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FORWARD

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Today, we announce a new issue of our journal, that is the first issue from the therteen volume of IJST, March , 2018.

Finally, I hope that all significant figures of sciences whom joined the editorial board, the researchers, and the readers of our journal will keep IJST between their eyes and contribute in continuing its journey, with their remarks, valuable recommendations and their researching outcomes.

Thanks a lot for all who support IJST.

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IJST

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ENGLISH SECTION

Conforming prevalence of Chrysomya bezziana (OWS) in north Basrah- south of Iraq

Mushtag A.M. A. Al-Helfi, Khawla B. N. Aljassim, Zainab M. S. Alklay and Waad M. H. Alfadheli

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ABSTRACT

Basrah Province was endemic with OWS *Chrysomya bezziana* since 1998. Myiasis had been reported in various regions of Basrah Governate, except northern area (Qurna). In May 2017, cutaneous myiasis was reported in cattle which had deep injuries at neck with a heavy infestation of *Chrysomya bezziana* larvae. The present study investigated the prevalence of OWS in an area not explored before.

Keywords: OWS, *Chrysomya bezziana*

INTRODUCTION

Chrysomya bezziana OWS (old world screwworm) (Villeneuve, 1914), belongs to Order: Diptera ; Family: Calliphoridae; Subfamily: Chrysomyinae; and Genus: *Chrysomya* (Brown *et. al.* 1998). It is regarded as the most dangerous species of Genus *Chrysomya* and all other species of flies in the world, which causes obligatory myiasis only in alive animals and human (Hall *et. al.,* 2016). Old world screw worm had been noticed in Iraq since the seventies of the past century, but the first reported cases were in 1996 (Abdul-Rassoul *et. al.,* 1996). Moreover, several studies had been conducted in Iraq since 1996 (Al-Ainy, 1997; Al- Rubaey, 1998; Al- Taweel, 1999; Ali, 2000; Nabeel, 2001; Al-Helfi, 2001; Al- Helfi, 2008 (a); Al- Helfi, 2008 (b); Al- Helfi *et. al.,* 2012).

Ch. bezziana causes myiasis which is defined as: the infestation of alive tissues of human beings or animals by the larvae of *Ch.bezziana* causing tissue damage or maybe death (James, 1947; Spradbery and Vanniasinggham, 1980; Al- Helfi, 2008 (b)).

Myiasis is classified into two types according to feeding method (Al- Helfi, 2001):

A-Specific myiasis which is divided into obligatory sarcobionts and facultative sarcobionts according to its feeding behavior.

B- Accidental myiasis, which occurs accidentally in the human body when eating food contaminated with eggs or larvae of *Ch. bezziana*or by the contact of invasive larvae to normal body openings like genitalia or urinary tracts (Ramalingam *et. al.*, 1980).

MATERIALS AND METHODS

Heavy infestation of larvae was done by OWS with a deep injury in live 3 years cows. The larva were collected by sterile medical thumb forceps. Ten larvae were put in a sterile tube with 60% alcohol. Mature adult flies were obtained by growing the larvae with the soil in Petri dish. Larvae and adults were sent to Veterinary Entomological Laboratory /Basrah/ Iraq, in order to identify and characterize the worm.

RESULTS AND DISCUSSION

The results showed that the fly belonged to Diptera-Caliphoridae-*Chrysomya bezziana* OWS. *Chrysomya bezziana* species of insects were considered as dangerous types of insects in Iraq, which can threaten animals and human to cause myiasis in any parts of the body of living tissues only and may cause damage or death.

In Iraq, the first record of *Ch. bezziana*larvae in animals was reported in Baghdad in 1996 and published in 1999 (Al-Taweel, 1999). In Iraq, the first record of *Ch. bezziana*larvae in animals was reported in Baghdad in 1996 and published in 1999 (Al-Taweel, 1999). Al-Ainy revealed that *Ch. bezziana*threatens animals are existed in Arab Area (Al- Ainy, 1997). *Chrysomya bezziana* larvae in human were firstly recorded in Basra, south of Iraq (Abdul-Rassoul *et. al.,* 1996), in buffalo (Spradbery, 1991; Al- Helfi, 2008 (b)), in sheep (Al-Rubaey, 1998). Al- ani et. al. (2005) had studied the effects of Gama Radiation on pupa of *Ch. bezziana*. The number of animals infested *with Ch.bezziana* were 120789 reported in Iraq as well as 22 cases were reported in human from 1998 to 2007 (Al- Helfi, 2008 (a)).Out of the total human cases, 8 cases of *Ch. Bezziana* larvae were reported in Basra province (Al- Helfi, 2001), who studied the morphological taxonomy of Diptera :Calliphoridae in the middle area of Iraq. Many reports of Myiasis indicated the infestation of animals in Basra by *Ch.bezziana* larvae such as sheep, cattle, dogs, camels, buffaloes and horses (Al- Helfi, 2001; Nabeel, 2001).

