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دراسة بيومترية ومورفولوجية على الغدد العرقية المتآكلة في بعض مناطق الجلد في الجاموس المصرى

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تم دراسة شكل وتوزيع الغدد العرقية في بعض مناطق الجلد في الجاموس المصرى بعشرون حيوان وقد اجريت بعض القياسات المختلفة .

ونوقشت نتائج هذا البحث مع مثيلاتها في الحيوانات المستأنسة الأخرى .

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BIOMETRICAL AND MORPHOLOGICAL STUDIES OF THE APOCRINE SWEATGLANDS IN SOME REGIONS OF THE SKIN OF BUFFALOES IN EGYPT

(With 3 Tables and 2 Figures & 5 Plates)

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SUMMARY

The present study was carried out on skin specimens taken from 9 body regions of adult male and female buffaloes.

Biometric studies were calculated. The average number of the apocrine sweat glands per-sq. cm of the skin was about 250. Sex and regional veriations in the density of sweat glands were noticed. The shape of the secretory portion of these glands differs in various regions.

INTRODUCTION

The differences in the measurments and morphology of the apocrine sweat glands in the skin of ruminants have been reported by several authors. SALEM (1966) studied the average number of these glands in friesian, Jersey and native cattle. The density of these glands per unite area of the skin varies according to the age, sex and breed (HAFEZ et al., 1955; SHAFIE and EL-TANNKHY, 1970 and JENKINSON and NAY, 1975).

The surface area, number, volume and shape of the apocrine sweat glands vary markedly according to the sex and body regions (HAFEW et al.,1955; SAR and CALHOUN,1965; JEHKINSON, 1967; LYNE and HOLLIS, 1968; SINGH et al., 1973 and FATHALIA, 1975).

The apocrine sweat glands vary in shape and volume in different bovine breeds. The most of the tropical breeds have a baggy type of sweat glands of varying length, and in some cases slightly coiled with wide diameter as in formasan cattle (YAMANE and ONO, 1936) and buffalo (JENKINSON and NAY, 1975).

On the other hand the temperute Zone breeds possess mostly tubular mone or lees coiled type of varying length with fairly constant small diameter as in Ayrshires (FINDLAY and YANG, 1946) and shorthorns cattle (NAY, 1959).

The lack of a rather detailed studies concerning the biometeterical and morphological features of the apocrine sweat glands in buffaloes in Egypt necessitates the carrying out of the present investigation. Also this investigation will serve as a usefull reference for comparative study.

MATERIAL and METHODS

The present study was carried out on spescimens taken from skin of 20 healthy mature male and femele buffaloes. The specimens were taken from 8 body regions as shown in table I.

The skin specimens were clipped and fixed in Bouin's fluid and Helly's fluid. Serial horizontal and vertical sections 8 - 20 Um thick were made. Besides, a number of thick hand frozen sections about 200 Um thick were obtained. For biometric studies Harris Haematoxylin and eosin (HARRIS, 1960) was adopted.

The shape of the apocrine sweat glands were made by tracing the outline of the gland with the aid of projecting microscope by using thick hand frozen sections stained with sudan black (LISON and DAGNELIE, 1935).

Measurments:

Horizontal sections directly udner the epidermis and the subepidermal stratum were used for counting the hair follicles per sq. cm of skin. The microscopic field area was 5.3 mm^2 one sq. cm of skin was equal to 19 fields.

Thick vertical sections were used for the measurments of sweat glands. The length (L) of the glandular portion of each of 10 glands per region was measured using eye piece micrometer scale which was caliberated with a stage micrometer to the nearest tenth of micrometer (NAY and HAYMAN, 1956) and the mean value was calculated.

By using the same method, the glandular portion of each of 10 glands was measured in three places D , D , D (Fig. 1). The mean of these 30 values was taken as gland diemeter. The shape, volume and the surface area of the sweat glands were calculated from the obtained length and diameter.

The ratio between the length and diameter (L/D) indicates the degree of colling of the glandular portion.

The volume of the apocrine sweat gland was estimated by using the formula:

$$\pi (1/2\ D)^2\ L$$

The glandular surface area per apocrine sweat gland was estimated by using the formula.

$$2\ \pi\ (1/2\ D)\ L$$

Statistical analysis for the results were carried out according to SNEDECOR & COCHROAN (1967).

