NUTRITION STAGES ACCORDING TO THE HISTOLOGICAL DESCRIPTION OF THE INTESTINE IN GUPPY FISH *Poecilia reticulate*

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ABSTRACT

The nutrition stages in the guppy fish were divided into three main stages according to the histological changes:

1- Endogenous nutrition stage characterized by the embryo was sticked on the surface of yolk sac which has vacuoles in the periphery part of it.
2- Mixed nutrition stage characterized by the small mount of yolk found in the abdominal cavity despite of the disappearance of yolk sac, and food was found inside the intestine lumen and large mount of fat vacuoles were found in the supranuclear position of cells of lining epithelium of intestine.
3- Exogenous nutrition stage characterized by the disappearance of yolk sac and little yolk was found in the abdominal cavity and food was found inside the intestine lumen and by the disappearance of fat vacuoles from supranuclear position of cells of lining epithelium of intestine.

Keywords: guppy fish, intestine, histology, nutrition stages.

مراحل التغذية حسب الوصف النسجي للمعى في سمكة الكوبي *Poecilia reticulate*

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الخلاصة

قسمت مراحل التغذية في سمكة الكوبي إعتماداً على المقاطع النسجية الى ثلاث مراحل هي:-

1 - مرحلة التغذية الداخلية المنشأ، وتميزت بالتصاق الجنين على سطح كيس محي حاوٍ على فجوات تركزت عند جزئه المحيطي.

2 - مرحلة التغذية المختلطة، وتميزت بوجود كمية قليلة من المح تركزت داخل الجوف البطني في المنطقة القريبة من المعى على الرغم من اختفاء الكيس المحي، كما تميزت بوجود غذاء داخل جوف المعى وظهور عدد كبير من الفجوات الدهنية في المنطقة القمية لخلايا النسيج الظهاري المبطن له.

3 - مرحلة التغذية الخارجية المنشأ، وتميزت بإختفاء المح المتركز داخل الجوف البطني في المنطقة القريبة من المعى، كما تميزت بوجود غذاء داخل جوف المعى واختفاء الفجوات الدهنية من المنطقة القمية لخلايا النسيج الظهاري المبطن له.

الكلمات المفتاحية : سمكة الكوبي ، معى ، تركيب نسجي ، مراحل التغذية .

INTRODUCTION

The guppy fish *Poecilia reticulata*, also known as million fish and rainbow fish [16] is one of the world's most widely distributed tropical fish, and one of the most popular freshwater aquarium fish species. It is a member of the Poeciliidae family and, like all other members of the family, is live-bearing [12] Guppies, whose natural range is in northeast South America, were introduced in various countries for mosquito control and often loosely called 'mosquito fish'.It has been found to establish itself in both fresh and polluted waters [17] Male guppies, which are smaller than females, have ornamental caudal and dorsal fins, while females are duller in

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colour. Wild guppies generally feed on a variety of food sources, including benthic algae and aquatic insect larvae[4]. Guppies are used as a model organism in the field of ecology, evolution, and behavioural studies [12].

Guppies have (23) pairs of chromosomes,including one pair of sex chromosomes,the same number as humans [9]. The genes responsible for male guppies ornamentations are Y-chromosome linked and are heritable [15].

The gestation period of a guppy is typically (21–30) days, varying considerably. Reproduction typically continues through the year, and the female becomes ready for conception again quickly after parturition[14] Male guppies, like other members of the Poeciliidae family possess a modified tubular anal fin called the gonopodium, located directly behind the ventral fin. The gonopodium has a channel-like structure through which bundles of spermatozoa, called spermatozeugmata are transferred to females. In courted mating, where the female shows receptive behavior following the male's courtship display, the male briefly inserts the gonopodium into the female's genital pore for internal fertilization. However, in the case of sneaky mating where copulation is forced, the male approaches the female and thrusts the gonopodium at the female's urogenital pore [2].Once inseminated, female guppies can store sperm in their ovaries and gonoducts, which can continue to fertilize ova up to eight months [5] Because of the sperm-storage mechanism, males are capable of posthumous reproduction, meaning the female mate can give birth to the male's offspring long after the male's death, which contributes significantly to the reproductive dynamics of the wild guppy populations [10].

