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# STUDIES ON THE DEVELOPMENT OF THE OVIDUCT IN HIGH AND LOW EGG-PRODUCING FOWL
## I- MORPHOMETRIC STUDIES

(With 6 Tables & 6 Figures)

By

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# دراسات لتطور قناة البيض في الدجاج ذات الانتاج العالي والمنخفض
## ١-دراسات مورفومتريه

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أجرى هذا البحث على سلالتين من الدجاج : الأولى : سلاله الدندراوى ( منخفضة نسبيا فى انتاجية البيض ) والثانية : ( عاليه نسبيا فى انتاجية البيض ) . وتم دراسة تطور قناه البيض فى الفترة ما بين عمر يوم حتى عمر ٢٤ أسبوع بعد التفريخ . دلت الدراسات على أن الزيادة فى طول قناة البيض فى كل من السلالتين تمر بمرحله نمو بطئ حتى عمر اسبوع، وعند الاسبوع العشرين من العمر وجد أن قناة البيض أطول فى سلاله الدندراوى عنه فى الهاي لاين حيث كان متوسط طولها فى الدندراوى ١٧ سم بينما لم يتجاوز ١٠ سم فى سلاله الهاى لاين وعند عمر ٢٤ اسبوع زادت قناة البيض فى الطول زيادة سريعة وفى هذه الفترة من التطور كان متوسط قناة البيض فى الهاى لاين أطول منها فى سلالة الدندراوى حيث بلغت حوالى ٧٥ سم فى الهاى لاين و٧٠ سم فى الدندراوى. ولقد سجل قطر وسمك قناه البيض وكذلك ارتفاع النسيج الطلائى المبطن للقناه وأيضا ارتفاع الثنيات المخاطية فى الاجزاء المختلفة من قناه البيض فى كلا السلالتين.

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## SUMMARY

The post-hatchery developmental changes in the oviduct of high (Hy-Line) and low (Dandrawi) egg-producing fowl were studied in the period from the first day to 24 weeks after hatching. The morphometerical studies of the oviduct in both breeds revealed that, the increase in the oviduct length for both breeds was slow till the 16th weeks of age. At the 20th weeks of age, the oviducal length was markedly longer for Dandrawi than that for Hy-Line. The average length was 17 cm and 10 cm for both breeds, respectively. At 24 weeks of age, the oviducal length for Hy-Line was higher than for Dandrawi breed. Their average length was 75 cm and 70 cm in both breeds, respectively. Moreover, the diameter and the thickness of the oviduct, the height of lining epithelium as well as the height of the mucosal folds in the different segments of the oviduct in both Hy-Line and Dandrawi breeds were recorded.


## INTRODUCTION

Regarding the egg production, it was found that, the native breed (Dandarawi) is of low performance as compared with foreign breeds (MOSTEGER, 1958 and AFIFY, 1984).

Although, many developmental studies have been done on the mature domestic fowl oviduct (RICHARDSON, 1935 and BRANT & NALBANDOV, 1956). The available literatures on the oviduct during the post-incubation period are scanty.

Therefore, this investigation was carried out as a part of a project to illustrate the morphometrical data of the oviduct in Dandrawi and Hy-Line as low and high egg producing breeds respectively; throughout the developmental stages from the first day to 24 weeks after hatching.

## MATERIAL and METHODS

The present investigation was conducted at the Poultry Research Farm, Animal Production Department, Faculty of Agricultre and Department of Histology and Anatomy, Faculty of Veterinary Medicine, Assiut University, from Jan. to Dec. 1991.

Two experimental breeds were used, an egyptian breed (Dandrawi) and a foreign breed (Hy-Line).

During the growing period (brooding and rearing periods) chicks were reared in batteries, provided with electrical heaters and air conditions to maintain the adequate temperature, up to sexual maturity.

At 20 weeks of age (prior to sexual maturity), pullets from each breed were distributed in individual cages under the same environmental conditions (25 C and 60-70% relative humidity). A growing diet containing about 18-19% protein and ME of 2817 Kcal/Kg was provided. The principal constituents of layers diet were 18% protein, 3.25% Ca, 0.8% P. Food and water were supplied ad libitum.

