

Toxic Effect of Powdered Castor Oil Seed (*Ricinus Communis L.*) on Roof Rat

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Abstract

The powder of castor oil seed of (*Ricinus communis L. Euphorbiaceae*) was used in a Laboratory experiment for its toxicity. The study was undertaken to investigate the effect of powdered castor oil seed (*Ricinus communis L.*) on roof rat. Forty five roof rat were caught and divided into three (3) groups, there were five (5) roof rat in a cage which represent a group, replicated three (3) times were used in the study. The castor oil seed was turned to powdery form using pestle and mortal to grind the seeds. Three feed formulations were used; A baited formulation of powdered castor oil seed plus fried fish at ratio 1:0.5; Another baited powdered castor oil seed plus fried fish at ratio 1:0.1; The third group were given a commercial rat feed only which serve as control. These feeds were administered to each group of the roof rat and their behaviors were properly monitored over a period of five (5) days. The histology of the kidney, liver, spleen, which was initially preserved in formalin were later analysed. The results showed that a powdered castor oil seed baited with fried fish can serve as rodenticide and all test groups show histological features of lethal tissue damage in all the organs examined while control group shows normal tissue.

Key words: Toxic effect, Castor oil seed, Roof rat, kidney, liver, spleen, feed.

Introduction

Ricin is obtained from *Ricinus communis*, the castor oil plant. Castor oil seed are not true beans (not pulses). The plant belongs to the spurges (i.e. fam. Euphorbiaceae). This beautiful plant is sometimes used to decorate gardens. It is cultivated chiefly to harvest oil from the seeds: ricinus oil or castor oil. In temperate regions it is an annual plant with brownish red stalks and large palmate leaves with long stalks and 5-11 jagged lobes. In tropical areas it grows as a shrub or a tree that can reach 40 feet in height along streams and rivers and on bottomlands with well-drained, nutrient rich soils (Ombrello, Noteworthy 1999). In the tropics it is perennial, and grows even taller. Most varieties are green, but some are red or purple. The flowers may be strikingly green, or a pronounced pink in the pigmented varieties. The seeds are approximately 17 mm long and 8 mm broad. Present-day cultivars have seeds weighing approximately 3 g. The seed mantle accounts for approximately ¼ of the weight. Dry seeds contain approximately 50% oil. The seeds also contain a lipase, which can be used commercially.

Castor oil seed contain approximately 50% oil which is composed of 80% to 90% ricinoleic acid (12-hydroxyl-cis-9-octadecenoic acid) (Robbelen et al. 1989). This unique hydroxy fatty acid is used in a number of processes to create unique chemicals and polymers.

Several insects may feed on the plant. The plant protects itself by producing toxins. The seeds contain the highest concentration of poison. The most important component is the protein ricin. Other poisonous components are tricinin and ricinin. Ricin is synthesised in the endosperm of ripening seeds and is stored as inactive proricin in a cell organelle ("protein body"). [Endosperm is the polyploid food tissue of the seed.] In this way the plant allows its own ribosome's to function. Ricin becomes activated after proteolytic splitting into A and B components. The ricin A part binds to a specific adenine of 28S ribosomal RNA. It prevents further production of protein in the cell.

MATERIALS AND METHODS

The experiment was carried out at the Toxicology Laboratory in the Department of Crop and Environmental Protection, Faculty of Agricultural Sciences, Ladoko Akintola University of Technology, Ogbomosho.

The roof rats use for this studies were collected from rabbitry, poultry and hostels. Forty five (45) wild rats were caught using cage trap and were divided into three (3) groups where each group contains three (3) cages. Each cage had 5 rats, There were 3 treatments as follows;

Group I: Powdered castor oil seed plus fried fish at ratio 1:0.5 and replicated thrice.

Group II: Powdered castor oil seed plus fried fish at ratio 1:0.1 and replicated thrice.

Group III: commercial rat feed only served as control and replicated thrice.

The rats were fed ad libitum (feeding without restriction) once daily with a baited powdered castor oil seed plus fried fish to treated rat and commercial feed to control rat, They were given fresh water once daily from a suspended water feeder.

The castor oil seed used for this experiment were obtained from the Botanical Garden Ladoke Akintola University of Technology, Ogbomoso. The seed were weighed in grams and ground into powder using pestle and mortar and mixed thoroughly with fried fish at ratio 1:0.5, 1:0.1, w/w respectively.

The castor oil seed powder was mixed with fried fish and administered to the test animals. The treatments were as follows:

Treatment I: Powdered castor oil seed plus fried fish at ratio 1:0.5

Treatment II: Powdered castor oil seed plus fried fish at ratio 1:0.1

Treatment III: Commercial rats feed only served as control

All the treatments were replicated three (3) times.

The experiment lasted for 5 days

Result

At replicate 1, the table below shows that a powdered castor oil seed plus fried fish at ration 1:0.5 was effective because four mortality of roof rat was recorded on the second day while nothing was recorded with a treatment of powdered castor oil seed plus fried fish at ratio 1:0.1. Likewise, nothing was recorded on control treatment. On the third day, mortality of the remaining one roof rat was recorded using powdered castor seed plus fried fish at ratio 1:0.5 while three roof rat mortality was first recorded using powdered castor seed plus fried fish at ratio 1:0.1, no mortality was recorded on control group. On the fourth day, mortality of the remaining two roof rat was recorded. The same thing happen on the second replicate but on the third replicate, it was on the fourth day before hundred % mortality was recorded.