The aim of the present study was to describe the stages of feeding in the guppy fish *Poecilia reticulata* depending on the histological sections.

MATERIALS AND METHODS

Embryos that ranged in length from (0.4-8) mm were taken by dissecting the abdomen of the gravid female specimens clearly distinguished by having swollen abdomen,The developmental stages of the embryos inside the gravid females were observed by dissecting the gravid female's abdomen. The larvae obtained by breeding fish in small aquarium, and after the larvae were isolated from the females by placing them in small aquarium and fed on Crustacea powder.The collected specimens were preserved in Bouin' s solution for (12) hours [8]. Serial transverse sections staining with Eosin and Delafield's hematoxylin attention according to Bancroft & Stevens method [1]. The sections were examined using compound light microscope under different magnification forces, then photographed by using digital camera (Nikon) and light microscope.

RESULTS

The stages of nutrition could be divided into the following:

1- Endogenous nutrition stage (Lecithotrophic stage) (length of embryo 0.4 -8mm before birth):

Serial transverse sections of the embryo at this stage were shown, adhesion of embryo on the surface of a yolk sac containing vacuoles focused at its periphery (Fig. 1).

2- Mixed nutrition stage (length of larva 8-9mm):

By studying the serial transvers sections of the larvae at this stage, it was observed that the yolk sac disappears completely. However, a small amount of the remaining yolk is located within the abdominal cavity in the area near the intestine. The presence of food within the intestinal cavity and the emergence of a large number of Fat vacuoles in the anterior region of the epithelial tissue cells (Fig. 2).

3-Exogenous nutrition stage (length of larva 9mm):

When the serial transvers sections of the larvae were observed at this stage, it was observed that the yolk was concentrated within the abdomenal cavity in the vicinity of the intestine has disappeared definitively, and food has been observed within the intestine, and the disappearance of fat vacuoles from the occipital region of epithelial tissue cells (Fig.3).

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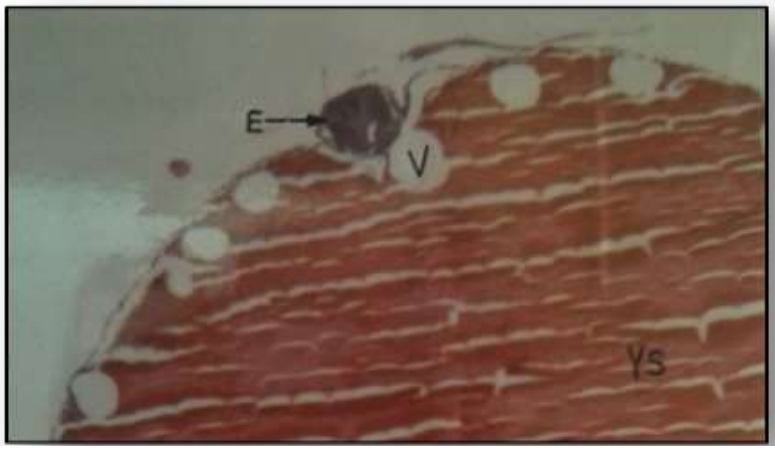

Figure (1): transverse section in embryo (0.4) mm show adhesion indicated on the surface of yolk sac containing vacuoles focused at its periphery (100x). Embryo (E) , Vacuole (V), Yolk sac (YS).

