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Study of histological structure of lung of albino rats treated with amygdalin zinc oxide nano particles

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***Abstract*---**The current study was conducted in the animal house of the Faculty of Education for Girls / University of Kufa, and the study aimed to know the effect of the nano-extract (zinc oxide) of the seeds of the *Prunus persica* and *Prunus armeniaca* seeds on the histological structure of the lungs in male white rats with ages ranging (6-10) weeks and weights (200-250 g). Which were divided into ten groups, each group included 5 rats. The first group is the control group and the second group is the group that was treated with the nano-extract of the seeds of the *P.persica* plant at a concentration (10 mg/kg) then (DENA+Ccl4), the third group is the group that was treated with just the nano-extract from the seeds of the *P.persica* plant at a concentration (15 mg/kg),the fourth group is the group that was treated with the nano-extract from the seeds of the *P.armeniaca* plant at a concentration (10mg/kg) then (DENA+Ccl4), the fifth group is the group that was treated with just the nano-extract from the seeds of the *P.armeniaca* plant at a concentration (15 mg/kg) and the sixth group was the infection group with cancer which treated with (DENA+Ccl4), the seventh group is the group that was treated with the nano-extract of the seeds of the *P.persica* plant at a concentration (15 mg/kg) then (DENA+Ccl4), the eighth group is the group that was treated with the nano-extract of the seeds of the *P.armeniaca* plant at a concentration (15 mg/kg) then (DENA+Ccl4), the ninth group is the group that was treated with just the nano-extract from the seeds of the *P.persica* plant at a concentration (10 mg/kg), the tenth group is the group that was treated with just the nano-extract from the seeds of the *P.armeniaca* plant at a concentration (10 mg/kg), per day for 42 days and after the end of the experiment, all rats were sacrified , as for the group that is given the apricot seed nano-extract and the peach seed nano-extract after cancer was induced, it showed simple

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and normal histological changes. As for the group that induced cancer without giving them the nano-extracts, tumors and significant changes in the nucleus and fibrosis at the tissue level appeared.

***Keywords*---**nucleus, fibrosis, tissue, animal.

Introduction

In humans and also most animals, along with a few fish and snails, the lungs are the major organs of the respiratory system. Two lungs are positioned near the backbone on either side of the heart in mammals and most other animals. As in the respiratory system, they collect oxygen from the air, transmit it to the bloodstream, as well as release carbon dioxide from the bloodstream into the atmosphere, in a gas exchange process. Various muscle mechanisms in different animals drive respiration. Different muscles are used by mammals, reptiles, and birds to support and nurture respiration. The pharyngeal muscles drove air into the lungs in early tetrapods by buccal pumping, which is still found in amphibians. The diaphragm is the major muscle of respiration in humans, and it is responsible for breathing. Airflow is also provided by the lungs, which allows vocal sounds such as human speech to be produced (Roger *et al* .,1997). A variety of respiratory disorders, such as pneumonia and lung cancer, can damage the tissue of the lungs. Chronic bronchitis and emphysema are examples of chronic obstructive lung disease, which can be caused by smoking or exposure to toxic chemicals. Coal dust, asbestos fibers, and crystalline silica dust are all known to induce a variety of occupational lung illnesses. Bronchitis, for example, can impact the respiratory tract. As in pulmonology, medical phrases connected to the lungs sometimes begin with pulmo-, from the Latin pulmonarius (of the lungs), or with pneumo-, from the Greek v "lung," as in pneumonia (Ganong, 2005; Martini *et al.*, 2012).

The lungs begin to form as an outpouching of the foregut, a tube that eventually forms the upper section of the digestive system, during embryonic development. Because the fetus is kept in the fluid-filled amniotic sac while the lungs develop, they don't really work to breathe. The ductus arteriosus also allows blood to be redirected from the lungs. Air begins to move through the lungs upon birth, and the diversionary duct shuts, allowing the lungs to begin to breathe. Early infancy is the only time when the lungs fully mature (Gartner and James, 2015). Lung cancer kills in many ways. Bronchial obstruction from lung cancer can cause pneumonia, making pneumonia the immediate cause of death. Lung cancer can invade and disrupt blood vessels resulting in fatal haemorrhage. The hypercoagulable state of malignancy from lung cancer can cause fatal pulmonary thromboembolism, The burden of tumor in the lungs or the liver can cause these organs to fail, resulting in a patient's demise, The tumor burden of extensive widespread metastases can essentially starve to death a patient with lung cancer (Kuderer *et al.*, 2009).