Many cases of myiasis by *Ch.bezziana* were reported in Arab countries and the Islamic Republic of Iran, from Arabia Saudi (Al-Azazy *et. al.,* 1994), to Iraq and Arabian Gulf as well as Oman, and the United Arab of Emirates (Al- Ani *et. al.,* 2005), which were considered as endemic area by *Ch. Bezziana,* which crossed to Bahrain in 1977 by infected sheep (Spradbery, 1991), and in 1978 infestation by *Ch. Bezziana* larvae was recorded in Bahrain (Humphery *et. al.*, 1980). In Kuwait, *Ch. Bezziana* was recorded. In Suadi Arabia, there were 11 cases of *Chrysomya bezziana* larvae as ophthalmic myiasis (Al- Ani *et. al.,* 2005; Kitching, 1976). In Sultanate of Oman Spradbery (18) recorded 82 cases of *Ch.bezziana*. In Iran, cases were recorded by (Humphery *et. al.,* 1980).

It causes economical loss and affects animals by making their skin torn and damaged and consequently become of less in value. In addition, larvae cause severe pain, nervousness, laminas, blindness, abortion, decrease of milk production, anomalies, anemia and bad behavior (Al- Helfi, 2008 (a)). It is classified as type B disease (Humphery *et. al.,* 1980). A heavy infestation of *Ch. bezziana* larvae was found in the head of two young girls suffered from head lice infestation caused hard pain, bad smell, headache and restless (Al- Rubaey, 1998). *Ch. bezziana* plays a serious role in the mechanical transport of causative disease and humans can be infected in this way although they can be infested with nasal or cutaneous myiasis (Spradbery, 1992). The female produces around 3000 eggs during its life cycle and looks for blood to obtain protein in order to produce other eggs. Parasitic infestation with the larvae of fly in traumatic lesions of vertebrate living tissues is a dangerous medical case in human and social health and also is deemed as an economical cause of losing domestic animals (Kumarsinghe *et. al.*, 2000).

Ch. bezziana can infect human and animals. OWS Myiasis causes 95% of 10 cases in cows in New Guinea (Sivaramasubramanyamp, 1967). It was revelaed that 84-95% of infective cows with Myiasis in Malaysia hade 30% mortality in newborn calves (Hall *et. al.,* 2016). Three hundred thousand cows were dead by Myiasis in Zimbabwe during the period from 1973-1978 (Hall *et. al.,* 2016). Myiasis caused by *Ch. bezziana* infested 26.3% in sheep, 20

% in ewes, 16.4% in buffalo, 13% in camels and 10% in cows (Furman and Catts, 1980). Myiasis can be caused by *Ch. bezziana*, Tics, Lice, Mites, Dog bits, FMD disease, injuries and barbed wire surrounding animals, their role as predisposing factors led OWS adult flies to find the best and safe media alongside with humidity, mild temperature,and green trees to spread and increase their numbers causing a wide range of infestation in Basra . Mean temperature degree, % Humidity, Dust and Rain are measured monthly depending on Al-Basra forecast office.The number and type of infested animals were observed and studied in all stations.This report confirm the occurrence of *Ch. bezziana* innorth of Basrah (Al-Gurna) which was considered free area for this type for several years ago.Accumulation of animals(cattle, buffaloes and sheep) with low hygiene lead to this fly to OWS to reach at this area of Gurna from south and middle of Basrah which were had several infestations in animals and human since from 1998.

REFERENCES

Abdul-Rassoul, MS, Ali, HA. and Jassim, FA. (1996). Note on *chrysomya bezziana vill*. (diptera :Calliphoridae) First record fromIraq. *Bulletin of the Iraq Natural History Museum.* 98(4),113-115.

Al-Ainy, MA. (1997). *Chrysomya bezziana* in Iraq, thretad animals at Arab East. *Agricultural Journal of Arab Area.* 1,24-29.