RESULTS

The average number of the apocrine sweat glands per sq. cm of skin was about 250. The lowest density of these glands was 182 and 293 per sq. cm in female and male buffaloes respectively (Table 2 and plate 1, 2).

The density of the apocrine sweat glands varies from one region to the other. In female buffaloes the highest number of glands per sq. cm was about 224 in the axillary fold region, while the lowest number was about 118 in the mammary gland region' In the male the highest number of these glands per sq. cm was about 325 in the front region, and the lowest number was about 268 in the base of the horn.

The depth of the apocrine sweat glands showed variation from one region to the other (Table 3 and plate 3). They were deep in the reticular layer of the dermis in the front region (1983 Um) and in the skin of the mammary gland (1950 Um) while those in the inguen were

only 1011 Um). In the other region the apocrine sweat glands occupied an intermediate location.

The histological studies of the skin of buffaloes in Egypt showed that the apocrine sweat gland is formed from glandular portion and elongated cylindrical duct. The shape of the glandular portion of the apocrine sweat gland differed from one region to the other (Fig. 2). In the front, base of the horn and dorsal aspect of the tail, the glands were short saccular and noncoiled. Somewhat elongated-shaped like a cucumber was met with in the base of the horn and dorsal aspect of the tail. In the inguen, mammary gland and scrotum regions, the glandular part was saccular and less coiled (clup-shaped). In the other regions they appeared sausage in shape.

The average length of the glandular portion of the apocrine sweat glands was about 922 Um. while its averaged diameter was about 167 Um. The mean gland length of the glandular portion was big in the axillary fold, ventral aspect of the tail and inguen, while it was small in the front and base of the horn regions (Plate 4).

The diameter of the apocrine sweat glands differed acoording to the regions. It increased in the inguen and the base of the horn and decreased in the front and scrotum regions (Plate 5).

Mean value for apocrine sweat gland length diameter ratio (L/D) for each studied body region is showed in Table 3. It was great in the ventral aspect of the tail (8.3), and axillary fold (7.06), while it was very low in the base of the horn (3.4).

Mean gland volume and glandular surface area for each body region are presented in Table 3 and plate 6,7. The highest sweat gland volume was present in inguen (40.4 x 10 Um^3), While the lowest volume was present in front (6.8 x 10 Um^3) and in. serotum (9.4 x 10 Um^3).

On the other hand the highest glandular surface area was found in the axillary fold (1.46 x 10 Um^2) and ventral aspect of the tail (1.20 x 10 Um^2), while the lowest one was in front region (0.51 x 10 Um^2).

DISCUSSION

Many efforts have been performed to study the apocrine sweat glands of the skin of different animals.

In accordance with the finding of HAFEZ et al. (1955) and JENKINSON and NAY (1975), in buffaloes, the average number apocrine sweat glands was relatively low (250 per Sq. cm). The Paucity of sweat glands is clearly a result of the semiaquetic life of the wild buffalo. Its significance for the domestic animal is reduced ability to cool by sweating. It is clearly dvisable to try and keep them cool by the application of water.

Regarding the sex differences, TURNER et al. (1962) stated that the hair density is higher in male than in female calves. Similar results were obtained in the present study. This differences may be due to the effect of sex hormones. However PETERS and SLEN (1964) found no significant difference in hair density between Herford heifer and steer calves.

The present study revealed that differences in density of the apocrine sweat glands in different body regions was controled by the degree of exposure to external enviroment and the tension of the skin, thus the glands in front region were more dense (325) than in the ventral aspect of the tail (275) in male buffaloes. On the other hand, as the skin of the ventral aspect of the tail is more tense than that of the axillary fold, therefore, the density of the apocrine sweat glands was more in the latter region (323) than the former (275) in male buffaloes.

In accordance with the finding of CHOWDHUARY & SADHU (1963) and HERZ & STEINAUF (1974) in cattle, the present study revealed that the depth of the apocrine sweat gland differs from one region to the another. The glands were more deep in front and mammary glands regions, however those of the inguen were located more superficially.