Amygdalin (d-mandelonitrile d-glucoside 6-glucoside) is a cyanogenic glycoside found in the seeds of rosaceous plants such as apricots, peaches, apples, and bitter almonds (Lerner IJ.,1981). It appears that amygdalin is not harmful in and

of itself, but its breakdown products, such as cyanide and benzaldehyde, are. According to an unproven theory, amygdalin is selectively broken down by the enzyme -glucosidase, which is abundant in tumor cells (Milazzo S, Horneber M.,2015). Proponents of amygdalin as an antitumoral agent claim it is a natural cancer therapy (Nightingale SL.,1984). Furthermore, tumor cells lack rhodanese, a mitochondrial enzyme that converts cyanide to a non-toxic thiocyanate molecule, hence cyanide toxicity in malignant cells is substantially higher than in normal cells (Nightingale SL.,1984).

Experiments

A number of recent research have shown that amygdalin can cause apoptosis in a variety of cancer cell lines (Mora CA.,*et al* 2016). The epidermal growth factor receptors (EGFRs) family, also known as ErbB or HER receptors, is one of the most significant targets for human breast cancer targeted treatment. ErbB1/EGFR1, ErbB2/HER2, ErbB3/HER3, and ErbB4/HER4 are members of this family of four transmembrane receptors having tyrosine kinase activity (Sanchez-Perez, R.; *et al* 2008). Amygdalin may be found in stone fruit kernels such almonds, apricots (14 g/kg), peaches (6.8 g/kg), and plums (4–17.5 g/kg depending on type), as well as apple seeds (3 g/kg) (Bolarinwa,*et al.*,2014). The bitter flavor comes from the benzaldehyde produced by amygdalin. Non bitter (or sweet) almonds have less amygdalin than bitter almonds due to a variation in a recessive gene called Sweet kernel [Sk] (Sanchez-Perez *et al.*,2008). Bitter almond amygdalin concentrations varied from 33 to 54 g/kg depending on variety, whereas semibitter types averaged 1 g/kg and sweet kinds averaged 0.063 g/kg, with substantial variation depending on variety and growing area (Lee *et al.*,2013).

Results

In the current study the results showed that the group treated with apricot seed nano-extract and peach seed nano-extract was similar to the control group (no histological change occurred). As for the group that is given the apricot seed nano-extract and the peach seed nano-extract after cancer was induced, it showed simple and normal histological changes. As for the group that induced cancer without giving them the nano-extracts, tumors and significant changes in the nucleus and fibrosis at the tissue level appeared. In figure (1) A Cross section of the lung tissue showing no alteration in the control group. In figure (2) A cross section of lung tissue showing no alteration in the group treated with Concentration of 10 mg/kg of the nanostructure of amygdalin extracted from *Prunus armeniaca*. In figure (3) A cross section of lung tissue in the group treated with (DENA+Ccl4) showing presence of inflammatory cells and destruction of the wall of some alveoli. In figure (4): A cross section of lung tissue in a rat in the group treated with (DENA+Ccl4) showing bronchiolar fibrosis. In figure (5): A cross section of the lung tissue in a rat in the group treated with 15 mg/kg of amygdalin extracted from *Prunus armeniaca* with (DENA+Ccl4) showing fibrosis and hemorrhage. In figure (6) A cross section of lung tissue in a rat in the group treated with amygdalin extracted from *prunus armeniaca* concentration 15 mg/kg showing normal structure. In figure (7) A cross section of a lung tissue in a rat treated with amygdalin extracted from *Prunus persica* concentration of 10 mg/kg showing the bronchioles and alveoli naturally .In figure (8) A cross section of lung

tissue in a rat treated with a concentration of 15 mg/kg of the nanostructure of amygdalin extracted from Prunus persica and the tissue appears naturally. In figure (9) A cross section of the lung tissue in the rat treated with amygdalin extracted from *Prunus persica* concentration 10 mg/kg with (DENA+Ccl4) showing narrowing of the lumen of the bronchioles. In figure (10) A cross section of the lung tissue in the rat treated with amygdalin extracted from *Prunus persica* concentration 15 mg/kg with (DENA+Ccl4) showing Bleeding.

