles were 153.53 µm long and 121.91 µm wide. Thyroid gland follicles obtained from summer cows were 146.57 µm long and 109.29 µm wide, (Graph 5).



Graph 5: Change in the micro morphometry of certain thyroid glands in cows, depending on the season, %

The results of the biochemical analyzes showed a high level concerning the thyroid hormones T3 and T4 for the cows of the winter season, for the T3 was 57.96 nmol / 1 and for the T4 it was 2.13 nmol / 1, while it was low in the spring period and the values were 37.35 nmol / 1 for T3 and 0.66 nmol / 1 for T4. During the summer period, the rates were minimal and they are 50.96 nmol / 1 for t3 and 1.94 nmol / 1 for T4, concerning the fall season, the results were 58.26 nmol / 1 for T3 and 1.99 nmol / 1 for T4, (Graph 6).



Graph 6: Seasonal change in T3, T4 hormone levels in certain thyroid glands in cows, nmol / 1

This staining technique allowed us to detect the architectonic structure of the organ by the presence of very dense reticular fibers at the parenchyma level, also we noticed that the differentiated reticular grid lines the whole of the star- shaped parenchyma, form a three-dimensional network. They are pressed against the fine crosslinked fibers; these observations are observed mainly in the center of the parenchyma, (Figure 2).

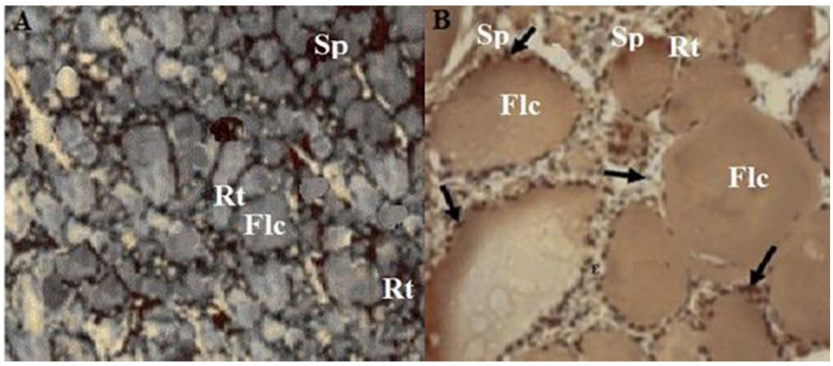


Figure 2: Histological section of cow thyroid gland, impregnation with silver nitrate, magnification A-X10-, B-X40: Cl-Colloid, E-inter follicular zone, Sp-peripheral septae, Tr- Reticular tissue area, Flc- follicles, thyrocytes presented by arrows

The follicles are distinguished by a pronounced heterogeneity of reticular fibers, concentric reticular areas form in the bottom of the follicles, and rare coarse-meshed networks that degenerate and resemble separate fragments of thinned weakly fibrous fibers. Thus, the bovine thyroid gland is a set of follicles with a specific architectonic structure, the uniqueness of which lies in the multilayer and mosaic arrangement of parenchymal structural units forming the lobe in space from the capsule The main morphological characteristics of the thyroid gland u bovine lymph node at the tissue level of the structural organization are a significant development of the specific cell system which are the thyrocytes, which is typical in the whole studied area based mainly on the connective tissue, which is particularly expressed in the glands.

The architectonics of the reticular skeleton is characteristic for each functional zone of the lobes with a maximum density of fibers in the parenchyma. At high magnification X100, we could see that the basal plate is composed of polarized cubic cells which are thyrocytes, surrounded by reticulin fibers and collagen fibers, with the presence of fatty tissue in the form of droplets, the C cells not was not visualized probable with the formation of the lipid contour which did not allow visualization.

The immunohistochemistry antibody reaction allowed us to visualize the thyrocyte, using of CD-56 antibodies, demonstrate that cells deposited around the follicles, the quality of the thyrocytes which host the parenchyma areas, the peripheral area consists of a layer of diffuse fatty tissue, in which there are numerous lymphoid follicles and a deep inner layer, which also consists of diffuse but less dense fatty tissue, continues without a clear boundary in the center. The outer layer of the follicles, a follicle layer and the inner layer is functionally dependent is rich in thyrocyte. On the blade of the thyroid gland of the cow, we could visualize that in the peripheral zone of the thyrocyte are visible of giant form and in each circumference of the follicle, there is an abundance in fat cell. Depending on the functional state of the follicles, the number of thyrocyte varies, which are in the deep zone that occupy. Also, it follows that the septae are concentrated both by the thyrocytes and adipose tissue, (Figure 3).

