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Histological Studies on Liver, Lung and Kidney of Albino Mice Fed on Wheat Infested with Granary Weevil, *Sitophilus Granarius*

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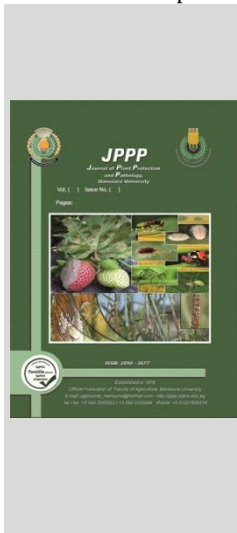


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ABSTRACT

Histological studies in the liver, lung and kidney of albino mice fed uninfested and infested wheat grains by granary weevil *Sitophilus granarius* were tested in the Agricultural Zoology laboratory of the Plant Protection Department, Faculty of Agriculture, Minia University, El-Minya, Egypt. Cross-section of the liver of an albino female fed healthy, uninfested grains, showed no bleeding or megakaryocytes. Sections in the liver of male albino mice fed on infested wheat grains by granary weevil *S. granarius* showed several megakaryocytes appeared in sinusoids as well as hemorrhage and congestion appeared in liver sections. Cross-section in the lungs of albino male mice fed healthy, uninfested grains, showed no focal chronic alveolitis. However histological studies on the lungs of albino mice fed infested wheat grains showed the thickness of alveolar walls with fibrosis, focal chronic alveolitis with fibrosis was likewise clear with a slight buildup of histiocytes around the terminal bronchiole and into the alveolar spaces. Bleeding inside bronchioles and outside alveoli also appeared. Moreover, kidney sections of male albino mice fed uninfested wheat grains by granary weevil showed normal kidney structure, while sections in kidneys of male albino mice fed infested wheat grains by granary weevil *S. granarius* showed many distortions of the tubules whose cuboidal cells are “vacuolated” with the absence of a clear brush border (microvilli) of the proximal convoluted tubules. Hemorrhage appeared inside and outside seminiferous tubules. Thus, the gained data exposed significant changes in the liver, lung, and kidney of male albino mice fed infested wheat grains with *S. granarius*.

Keywords: Histological study – Albino mice- *Sitophilus granarius*.



INTRODUCTION

Health problems have appeared for workers in grain stores, especially when there is an infestation with the wheat weevil, for example. These phenomena were explained by the fact that infestation with this insect encourages the growth of some fungi that secrete toxic secretions such as aflatoxin that cause health problems, especially respiratory problems and others (Frankland and Lunn ,1965). Therefore, attention was paid to studying the details of the tissue defect caused by these toxins. Aflatoxins cause damage to the liver representing in steatosis, hemorrhagic liver necrosis, proliferation in bile duct then liver failure, and have been detected in lung lesions of immune-compromised patients with systemic aspergillosis (Wangikar *et al.*, s2005; Wang and Colby 2007; Alia Kudayer 2019 and Rugeberg *et al.*, 2020).

MATERIAL AND METHODS

The investigation was conducted on twelve male albino mice (25-35 g). These mice were kept in cages of appropriate sizes for two weeks at 23-25 °C temperature under light-dark cycles of 12 h, for adaptation before the start of the study. Before the onset of grain-infested treatment, experimental individuals were fed with uninfested wheat grain and provided water in the required daily amounts. Animal Investigations were divided equally into two groups (i.e., control and treated group). The treated group was fed on 100% infested wheat grains. The control group was fed on intact healthy and un-infested grains. After the 14-day examination, the mice were anesthetized and murdered using

ether. The liver, lung, and kidney were promptly extracted from the dead animals and stored in 10% formalin at room temperature for 24 hours.

Subsequently, specimens removed from the buffered formalin were then exposed to graded series concentrations of ethanol and xylene before paraffin embedding. After that, specimens were embedded in pure paraffin, sectioned at the thickness of five microns using a rotary microtome, mounted on the slide, and stained with hematoxylin-eosin (Corrin 1981). Under a light microscope, slides were examined to detect and describe any histopathological changes in the liver, lung, and kidney of the treated male albino mice when compared to untreated controls.