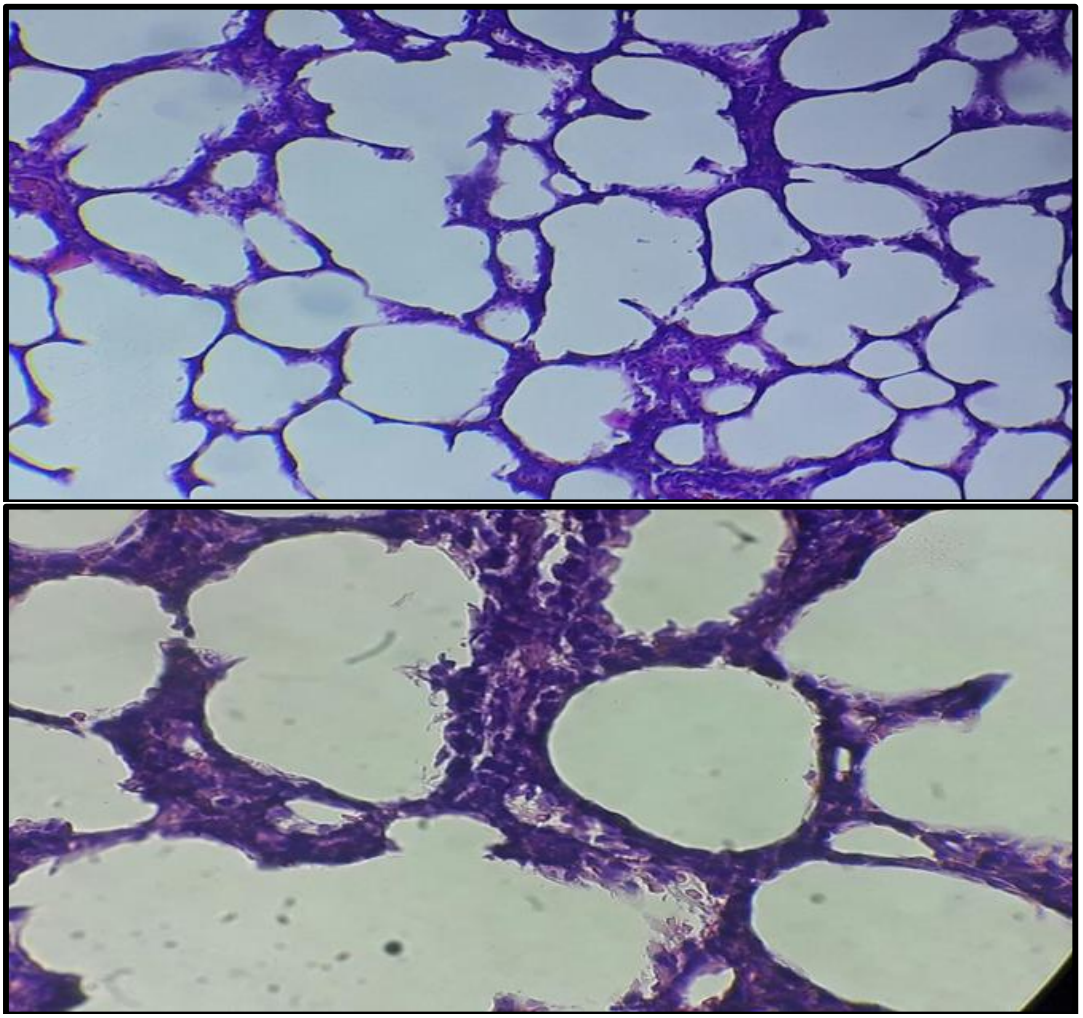

Figure (1)A Cross section of the lung tissue showing no alteration in the control group(H&E X400)