Al-Ani, MA., Hassan, AS. and AlKaraguly, AY. (2005). Comparative action of Amoxidactine and Ivermctine in treatment of infected cattle by OWS *Chrysomya bezziana. Iraqi Journal for Vaterinary Sciences.* 9(12), 175-177 (in Arabic).

Al-Azazy, OM., Scrimgeour, EM., Khatib, HA., Dibb WL. and Zawawi, TH. (1994). Ophthalmomyiasis caused by Oestrusovis contracted while driving occurred in Jeddah ,Saudi Arabia- Case report. Saudi Journal of Ophthalmology. 2(3), 102-106.

Al-Helfi, MAMA. (2001). Taxonomy and ecological studies on the medical insect (order: Diptera) caused myiasis in Basra. Province with a mention to its control. Master thesis. College of Sciences, University of Basra.

Al-Helfi, MAMA. (2008 a). *Chrysomya bezziana* fly in dog threat Basra south of Iraq. *Basrah Journal for Vetrinary Research.* 7(1), 26-27.

Al-Helfi MAMA. (**2008 b**). Environmental study to. OWS fly in Buffalo in Basra marsh. *Mesopotamia. Journal*. (special issue).

Al-Helfi, M., Al-Jassim, K. and Al-Salem, Z. (2012). A case report of cutaneous myiasis by chrysomya bezziana (OWS) in camel at Basra province. *Basra Journal for Veterinary Research.* 11(2),108-112.

Ali, HB. (2000). Taxonomical and identification study for uncompleted instars and adult fly of *Chrysomya bezziana* in Baghdad. Master thesis. College of Sciences, University of Baghdad.

Al-Rubaey, KK. (1998). Human cutaneous myiasis: A report of two cases associated with head lice caused by *chrysomya bezziana* (Diptera: calliphoridae). *Basra Journal for Sciences.* 16(2),23-26.

Al-Taweel, A. (1999). Incidence of old world screw worm fly *Chrysomya bezziana* in Iraq. Master thesis. University of Sains, Malaysia. Pp.:10-105.

Brown,WV., Morton, R., Lacey, MJ., Spradbery, JP. and Mahon, RJ.(1998). Identification of the geographical source of adults of the Old World screw-worm fly,*Chrysomya bezziana* Villeneuve (Diptera:Calliphoridae), by multivariate analysis of cuticularhydrocarbons. *Comparative Biochemical Physiology*. 119 B,391-3399.

Furman, DP. and Catts, EP.(1982). Manual of Medical Entomology. 4th ed. Cambridge University Press,Cambridge,UK.

Hall, MJ., Wall, RL. and Steven, JR. (2016). TrumaticMyiasis :a neglected disease in a changing world. *Annual Review of Entomology.* 61,159-176.

Humphery, JD., Spradbery JP. And Tozer,RS. (1980). *Chrysomya bezziana*: pathology of old world screw worm fly infestation in cattle. *Experimental Pathology.* 49,381-397.

James, MT. (1947). The flies that cause myiasis in man. US Department of Agriculture. Miscellaneous Publication. 631. U.S. Government Printing Office, Washington DC.

Kitching, RL. (1976). The immature stages of the old world Screw –worm fly, *Chrysomya bezziana* Villeneuve, with comparative notes on other Australian species of *Chrysomya* (Diptera, Calliphoridae). *Bulletin of Entomological Researches.* 66,195-203.

Kumarsinghe, SP., Karunaweera, ND., Ihalamulla, RL. (2000). A study of cutaneous myiasis in Srilanka. *International Journal of Dermatology*. 39,689-694.

Nabeel, AM. (2001). Taxonomy study for blow fly (Calliphridae :Diptera in middle of Iraq. Ph.D thesis. College of Agriculture, University of Baghdad.

Ramalingam, S., Nurulhuda, A. and Bee, LH. (1980). Urogenital myiasis caused by *Chrysomya Bezziana* (Diptera :Calliphoridae) in peninsular myiasis. Southeast Asian Journal for Tropical Medicine. Public Health.11,405-407.

Spradbery, JP. and Vanniasinggham, J. (1980). Incidence of the screw-worm *Chrysomya bezziana* of Zoo Negara, Malaysia.

Spradbery, JP. (1991). A manual for the diagnosis of screw worm fly. Canberra, Australia. Commonwealth Scientific and Library Search.