Regarding the lighting program used in this experiment, it is worthy to mention that one day old chicks were exposed to 21 hours light/day during the first week and then followed by 11 hours continuous photoperiod till the 21th week of age and 17 hours light-day from the 21th week of age till the end of the experiment.

Age and number of birds used in this experiment are shown in Table (1). Birds from each breed were slaughtered at 11:00 a.m. The length of the oviduct was recorded.

The oviducts were immediately obtained after slaughtering and small pieces from each segment were fixed in Bouin's fluid. After proper fixation, the materials were dehydrated and embedded in paraffin wax. Step serial sections were cut at about 5-7 um. thickness then they were stained with Haematoxylin and Eosin, (HARRIS, 1898) and Crossman's trichrome stain (CROSSMAN, 1937).

The micromorphometrical examination included measuring the diameter and thickness of the oviduct, the height of lining epithelium as well as the height and number of the mucosal folds in different segments of the oviduct in both Dandrawi and Hy-Line breeds.

Measurements were carried out with an eye-piece micrometer disc calibrated on a stage micrometer to the nearest micron.

Table 1: Material available in the present study

| Age | No. of birds | |
|---|---|---|
| | D | H |
| 1 day | 3 | 3 |
| 1 week | 3 | 3 |
| 2 | 3 | 3 |
| 3 | 3 | 3 |
| 4 | 3 | 3 |
| 6 | 3 | 3 |
| 8 | 3 | 3 |
| 12 | 3 | 3 |
| 16 | 3 | 3 |
| 20 | 3 | 3 |
| 24 | 3 | 3 |

D = Dandarawi H = Hy-Line

## RESULTS

At the first day of age, the oviduct for both Dandarawi and Hy-Line breeds was represented by a straight, flat and thin tube. Its average length was 1.7 cm and 1.5 cm, respectively. The increase in the oviducal length in both breeds was slow till 16 weeks of age.

At 20 weeks of age, the oviducal length was markedly higher for Dandarawi than for Hy-Line. Their average length was 17 cm and 10 cm for both Dandarawi and Hy-Line breeds, respectively.

At 24 weeks of age, the oviducal length in both breeds was rapidly increased where the duct became very tortuous and occupied a larger part of the abdominal cavity. At this period of development, the oviducal length for Hy-Line breed was higher than for Dandarawi breed. Their average length was 75 cm and 70 cm in both breeds, respectively.

At the early stages of post-hatchery development the mucosa of the oviduct in both breeds showed few and short longitudinal mucosal folds. With the advancement of age, these folds increased in height, number and thickness.

With the advancement of age, the muscular layer of the oviduct became better developed and became thicker than that observed at the early stage of development.

The expanded pouch-like part of the uterus in both Dandarawi and Hy-Line was well recognized from the first day after hatching and was of greater diameter than other segments of the oviduct.

The present investigation revealed that, there was a sudden increase in the diameter and thickness of the wall of the oviduct at 20 weeks in Dandrawi breed and at 24 weeks in Hy-Line breed.

The dimensions of the different segments of the oviduct in both Hy-Line and Dandrawi breeds are presented in tables 2 – 6 and figures 1 – 6.

## DISCUSSION

The morphometerical data in the present investigation revealed that there were three distinct phases of growth pattern for oviduct in relation to age in both Dandrawi and Hy-Line breeds. The increase in the oviducal length in both breeds was slow till 16 weeks of age. At 20 weeks of age, the oviducal length was markedly higher in Dandrawi than that in Hy-Line breed. Their average length was 17 cm and 10 cm for both Dandarawi and Hy-Line breeds, respectively. The results indicated that the oviduct in both Dandarawi and Hy-Line breeds was still more shorter than 32.3 cm long as reported at the same age by WILKINS (1915) and HALL (1926). EL-HAMMADY; OSMAN and MAKLED & ATTIA (1975) found that the oviducal length in Dokki-4 at 20 weeks of age was 17 cm.