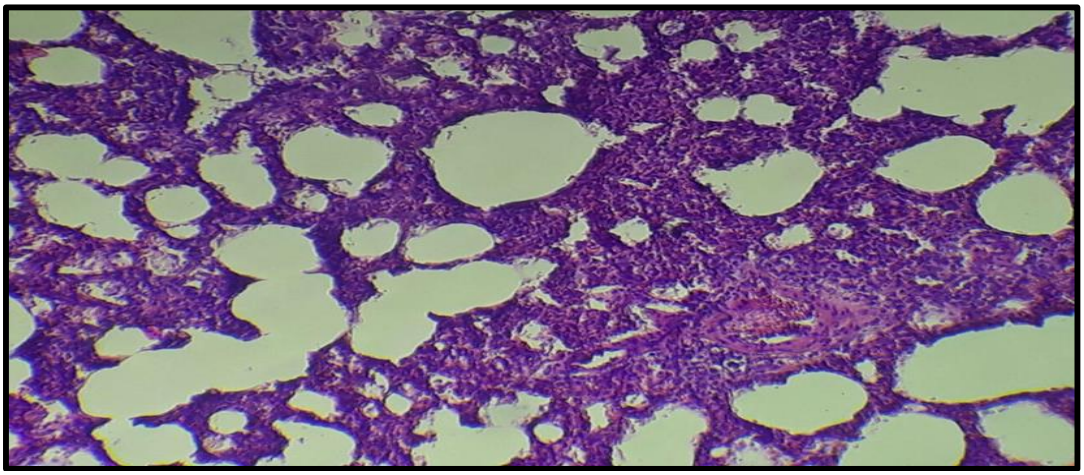

Figure.(2): A cross section of lung tissue showing no alteration in the group treated with Concentration of 10 mg/kg of the nanostructure of amygdalin extracted from *Prunus armeniaca* (H&E X400)

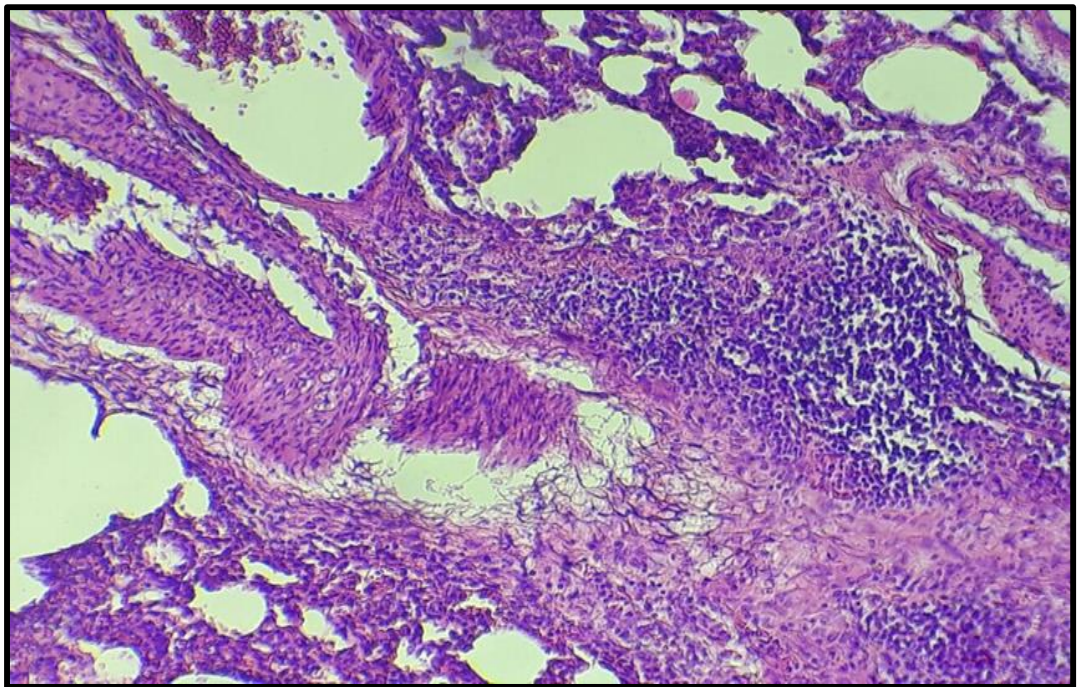

Figure (3) A cross section of lung tissue in the group treated with (DENA+Ccl4) showing presence of inflammatory cells and destruction of the wall of some alveoli (H&E X400)