In the present work the apocrine sweat glands were formed of glandular portion and elongated cylind rical duct. The shape of the glandular portion differed from one region to the other. They were short saccular and non coiled and some times elongated shaped like a cucumber, in the base of the horn and dorsal aspect of the tail. However in the inguen, mammary gland and scrotum regions, they appeared saccular less coiled (clup-shaped). In the other studied body regions, they appeared sausage in shape.

In the different bovine breeds the apccrine sweat glands varies in shape. The temporate zone breeds possess mostly tubular more or less coiled type of varying length with fairly constant small diameter as in Ayrshire (EINDLAY and YANG, 1948), and in shorthorns (NAY, 1959). On he other hand, in most of the tropical breeds the glands have a baggy type with varying lengths and in some cases slightly coiled with wide diameter as in buffalo (HAFEZ et al., 1955) and JENKINSON and NAY, 1975).

In the present work there was a reverse relation between the degree of the exposure of the skin to external environment and the length of the glandular portion of the apocrine sweat gland. They were longer in the axillary fold (1325 Um) than in the front (61 Um).

The gland length diameter ratio (L/D) was correlated with the degree of the coiling of the apocrine sweat glands. The ratio was greater in the ventral aspect of the tail (8.3) and lower at the hase of the horn (3.4). Accordingly the glands were less coiled in the latter than in the former.

JENKKINSON and NAY (1975) stated that the more active gland has smaller volume. This indicates reverse relation between the activity and volume of the apocrine sweat gland.

In the present work in addition to the volume the glandular surface area has also a reverse relation to the glandular activity. The volume and glandular surface area of the apocrine sweat gland in the inguen and axillary fold regions are larger than those of the front region, this indicates that the glands of the front region are more active than those of the inguen and axillary fold.

Whereas AMAKARI (1974) and JENKINSON and NAY (1975) stated that in tropical climate the cattle race has smaller of andular volume than those of the temperate wone, the present study and PAN (1963) and BARKER and NAY (1964) pointed out that the glandular volume is larger in the animal of the tropical zone than in those of the temperate zone.

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Table (1)

Skin of body regions usedin the present investigation

No.	Body region	Symbol
1	Front	FRR
2	Base of the horn	Bh
3	Axillary fold	Ax
4	Dorsal aspect of the tail	Dt
5	Ventral aspect of the tail	Vt
6	Inguen	In
7	Scrotum	Sc
8	Mammary gland	Mg

Table (2)

Mean number of the apocrine sweatglands per sq. cm of skin in different body regions of the Egyptian buffaloes in Egypt.

Sex	Fr	Bh	Ax	Dt	Vt	In	Sc	Mg	Mean
Female	192±7	180± 8	224±20	212±3	134±3	216±34	-	118±5	182±41
Male	352±46	268±21	323±83	310±41	275±43	271±12	281±12	281+60	293±25

Table (3)

Average measurements of the apocrine sweat glands in the skin in different body regions of the buffaloes in Egypt.

Rrgion	Depth (Um)	Glandular portion				
		Lenth (L) (Um)	Diameter (D) (Um)	Length/Diam. (Um)	Volume X 10^{6} (Um)	Surface area X 10^{-6} (Um)
Fr	1983±335	619±98	125±29	5.3±1.4	6.8±3.7	0.51±0.15
Bh	1543±201	633±35	199±36	3.4±0.5	19.06±6.3	0.77±0.14
Ax	1671±282	1325±132	189±31	7.06±0.81	37.6±9.9	1.46±0.55
Dt	1752±167	817±101	161±34	5.2 ±1.1	16.9±5.7	0.83±0.17
Vt	1938±460	1271±229	157±33	8.3 ±1.3	23.9 ±7.5	1.20±0.3
In	1011±183	1014±77	222±39	4.7 ±0.7	40.4 ±7.6	1.40±0.2
Sc	1742±664	737 ±38	126±31	5.9 ±0.8	9.4 ±3	0.59±0.12
Mg	1950±700	966 ±263	165±36	6.1 ±2.1	21.1 ±7.2	0.99±0.3
Mean	1698.69	9.22.68	167.9	5.5	21.89	1.94

