

## A Morphometric Study on the Uropygial Gland of the Male and Female Chicks Given Diets Containing Red Hot Pepper

Ayşe SERBEST\*

Geliş Tarihi: 13.12.2004

Kabul Tarihi: 08.03.2005

**Summary:** In this study, the effect of feeding with diet containing red hot pepper on the uropygial gland was investigated comparatively and quantitatively. For this reason, 100 male and 100 female chicks were divided into two equal groups as the control and experimental that each contained 50 chicks. The animals in control groups were fed with normal chicken diet and the animals in experimental groups were fed with the same diet, that containing 1% red hot pepper (10g for 1kg feed). The study was began with new born chicks and was continued for 5 months and, the findings were obtained monthly.

The values related to the uropygial gland were found to be greater in males than females in both control and experimental groups in all months. The noticeable finding is that the all parameters in control and experimental groups were different statistically between male and female chicks in 4<sup>th</sup> month and 4<sup>th</sup> and 5<sup>th</sup> months, respectively.

As a result of the study, it was found that the effect of feeding diet containing red hot pepper in non-toxic dose on the morphometry of the uropygial gland was greater in males compared to females.

**Key Words:** Chick, red hot pepper, uropygial gland, morphometry.

### Erkek ve Dişi Cıvcivlerde Kırmızı Acı Biberli Rasyonla Beslenmenin Glandula Uropygialis'in Morfometrisi Üzerine Etkisinin İncelenmesi

**Özet:** Bu araştırmada kırmızı acı biberli rasyonla beslenmenin glandula uropygialis üzerine olan etkisi erkek ve dişi cıvcivlerde karşılaştırmalı olarak morfometrik yönden incelendi. Bunun için 100 erkek cıvciv (50'si kontrol, 50'si deney) ile 100 dişi cıvciv (50'si kontrol, 50'si deney) kullanıldı. Kontrol grubunu oluşturan hayvanlar normal tavuk rasyonu ile deney grubunu oluşturan hayvanlar da kontrol grubuna verilen rasyona %1 oranında (1kg. yeme 10 gr) kırmızı acı biber ilavesi yapılarak beslendi. Araştırma günlük erkek ve dişi cıvcivler ile başlamış ve 5 ay sürmüştür. Bulgular çalışma süresince aylık olarak alındı.

Glandula uropygialis'e ait değerlerin bütün aylarda hem kontrol hem de deney gruplarında erkeklerde daha fazla olduğu belirlendi. Erkek ve dişi kontrol gruplarında 4. ayda, erkek ve dişi deney gruplarında 4. ve 5. aylarda glandula uropygialis'e ait bütün değerlerin arasındaki farklılıkların önemli olduğu görüldü.

Sonuç olarak, bu araştırmada toksik olmayan dozda kırmızı acı biberli rasyonla beslenmenin glandula uropygialis'in morfometrisini, erkeklerde dişilere nazaran daha fazla etkilediği belirlendi.

**Anahtar Kelimeler:** Cıvciv, kırmızı acı biber, glandula uropygialis, morfometri.

---

\* Department of Anatomy, Veterinary Faculty, University of Uludag, Bursa-Turkey.

## Introduction

Red hot pepper is a kind of spice that is widely used in food by humans. The name of the red hot pepper is *capsicum annum* in the branch of botany and its active substance is capsaicin<sup>2,3</sup>. In recent years, there have been done many studies on red hot pepper or its active substance, that is capsaicin. But, most of these researches were carried on experimental animals and were aimed to determine the defects by using capsaicin in the long term or at high doses<sup>8,7,10,11,17</sup>.

The effect of capsaicin on the fat metabolism is also investigated. Srinivasan and Satyanarayana<sup>15</sup> stated that capsaicin consumption with diet decreases the levels of liver and serum triglycerid and the weight of fat tissue, additionally, Nopanitaya<sup>12</sup> pointed out that capsaicin additionally ensures fat absorption from intestines. Kawada et al.<sup>9</sup> claimed that it causes an increase in the weight of fat tissue surrounding kidneys.

Glandula uropygialis in fowls is a kind of gland that has similar functions to the sebaceous glands in mammals. It is as big as bean and it consist of symmetrical two lobes in chickens. The glandular secretion is discharged to the outside with one each duct of which are separate for each lobe and go along inside papilla glandula uropygialis<sup>1,6,13,14</sup>.