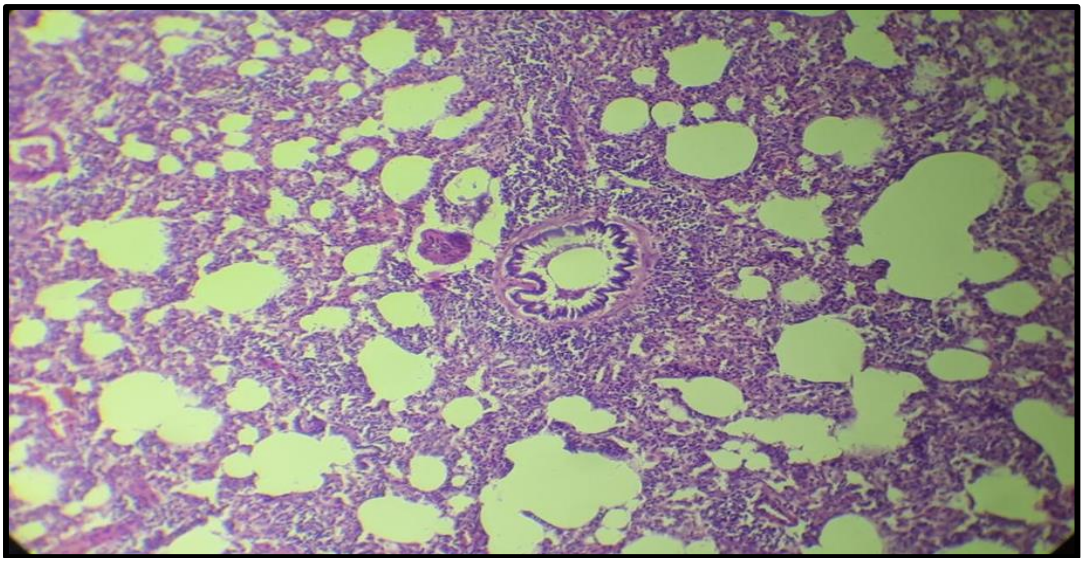

Figure (4): A cross section of lung tissue in a rat in the group treated with (DENA+Ccl4) showing bronchiolar fibrosis (H&E X400)

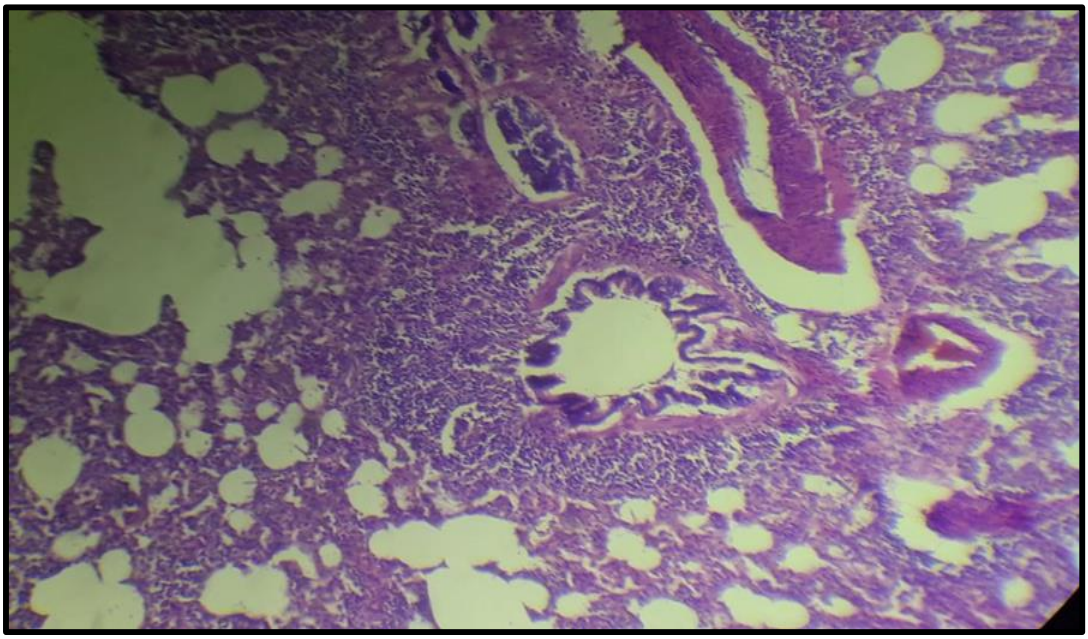

Figure (5): A cross section of the lung tissue in a rat in the group treated with 15 mg/kg of amygdalin extracted from *Prunus armeniaca* with (DENA+Ccl4) showing fibrosis and hemorrhage (H&E X400)

