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VARIATION IN THE LIPID CONTENT OF TISSUES OF *TILAPIA NILOTICA* AT DAM LAKE (ASSWAN), IN RELATION TO FEMALE REPRODUCTIVE CYCLE.

By

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INDRODUCTION

Earlier investigations often indicated that chemical composition of fishes is affected by many factors such as age, sex, season, reproductive cycle, and food (Legendre, 1938; Hafez, 1978, Shchepkin, 1979).

As regards to fat, it is stored in fish, as in many animals, to supply energy during food scarcity and reproduction. Accumulation and storage of fat prior to the maturation of gonads takes place in some fishes in the muscle, while in other fishes, storage occurs in the liver (Bailey, 1952; Hoar, 1957; Jafri, and Qasim, 1965; Hussein et al., 1966; Hafez, 1978; Love 1970 and Shchepkin, 1979).

This work was undertaken to give comparative studies on the lipid contents of tissues of Dam Lake fish *Tilpia nilotica* in relation to the female reproductive cycle, which is mainly three different sexual stages namely. immature, spawning and completely spent ovary stages. It is hoped that these studies should help nestablishing a sound scientific basis for future measures to be followed in order to improve the fish production in the Dam Lake (Aswan, A.R.E.).

MATERIAL and TECHNIQUE

Tilapia nilotoca (family, Cichlidae) is the most dominating and economic species in the Dam Lake (Latif, 1974).

Regular visits were made to the Lake during the years 1980 and 1981. Adult female samples were collected during the following months; Feb–ruary and August (for immature stage), April and September (for spawn–ing stage), and June and October (for completely spent stage).

These are according to the gonadic cycle of *Tilpapia nilotica* at Dam Lake recorded by Latif and Rashid (1971).

Samples of tissues weighing 0.4—2 gm were taken from the fish. Skin (without scale) was obtained from the trunk region of the fish. Ske–letal muscle sample was taken from the trunk region of the dorsal side. The fish was then opened to get samples of liver, kidney, ovary, cardiac muscle, adipose tissue, brain, spinal cord, samples of stomach and small intestine.

Fat determinations were carried out on the dried tissues but the results expressed on the fresh basis. The lipid content is expressed in % of wet tissue (EL–Elaimy and EL Said, 1982).

The data were statistically analyzed; the mean, the standard devia–tion and t–test were computed according to Snedecor and Cochran (1971).

RESULTS and DISCUSSION

The lipid content of various tissues of female *Tilapia nilotica* was determined in the three different stages (immature, spawning and comp–letely spent). The lipid content of all tissue, was calculated as the per–centage of wet tissue. The data obtained are shown in table (1) and graphically represented in Figure (1).

It is clear from the present study that the different tissues, in each of the three sexual stages, showed varied contents of lipids.

The adipose tissue (anuclear tissues) was found to possess a remar–kably high content of fats in the three sexual stages. This tissue acts as fat store, that is consumed at time of need (Hyden, 1954, Pitts, 1956; James, 1967 and Robert, 1967).

Table (1)

The changes in fat content of various tissues of adult female *Tilapia nilotica* during different sexual stages.

Number of Specimens	Average fat content (% wet tissue)a		
	Immature stage	Spawning stage	Completely spent stage
	10	10	10
I. Nuclear tissues			
Alimentary canal			
Stomach	1.16±0.57***	0.85±0.18*	1.63±0.59***
Small intestine	0.80±0.16***	0.61±0.10**	0.94±0.08***
Muscular tissues			
Skeletal muscle	0.47±0.17***	0.21±0.06*	0.51±0.18***
Cardiac muscle	1.78±0.85*	1.52±0.57*	1.85±0.66*
Epithelial tissues			
Skin	1.27±0.30***	0.83±0.15**	1.67±0.42***
Kidney	1.09±0.28*	1.37±0.43*	1.14±0.23*
Liver	5.80±1.49***	1.08±0.22***	1.84±0.56***
Ovary	5.24±0.73***	15.74±2.08***	2.91±1.17***
Nervous tissues			
Brain	11.22±1.55***	9.39±0.69*	10.42±1.95*
Spinal cord	14.38±2.12*	13.03±1.64*	13.47±1.65*
II. Anuclear tissue			
Adipose tissue	70.85±7.50*	69.31±1.96***	80.12±2.29***

a Mean ± SD.