However, the studies related to the effect of red hot pepper or its active substance capsaicin on uropygial gland are very limited in fowls<sup>4,5,11,16,18</sup>.

And most of these studies are carried on comparatively in order to display the effects of red hot pepper in non-toxic doses on the males and females in their early ages.

In this study, it was proposed to determine the effect of red hot pepper on the morphometry of uropygial gland in chicks and to compare the values between male and female chicks feeding with a diet in non-toxic dose of capsaicin in respect to the sexual dimorphism.

## Materials and Methods

Two hundred, 100 males and 100 females, Isobrown race line chicks obtained from a private slaughterhouse were used in this study. Two groups, each containing 50 chicks, were formed from male and female chicks as the control and experimental groups. The study was continued five months and the findings were obtained

monthly. The chicks in control groups were fed with starter, grower and finisher diets depending on their ages, and the chicks in experimental group were fed with same diets but containing 1% red hot pepper (i.e. 10 g for 1kg feed). Crushed red hot pepper were given less in amount by grinding at the beginning of the study, but later without grinding the pepper was added to the feed. All animals were fed ad libitum and were housed in the same conditions during the study.

The chicks were inoculated against the infections of Newcastle in 7<sup>th</sup>, 33<sup>rd</sup> and 67<sup>th</sup> days and Gumbora in 12<sup>th</sup> and 21<sup>st</sup> days.

During the study, ten animals from each group were chosen randomly monthly for slaughtering and the body weights were obtained. Later, the uropygial glands of animals were dissected. Then, the uropygial gland was kept in 10% formaldehyde and its weight was measured with balance. The length, width and thickness of the middle parts of right and left lobes of the glands, and the length of the papilla glandula uropygialis were measured with callipers (in Table I).

The means of the values were calculated. The differences between male and females chicks both in the control and experimental groups were evaluated by means of Mann Whitney U test. The statistical analysis were done by using of SPSS 9.0 software program.

## Results

Body weight was equal in the males and females in 1<sup>st</sup> month of the control groups but this increase was greater in 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> months of the males in control groups. The body weight was heavier in females in 1<sup>st</sup> month and in males in 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> months of the experimental groups (in Table I).

The weight of the uropygial gland was heavier in males of the control group in all months. This value was smallest in the 1<sup>st</sup> month of male experimental group and in the following months the males had heavier gland than females (in Table I).

The length and width of the left lobe had a greater value in males compared to females in all months except in 1<sup>st</sup> month of the experimental group (in Table I).

The left lobe was ticker in males than females in 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> months and in 1<sup>st</sup>

**Table I. The values of control (c) and experimental (e) groups in male and female chicks.****Tablo I. Erkek ve dişi kontrol (c) ve deney (e) gruplarına ait değerler.**