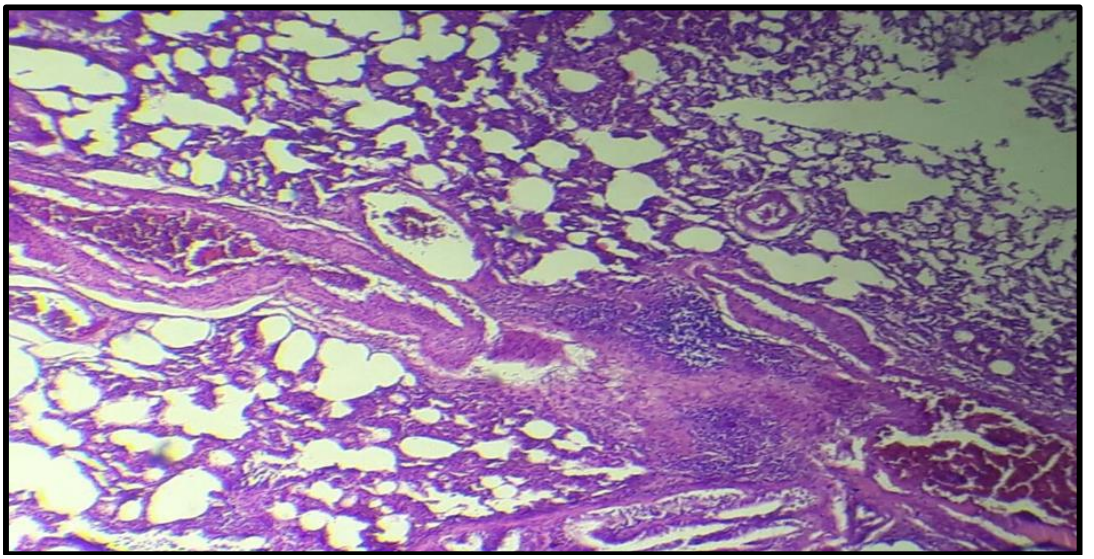

Figure (6) A cross section of lung tissue in a rat in the group treated with amygdalin extracted from *prunus armeniaca* concentration 15 mg/kg showing normal structure (H&E X400)

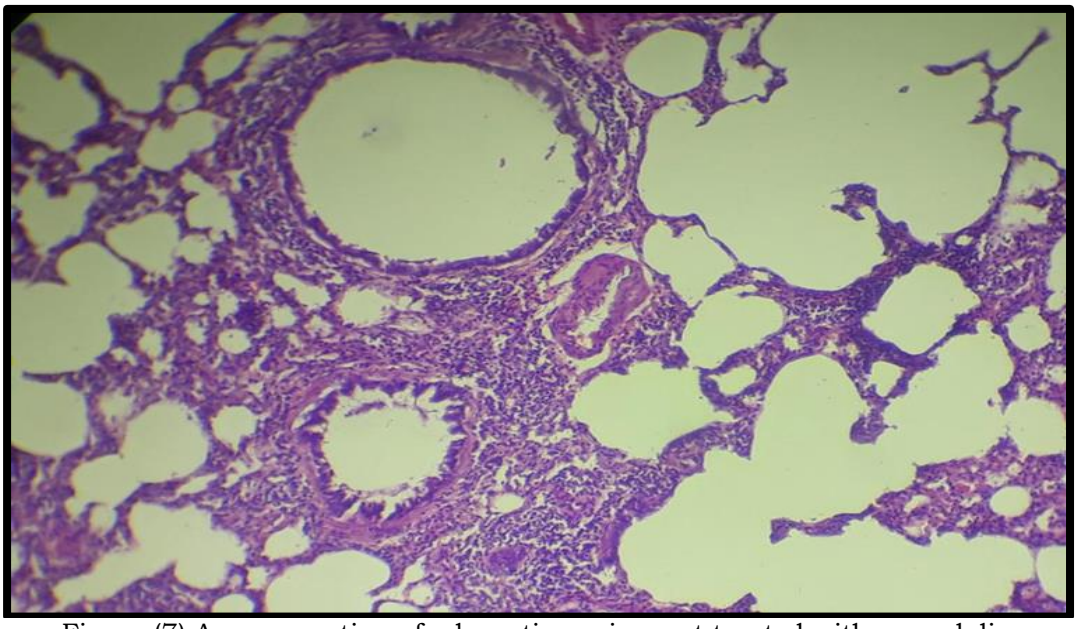

Figure (7):A cross section of a lung tissue in a rat treated with amygdalin extracted from *Prunus persica* concentration of 10 mg/kg showing the bronchioles and alveoli naturally (H&E X400)