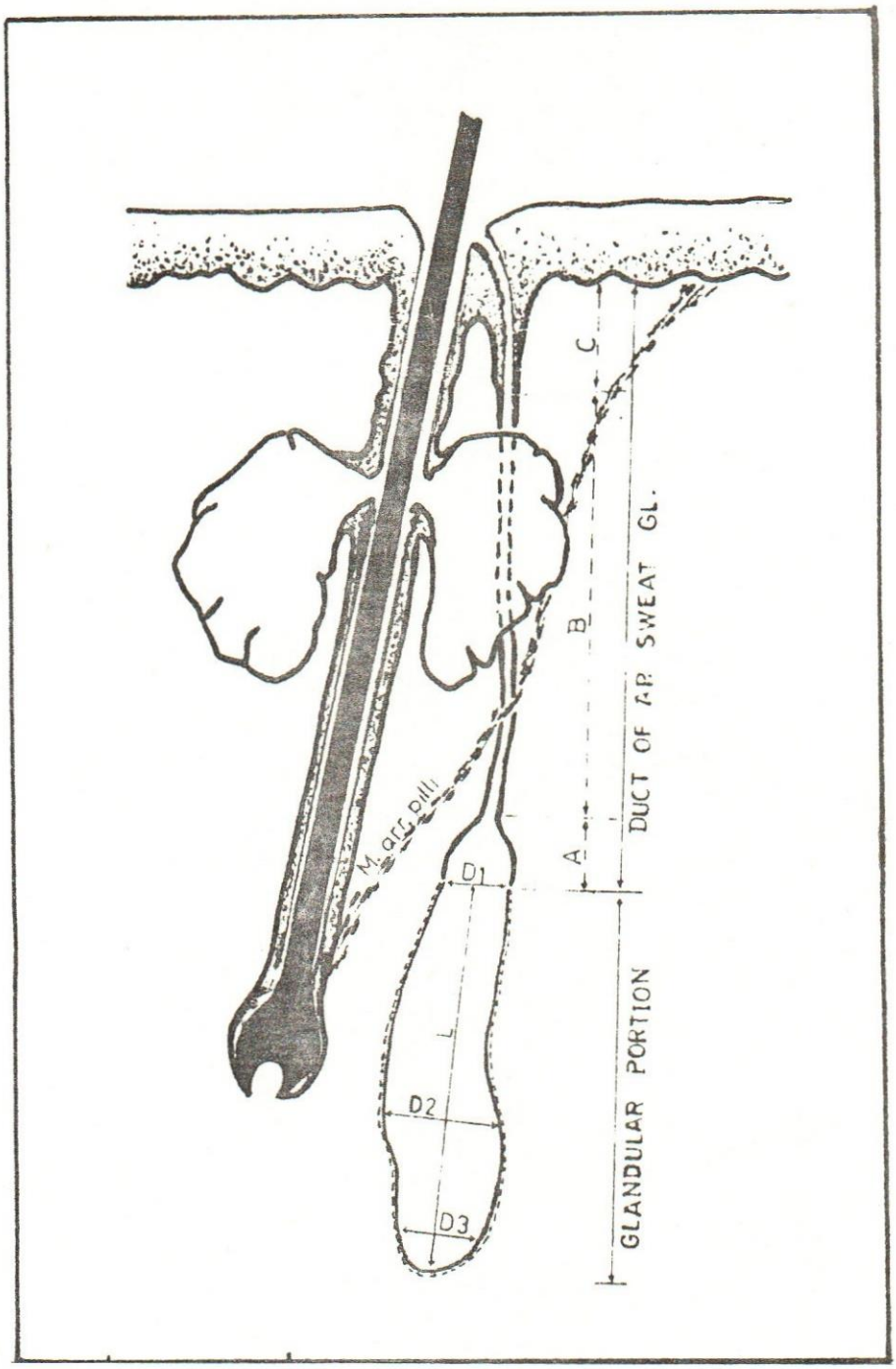


Fig. (1)

Adiagram showing the measurments of the different parts of the apocrine sweat gland.

The glandular portion; (L) length.
(Dl, D2, D3) Diameter.