One hundred percent mortality of the treated rats occurred within 3 days in the castor seed /fried fish 1:0.5 while that of 1:0.1 occurred within 4 days (Table 1). No mortality occurred in the control treatment. In the two treatments and for all the rats as soon as the rats fed on the fried fish baited castor seed, the following symptoms preceded the death of the rats: the rats were feeling nausea; they showed unpleasant feeling when touched, there was diarrhea, they felt weak, they secreted black substance which covered their eyes.

Histopathological studies

The histology Section of the kidney in the control treatment show glomeruli, proximal and distal tubules as well as the interstitium. Both the cortical and medullary glomeruli appear normal. There is normal mesangial cellularity, i.e there is normal renal histology. The kidney section of the Albino Rats fed with treatment at ratio 1:1 show distorted histological architecture as evidenced by numerous foci of haemorrhage within the interstitium, more severe within the medullary interstitium. There is extensive necrosis of the tubular structures. The glomeruli are reduced in number and of poor outline which shows that feature are in keeping with acute tubulo-interstitial necrosis of the kidneys. The histology Section of the albino rat kidney treated at ratio 1:2 Section shows incomplete loss of renal histological architecture. Features agree with partially necrotic tissue. Treated feed at ratio 1:5 and 1:10 Section shows faint outline of tubules and glomeruli. There are also foci of haemorrhages.

The histology sections of the albino rat liver fed with the normal feed show plates of hepatocytes arranged as anastomosing cords and plates in radial orientation around terminal hepatic venules. Portal tracts are disposed peripherally within each lobules of liver. Within the portal tracts are seen terminal portal venule, bile ductules and branches of the portal artery which shows that there is normal liver histology. The histology sections of the albino rat liver fed with treated feed at ratio 1:1 show severely distorted histological architecture as evidenced by loss of hepatocytes outline and extensive intraparenchymal haemorrhage. Features are in keeping with severe hepatocellular necrosis. Section of the albino rat liver fed with treated feed at ratio 1:2 shows ghost appearance of hepatocytes and foci of haemorrhages. Features are in keeping with ongoing hepatocellular death. Both treatment 1:5 and 1:10 section shows haemorrhagic and necrotic tissue.

The histology of the splenic tissue in control cage showed splenic pulps which are arranged in nodular pattern with partial trabecular partitions. Both red and the white pulps are distinguishable and numerous small vascular channels are also seen which showed the normal spleen. Whereas the histology of the animal spleen in the first cage treated with a powdered castor seed at ratio 1:1 showed an extensive necrosis and haemorrhage, that is, features are that of necrotic splenic tissue. Derenzini et al (1976) quot that a severe necrosis of the red pulp of the spleen was observed in rats poisoned with this dose of ricin. The histology of the spleen of the animal in 2nd treatment which was given a powdered castor seed and a commercial rat feed at ratio 1:2 shows completely necrotic tissue while 3rd and 4th treatments which were given a powdered castor seed and a commercial rat feed at ratio 1:5 and 1:10 shows haemorrhagic and necrotic tissue.

In short, all test groups show histological features of lethal tissue damage in the organ examined (kidney, liver, spleen). The control group shows normal tissue.

DISCUSSION

The observation revealed that powdered castor seed baited with fried fish is highly effective in controlling rats.

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Table 1: Number of mortality of the roof rat fed with castor oil seed feed baited with fried fish.
Days after Treatment

Treatment	Replicate 1 (% mortality)					Replicate 2 (% mortality)					Replicate 3 (% mortality)				
	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th
Castor Seed + Friedfish (1:0.5)	0	4	1	0	0	0	3	2	0	0	0	3	2	0	0
Castor Seed + FriedFish (1:0.1)	0	0	3	2	0	0	0	3	2	0	0	1	2	2	0
Control	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

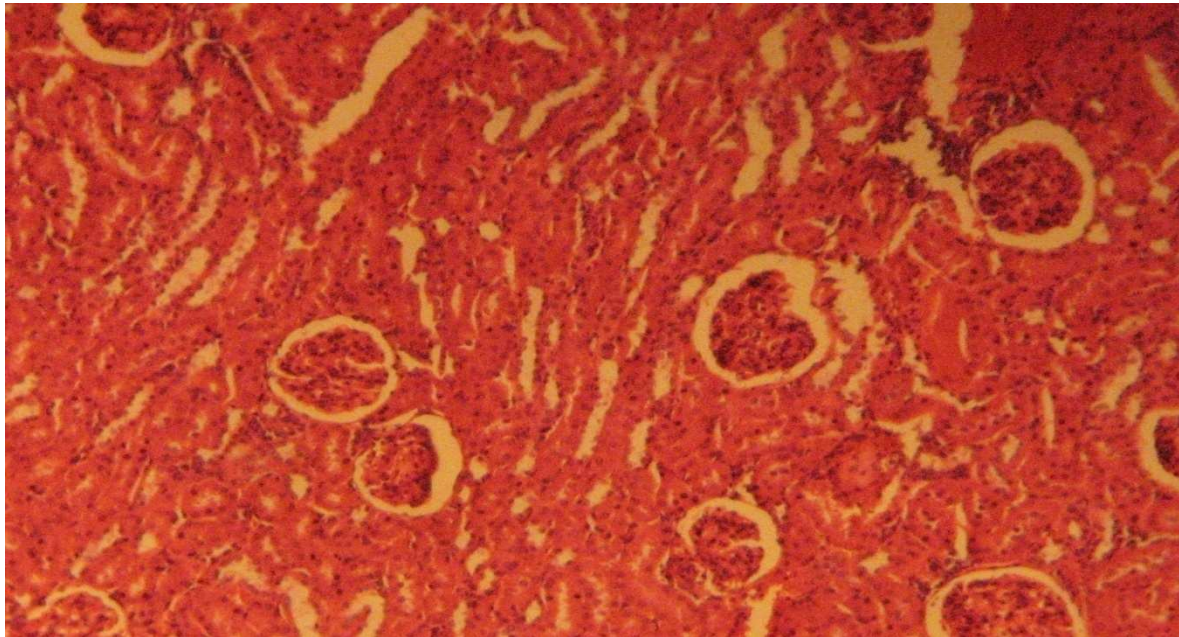


Fig 1; Photomicrograph of the Albino rat kidney treated without castor oil seed powder