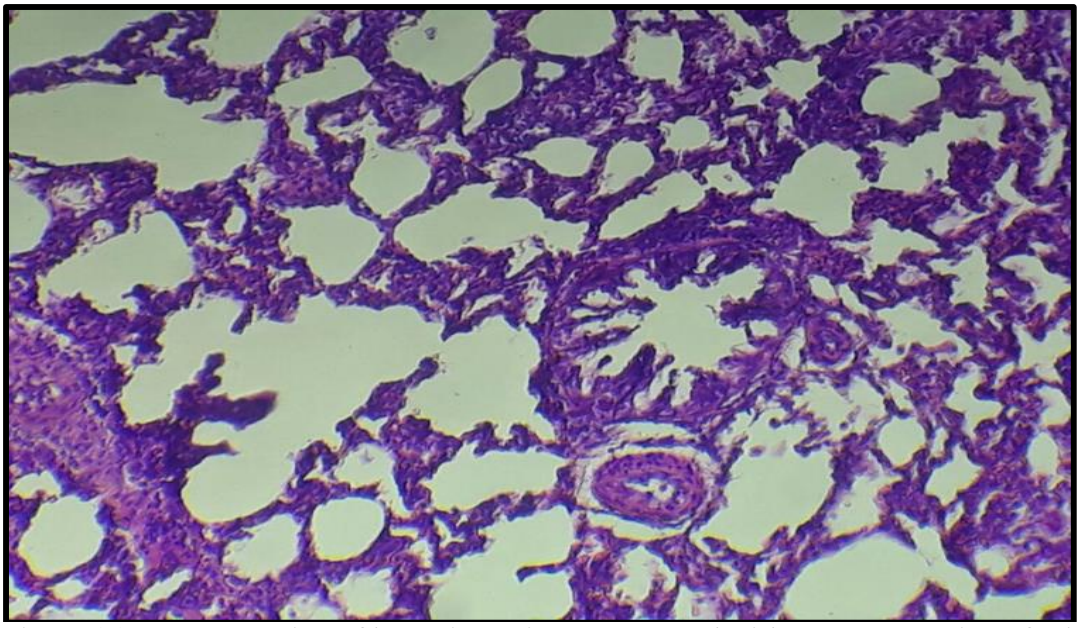

Figure (8):A cross section of lung tissue in a rat treated with a concentration of 15 mg/kg of the nanostructure of amygdalin extracted from Prunus persica and the tissue appears naturally (H&E X400)

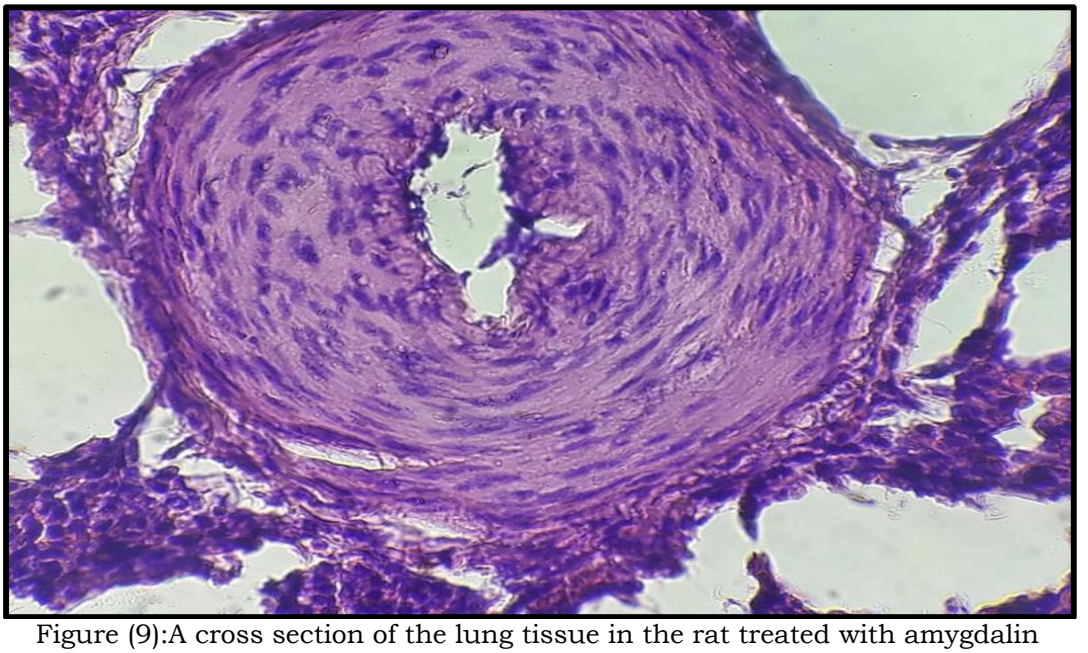

Figure (9):A cross section of the lung tissue in the rat treated with amygdalin extracted from *Prunus persica* concentration 10 mg/kg with (DENA+Ccl4) showing narrowing of the lumen of the bronchioles (H&E X400)