* non significant P <0.10

** significant P <0 05

*** highly significant P <0.01

results of t-test for first column represent first vs. second column, for second column represent second vs. third column, and for third column represent third vs. first column.

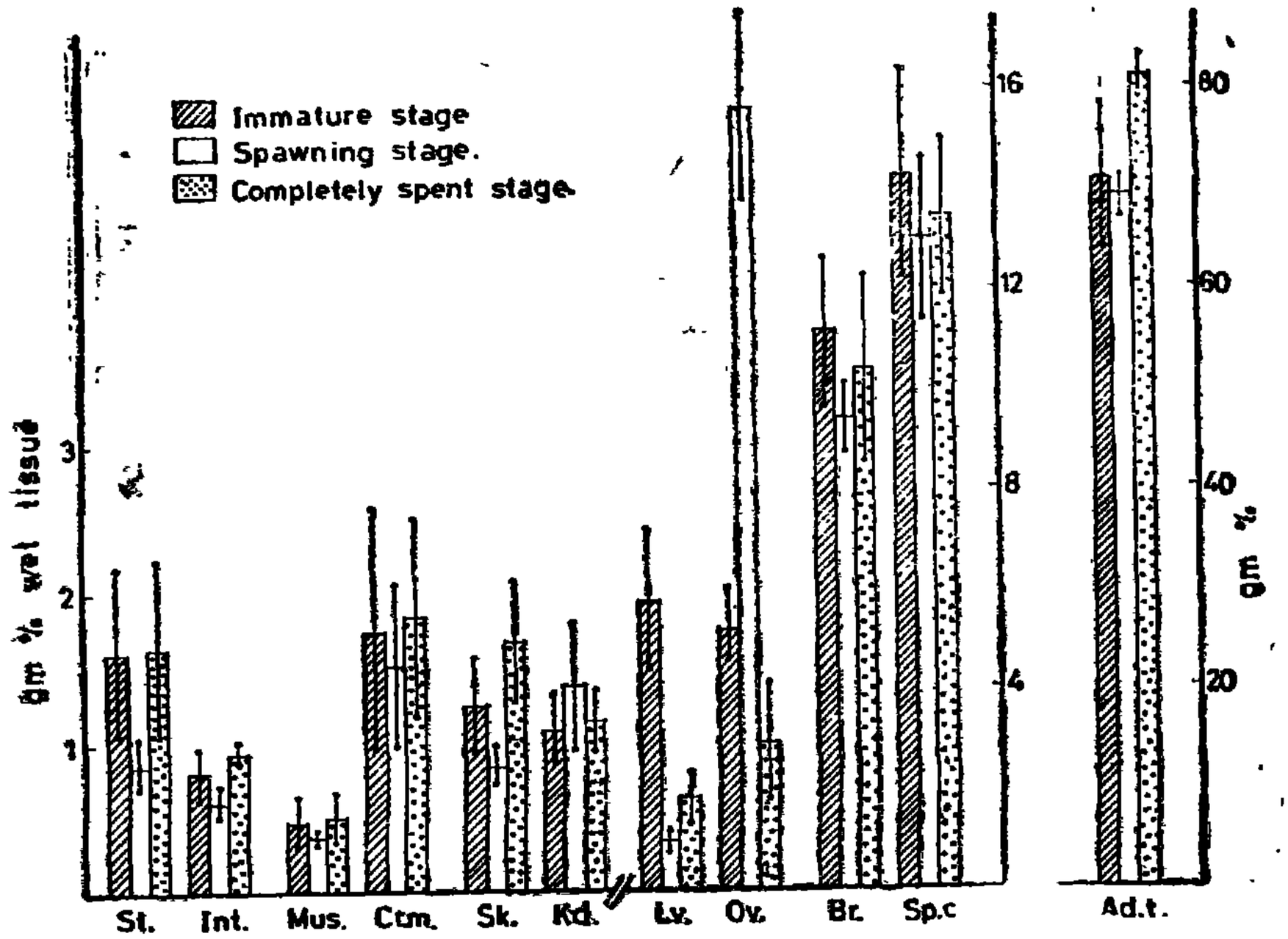

Fig. (1) Lipid content of tissues of adult female Tilapia nilotica during different sexual stages.