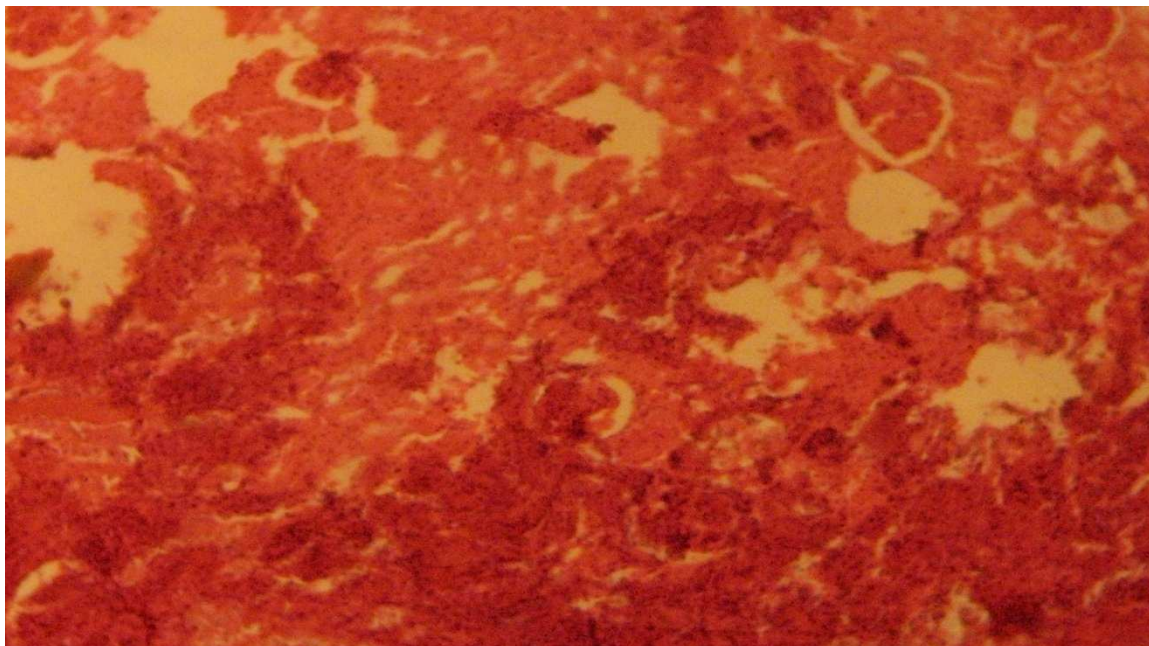


Fig 2; Photomicrograph of the Albino rat kidney treated with powdered castor oil seed and a commercial rat feed at ratio 1:1

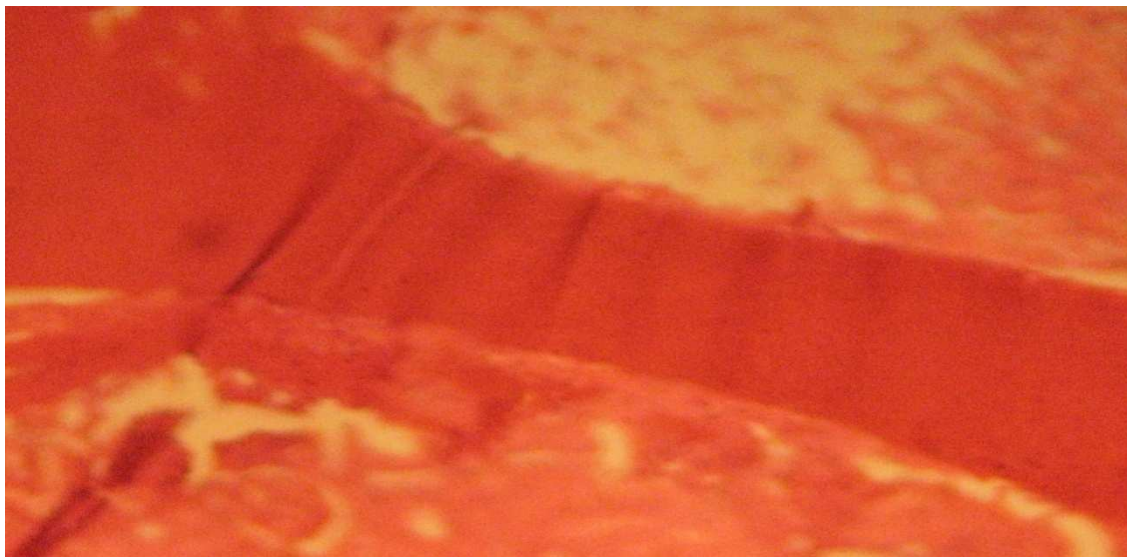


Fig 3; Photomicrograph of the Albino rat kidney treated with powdered castor oil seed and a commercial rat feed at ratio 1:2