RESULTS AND DISCUSSION

1-Histological studies on livers of male albino mice fed infested wheat grains by *Sitophilus granarius*:

A cross-section of the liver of an albino female fed healthy, uninfested grains, showed no bleeding or megakaryocytes (Figure, 1).

Histological study on the liver of albino male mice fed infested wheat grains by *Sitophilus granarius* as shown in Figure (2) shows several megakaryocytes appeared in sinusoids. These physiological symptoms may be the result of different health problems. Lefkowitz (2016) mentioned that megakaryocytes are responsible for hematopoiesis. Megakaryocytes may be the predominant form of hemopoiesis and perisinusoidal fibrosis. Intrasinusoidal

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megakaryocytes can be the first sign of a myeloproliferative or myelodestructive disease (Flucke and Fischer, 2008).

In another shot of the liver sector as seen in figure (2) hemorrhage in the liver and congestion were obvious. Ochieng *et al.* (2016) reported that necrosis, hemorrhage, and apoptosis were observed in mice liver exposed to aflatoxin b 1, the toxic metabolites of *Aspergillus flavus* and *Aspergillus*

parasiticus which usually contaminates foods. Also, Newberne and Butler (1969) found that hemorrhagic necrosis appeared in the liver of mice fed on a single Id50 dose of aflatoxin b1 for two weeks. They also mentioned that in the liver of birds, periportal hepatic parenchymal cell necrosis and venous congestion appeared.

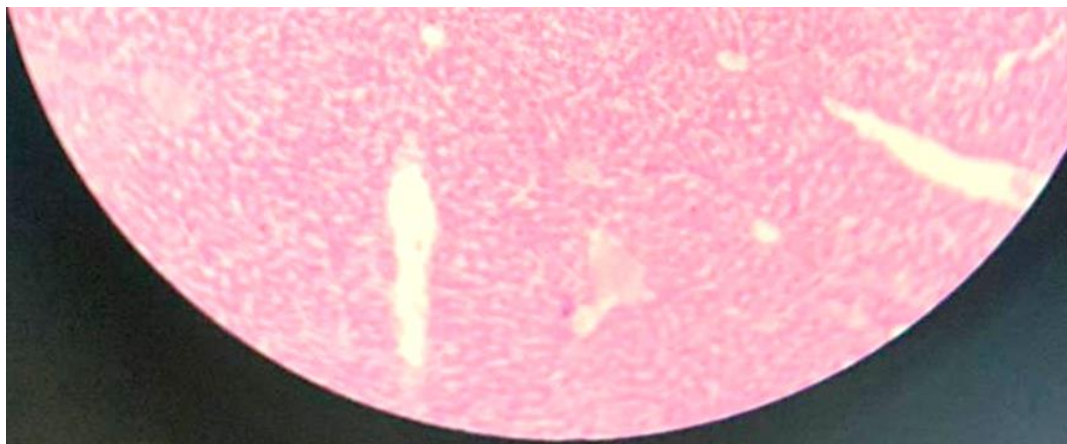


Fig. 1. Cross-section of the liver of an albino female fed healthy, uninfested grains, showing no bleeding or megakaryocytes