		1 <sup>st</sup> month		2 <sup>nd</sup> month		3 <sup>rd</sup> month		4 <sup>th</sup> month		5 <sup>th</sup> month	
		male	female	male	female	male	female	male	female	male	female
Body weight (kg)	c	0.21 <sup>a</sup>	0.21 <sup>a</sup>	0.76 <sup>b</sup>	0.52 <sup>b</sup>	1.29 <sup>c</sup>	1.00 <sup>c</sup>	1.56 <sup>d</sup>	1.19 <sup>d</sup>	1.69 <sup>e</sup>	1.37 <sup>e</sup>
	e	0.21 <sup>a</sup>	0.22 <sup>a</sup>	0.78 <sup>b</sup>	0.61 <sup>b</sup>	1.29 <sup>c</sup>	1.04 <sup>c</sup>	1.50 <sup>d</sup>	1.17 <sup>d</sup>	1.83 <sup>e</sup>	1.16 <sup>e</sup>
Gl. urpygialis weight (g)	c	0.26 <sup>a</sup>	0.24 <sup>a</sup>	0.58 <sup>b</sup>	0.52 <sup>b</sup>	1.06 <sup>c</sup>	0.68 <sup>c</sup>	1.04 <sup>d</sup>	0.52 <sup>d</sup>	1.14 <sup>e</sup>	0.86 <sup>e</sup>
	e	0.18 <sup>a</sup>	0.36 <sup>a</sup>	0.80 <sup>b</sup>	0.54 <sup>b</sup>	1.02 <sup>c</sup>	0.76 <sup>c</sup>	1.42 <sup>d</sup>	0.70 <sup>d</sup>	1.48 <sup>e</sup>	0.74 <sup>e</sup>
Left lobe length (cm)	c	0.74 <sup>a</sup>	0.72 <sup>a</sup>	0.92 <sup>b</sup>	0.88 <sup>b</sup>	1.08 <sup>c</sup>	0.90 <sup>c</sup>	1.08 <sup>d</sup>	0.94 <sup>d</sup>	1.14 <sup>e</sup>	0.98 <sup>e</sup>
	e	0.76 <sup>a</sup>	0.82 <sup>a</sup>	0.98 <sup>b</sup>	0.88 <sup>b</sup>	1.08 <sup>c</sup>	1.04 <sup>c</sup>	1.16 <sup>d</sup>	1.02 <sup>d</sup>	1.32 <sup>e</sup>	0.92 <sup>e</sup>
Left lobe width (cm)	c	0.56 <sup>a</sup>	0.54 <sup>a</sup>	0.86 <sup>b</sup>	0.76 <sup>b</sup>	0.90 <sup>c</sup>	0.86 <sup>c</sup>	0.92 <sup>d</sup>	0.72 <sup>d</sup>	0.96 <sup>e</sup>	0.88 <sup>e</sup>
	e	0.56 <sup>a</sup>	0.66 <sup>a</sup>	0.82 <sup>b</sup>	0.76 <sup>b</sup>	0.92 <sup>c</sup>	0.82 <sup>c</sup>	1.02 <sup>d</sup>	0.86 <sup>d</sup>	1.04 <sup>e</sup>	0.82 <sup>e</sup>
Left lobe thickness (cm)	c	0.44 <sup>a</sup>	0.44 <sup>a</sup>	0.78 <sup>b</sup>	0.56 <sup>b</sup>	0.72 <sup>c</sup>	0.58 <sup>c</sup>	0.74 <sup>d</sup>	0.48 <sup>d</sup>	0.74 <sup>e</sup>	0.72 <sup>e</sup>
	e	0.42 <sup>a</sup>	0.48 <sup>a</sup>	0.78 <sup>b</sup>	0.62 <sup>b</sup>	0.76 <sup>c</sup>	0.68 <sup>c</sup>	0.78 <sup>d</sup>	0.64 <sup>d</sup>	0.84 <sup>e</sup>	0.62 <sup>e</sup>
Right lobe length (cm)	c	0.76 <sup>a</sup>	0.70 <sup>a</sup>	0.88 <sup>b</sup>	0.80 <sup>b</sup>	1.12 <sup>c</sup>	0.98 <sup>c</sup>	1.06 <sup>d</sup>	0.82 <sup>d</sup>	1.14 <sup>e</sup>	0.98 <sup>e</sup>
	e	0.76 <sup>a</sup>	0.78 <sup>a</sup>	0.88 <sup>b</sup>	0.86 <sup>b</sup>	1.08 <sup>c</sup>	1.00 <sup>c</sup>	1.18 <sup>d</sup>	1.06 <sup>d</sup>	1.30 <sup>e</sup>	0.98 <sup>e</sup>
Right lobe width (cm)	c	0.58 <sup>a</sup>	0.58 <sup>a</sup>	0.82 <sup>b</sup>	0.66 <sup>b</sup>	0.92 <sup>c</sup>	0.82 <sup>c</sup>	0.90 <sup>d</sup>	0.72 <sup>d</sup>	0.98 <sup>e</sup>	0.86 <sup>e</sup>
	e	0.54 <sup>a</sup>	0.64 <sup>a</sup>	0.78 <sup>b</sup>	0.66 <sup>b</sup>	0.88 <sup>c</sup>	0.82 <sup>c</sup>	1.04 <sup>d</sup>	0.84 <sup>d</sup>	0.98 <sup>e</sup>	0.80 <sup>e</sup>
Right lobe thickness (cm)	c	0.46 <sup>a</sup>	0.40 <sup>a</sup>	0.72 <sup>b</sup>	0.62 <sup>b</sup>	0.72 <sup>c</sup>	0.60 <sup>c</sup>	0.80 <sup>d</sup>	0.56 <sup>d</sup>	0.74 <sup>e</sup>	0.70 <sup>e</sup>
	e	0.38 <sup>a</sup>	0.44 <sup>a</sup>	0.78 <sup>b</sup>	0.60 <sup>b</sup>	0.76 <sup>c</sup>	0.64 <sup>c</sup>	0.84 <sup>d</sup>	0.62 <sup>d</sup>	0.84 <sup>e</sup>	0.62 <sup>e</sup>
Papilla gl. uropygialis length (cm)	c	0.34 <sup>a</sup>	0.46 <sup>a</sup>	0.50 <sup>b</sup>	0.44 <sup>b</sup>	0.54 <sup>c</sup>	0.54 <sup>c</sup>	0.56 <sup>d</sup>	0.56 <sup>d</sup>	0.70 <sup>e</sup>	0.68 <sup>e</sup>
	e	0.40 <sup>a</sup>	0.50 <sup>a</sup>	0.50 <sup>b</sup>	0.50 <sup>b</sup>	0.52 <sup>c</sup>	0.52 <sup>c</sup>	0.58 <sup>d</sup>	0.60 <sup>d</sup>	0.74 <sup>e</sup>	0.64 <sup>e</sup>