At 24 weeks of age, the oviducal length in both breeds was rapidly increased where the oviduct became tortuous and occupied a large part of the abdominal cavity. The oviduct length for Hy-Line breed was higher than for Dandrawi breed. Their average length was 75 cm and 70 cm in both breeds, respectively. WILKINS (1915) and HALL (1926) observed that the oviduct in domestic fowl reached 67.7 cm at 24 weeks of age. The obtained results in the present study was nearly similar to that reported by WILKINS (1915) and HALL (1926). WHILE, EL-HAMMADY; OSMAN and MAKLED & ATTIA (1975), mentioned that at 24 weeks, the oviduct reached 30.6 cm long. They added that the size of the oviduct especially in mature domestic hen depends on the bird's age and on the state of the functional activity of the oviduct. YU and MARQUARDT (1981), demonstrated that oviduct length increased from 4.5 cm in the 20 day old chick to 80 cm in the laying hen.

The present study indicated that, there was a sudden increase in the diameter and thickness of the wall of the oviduct at 20 weeks in Dandrawi breed and at 24 weeks in Hy-Line breed. This increase might be attributed to the growth of the oviducal wall as a result of glandular formation (RICHARDSON, 1935 and YU & MARQUARDT, 1973b).

In conclusion, the oviduct in Dandrawi breed reached an advanced developmental stage more earlier (20 weeks) than that of the Hy-Line breed (24 weeks).

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Table (2): Dimensions of the infundibulum (Microns).

| Age | Hy-line breed | | | | Dandarawi breed | | | |
|---|---|---|---|---|---|---|---|---|
| | Wall | | Fold. | Epithelium | Wall | | Fold | Epithelium |
| | Diameter | Thickness | | | Diameter | Thickness | | |
| 1 day | 140 | 64 | - | 9-11 | 140 | 60 | - | 9-11 |
| 1-4 weeks | 330 | 75 | 40 | 15 | 297 | 68 | 60 | 15 |
| 6-8 weeks | 720 | 222 | 160 | 16 | 610 | 205 | 140 | 16 |
| 12-16 weeks | 1100 | 380 | 290 | 19 | 1008 | 330 | 270 | 19 |
| 20 weeks | 1296 | 400 | 320 | 22 | 1008 | 1200 | 900 | 27 |
| 24 weeks | 3047 | 1500 | 1107 | 33 | 2493 | 1450 | 955 | 30 |




Fig. (1): The length of the oviduct.

Table (3): Diamensions of the magnum (microns).

| Age | Hy-Line breed | | | | Dandrawi breed | | | |
|---|---|---|---|---|---|---|---|---|
| | Wall | | Fold. | Epithelium | Wall | | Fold. | Epithelium |
| | Diameter | Thickness | | | Diameter | Thickness | | |
| 1 day | 239 | 60 | 12 | 10 | 214 | 46 | 15 | 10 |
| 1-4 weeks | 610 | 154 | 60 | 14 | 597 | 110 | 68 | 14 |
| 6-8 weeks | 490 | 219 | 141 | 16 | 900 | 190 | 130 | 15 |
| 12-16 weeks | 1584 | 637 | 397 | 20 | 1271 | 480 | 321 | 16 |
| 20 weeks | 1656 | 633 | 434 | 20 | 2816 | 1547 | 997 | 25 |
| 24 weeks | 6300 | 2700 | 2100 | 31 | 6040 | 2170 | 1750 | 25 |

Table (4): Dimensions of the Isthmus (Microns).

| Age | Hy-Line breed | | | | Dandrawi breed | | | |
|---|---|---|---|---|---|---|---|---|
| | Wall | | Fold | Epithelium | Wall | | Fold | Epithelium |
| | Diameter | Thickness | | | Diameter | Thickness | | |
| 1 day | 130 | 43 | - | 10 | 130 | 40 | - | 10 |
| 1-4 weeks | 290 | 155 | 60 | 12 | 270 | 146 | 66 | 11 |
| 6-8 weeks | 600 | 390 | 190 | 13 | 460 | 290 | 220 | 16 |
| 12-16 weeks | 980 | 600 | 310 | 19 | 913 | 490 | 360 | 16 |
| 20 weeks | 1069 | 660 | 410 | 20 | 3047 | 1367 | 1108 | 26 |
| 24 weeks | 4709 | 2008 | 1819 | 32 | 3607 | 1644 | 1246 | 29 |