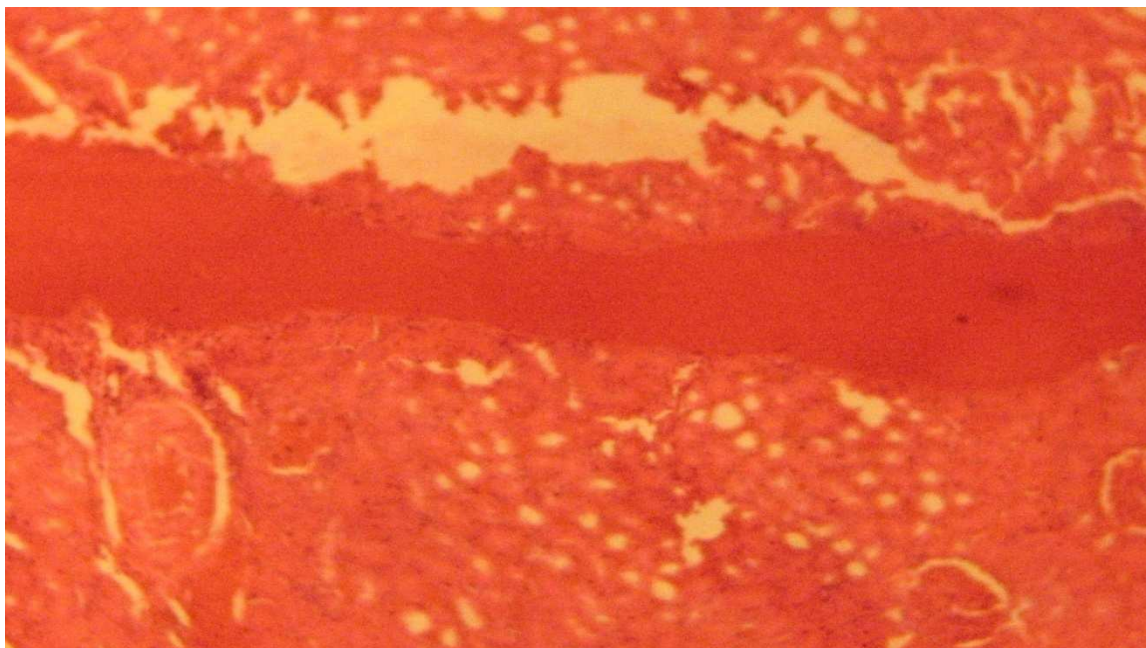


Fig 4; Photomicrograph of the Albino rat kidney treated with powdered castor oil seed and a commercial rat feed at ratio 1:5

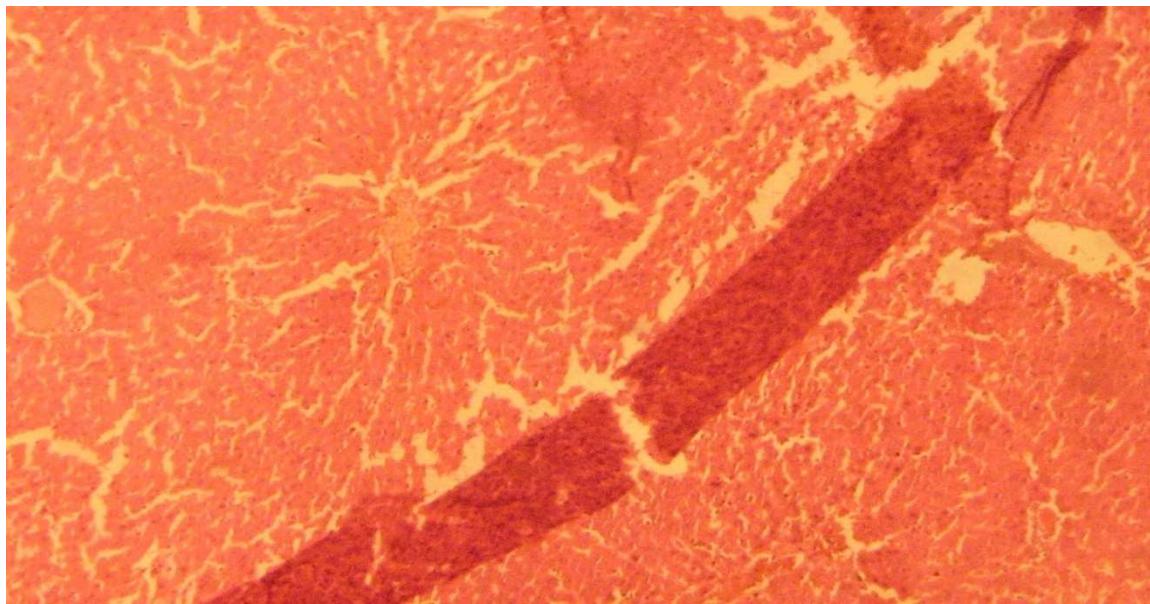


Fig 5; Photomicrograph of the Albino rat kidney treated with powdered Castor oil seed and a commercial rat feed at ratio 1:10