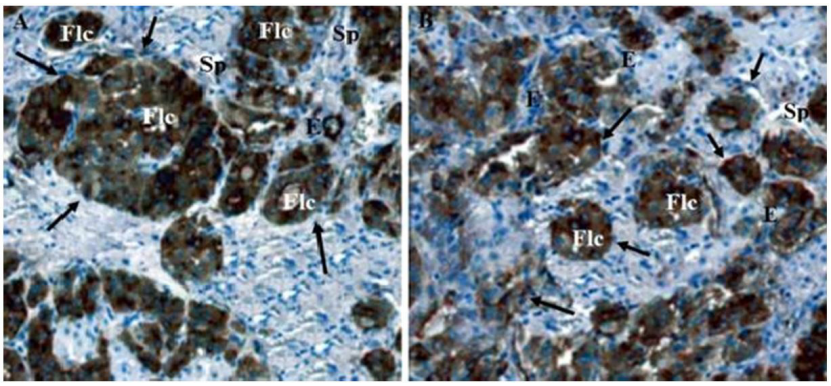


Figure 3: Thyrocyte location (CD-56) in the cow thyroid gland. Immunohistochemical staining - hematoxylin from Mayer. × 100. A, B: Flc - follicle center, 2 - peripheral area of the follicle, Cl-colloid, E-Interfollicular area, cluster of, thyrocytes presented by arrows

Discussion

According to our research, the thyroid gland in cattle is located just adjacent to the lateral surface of the trachea and caudally to the larynx, shiny triangular pieces, red-brown in color, composed of two lobes connected by a fibrous isthmus which had a vascular aspect, our results similar to research by (Benvenga et al. 2018) [21]. On the morphological level the organ of the gland has the shape of a butterfly with two lateral lobes which are joined by a wide and thin isthmus, surrounded by a layer of fat giving the whole the shape of the letter H, results similar to research by (Rajathi et al. 2019) [5], the right lobe larger than the left, also found by (Billing et al. 2019) [22] results also found by the authors (Skovorodin et al. 2020) [23], which coincide with the results we obtained, that a turgor branches off in the middle and gives the lark pyramid which arises from the left lobe, this part and very inconstant,

the coloring of which varies from yellowish pink to light yellow, of soft consistency, with a more or less shellacked surface, which the author (Benvenga et al. 2018) [21], have also mentioned.

The mass of the organs have a clear variation, limited between 32.88 g as mass found in summer which is a minimal value and 43.66 g as maximum value, found in winter season, in the literature there is a lack of research concerning the impact of the seasons on the change in the mass index of the thyroid glands in cattle, except that there are authors (Habibu et al. 2016) [24], mentioned in their research the effect of the seasons on the thyroid gland in goat kids. Also, the authors (Nouri et al. 2009) [25], researched the change in the mass index by sex of cattle, its data mentions that the mass in females is higher than that of males.

The morphometric of the thyroid glands, differ according to the period of the season, in our results a margin of the length and the width were well noticed during the period of winter, then they were minimal in summer, a lack of data in the literature concerning the impact of the season on the morphometric parameters of the thyroid gland in cattle, on the other hand studies carried out by the authors (Herrmann et al. 1990) [26], who mention that there is an influence of temperature on the morphometric parameters in the laboratory wistar-rat. In research by (Nakayama et al. 2018) [27], were cited the effect of the seasons on the morphometric parameters of the thyroid gland in White grouper (Epinephelus aeneus) in the Gulf of Suez.

The study of the volume of the thyroid glands of cows allowed us to see that the maximum high value was in the winter period, while the minimum value was found in the spring, similar results were found by the researchers (Grewal et al. 2019) [28], who mentioned the impact of seasonal temperature on the thyroid gland in animals.

Concerning the histological structure of the thyroid glands of cattle, are lobulated, rich in follicles, located in a parenchyma rich in fenestrated blood capillaries, septae divide the parenchyma which was clearly visible, these observations were been described by several authors, in goats by (Pankowski et al. 2020) [29], which mention the same results as obtained, also in the research of (Skripkin et al. 2019) [30], who carried out research on the thyroid gland in sheep. It was also distinguished that the follicles have a spherical shape and composed of a wall formed of simple epithelial tissue which rests on a basal lamina and comprises follicular cells which bathe in an amorphous, pasty and yellowish content, the follicular cells, results confirmed by the authors (Peksa et al. 2011) [31], also of basal pole which rests on the basal lamina of the follicle, their apical pole presents microvilli projecting into the colloid and their lateral faces are joined to those of adjacent follicular cells by junction complexes, similar studies obtained by (Aceves et al. 1987) [32].

On the other hand, the basal pole of thyrocytes rests on the basal lamina of the follicle, their apical pole presents microvilli projecting into the colloid, and their lateral faces are united with those of adjacent follicular cells by junctional complexes of the gap type. researchers (Woźniak et al. 2018) [33], found the same results. The follicles have a voluminous appearance in cows of the summer period, on the other hand the colloid is of low density and the thyrocytes, are located against the basal lamina of the follicles and had no contact with the colloid, this as researchers (Yanko et al. 2020) [34], have described in their work in humans. In cows, the fat-rich gelatinous mass was found at the bottom of the parenchyma of the thyroid gland, researchers (Dar et al. 2018) [35], found similar results.