Table (5): Dimensions of the uterus )(Microns).

| Age | Hy-Line breed | | | | Dandrawi breed | | | |
|---|---|---|---|---|---|---|---|---|
| | Wall | | Fold | Epithelium | Wall | | Fold | Epithelium |
| | Diameter | Thickness | | | Diameter | Thickness | | |
| 1 day | 453 | 90 | 60 | 7 | 435 | 90 | 48 | 8 |
| 1-4 weeks | 900 | 150 | 65 | 11 | 728 | 138 | 55 | 9 |
| 6-8 weeks | 1300 | 231 | 100 | 12 | 1152 | 190 | 123 | 11 |
| 12-16 weeks | 1400 | 490 | 273 | 13 | 1592 | 492 | 188 | 13 |
| 20 weeks | 2077 | 560 | 325 | 16 | 6000 | 2132 | 1561 | 30 |
| 24 weeks | 4046 | 3945 | 3566 | 33 | 6410 | 3416 | 3000 | 31 |

Table (6): Dimensions of the vagina )(Microns).

| Age | Hy-Line breed | | | | Dandarawi breed | | | |
|---|---|---|---|---|---|---|---|---|
| | Wall | | Fold | Epithelium | Wall | | Fold | Epithelium |
| | Diameter | Thickness | | | Diameter | Thickness | | |
| 1 day | 340 | 100 | 16 | 7 | 332 | 120 | 19 | 6 |
| 1-4 weeks | 630 | 220 | 49 | 13 | 600 | 180 | 60 | 9 |
| 6-8 weeks | 932 | 330 | 82 | 15 | 700 | 290 | 99 | 13 |
| 12-16 weeks | 1184 | 383 | 231 | 16 | 972 | 604 | 239 | 16 |
| 20 weeks | 1280 | 492 | 265 | 16 | 3105 | 1766 | 1211 | 80 |
| 24 weeks | 6000 | 4653 | 3116 | 34 | 3220 | 2700 | 1558 | 31 |