month this value was same and a little greater in females of control and experimental groups, respectively (in Table I).

The length and width of the right lobe had greater values in male when compared to the female chicks in all months of both groups except the 1<sup>st</sup> month. These measurements were longer in 1<sup>st</sup> month of female experimental group while the width was the same in 1<sup>st</sup> month of control groups (in Table I).

The male chicks had a greater value in the thickness of right lobe in all age period of both groups except the 1<sup>st</sup> month of experimental group (in Table I).

The important finding about the length of the papilla gl. uropygialis was that the length was longer in females and males in 1<sup>st</sup> and 5<sup>th</sup> months, respectively (in Table I).

The comparison of the value between male and female chicks showed that the all parameters differed significantly in 4<sup>th</sup> month of both control and experimental groups as well as 5<sup>th</sup> month of the experimental group. Additionally, the weight of the uropygial gland and width of the right lobe were most effected parameters from sexual differences in chicks (in Table II).

**Table II. Statistical comparison of the values between control (c) and experimental (e) groups of male and female chicks.****Tablo II. Erkek ve dişi kontrol (c) ve deney (e) gruplarına ait değerlerin istatistiksel karşılaştırması.**

		1 <sup>st</sup> month	2 <sup>nd</sup> month	3 <sup>rd</sup> month	4 <sup>th</sup> month	5 <sup>th</sup> month
Gl. Uropygialis weight (g)	c	aa-	bb-	cc*	dd**	ee*
	e	aa**	bb**	cc-	dd**	ee**
Left lobe length (cm)	c	aa-	bb-	cc-	dd*	ee*
	e	aa-	bb*	cc-	dd*	ee**
Left lobe width (cm)	c	aa-	bb*	cc-	dd**	ee-
	e	aa*	bb-	cc-	dd*	ee*
Left lobe thickness (cm)	c	aa-	bb*	cc-	dd**	ee-
	e	aa-	bb*	cc-	dd*	ee*
Right lobe length (cm)	c	aa-	bb-	cc-	dd**	ee-
	e	aa-	bb-	cc-	dd*	ee*
Right lobe width (cm)	c	aa-	bb**	cc*	dd*	ee-
	e	aa*	bb*	cc-	dd*	ee**
Right lobe thickness (cm)	c	aa-	bb-	cc-	dd*	ee-
	e	aa-	bb*	cc-	dd*	ee*
Papilla gl. Uropygialis length (cm)	c	aa*	bb-	cc-	dd*	ee-
	e	aa**	bb-	cc-	dd*	ee*

\* p &lt; 0.05

\*\* p &lt; 0.01

- not significant

## Discussion

Jang et al.<sup>7</sup>, stated that no differences were seen in the weights of body weight, liver, kidney and thymus of between control and experimental groups in mice with red hot peppers. McElroy et al.<sup>11</sup>, who added capsaicin to the diets of chickens in amount of 5 and 20 g/kg did not find any important difference in the body weights between control and experimental groups at the end of their study. Furuse et al.<sup>4</sup> found that there was no difference in the abdominal fat amount between laying hens fed with diet containing red hot pepper in amount of 2 and 10g/kg and those feeding with diet without pepper.

In this study, the increase of body weight was found to be greater in males both in control and experimental groups compared to control and experimental groups of females except the first month. Also the values of the uropygial gland was found to be greater both in control and experimental groups of males compared to females. The difference between the control groups of males and females was significant especially in the 4<sup>th</sup> month while the significant differences between the experimental groups of males and females were found in the 4<sup>th</sup> and 5<sup>th</sup> months.