Spradbery, JP. *et. al*.(1992). Incidence of old world screw –worm fly in the United Arab Emirates. *The Veterinary Record.* 33-130.

Sivaramasubramanyamp, S. (1967). Opyhalmomyiasis. 52(1),64.

Villeneuve, J.(1914). Myodairces superiors Africa innouveaux. *Bulletin of Social Entimology.* 384-384.

Observational study of ovarian cancer in birds in Basra province

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ABSTRACT

The goal of this study was to report tumor in birds that lives in such conditions. Two hundred pigeons were investigated between 2014-2016, for the presence of ovarian tumor in Basrah Governorate. The judgments of presences of tumor based upon; size of ovary in examined pigeon compare to healthy anatomical standard ovaries. Result reveals the presence of ovarian tumors in 10 pigeons (5% of total), the size of tumor varies between 4 to 10 cm. The pigeons with tumor were died. The presence of tumors in birds may indicating the pollution of environment, since Basrah governorate rich with oil wells and fertile land for agriculture.

Keywords: Ovary, Tumor, Pigeon

INTRODUCTION

Tumors come in two main types :the benign (non-cancerous)once and the malignant (cancerous)kinds .Either type of tumor can be life-threatening to pet birds, but benign growths are generally considered to be less serious than malignant tumors.

Benign tumors tend to stay within one location in the body and do not spread to other areas. They may still grow, but they proliferate very slowly," explained Richard Nyne, DVM, a veterinarian in Illinois. He said benign tumor can normally be removed without too much trouble, and in most cases, do not come back.

Malignant tumors, on the other hand , can invade and damage nearby tissues and organs. This is system done through the process of metastasis, wherein cancer cell break away from a malignant tumor and travel through the bloodstream or lymphatic system to form new, secondary tumors in other parts of the body." Even if a malignant tumors also tends to grow faster than benign tumors.

Many times though ,a lump is actually a cyst. A cyst is a tissue sac that is filled with fluid or other loose material. Feather cysts, for instance are filled with keratin. Cysts are not cancerous and do not grow or spread like tumors do, although they might get bigger because they have fluid inside, "noted David Phalen, DVM, an avian researcher and associated professor at Texas A & M University. Cysts are generally not serious.

In contrast, a tumor (or "neoplasm" as it's known by medical professionals) is a solid mass of tissue and depending on the type of tumor, it may grow very quickly and spread. A tumor can occur anywhere on the body, and may protrude from the skin, under the skin, or grow inside the body. Tumors are usually much more urgent matters than the other kinds of lumps and bumps just mentioned.

Al-Helfi (2005) improved that's the insecticides as a good source to cause cancer in human and animals when they eats or drink polluted food or drink which accumulated and precipitated in adipose tissue then led to irritate cells and made tumor.

"Vitamin-A deficiency and repeated skin injuries may make birds more susceptible to this type of cancer, "Speculated Larry Nemetz , DVM, an exotics-only veterinarian in Santa Ana, California.

Tumors of the fibrous, connective tissue –fibromas or "fibroid tumors", which are benign and fibro sarcoma which are malignant are commonly seen in pet birds. These are fairly easy tumor to spot and may simply show up as an unusual pump on the skin or they may be a couple feathers sticking up in a strange way on the birds body,"Nye said. Fibroids and fibro sarcomas appear on the wings, leg, junction of the beak and face, neck and sternum. The birds most often involved are budgerigars, parakeets, cockatoos, macaws.

Probably the most common internal tumor in pet birds is an intraabdominal mass, which is a tumor of either the reproductive organs (ovaries or testicles) or kidney. These could be either malignant or benign .Abdominal masses are most often seen in budgies that are between 5 and 8 years of age, according to Burge. More often than not, these types of tumors are not detected until the birds is emaciated and acting very sick. This, Burge said , "can be due to the pressure the tumor puts on the digestive tract , making it difficult for food to pass through , or droppings may accumulate around the vent causing blockage ." Some of these birds may be presented with labored breathing as the main symptom due to the large tumor causing collapse of the air sacs. Lameness may also be a presenting sign when the tumor puts pressure on the nerve supply to one leg.

Many birds also develop cancer of the lymphatic system .In a healthy animal, the lymphoid system is an important part of the body's immune system defense against infectious agents such as viruses and bacteria. Lymphoid tissue normally is found in many parts of body including lymph nodes, liver, spleen, gastrointestinal tract and skin. If malignant cells invade these tissues, the disease is known as lymphosarcoma. If the cells are benign the disease is called lymphoma.