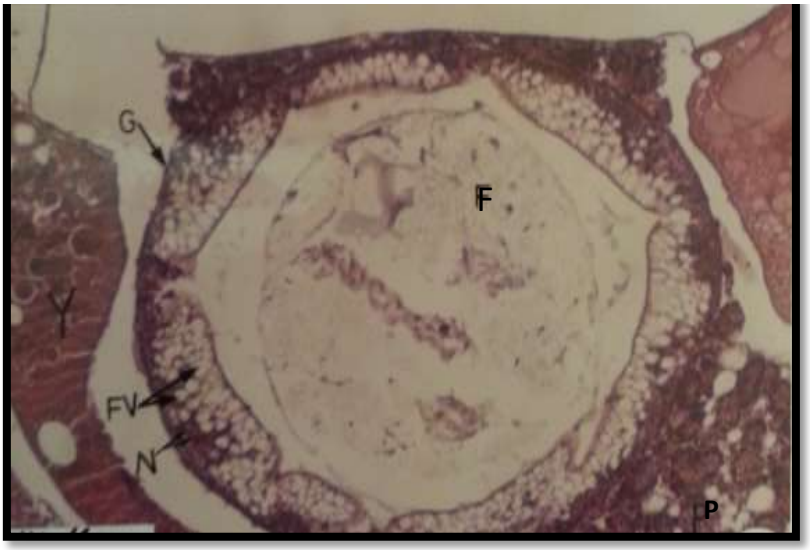

Figure (2): Tranvers section in larva (8.5) mm show presence of a small amount of yolk inside abdominal cavity in the vicinity of the intestine, despite the disappearance of yolk sac and the presence of food within the intestine and fat vacuoles in the occipital area of cells of the epithelial tissue (100x). Fatvacuoles (FV), Food (F),Gut (G), Nucleus (N), Pancreas (P), Yolk (Y).

Figure (3): Transvers section in larva (9) mm show the disappearance of the yolk from the abdominal cavity, the presence of food within the intestinal cavity and the disappearance of the fat vacuoles from the occipital region of the cells epithelial tissue (100x). Food (F),Gut (G),Gonads (GO).

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DISCUSSION

The results of this study showed the emergence of the endogenous nutrition stage in embryos whose length ranged between(0.4-8) mm on the formation of vacuoles in the peripheral part of the yolk sac. This is consistent with what observed [3] in fish larvae *Acipenser fulvescens* at the age of (1-16) day, and with what noted by [6]in the larvae of *Acipenser baeri* at length of (10-20)mm, due to environmental and genetic factors.

The emergence of vacuoles in the peripheral part of the yolk sac during the endogenous nutrition stage may return to the stage of endocytosis and intracellular digestion [3,6], Gisbert *et al*.[7] found substances in the endoderm cells conducted of the yolk sac that were associated with secretion of lipase enzymes, alkaline and acid phosphatase and non- specific esterase and ATP-ase, solution of yolk to its simple units for easy absorption by the cells themselves.

The results of the study also indicated the emergence of fat vacuoles in the area of cells epithelial tissues of the intestine synchronized with the appearance of the yolk substances within the abdominal cavity and nutrients within the intestine are indicated to mixed nutrition stage at length of (8 -9)mm, which corresponds to what [6] reported in the larvae of the *Acipenser baeri* at length of (20-25) mm.

Researchers differed about the source of lipid vacuoles during the mixed nutrition stage, Loewe & Eckmann[11] explained in their study that they were made on the larvae of the *Corgonus fera* fish as originating from the food as it is a storage for fatty acids resulting from extracellular digestion of lipid by lipase enzyme has been explained by either the absence of enzymes responsible for the union of fatty acids with Proteins, Phospholipids and cholesterol to form the lipid form of epithelial cells into the blood stream and the basement membrane, chylomicrons, either because of the lack of proteins, lipids, cholesterol, or lack of energy needed to form Chilocytes. Intraoplasmic reticulum and a poorly formed Golgi apparatus. Gisbert *et al*.[6,7] confirmed that the yolk substances are the source of the fat vacuoles in the larvae of the *Acipenser baeri*, since the formation of fat within these vacuoles was due to the process of Endocytosis and Intracellular digestion, and it is considered by Gisbert and his group [6] Fat vacuoles are a source of energy for the larvae if they can not get food from the outside (Exogenous nutrition stage) .

The Exogenous nutrition stage of the *Acipensre baeri* larvae starts at (25) mm after the disappearance of the fat vacuoles and yolk substances [6], As for the fish being studied, it begins with a (9) mm length of larvae, so it is possible to say: This stage is different in different fish.

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