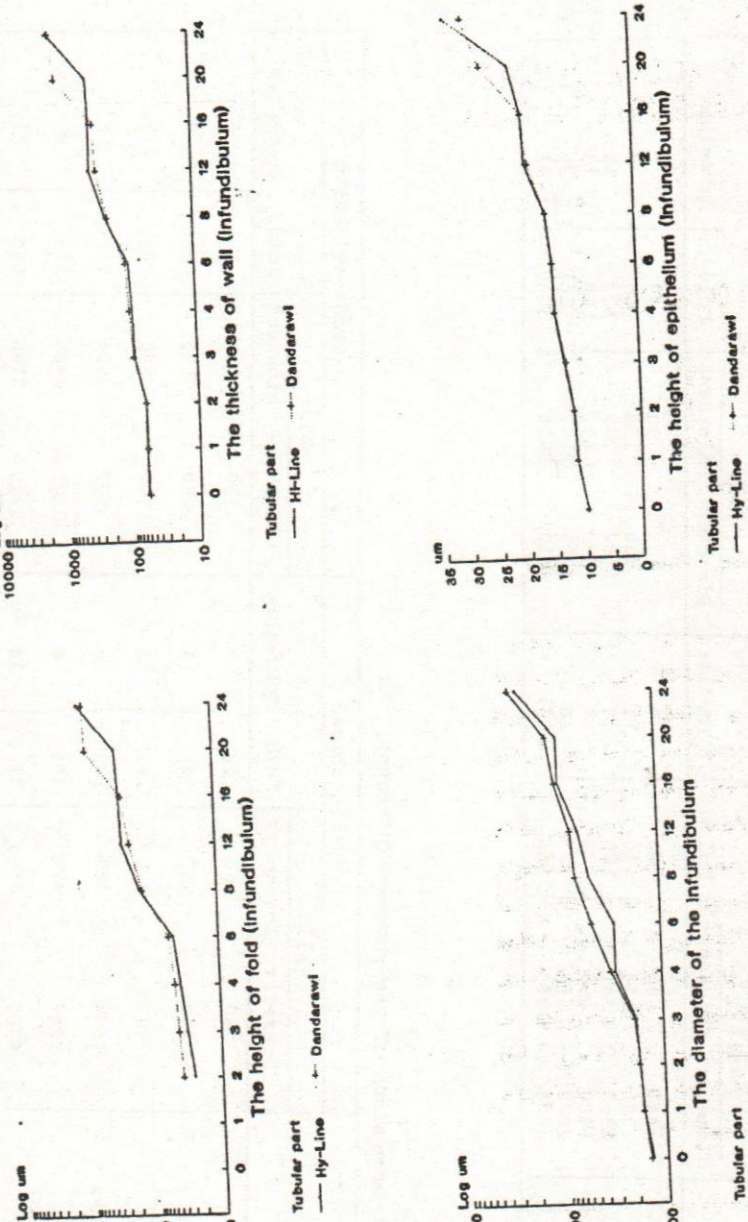
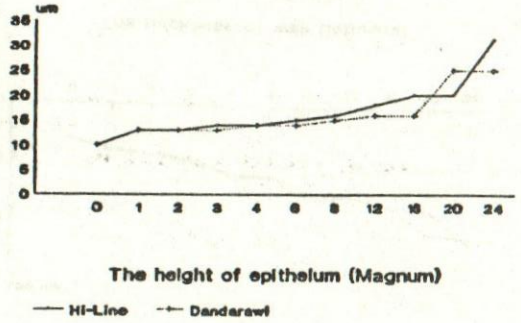
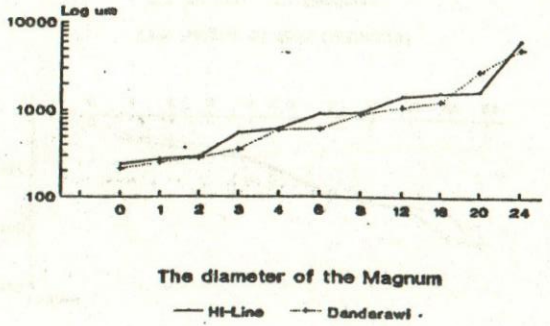
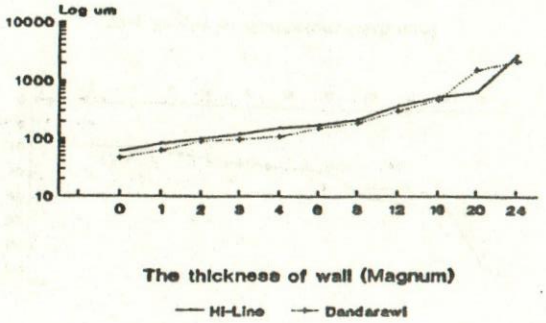



Fig. (2): The dimensions of the infundibulum.



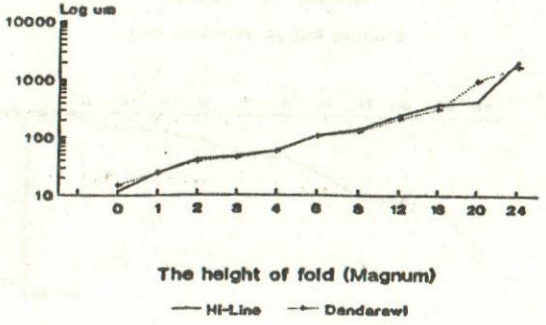




Fig.(3): The dimensions of the magnum.