Lipomas are benign tumors that are composed of mature fat cells. "Most of them are found just under the skin ,rarely filtrating into muscle or organ ,"Burge noted. They are commonly found on the upper chest and over the abdomen , although may be found in other location of bird's body. "Lipomas don't usually cause birds a lot of problem unless they get so big that they interfere with leg movement. If they are becoming a problem , many times putting the bird on a low-fat diet will be enough to shrink down the fatty tumor , or even get rid of it all together. In extreme cases, Lipomas can also be surgically removed. These tumors generally occur in overweight birds and are most commonly seen in budgerigars ; and Gallah , rose-breasted and sulphur –crested cockatoos.

Unlike the other tumors on this list, papillomas are not caused by out of-control cells but by a virus called Psittacid herpes virus. Papillomas appear as wart-like lesions of the oral cavity of the mouth and of the vent. "The lesion are benign ,and can sometimes come and go without treatment", Phalen noted. "Other times they just keep getting worse and worse and can be very irritating to the bird and start bleeding. "In that situation , the papillomas would need to be surgically removed. South American species (especially Amazons and macaws) are seen with papillomas more often than other species.

Predisposing factors:

1-Pesticide.
2- Insecticide.
3- Illegal fish hunter.
4- Radiation.
5- Drugs.
6- Oil companies waste.
7- War scrapes

MATERIALS AND METHODS

When we made post mortem lesions to infected birds, we observed a mass surrounded of ovary it's been like big egg but it is like a fiber tissue with many layers.
This mass was suspected primary as mature eggs when its removes by medical scalpel its indicate as a tumor (overian tumor).
Measures and weight of masses were reported as new information of bird cancer.

RESULTS AND DISCUSSION

The results showed 5% of local birds in Basrah province have overian cancer. All areas of Basra are contaminated environment with many factors (air, soil, water, plants), which are natural environment to birds.
Results showed that the insecticide, radiation, many drugs and hormones, pesticide, which lead to cancer to occur. Results showed also that many hormones when gave as a growth hormones with feed of bird with illegal process were accumulated in adipose tissue of body like ovary ,or brain or joints or may be liver.
Basra province showed many wars with many type of common fatal with chemicals weapons which polluted soil, water and air of Basra and Iraq. Cancer has two types benign or malignant. In birds, the fatty tumor is benign type.

REFERENCES

Al-Helfi, MAM. (2005). Effect of insecticides on pollution of marsh environment, south Iraq.
Cook RH. and Olson, Jr. (1951). Experimental transmission of cutaneous papillomas of the horse. *American Journal of Pathology.* 27(6), 1087-1097.
Kilham L. (1955). Metastasizing viral fibromas of gray squirrels: pathogenesis and mosquito transmission. *American Journal of Hygiene.* 61(1),55- 63.
Russell, FE. and Kotin, P. (1957). Squamous papillomas in the white croaker. *Journal of National Cancer Institute.* 18(6), 857- 861.
Stewart, SE., Lovelace, E., Whang, JJ. and Ngu, VA. (1965). Burkitt tumor: tissue culture, cytogenetic and virus studies. *Journal of National Cancer Institute.* 34,319-327.

Pollution assessment of soil along highways among Basra-Nassiriya and Samawa cities by polycyclic aromatic hydrocarbons

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ABSTRACT

The industrial and vehicular emissions are the most potential sources ofpolluted soil by aromatic hydrocarbons, these pollutants have a significant impact on human health. The present study was carried out to assess the pollution of agricultural soil by polycyclic aromatic hydrocarbons (PAHs) along the highways between Basra, Nasiriya and Samawa, southern Iraq. The soil samples were collected from 6 boreholes (50cm depth) located in some agricultural sites closest to both sides of the high ways. The PAHs concentrations were determined using High-Performance Liquid Chromatography (HPLC). Some factors that control the distribution of PAHs were also measured such as pH, EC, grain size of soil and TOC. The results showed that the concentrations of PAHs were variable with depths controlled by clay and TOC content of samples. The low molecular weight (LMW) and high molecular weight (HMW) hydrocarbonsare exceed the international allowable limits in soil, especially for the samples closest to the highways in Nasiriya and Samawa stations respectively, the increases of PAHs concentration is related to the high emissions of exhausts cars, vehicles and the waste of industrial oil that spread near the highways.