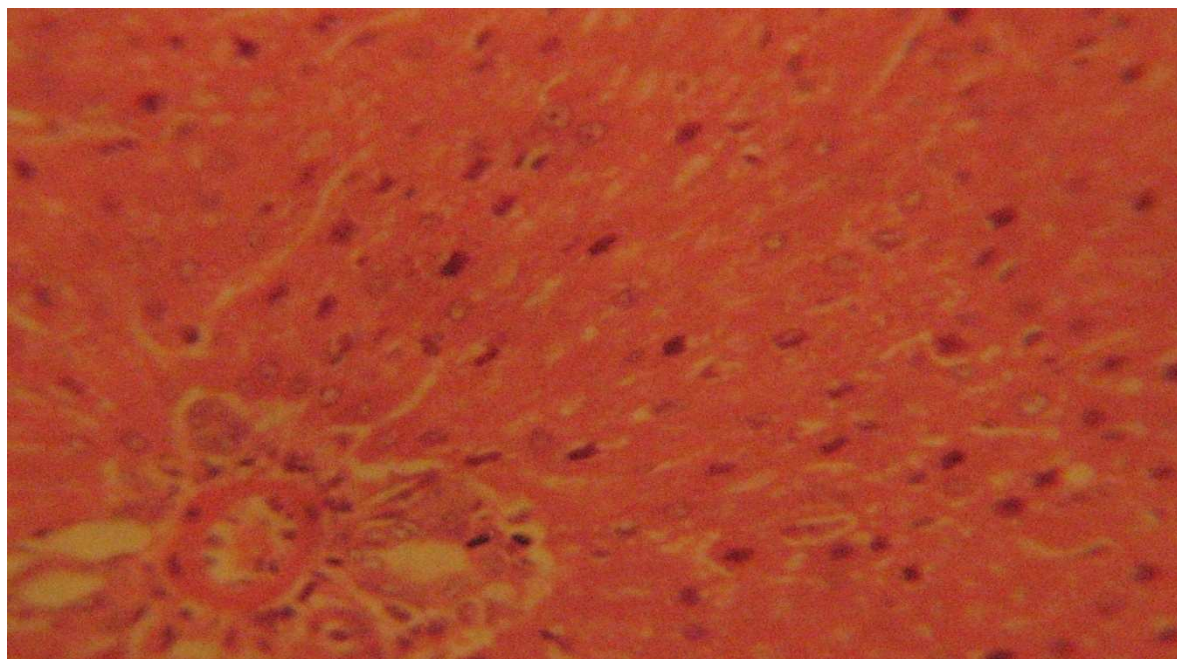


Fig 6; Photomicrograph of the Albino rat liver treated without castor oil seed powder

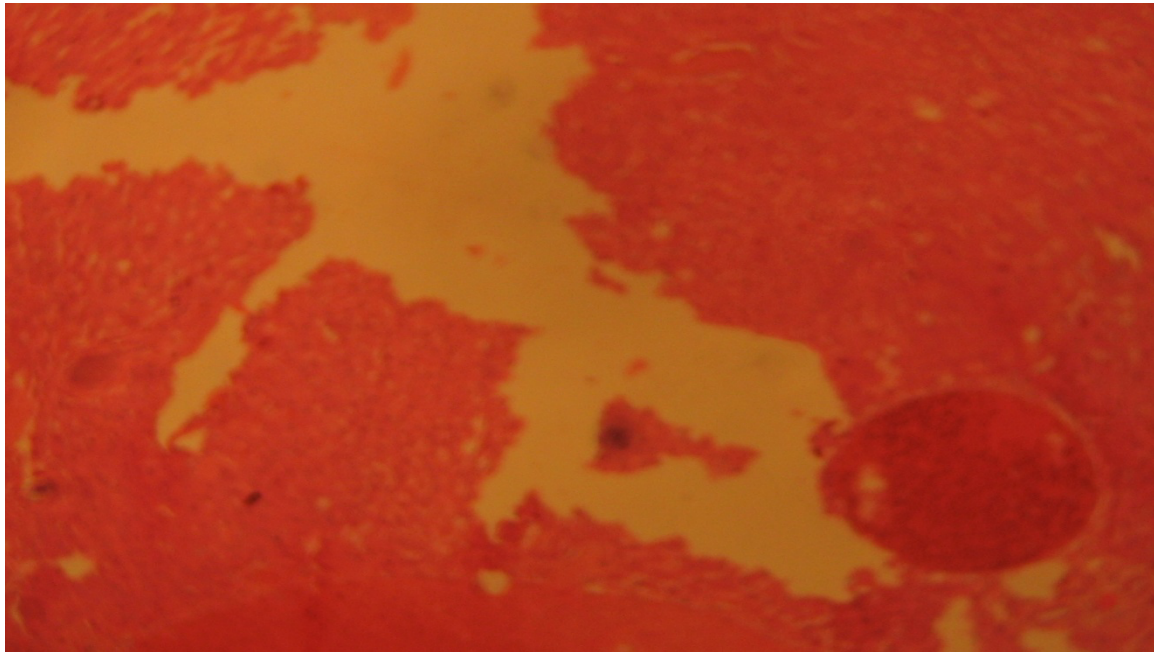


Fig 7; Photomicrograph of the Albino rat liver treated with powdered castor oil seed and a commercial rat feed at ratio 1:1