The duct of the apocrine sweat gland:

(A) Proximal part, (B) Middle part, (C) Distal part.

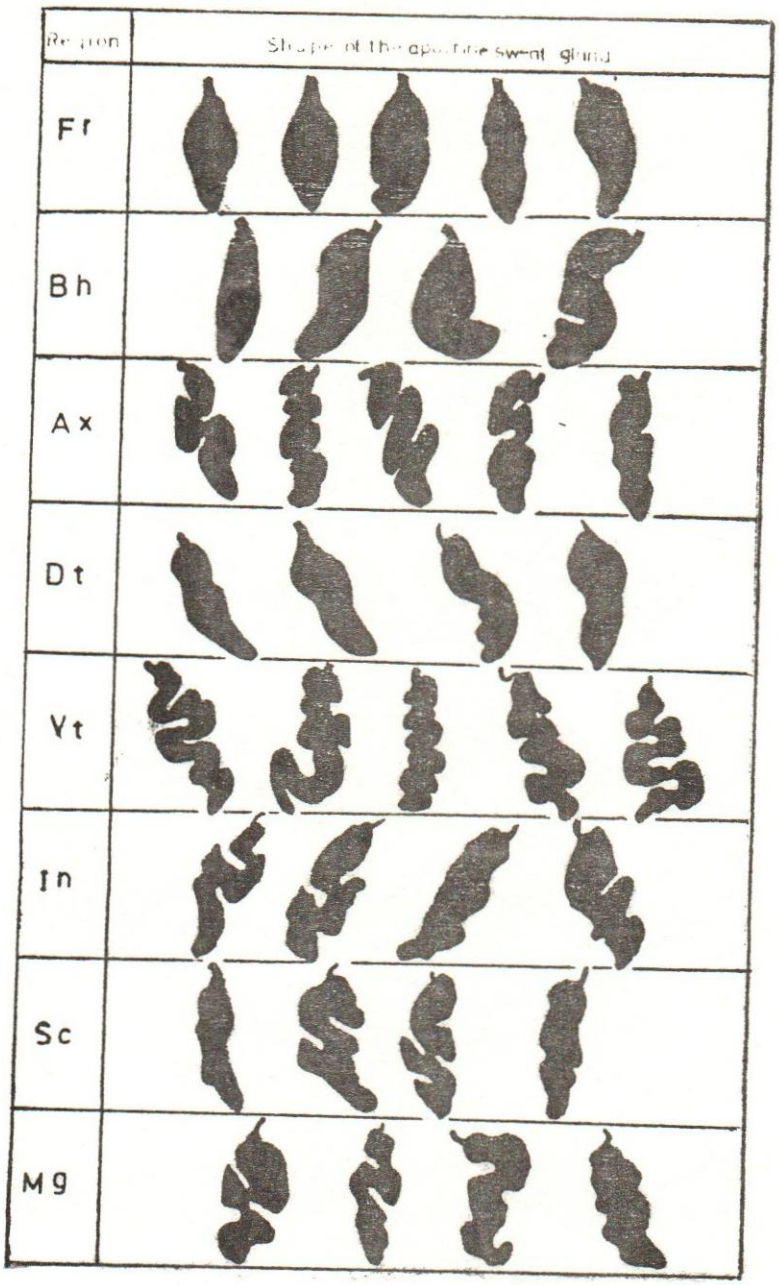


Fig. (2)
Shows the variations in the shape of the apoorine sweat glands in different body regions of the fubfaloes in Egypt.