As a result, the effect of feeding with diet containing red hot pepper in non-toxic doses on the uropygial gland morphometry was found to be greater in males compared to females.

## References

1. Baumel, J.J., King, A.S., Lucas, A.M., Breazile, J.L., Evans, H.E. *Nomina Anatomica Avium*, Academic Press London, New York, Toronto, Sydney, San Francisco, 1979. 21-42.
2. Blackwell, H.W. *Poisonous and Medicinal Plants*, Prentice Hall Inc., 1990; 171.
3. Frohne, D., Pfander, H.J. *A Color Atlas of Poisonous Plants*, Wolfe Publishing LTD, 1983.
4. Furuse, M., Nakajima, S., Miyagawa, S., Nakagawa, J., Okumura, J. Feeding behaviour, abdominal fat and laying performance in laying hens given diets containing red pepper. *Jpn. Poult. Sci.* 1994; 31 (1) 45-52.
5. Geisthovel, E. Die Wirkung des Capsaicins auf die Temperaturregulation der Vogel, untersucht am Beispiel der Peking-Ente (*Anas platyrhynchos*). Thesis. 1985; 90. Giessen.
6. Grau, H. *Anatomie der Hausvögel. "Ellenberger Baum'un Handbuch der Anatomie der Haustiere"* (O.E. Zietschmann, E. Ackerknecht und H. Grau, eds.) 18. Auflage, Springer Verlag, Berlin. 1943.
7. Jang, J.J., Devor, D.E., Longsdon, D.L., Ward, J.M. A 4- Week feeding study of ground red chilli (*Capsicum annum*) in male B6C3f1 Mice. *Fd. Chem. Toxic.* 1992; 30 (9) 783-787.
8. John, A.T., Abraham, S. Cytological abnormalities induced by red pepper in mouse bone marrow cells in vivo. *Caryologia.* 1994; 47 (1) 53-58.
9. Kawada, T., Hagihara, K., Iwai, K. Effects of capsaicin on lipid metabolism in rats fed a high fat diet. *J. Nutr.* 1986; 116, 1272-1278.
10. Matsuo, T., Yoshioka, M., Suzuki, M. Capsaicin in diet does not affect glycogen contents in the liver and skeletal muscle of rats before and after exercise. *J. of Nutr. Sci. and Vitaminol.* 1996; 42 (32) 249-256.
11. McElroy, A.P., Manning, J.G., Jaeger, L.A., Taub, M., Williams, J.D., Hargis, B.M. Effect of prolonged administration of dietary capsaicin on broiler growth and *Salmonella enteridis* susceptibility. *Avian Diseases.* 1994; 38 (2) 329-333.
12. Nopanitaya, W. Long term effects of capsaicin on fat absorption and the growth of the rat. *Toxico. and App. Pharm.* 1973; 37, 269-279.
13. Schummer, A. *Anatomie der Hausvögel, Lehrbuch der Anatomie der Haustiere*, Nickel, R., Schummer, A., Seiferle, E., Paul Parey In Berlin und Hamburg, Band V, 1973, 158.
14. Schwarze, E., Schröder, L. *Kompendium der Geflügel Anatomie.* Gustav Fisher Verlag, Stuttgart, New York, 1979.
15. Srinivasan, M.R., Satyanarayana, M.N. Effect of capsaicin on skeletal muscle lipoprotein lipase in rats fed high fat diet. *Indian Journal of Experimental Biology.* 1989; 27 (10) 910-912.
16. Tellez, G.I., Jaeger, L., Dean, C.E., Corrier, D.E., Deloach, J.R., Williams, J.D., Hargis, B.M. Effects of prolonged administration of dietary capsaicin salmonella enteridis infection in Legorn chicks. *Avian Diseases.* 1993; 37(1) 143-148.
17. Traurig, H.H., Papka, R.E., Saria, A., Lembeck, F. Substance P immunoreactivity (SP-I) in lactating rat nipples and the effects of neonatal capsaicin treatment on subsequent. *Anat. Rec.* 1984; 208 (3): 185A.
18. Weyrich, M. *Der Einfluss von Capsaicin auf die Membranstrome sensorischer Kucken neurone.* Thesis. 1987; 92. Giessen.