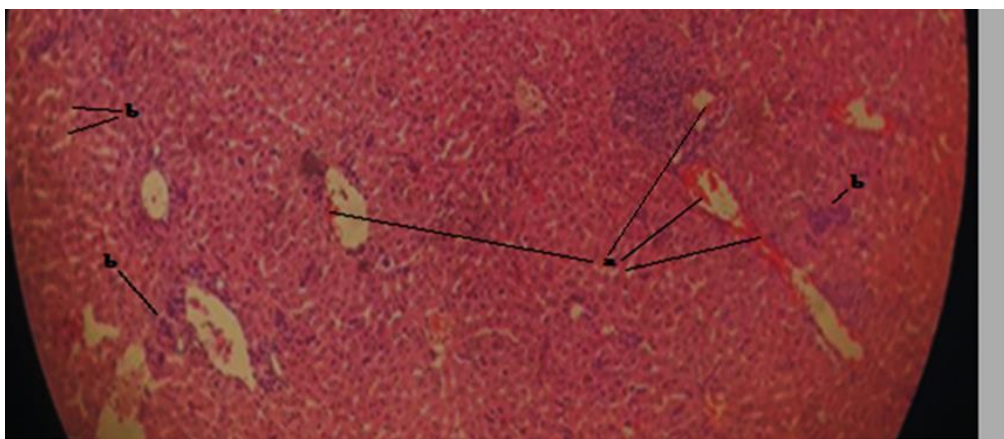


Fig. 2. Cross section in the liver of male albino fed infested wheat grains. Note Congestion in liver, periportal zone of necrosis and hemorrhagic necrosis (a) . Megakaryocytic in sinusoids (b)

2-Histological studies on lungs of male albino mice fed infested wheat grains by *Sitophilus granarius*:

The cross-section in the lungs of albino male mice fed healthy, uninfested grains, showed no focal chronic alveolitis (Fig. 3)

Histological studies on the lungs of albino mice fed infested wheat grains showed thickness of alveolar walls with fibrosis, focal chronic alveolitis with fibrosis was also evident with slight buildup of histiocytes around the terminal bronchiole and into the alveolar spaces (figure 4). The cross-section explains focal chronic alveolitis with fibrosis was evident with thickened alveolar walls with fibrosis and mild accumulation of histiocytes around the terminal bronchiole

and in the alveolar spaces. These results may be due to the effect of aflatoxins in grain infested by grain weevils that cause health problems seen in mice lungs and respiratory tracks. Aflatoxin B₁ (AFB₁) induced pathological alteration in the form of pulmonary adenomas and lung cancers as outlined by (Roger and Coulombe, 1994). However, the susceptibility of the lung to AFB₁ toxicity may be negligible capacity for glutathione S-transferase-catalyzed detoxification of bio-activated AFB₁ in the lung (Stewart *et al.*, 1996). On the other hand, Figure (5) shows bleeding inside bronchioles and outside alveoli. William and Anupma (2000) pointed to the occurrence of hemorrhage in the lungs and multiple organs in chicks exposed to aflatoxin.

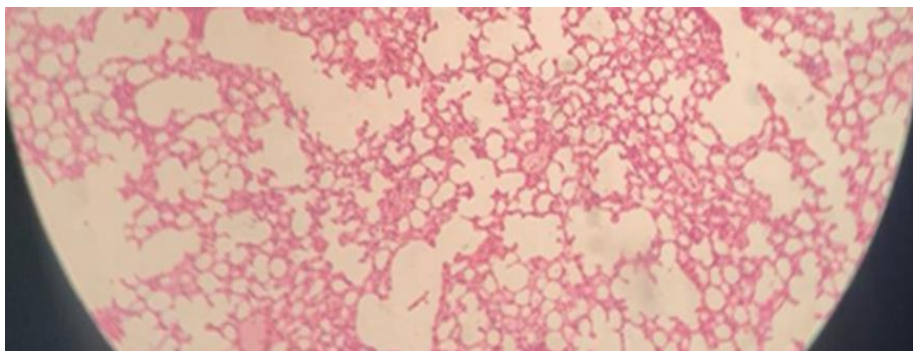


Fig. 3. Cross section in the lung of healthy albino fed on wheat grains free from grain weevil infestation