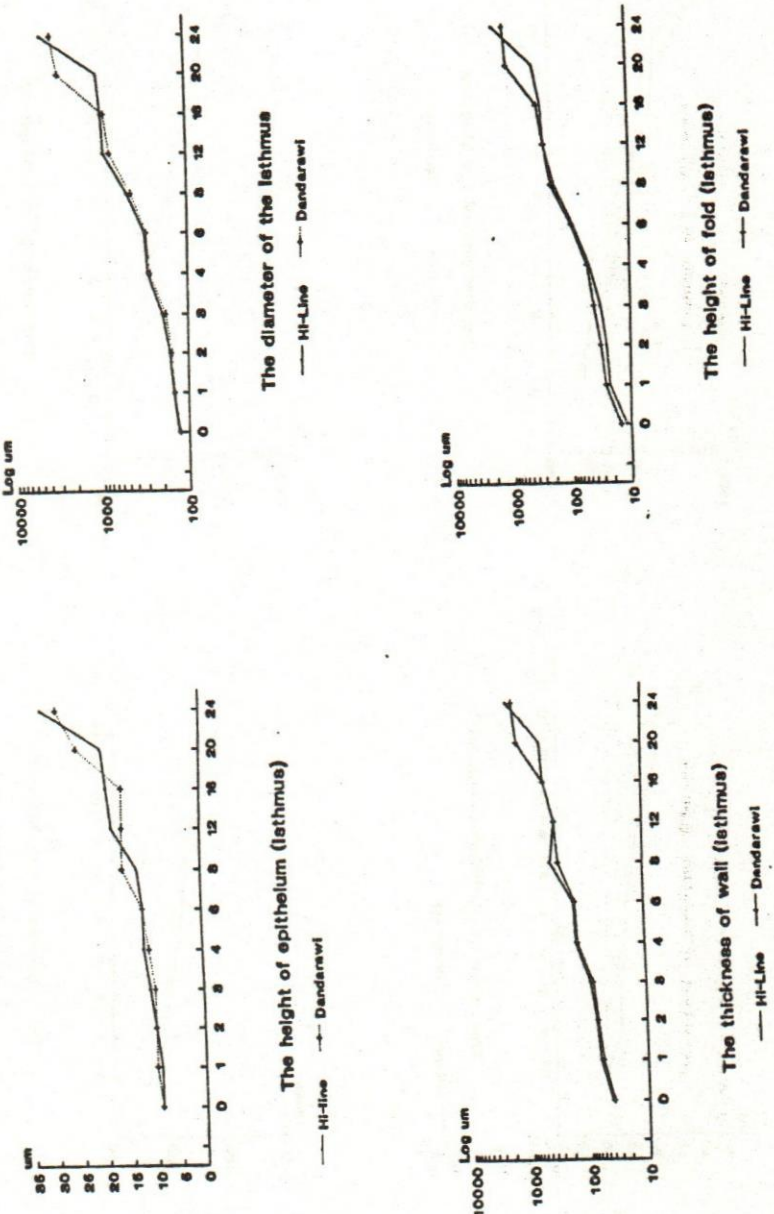



Fig.(4): The dimensions of the isthmus.

