Effects of interaction between Aflatoxins (AFs) and functional materials FM in the hematological, biochemical parameters and enzyme activity in Rats

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ABSTRACT

The present study investigation the effect of aflatoxin induced the biochemical, hematological and enzyme activity in Rats Animals were fed aflatoxin-contaminated diet 1mg/kg diet for 21 days were caused to reduced significantly (p<0.05) red blood cells(RBCs), hemoglobin (Hb) and increased significantly the white blood cells(WBCs) also decreased some the biochemical parameters so the liver function enzymes activity measuring were indicated as significantly decreased in alanine aminotransferase (ALT), aspartate aminotransferase (AST) and increased in alkaline phosphatase (ALP). The results of interactions between FMs as ginsing GS, Whey protein WP and Butylated Hydroxyl Toluene BHT and AF by Co-treatment with FMs

Keywords: Aflatoxins, functional materials, RBC, Hb, whey protein, hydroxyl butylated tuluen

INTRODUCTION

Aflatoxins are naturally occurring produced by many species of Aspergillus fungus, the most notable ones being A. flavus and A. parasiticus plus related species, A. nomius (Lutfullah and Hussain, 2011). After entering the body, aflatoxinB1 is ingested, once inside the body, it is absorbed by the intestine and carried to the liver (Wild and Turner, 2002). There aflatoxinB1 may be metabolized by the liver enzymes to changes for a reactive epoxide intermediate or hydroxylated derivatives compounds to become less harmful named aflatoxin M1(Hudler,1998). Metabolized Aflatoxin, by enzymes in the liver, binds to proteins and causes acute toxicity (aflatoxicosis). Aflatoxin exposure causes acute liver damage and liver cirrhosis, as well as development of tumors or other genetic effects (Wu and Khlangwiset, 2010). On the another hand, the dietary sources, including plants, herbs, spices, vitamins and herbal extracts, play an important role to overcome the reactive metabolites production (Noori, 2012). So, an Antioxidant compound in food, which is main characteristic of an antioxidant, is its ability to catch free radicals and play an important role as a health protecting factor. So the antioxidants compounds were able to reduce the risk for chronic diseases (Percival, 1998). As, Ginseng is widely used medicinal plants which has a wide range of pharmacological and physiological actions (Ko, 1998; Slifman, 1998) Previous studies have shown that ginseng has
antioxidant activity (Zhang, 1996; Keum, 2000), and it has protection from toxic substances (Lee, 1984; Mannaa, 2006). Also, whey proteins protect liver effect against oxidative stress-induced cell death in human prostate cells (Bounous, 2000 and Kent, 2003). Also Butylated Hydroxyl Toluene BHT inhibits AFB1 hepatocarcinogenesis

MATERIAL AND METHODS

Aflatoxins Production
Toxins were prepared by developing a strain of mold Aspergillus parasiticus NRRL2999 on rice according to shotwell; et al. (1966); then aflatoxins were extracted with chloroform according to Matny, (2012) and the AFs content was measured by the use of ELISA.

Experimental Animals
Forty two Albino-Sprague Dawley males Rats (110-115 g) at 45 day age have been obtained from the house livestock in the Faculty of Veterinary Medicine, University of Mosel were used to determine the effect of AF, and the prevention role of Ginseng extract (GS), Whey protein (WP) and Butylated hydroxyl toluene (BHT) reared at an optimal room temperature ranged between 22–25°C. Animals were fed on locally prepared diet which formulated from natural ingredients suitable for growing maintenance according to (NAS. NRC, 2002). The experimental design consisted of fourteen dietary treatments. JSextract, WP and BHT were added from each ones at 100 and 150 mg/kg diet to the feed each of animal’s groups containing AF at 1mg/kg diet.

Preparation of Blood Samples
At the end of the experiment, at 21 days we randomly selected from each treatment (4 rats of each iteration); 5ml of blood were collected with EDTA from Jugular Vein for hematological parameters determination. The measured of experiment as follows which working according to (Theml, et al., 2004).and other collected without them that have conducted the process of centrifugation at 3000rpm/15mint., to get the serum that was saved on 20°C° until a chemical analysis (Titez, 2005).

Blood Characteristics
The (10³/ML), as well as, was measuring hemoglobin concentration HGB (g/dL) by used Heamocytometertotal number of red blood cells RBCs (10⁶/ML) and the total number of white blood cells WBC was measured in collected blood. Also, all tests in haematology were taken by mathematically according to (Titez, 2005).