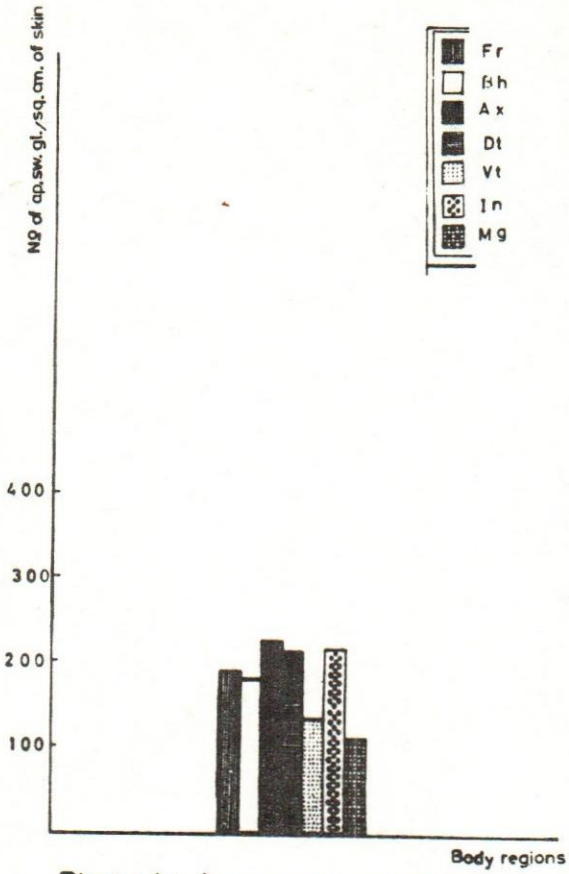
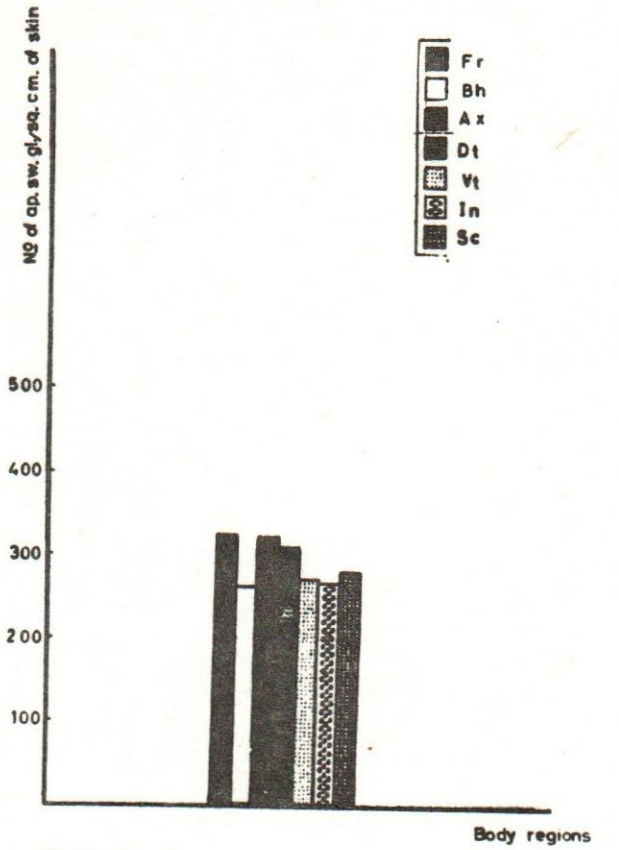


Plate (1) Shows the density of the apocrine sweat glands in female Egyptian buffaloes.



Plate(2) Shows the density of the apocrine sweat glands in male Egyptian buffaloes.

