AMELIORATIVE EFFECT OF TRIPHALA ON RENAL HISTOPATHOLOGY IN EXPERIMENTAL AFLATOXICOSIS*

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Abstract

An evaluation study on the protective effect of a herbal composite mixture triphala containing Emblica officinalis (Nellika), Terminalia bellirica (Thannika) and Terminalia chebula (Kadukka) on aflatoxicosis in rabbits was carried out. The study was conducted for a period of two months on twenty four rabbits, divided into three groups, Group I fed was fed with aflatoxin contaminated feed at 0.5 ppm and group II was given combination of triphala (four per cent) and aflatoxin (0.5 ppm) contaminated feed. Control group was fed with toxin free diet. The animals died during the experiment and animals euthanized at the end of two months were subjected to detailed gross and histopathological studies. The kidney revealed extensive vascular changes and necrotic changes in toxin group. The changes were less severe in triphala group and pronounced regenerative process was evident in kidney.

Key words: *Rabbits, aflatoxin, kidney, triphala*

Aflatoxin is a widely distributed mycotoxin in nature produced by *Aspergillus* species. Among the various mycotoxins, aflatoxins have been the subject of most intensive research because of the extremely potent cytotoxic and carcinogenic effects. Medicinal plants and their active principles have received great attention as protective agents in aflatoxicosis. Triphala is an ayurvedic herbal formula consisting of equal parts of *Emblica officinalis* (Nellika), *Terminalia bellirica* (Thannika) and *Terminalia chebula* (Kadukka). The present study was designed to determine whether triphala could modify aflatoxin induced nephrotoxicity in New Zealand White rabbits. The kidney is susceptible to toxic agents due to the high amount of blood it receives and filters. Different parts of nephron are exposed to toxins and its metabolites leading to nephrotoxicity before it is excreted in the urine (Abyanesh, 2013).

Materials and Methods

Production of aflatoxin

Aspergillus parasiticus var. globosus culture maintained on potato dextrose agar was used in this study. Aflatoxin was produced in rice at the Laboratory of Department of Veterinary pathology as per the method of Shottwell *et al.* (1966). The representative samples of fungal culture material were quantified by thin layer chromatography (AOAC., 1990) at Animal Feed Analytical and Quality control laboratory,

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TANUVAS, Nammakkal. The rice culture was incorporated into the ration to give a final concentration of 0.5 ppm of aflatoxin.

Experimental Animals

Twenty four, four weeks old rabbits were divided into three groups of eight each. The animals were fed *ad libitum* with the experimental diet for a period of two months. Group I was given 0.5 ppm aflatoxin contaminated feed, Group II was given combination of triphala (four per cent) and aflatoxin (0.5 ppm) contaminated diet. The group III was given control diet. The rabbits died during the experiment and the animals euthanized at the end of two months were subjected to detailed post mortem examination.

Results and Discussion

The gross changes in kidneys were paleness, nephrosis, uni or bilateral enlargement with congestion and petechiae in toxin fed group. The lesions were similar but less severe in rabbits of triphala group. The enlargement of kidney may be due to degenerative damage caused by aflatoxin. Similar enlargement of kidneys were observed by various researchers (Maryamma *et al*., 1990; Manimaran *et al*., 2001; Srivani *et al*., 2003). The control group animals had normal morphological appearance of kidneys throughout the experimental study.

Microscopically, the vascular changes observed in kidneys of toxin fed group were congestion and haemorrhages in cortical and medullary areas (Fig.1). Haemorrhages could be due to inhibition of clotting factors and protein synthesis as reported by Dutta *et al* (2006). Mononuclear infiltration was noted in the interstitial spaces especially in the cortical area and cortico medullary junction (Fig.2). Mononuclear infiltration might be related to immunological response by the body to get rid of the toxic materials (Dutta *et al*., 2006). There was extensive damage to tubular epithelium which ranged from vacuolation of cytoplasm to necrotic changes (Fig.3). Extensive necrotic changes were seen in tubules with desquamation of epithelial cells and cellular debris in the lumen. There was shrinkage of glomeruli followed by glomerular necrosis.