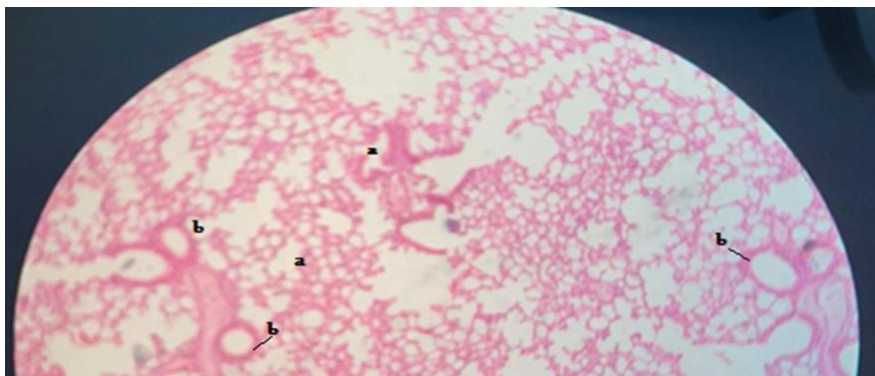


Fig. 4. Thickness of alveolar walls with fibrosis, focal chronic alveolitis with fibrosis was also evident with slight buildup of histiocytes around the terminal bronchiole (b) and into the alveolar spaces (a)

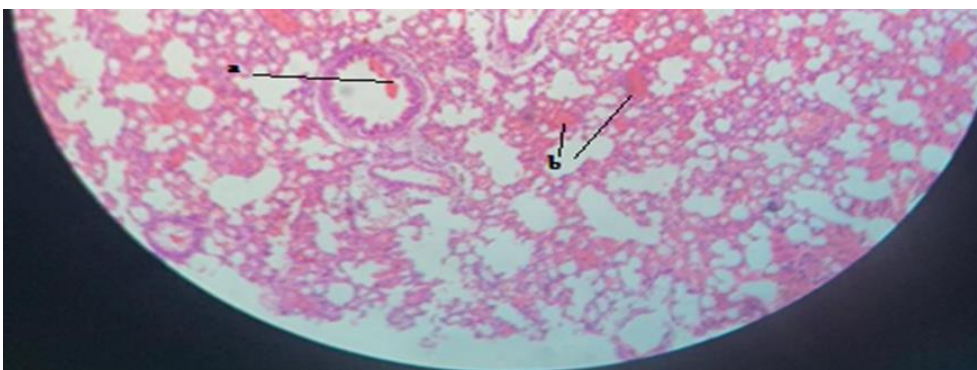


Fig. 5. Hemorrhage observed inside bronchioles (a) and outside alveoli (b).

3-Histological studies on kidneys of male albino mice fed infested wheat grains by grain weevil fed infested wheat grains by *Sitophilus granarius*:

Figure (6) shows the cross section of male albino mice fed un-infested wheat grains by *Sitophilus granarius*. Normal tubules and glomeruli were observed.

Sections in the kidneys of male albino mice fed infested wheat grains by *Sitophilus granarius* show many distortions of the tubules whose cuboidal cells are “vacuolated” with the absence of a clear brush border of the proximal convoluted tubules. Also, hemorrhage appeared inside and outside the uriniferous tubules. (Figure, 7). These results were confirmed by similar results by May *et al.* (2007).

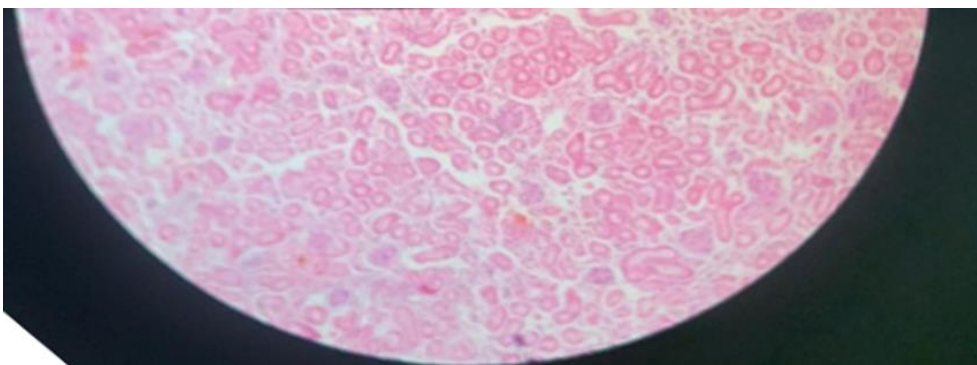


Fig. 6. Cross section in the kidney of male albino mice fed un-infested wheat grains with grain weevils shows a normal histological structure