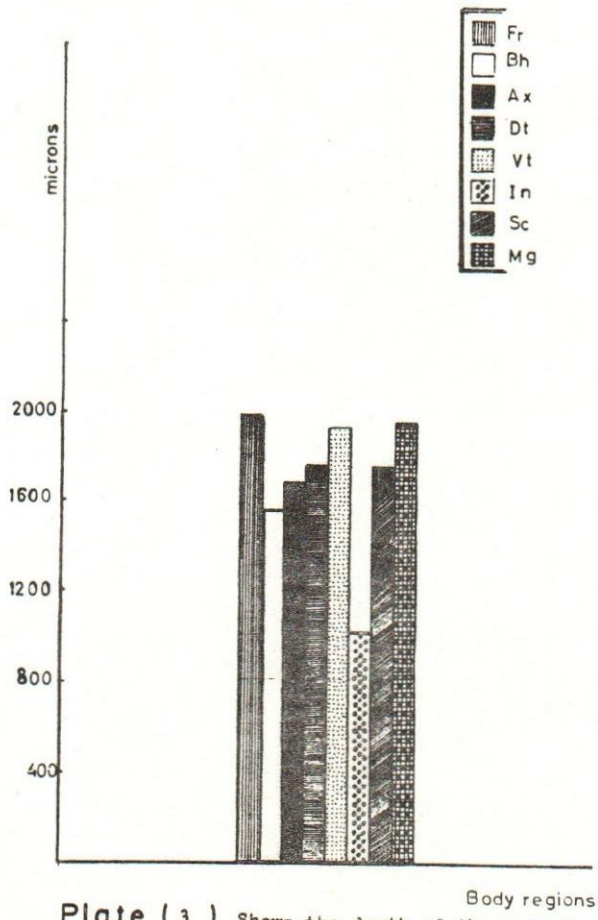


Plate (3) Shows the depth of the apocrine sweat glands in Egyptian buffaloes.

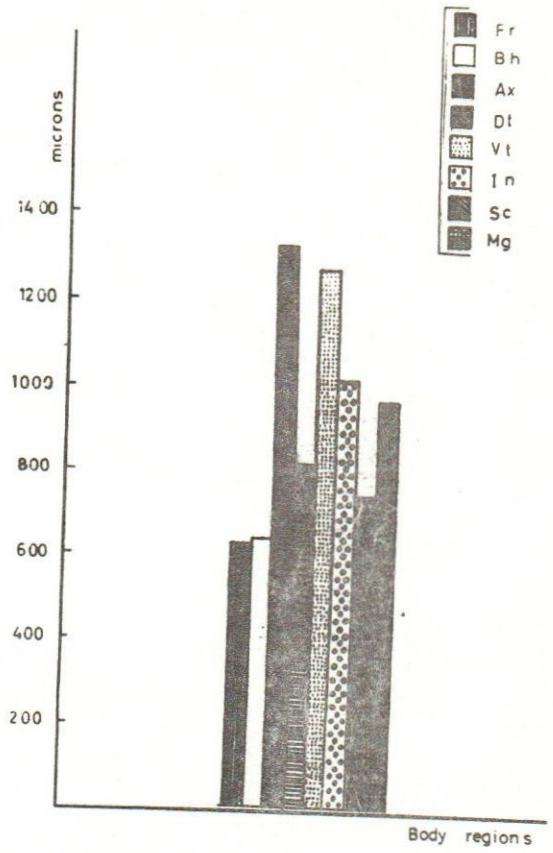


Plate (4) Shows the length of the glandular portion of apocrine sweat gland in the Egyptian buffaloes.

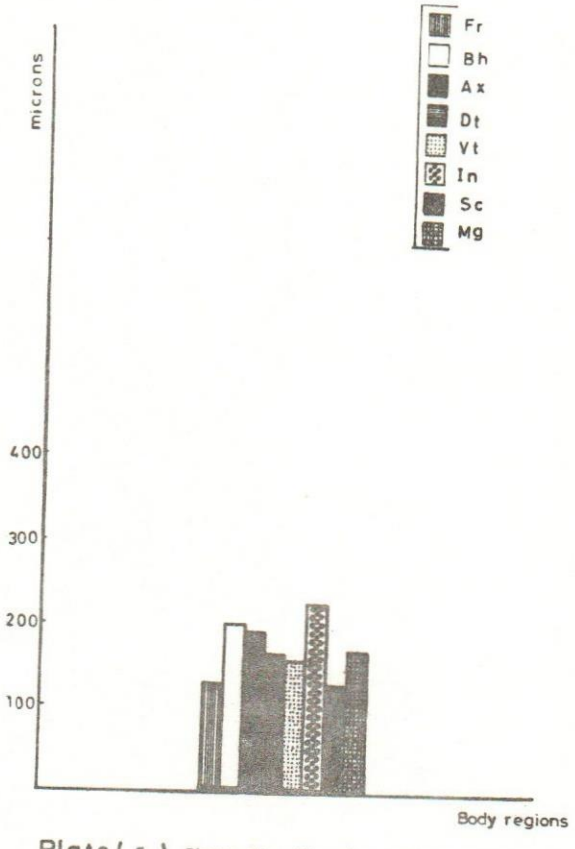


Plate (5) Shows the diameter of the apocrine sweat glands in the Egyptian buffales.