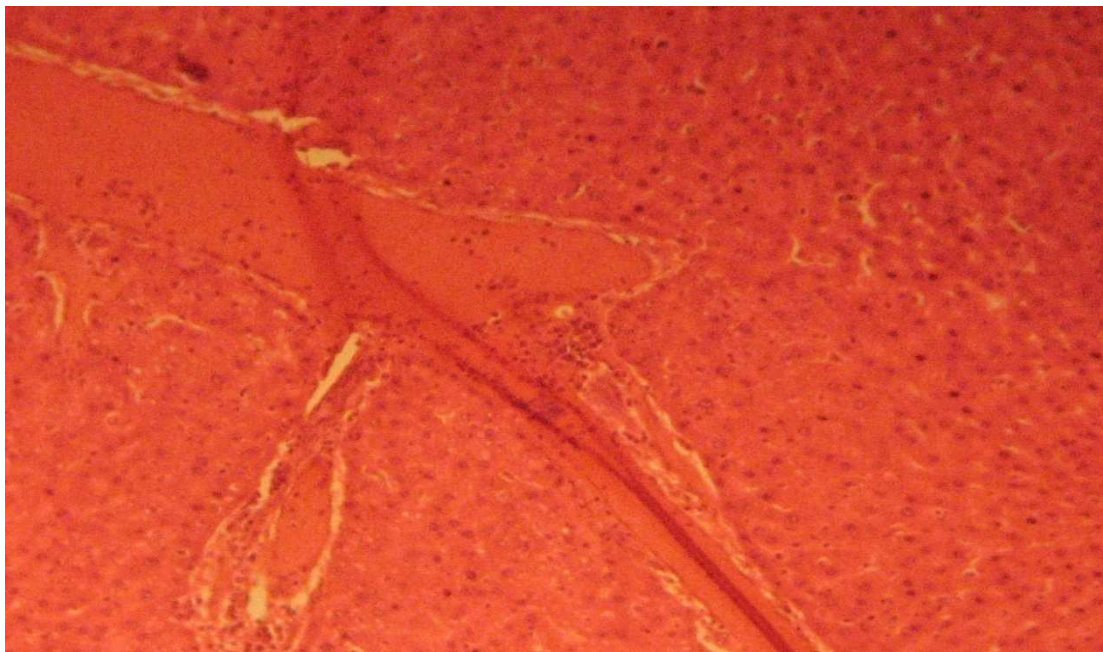


Fig 8; Photomicrograph of the Albino rat liver treated with powdered castor oil seed and a commercial rat feed at ratio 1:2



Fig 9; Photomicrograph of the Albino rat liver treated with powdered castor oil seed and a commercial rat feed at ratio 1:5

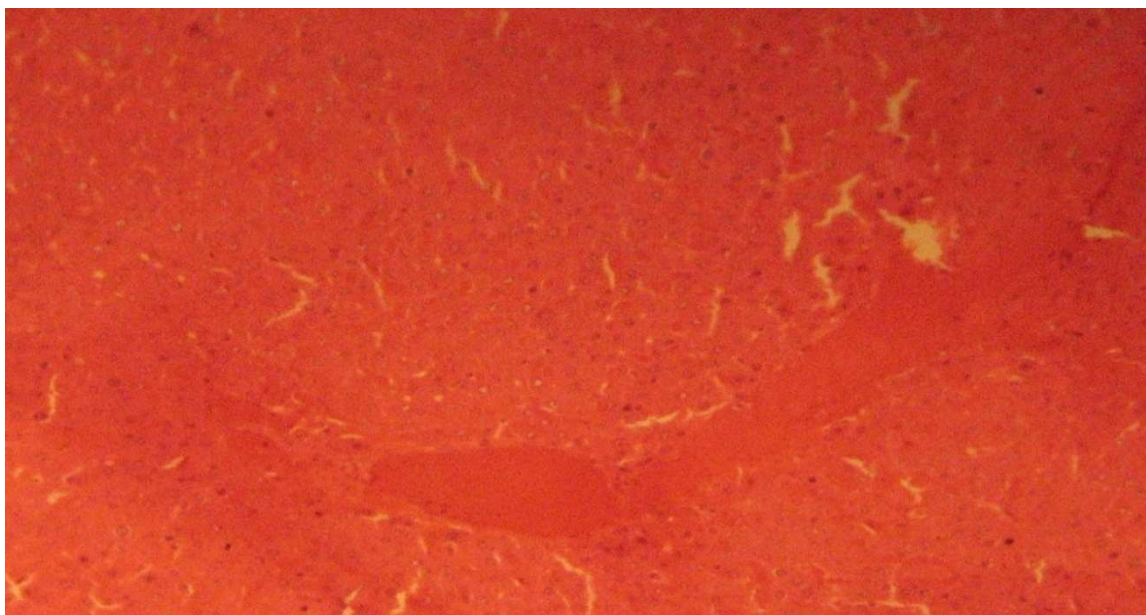


Fig 10; Photomicrograph of the Albino rat liver treated with powdered castor oil seed and a commercial rat feed at ratio 1:10