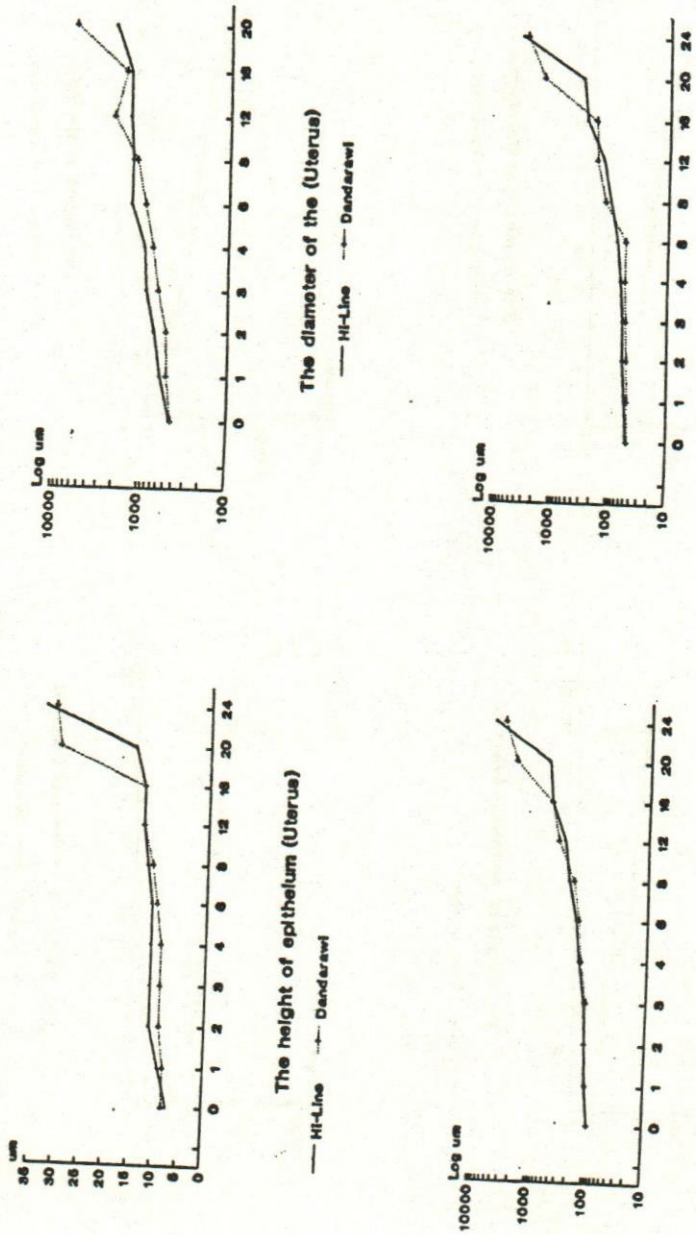



Fig.(5): The dimensions of the uterus.

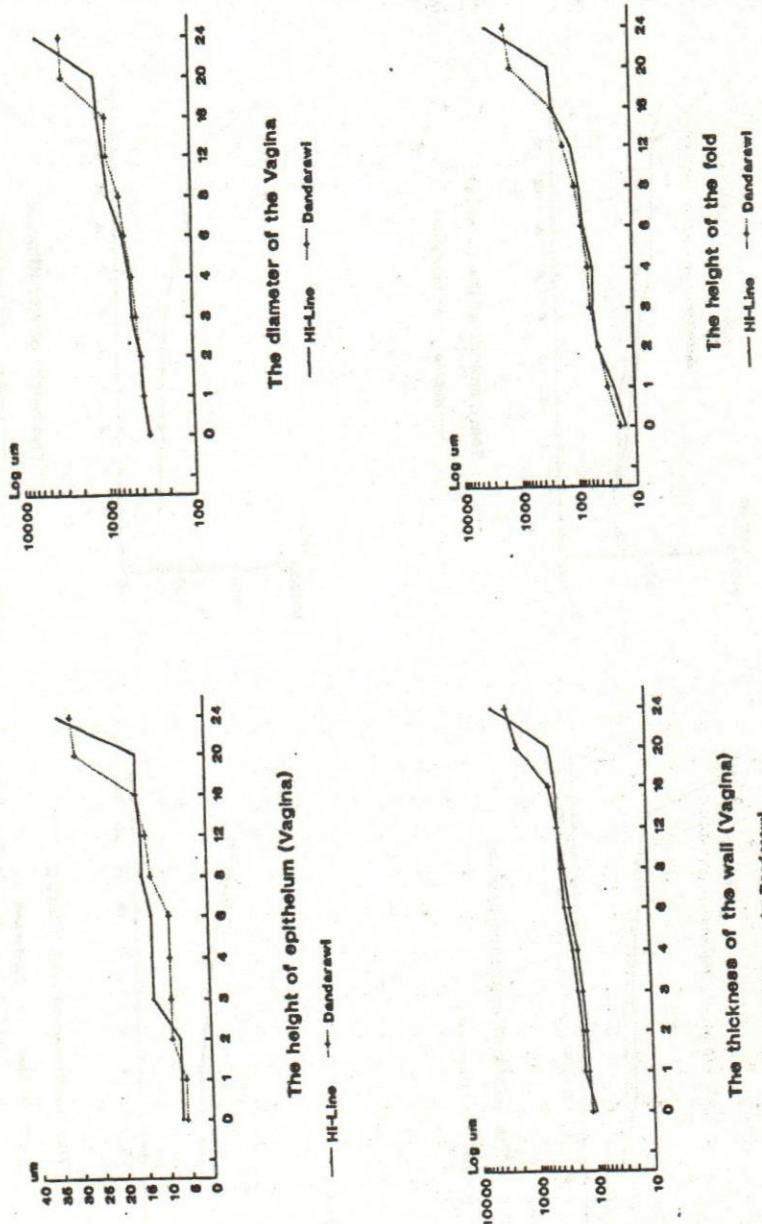



Fig.(6): The dimensions of the vagina.