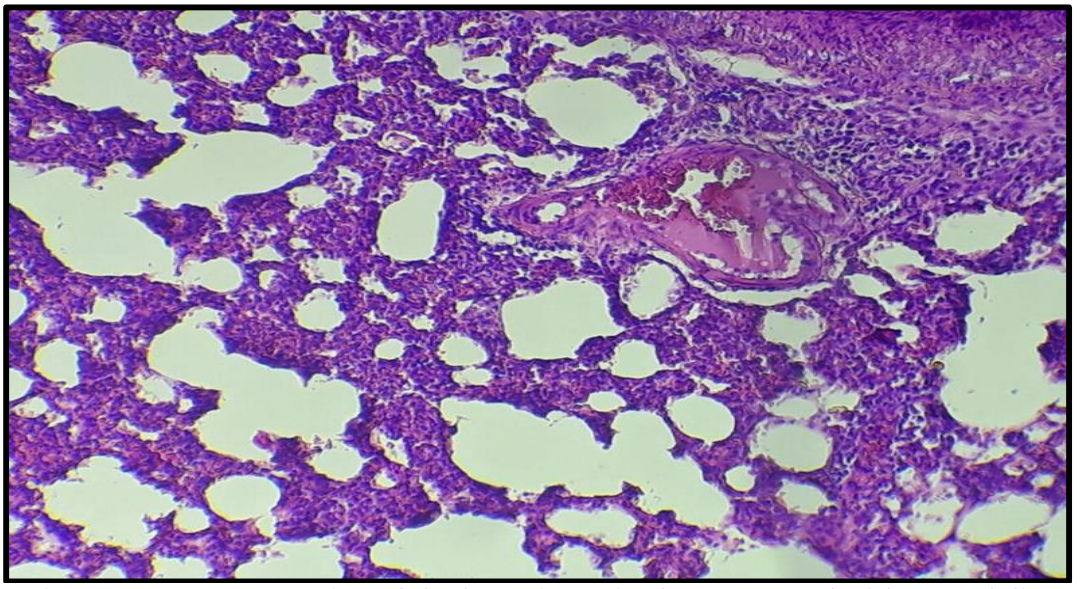

Figure (10) A cross section of the lung tissue in the rat treated with amygdalin extracted from *Prunus persica* concentration 15 mg/kg with (DENA+Ccl4) showing Bleeding (H&E X400)

Discussion

Results of our previous studies showed that amygdalin extracted from *Prunus a.* and *Prunus p.* described variety of effects a slight increase in the normal state Primarily, the toxic property of cyanide is attributed to its association with the cytochrome oxidase terminal in the respiratory pathway of the mitochondria creating a hinderance in the cells (ability to use oxygen) Results agree with reported (Opyd *et al.*, 2017). In humans, cyanide has been shown to cause highly acute toxicity, causing increased LPO levels and oxidative stress (Kamendulis *et al.*, 2002). Mitochondrial dysfunction and increased metabolism in cancer cells, compared with those in normal cells, are the main causes of high levels of ROS. This mechanism may be associated with the anticancer effects of amygdalin by triggering several ROS-induced cell death pathways of cancer cells (Galadari *et al.*, 2017). Other studies have shown that amygdalin exerts additional effects, including prevention of pulmonary fibrosis, inhibition of renal interstitial fibrosis, suppression and regulation of the immune system, and resistance to hyperoxia-induced lung injury, as well as anti-inflammatory, antitumor and anti-ulcer activities (Chang *et al.*, 2005; Guo *et al.*, 2013; Hwang *et al.*, 2008; Yan *et al.*, 2006; Zhu *et al.*, 2004). Amygdalin has been used to treat leprosy, asthma, emphysema, bronchitis, vitiligo and colorectal cancer (Chang *et al.*, 2005; Do *et al.*, 2006; Song & Xu, 2014). Amygdalin can promote the synthesis of pulmonary surfactant in animal experimental model of respiratory distress syndrome and ameliorate the disease (Wei and Xie,2010). Cyanic acid calms down respiratory movements. This action has been attributed in animal research models to further synthesizing pulmonary surfactants. In an *in vitro* study (Chang *et al.*,2005). Investigated the protective effects of amygdalin on hyperoxia-exposed type II Alveolar Epithelial Cells (AECII) isolated from premature rat lungs. Amygdalin

promotes the proliferation of premature rat AECII exposed to air or hyperopia, and the best concentration of amygdalin was obtained at 200 umol/L(Lv and Deng,2012).

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