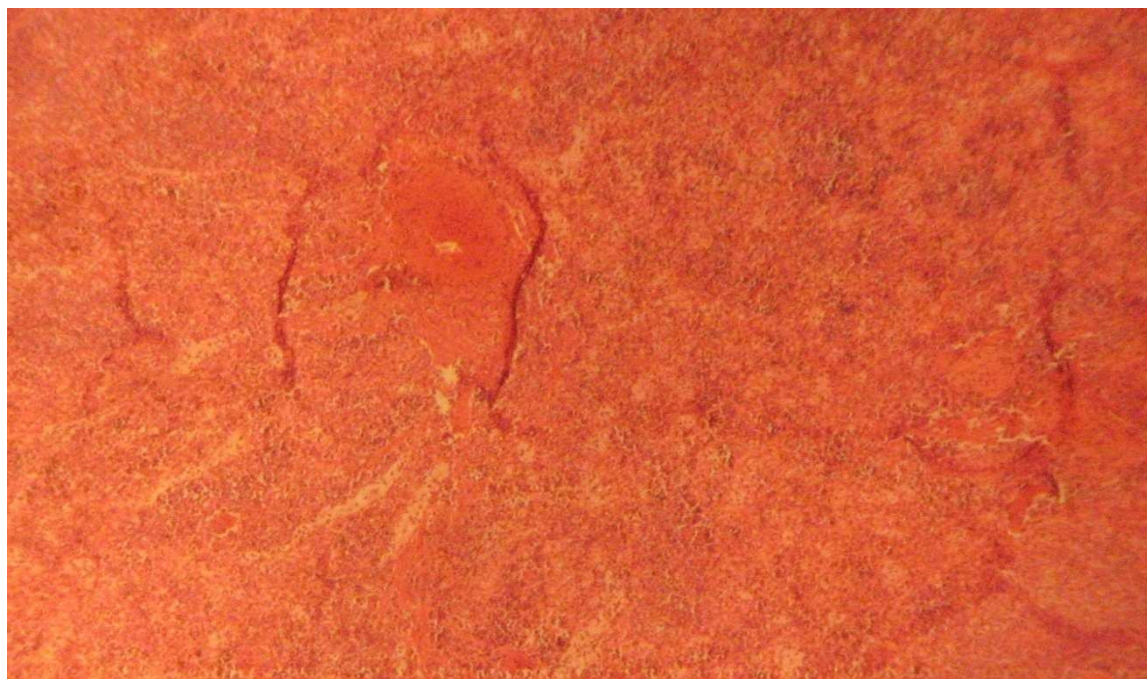


Fig 11; Photomicrograph of the Albin rat spleen treated without castor oil seed powder

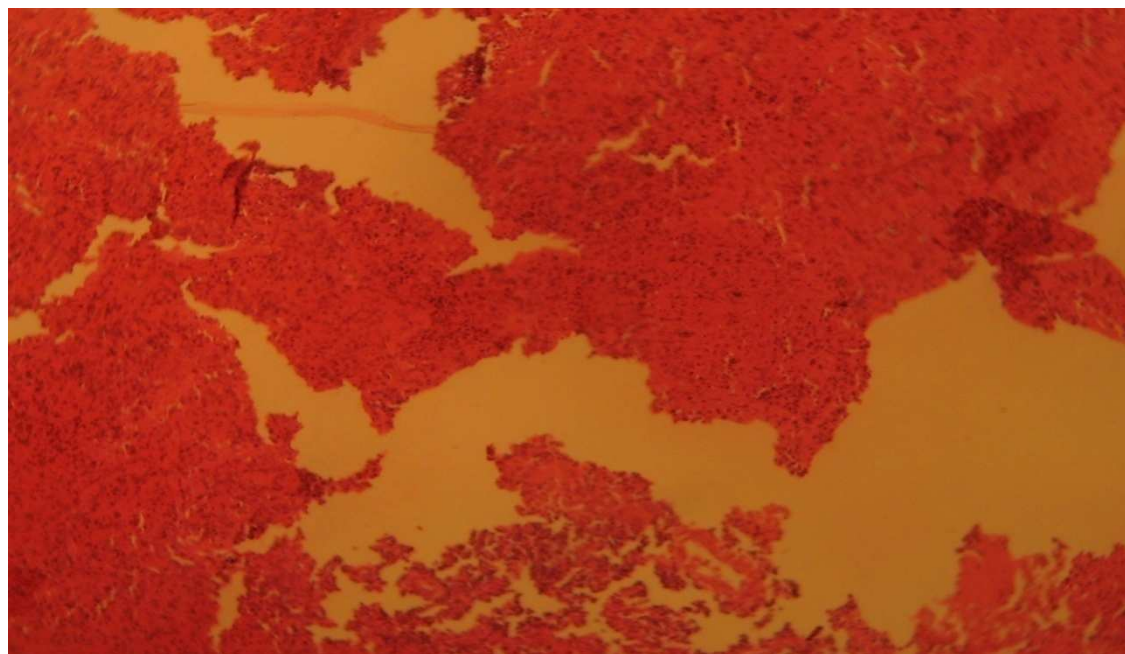


Fig 12; Photomicrograph of the Albin rat spleen treated with powdered castor oil seed and a commercial rat feed at ratio 1:1

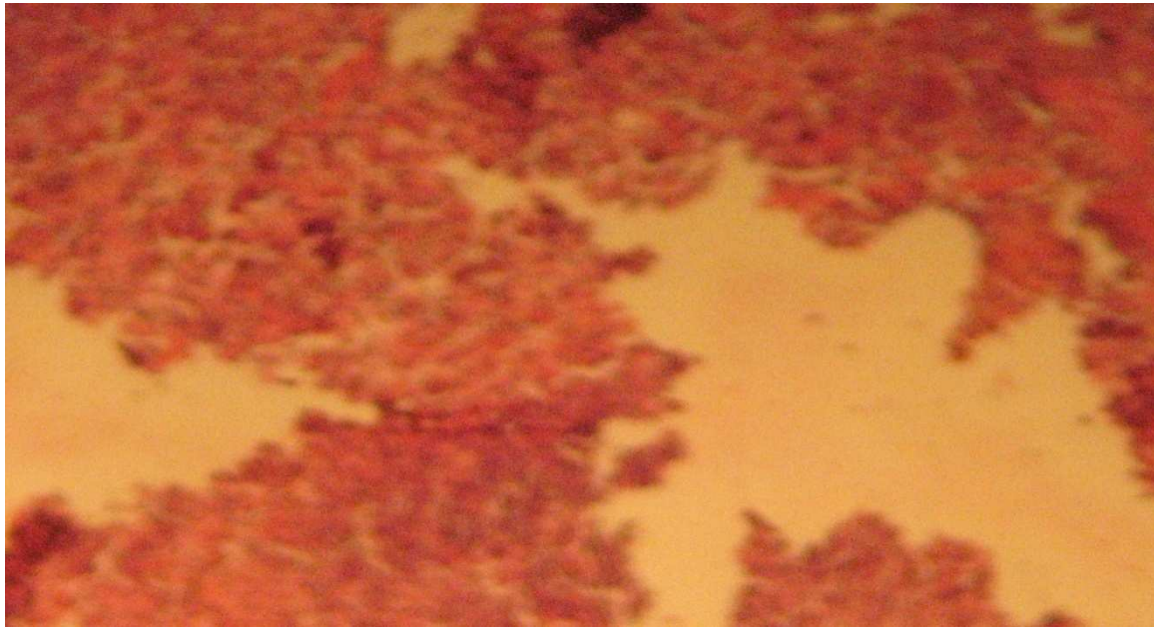


Fig 13; Photomicrograph of the Albino rat spleen treated with powdered castor oil seed and a commercial rat feed at ratio 1:2