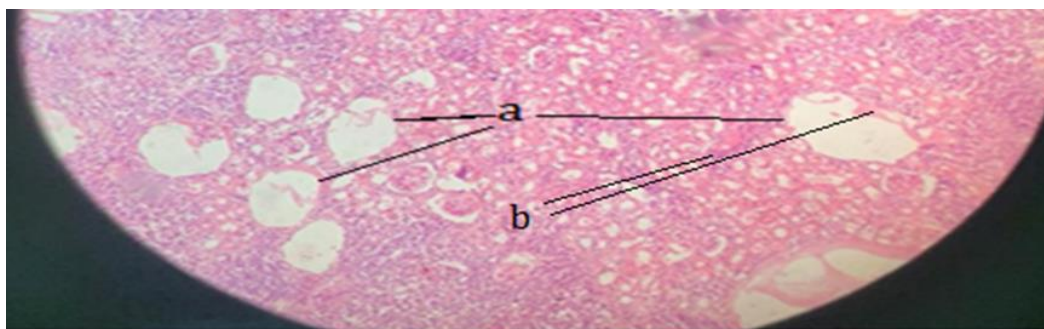


Fig. 7. Cross section in the kidney of male albino mice fed infested wheat grains by grain weevils. There are many distortions of the tubules whose cuboidal cells are "vacuolated" with the absence of a clear brush border of the proximal convoluted tubules (a). Also hemorrhage appeared (b)

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دراسات هيستولوجية على الكبد والرئة والكلية في الجرذان البيضاء المغذية على القمح المصاب بسوسة الحبوب *Sitophilus granarius*

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المخلص

تم إجراء دراسات نسجية على الكبد والرئة والكلية للجرذان البيضاء المغذية على حبوب القمح غير المصابة والمصابة بسوسة الحبوب *Sitophilus granarius* في معمل قسم وقاية النبات بكلية الزراعة جامعة المنيا. مقطع عرضي من كبد أنثى البينو تتغذى على حبوب صحية وغير مصابة، ولا يظهر أي نزيف أو خلايا نواة كبيرة. أظهرت المقاطع في كبد ذكر الجرذ الأبيض الذي يتغذى على حبوب القمح المصابة بسوسة الحبوب ظهور العديد من الخلايا الضخمة في الجيوب الدموية بالإضافة إلى ظهور نزيف واحتقان في قطاعات الكبد. المقطع العرضي في رتي ذكر الجرذان البيضاء التي تتغذى على حبوب صحية وغير مصابة لم يظهر أي التهاب مزمن بؤري للحوبيصلات الهوائية. ومع ذلك، أظهرت الدراسات الهيستولوجية على رتي الجرذان البيضاء التي تتغذى على حبوب القمح المصابة أن التهاب الحويصلات الهوائية المزمن البؤري مع التليف كان واضحاً مع سماكة جدران الحويصلات الهوائية مع التليف وتراكم خفيف للخلايا المنسجة حول القصبيات الطرفية وفي فراغات الحويصلات الهوائية. كما ظهر نزيف داخل القصبيات الهوائية وخارج الحويصلات الهوائية. أظهرت قطاعات الكلوية في ذكر الجرذان البيضاء التي تتغذى على حبوب القمح غير المصابة بواسطة سوسة الحبوب تركيب طبيعي للكلية ، بينما أظهرت المقاطع في كبد ذكر الجرذان البيضاء التي تتغذى على حبوب القمح المصابة بواسطة *Sitophilus granarius* تشوهات كثيرة في الأنابيب التي "تفرغت" خلاياها المكعبة مع عدم وجود حدود واضحة لفرشاة الأنابيب الملوتية القريبة. كما ظهر نزيف داخل الأنبيبات البولية وخارجها.

الكلمات الدالة: دراسات هيستولوجية-الجرذان البيضاء-سوسة الحبوب