Biochemical Blood Characteristics
Total protein, albumin, globulin, creatinine were estimated using biochemical kits (Bio labo, France, kits) in the blood serum Alkaline phosphatase (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST) were determined by Reflotron using a clinical chemistry analyzer according to the manufacturer’s recommended procedure from Rondex Laboratories Ltd. (Tietz, 200)

RESULTS AND DISCUSSION

The Hematological Parameter
Hematological parameters in rat's animal fed with AF and supplemented with FMs as GS, WP and BHT for 21 day treatments are showed in Fig. (1.1). RBC count, hemoglobin concentration (Hb) and WBCs counts were significant difference
(p<0.05) reductions in RBC $5.53 \times 10^3$/mm$^3$ Hb 9.1 dl/mm and WBC $10.6 \times 10^3$/mm$^3$, animals group fed with AF for 21 days compared with the control group which were RBC 7.7, Hb 13.5 and WBC 6.3 respectively, the addition of FMs were not causes significant difference on the levels of above parameters. Animal group fed with a diet contained FMs and AF (1 mg/kg diet) which caused to improve the rat’s blood parameters became close to the control group, which means that FMs effects on moderate the negative effects from AF and may offer the host protection against the negative effects of AF on intestinal absorption. The reason for this decline to the occurrence of lytic anemia because of the dissolution of red blood cells then decrease Hb concentration (Martins, 2004). And Hyperplasia in the bone marrow (Grior,1991 and Huff, et al.,1991).

Fig. 1: Effects of interaction between FMs and AF on the hematological parameters of Rat after dietary for 21 days.
T1: control group; T2: 1mgAF/kg; T3:JN (100mg/kg); T4: JN 100mg+1mg AF/kg; T5: JN 150mg/kg; T6: JN 150mg+1mg AF/kg; T7: WP (100mg/kg); T8: WP 100 mg+1mgAF/kg; T9: WP150 mg/kg; T10: WP 150 mg+1mgAF/kg; T11: BHT100mg/kg; T12: BHT 100 mg+1mgAF/kg; T13: BHT 150mg/kg and T4:BHT 150 mg+1mgAF/kg.

Biochemical Parameters
The effect of interactions between AF and FMs in biochemical parameters including total proteins, albumin, globulin and creatinine in rats fed with a diet for 21 days were showed in Fig. 2. The results showed that AF added in diet alone reduced the concentration of total protein, albumin, globulin and the creatinine, significantly different. The addition of FMs alone to the diet of the rats, no significant relationship was found compared with the control group. The addition of FMs with AF to the diet were caused ameliorative the values of these parameters significantly compared with the T2 (AF alone group) and with the T1 (control group). The decrease in total protein concentration which lead to decrease the efficiency of the immune system since the key mechanisms of some immune responses were initial by production of inhibitory factors that effects on defense against the pathogens and other foreign materials, such as antimicrobial peptides and globulins (Buchau and Gallo, 2007). The results indicated that FMs were significantly improved a diet when incorporated with AF which was caused a negative effects, present results agreed with (Verma, et al., 2008). Toulah, (2007) reported that the addition of turmeric as animals diet supplement (G4) were significantly decreased total protein and albumin levels, also, Hydrated sodium calcium alumino silicate (HSCAS) has demonstrated an ability to sorb aflatoxins (AFs) with a high affinity. Addition of this compound to feed stuffs contaminated with AFs has shown a protective effect against the development of aflatoxicosis in farm animals were significant improvement in the biochemical parameters. ( Abdel-
Wahhab et al., 2002). GS it serve as protective agents in cancer prevention and treatment while treatment rats of the intoxicated with ginseng resulted in significant enhancement in kidney function indicated by the marked decrease in creatinine levels and serum urea (Li, et al., 2008).

Enzymes Concentrations

The blood enzymes concentrations of serum glutamic-oxaloacetic transaminase (GOT), serum glutamic-oxaloacetic transaminase (ALT) alkaline phosphatase (ALP) after adding FMs and AF for 21 days to the rat diet the results illustrated in Fig. 3. The results indicated that serum alkaline phosphatase was significantly increased (P ≤ 0.05) in animals treated with AF 1mg/ kg diet and the enzyme concentration reached 857.5 IU/l, while the rats treated with FMs caused to ameliorative the enzymes concentration and became close to the control group of animal rats (286.8 IU/L), for the control group (286.8 IU/L). Serum ALT and AST were decreased significantly in animals when treated with 1mg AF/kg diet comparing with control animals group, GS extract stimulates the production of the reactive glutathione S transferases (one of the phase7II metabolizing enzymes) system found in the cytosol and microsomes catalyzes the conjugation of activated aflatoxins with reduced glutathione, leading to the excretion of aflatoxin (Williams, 2004).

Moreover, BHT with its potent free radicals cavenging ability was expected to inhibit Fe3+-ascorbate induced damage Since Fe3+ is a Fenton catalyst accelerating
ROS formation, BHT might also be expected to exclude Fe3+ as a strategy to control ROS. (Khoobchandan, et al, 2010).

CONCLUSION

The consumed of food contaminated with aflatoxins from laboratory animals caused in changes the natural and biochemical parameters of the animals blood. Also the results were appear that the different concentrations of GS, WP and BHT as a prevention materials against the negative effects of aflatoxins on haematological, and biochemical parameters.

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REFERENCES