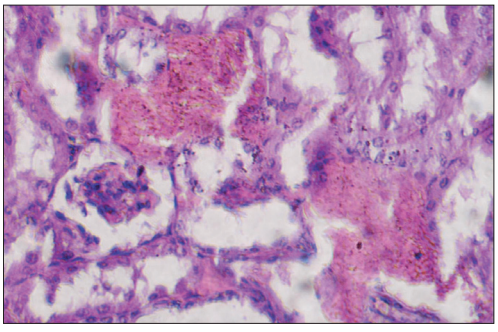

Fig.1. Kidney-glomerular and tubular haemorrhage in aflatoxin group (H&E x 400)

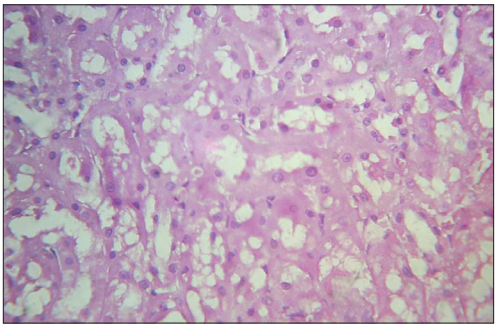

Fig.3. Kidney-necrotic changes in the tubules of aflatoxin group (H&E x 400)

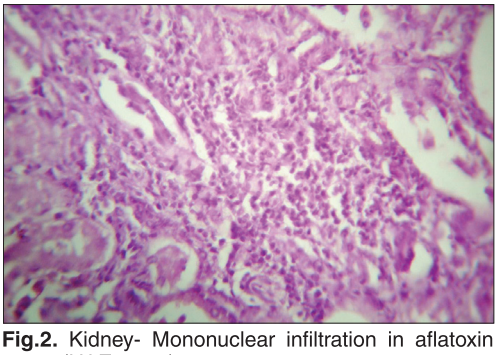

Fig.2. Kidney- Mononuclear infiltration in aflatoxin group (H&E x 400)

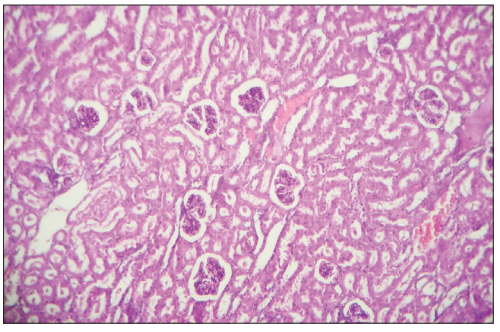

Fig.4. Kidney-Well maintained tubular epithelium and less glomerular damage in triphala group (H&E x 100)

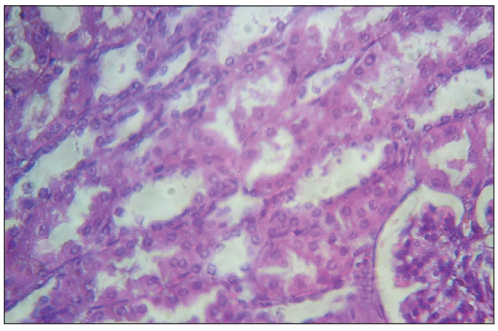

Fig.5. Kidney-well maintained tubular epithelium with intact nucleus in triphala group(H&E x 400)

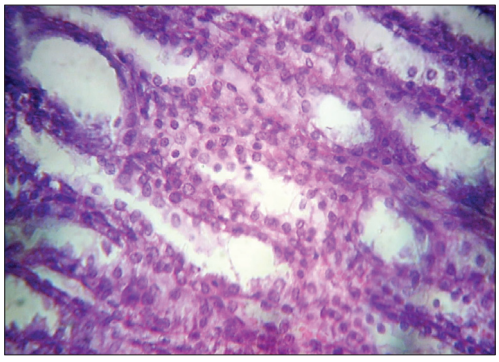

Fig.6. Kidney-tubules with more than one layer and cell crowding in triphala group (H&E x 100)

The vascular changes were evident in the kidneys of triphala group also, but the necrotic changes were less prominent compared to toxin treated group. The tubular epithelium was well maintained with intact nucleus and glomerular damage was less evident (Fig.4 and Fig.5). There was vacuolation of the tubular epithelium and mononuclear infiltration. Some tubules appeared to have lined by more than one layer and cell crowding in the lumen was noted (Fig.6). These are suggestive of repair and regeneration. Regenerative process in kidney tubules after surgical excision was reported by samsonidze (1960) where thickness of tubular walls increased, lumen size reduced and cells in the tubular walls taller. There was marked cellular hyperplasia. The kidney of control group animals appeared histologically normal throughout the experimental study.

The fruits of *Terminalia chebula, Terminalia bellirica* and *Emblica officinalis* are important herbal raw materials containing polyphenols. Polyphenolic compounds in these herbals have been reported to possess antioxidant properties and free radical scavenging abilities. This might be responsible for protective effect provided by triphala (Girdhani *et al*., 2005). Results of the present study revealed that aflatoxin at 0.5 ppm produced gross and histopathological alterations kidneys. It could be concluded that the inclusion of triphala at four per cent level to the aflatoxin contaminated feed (0.5 ppm) could ameliorate the toxic effects of aflatoxin in kidney. Natural substances that can prevent aflatoxin toxicity would be helpful to human and animal health with minimal loss in food and feed.

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