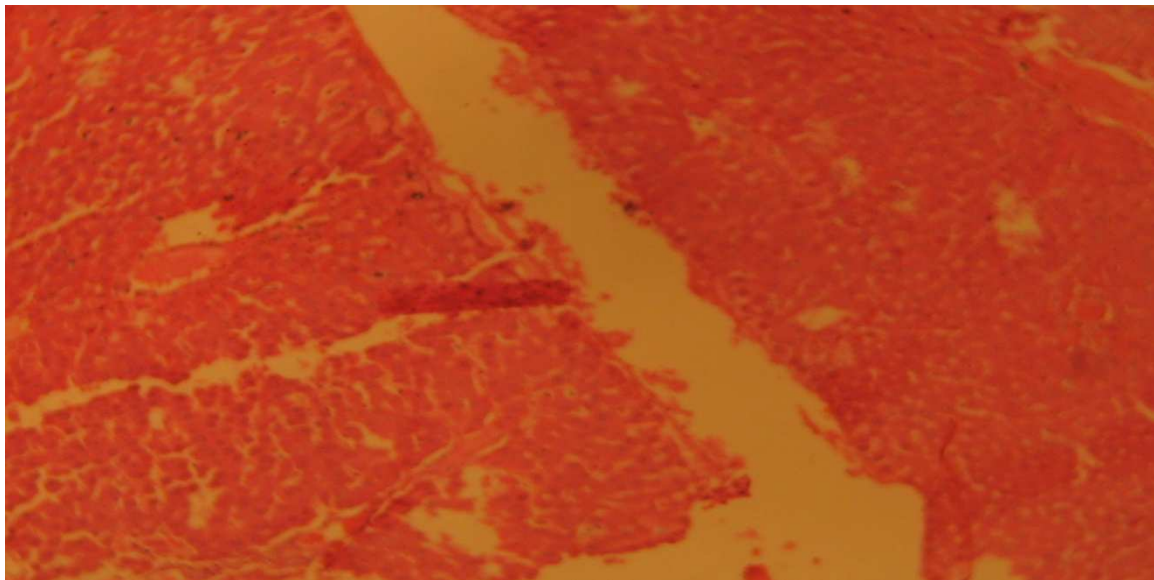


Fig 14; Photomicrograph of the Albino rat spleen treated with powdered castor oil seed and a commercial rat feed at ratio 1:5

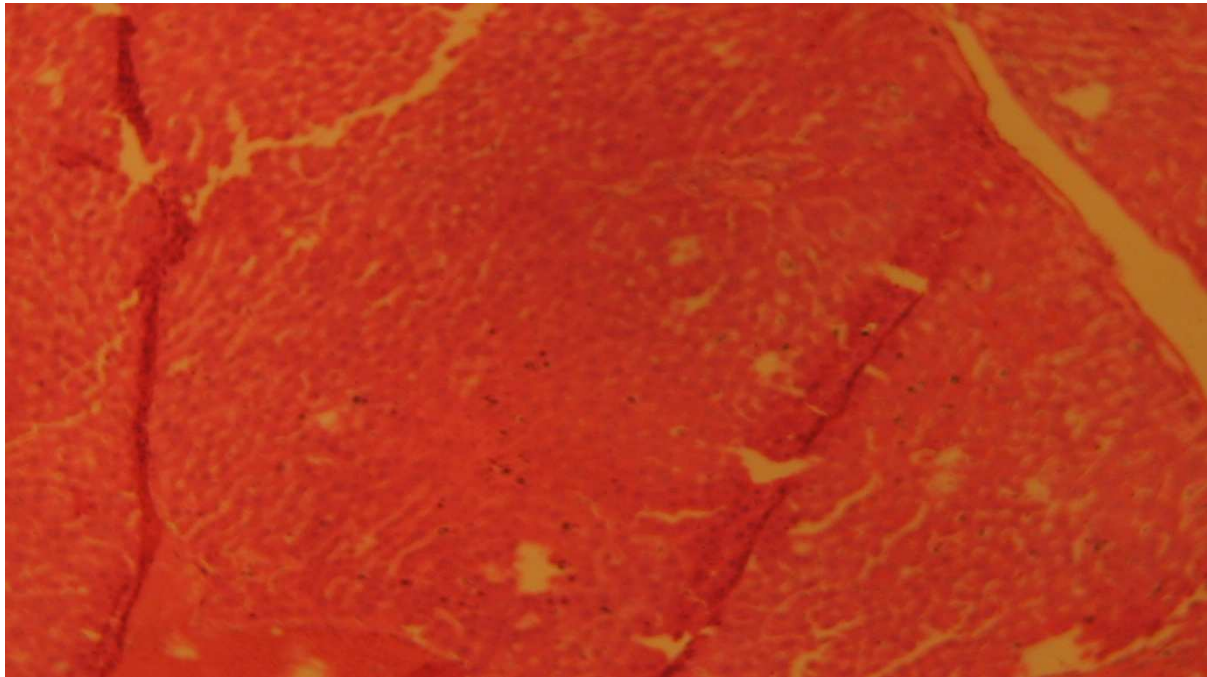


Fig 15; Photomicrograph of the Albino rat spleen treated with powdered castor oil seed and a commercial rat feed at ratio 1:10

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