Among the nuclear tissues, the nervous tissues are found to be highly fatty in the three sexual stages. The same results were obtained by Sykora et al., (1979) on some river fishes. There was also an invesrse relationship between the activity and importance of the tissue and its content of lipid. In the three sexual stages studied in *Tilapia nilotica,* the spinal cord shows higher lipid content than brain. Thus, the greater the activity, the lesser is its contents of lipids. Similer findings were recorded by Azouz (1958), Khalifa (1972) and Boulos et al (1974).

The lipid content of the spinal cord showed nonsignificant changes during different stages. On the other hand, the brain showed a highly significant decrease in lipid content from immature to spawning stage followed by non–significant increase from spawning to completely spent then back to immature stage.

Generally, the cardiac muscle is more fatty than the skeletal muscle, throughout the three reproductive stages. The skeletal muscle showed the lowest lipid content among tissues studied in the three stages. Thus,

Tilapia nilotica may be considered as a lean fish. This is in full accordance with the results obtained by previous workers (Hoar, 1957, Jafri and Qasim, 1965, Love, 1970 and Hafez 1978).

The statistical results in the present work, showed that lipid content of cardiac muscle does not change significantly throughout the three sexual stages. On the other hand, the skeletal muscle shows a highly significant decrease in the lipid content from immature to spawning, followed by highly significant increase on passing to completely spent stage. Similar finding were recorded by Shchepkin (1979), working on mackeral and scorpion fish.

As regards the tissues of the alimentary canal of *Tilapia nilotica* the stomach shows higher lipid content than the small intestine, throughout the three sexual stages. Lipid content of the stomach and intestine show a highly significant decrease from immature to spawning stage, and a highly significant increase from spawning to completely spent stage. Thus, it may be assumed that the stomach and intestine act as fat storing tissues prior to spawning.

In the epithelial tissues, the lipid content in the kidney shows non-significant changes. On the other hand it shows highly significant changes in the skin, liver and ovary throughout the three sexual stages.

The skin of *Tilapia* may be considered as fat depot prior to spawning-season, as there is a highly significant decrease in lipid from immature to spawning stage. The lipid content of skin shows a highly significant rise from spawning to completely spent stage. Similar observations were recorded by Hafez (1978) on *Solea vulgaris.*

Again, the liver shows a highly significant decrease in its lipid content from immature to spawning stage. Thus, the liver is considered as a fat depot of the prespawning fish. This finding confirms the previous results obtained by Jafri and Qasim (1965), Love (1970), Chioldi (1971), Abdou (1977), Hafez (1978), Shchepkin (1979) and Sykora et al., (1979).

Concerning the lipid content in the ovary, it shows a highly significant rise on passing from immature to spawning stage, followed by a sharp drop the completely spent stage. These results were in agree-

ment with Hoar (1957). Chiodi (1971); Hafez (1978); and Ramadan et al., (1977). So. if one tissue shows a significant increase in lipid level, it should be at the expense of other tissues.

SUMMARY

1. Fat content of different (eleven) tissues of adult female *Tilapia nilotica* of Dam Lake (Aswan), were determined during the sexual stages, immature, spawning and completely spent stages.

2. The tissues studied were, nuclear tissues : stomach, samll inte–stine, skeletal muscle, cardiac muscle, skin, and anuclear tissues : adipose tissue.

3. The variations observed in fat content of these tissues were studied in relation to the female reproductive cycle.

4. Tissues showed marked variations in their lipid content during the three sexual stages. Some tissues, as liver, act as fat depots prior to spawning.

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دراسات على التغير فى المحتوى الدهنى لانسجة سمكة البلطى النيلى فى بحيرة السد (اسوان) وعلاقتها بدورة التنـــاســل

للدكتور / ابراهيم العليمى ــ والسيد / محمد السيد

اجرى هذا البحث خلال عام ١٩٨١/١٩٨٠ على اناث سمك البلطى الموجود فى بحيرة السد (أسوان) وقد اشتمل البحث على دراسه التغير فى المحتوى الدهنى لاحد عشر نسيجا مختلفا لهذه الاناث وذلك فى ثلاث مراحل من مراحل النضج الجنسى وهى : ــ

مرحلة عدم النضوج ومرحلة التبويض ومرحلة اكتمال التبويض .

وقد وجد أن هناك تغيرات واضحة فى المحتوى الدهنى لهذه الانسجة فى المراحل المختلفة للنمو الجنسى للبلطى .

وقد نوقشت هذه النتائج فى ضوء الأبحاث وعلاقتها بدورة التناسل ومراحلها المختلفة .