The architectural structure of the organ is ensured by the presence of very dense reticular fibers at the level of the parenchyma, the reticular grid lines the entire star-shaped parenchyma, forming a three-dimensional network, which are pressed against the fine reticulated fibers, these findings are observed mainly in the center of the parenchyma, the authors (Peksa et al. 2011) [31], found similar results. The authors (Gothié et al. 2020) [36], mention the identical results in our results, that the follicles are distinguished by a pronounced heterogeneity of reticular fibers, concentric reticular areas form in the bottom of the follicles, and rare mesh networks coarse, degenerating and resembling separate fragments of thinned weakly fibrous fibers. The bovine thyroid gland groups together a set of follicles with a specific architectonic structure, the uniqueness of which lies in a disharmony of the arrangement of the parenchymal structures forming the lobe in space from the capsule, these results are also found by (Nakayama et al. 2018) [27].

The main morphological features of the bovine thyroid gland at the tissue level of the structural organization are a significant development of the specific cell system which are the thyrocytes, which is typical throughout the area studied mainly based on the connective tissue, which is particularly expressed in the glands, results similar to research data from (Doustdar et al. 2019) [37].

The researchers (Bitman et al. 1984) [38], also note the results that we found, that the architectonics of the reticular skeleton is characteristic for each lobe area with a maximum density of fibers in the parenchyma. The basal lamina is made up of polarized cubic cells which are thyrocytes, surrounded by reticulin fibers and collagen fibers, with the presence of droplet-shaped fatty tissue, results similar to the research of (Yanko et al. 2020) [34]. The immunohistochemical study made it possible to visualize the thyrocytes, as demonstrated by the authors (Viana et al. 2019) [39], cells deposited around the follicles, the quality of the thyrocytes which host the zones of the parenchyma, the peripheral zone consists of 'a diffuse fatty tissue layer, in which there are many lymphoid follicles and a deep inner layer, which also consists of diffuse fatty but less dense tissue, continuous without a clear boundary in the center, this was mentioned by (Casmir et al. 2015) [7]. It was also noted that the outer layer of follicles, a follicle layer and the inner layer is functionally dependent is rich in thyrocytes, which has been described by the authors (Ali et al. 2020) [40]. Others researchers (Sasaki et al. 2019), mentioned that the thyrocytes are visible in giant form and in each periphery of the follicle with an abundance of fatty cell On the blade of the thyroid gland of the cow, one could visualize that in the peripheral area, these results are similar to our data. Depending on the functional state of the follicles, the number of thyrocytes varies according to the season, which are found in the deep zone which occupy, also, it follows that the septae are concentrated by both thyrocytes and adipose tissue, results similar to the work of (Wang et al. 2019) [41].

Research performed by (Kulathunga et al. 2016), cited that T3 and T4 are essential for metabolism in cattle. Thus our results were as indexes of parameters very variable whatever the cows of the summer season, the level of these hormones were elevated from the normal, authors (Surya et al. 2018) [42] mention that thyroxine is essential for milk production when there is an iodine deficiency, in this period, the nutritional quality is poor in iodine in the region where these cattle are located. The results obtained from the laboratory were very clear that the quantity of hormones in cows was much higher than normal, this is due to the milk production which requires these hormones for an adequate metabolism as mentioned by the authors [43,44].

Conclusions

The present study revealed several variations in the anatomy of the thyroid gland of local breed cattle from the Souk Ahras region in Algeria; these variations could be structural modifications adapted to the climate of the seasons and also to the poverty of the iodine element in the feed of the cattle and the living conditions of the animal.

The thyroid gland appears as a bilobed organ, located just adjacent to the lateral surface of the trachea and caudally to the larynx, shiny triangular pieces, pink in color, composed of two lobes connected by a fibrous isthmus which has a vascular appearance. The morphometric and mass parameters of the thyroid glands of the cattle had higher indices in summer and lower in winter. Microscopic examination of histological sections of the thyroid glands of cattle consist of a capsule and a parenchyma. Septae submerge in the parenchyma, dividing it into compartments. Analytical biochemistry has proven that the concentration of thyroid hormones was high in cows during the summer period.

On the vital activity of animals, the bovine thyroid gland of the Souk Ahras region as part of the regulatory systems of adaptive reactions to various environmental conditions, the morphological parameters of the gland (histometric of the follicles), is essential to assess the functional state of the organ.

Acknowledgements

We would like to take this opportunity to express our deep gratitude to our close colleagues at the Department of Normal and Pathological Anatomy of Farm Animals, Faculty of Veterinary Medicine, Dnipro State Agrarian and Economic University, Ukraine.

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