Keywords: Basra; PAHs;Boreholes; Industrial emissions; Soil

INTRODUCTION

Polycyclic Aromatic Hydrocarbons (PAHs) are a major group of organic pollutants that are widely extent in the environment and carcinogenic, mutagenic, and toxic to all organisms (Tobiszewski and Namieśnik, 2012; Wang *et al.,* 2017). PAHs enter the environment through a number of sources,especially combustion processes, such as wood burning,oil industry, motor vehicle exhaust, cigarette smoking, cooking and agricultural waste burning (Ong *et al.* 2007). PAHs also originate from a variation of processes, containing combustion, slow maturation of organic matter and the short degradation of biogenic precursors (Arias *et al.,* 2010; Li *et al.,* 2010). Nevertheless, a considerable number of these organic pollutants still persist in the environment because of their a long half-life and illegal production and use (Zhi *et al.,* 2015). The highways are the most polluting sources because they have been account between 46-90% of total PAHs (Nikolaou *et al.,*1984; Jang *et al.,*2013). They are considered road and highway surfaces are impervious, and serve as temporary sinks for various types of pollutants.PAHsassemblage can divided into two major groups with respect to their molecular weight. The firstgroupincludes the light (low molecular weight) compounds with two or three fused aromatic rings refer to the itspetrogenic origin from oil and its derivatives, fuel, lubricants, spills and accidents (Ye *et al.,*2006). Low molecular weight consists of: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, and Carbazole. The secondgroup includes the heavy (high molecular weight) compounds with four or more fused aromatic rings consisting of: Floranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)flouranthene, Benzo(k)flouranthene, Benzo(a)Pyrene, Indeno(1,2,3,c,d) Pyrene, Dibenzo(a,h) anthracene**,** Benzo (g,h,i) perylene, heavy PAHs with (5-6) benzene rings, especially dibenzo[a,h]anthracene [D(a)A] and benzo [a] pyrene [B(a)P], and Benzo [a] anthracene [B(a)P], referring to the pyrogenic source originated from the generation of oxygen with high heat of any combustion of fuel, coal and wood (Wang *et al.,*2007). PAHs are abundant in soils and sediments, freshwater, and atmosphere where the more health hazardous congeners (WHO,2010). In urban soil the Industrial and vehicular emissions and road dust are the potential sources of metals and hydrocarbons, these pollutants have a significant impact on human health, plant and system, these potentially toxicants enter into food chain through plant and also accumulate in the human body via direct ingestion, inhalation and hand to mouth pathways (Aditya *et al.,*2015). When these pollutants enter the environment and especially the soil and have undergone different physical, chemical, and biological effects, including adsorption, oxidation, photolysis and biodegradation (Sultana *et al.,*2014; Mahugija *et al.,*2015).PAHs released in to the soil through a variety of sources include agricultural runoff, vehicle exhaust emission, and fossils fuel spillage (Rinawati *et al.,*2012). The exposure to PAHs has been associated with increased risks of various cancers lungs, bladder, skin, urinary and gastrointestinal

systems, (Boffetta *et al.,* 1997; Diggs *et al.,* 2011; Rota *et al.,* 2014), cell damage via gene mutation (Kamal *et al.,* 2015; Kuang *et al.,* 2013; Poirier, 2004), oxidative stress and cardiovascular diseases (Burstyn *et al.,* 2005; Jeng *et al.,* 2011; Kim *et al.,* 2013; Lee *et al.,* 2011). Thus, there is a need for the studies on hydrocarbons pollution /accumulation in urban soils in order to safe guard human health, particularly children and old age persons and systems (Dao *et al.,* 2010; De Kimple and Morel, 2000; Wei and Yang, 2010).

The aim of the present study is toidentify and study the distribution and sources of polycyclic aromatic hydrocarbons (PAHs) in selected agricultural sites along to the highways between Basra, Nasiriya and Samawa and their impact on soil.

MATERIALS AND METHODS

Soil sampling:

Field work was carried out at November 2/11/2016, samples of 30 agricultural soils weretaken from six boreholes at depth(50)cm. Dugged along both sides of the highway between Basra, Nasiriya and Samawa area (Figure 1). Most of these sites were affected by the presence of the waste of cars, tires, oils and full transported by vehicles, as well as the presence of oil installation. The borehole samples were taken using plastic tube the lower and upper end of plastic tube were covered and tide by plastic bags. Field notes were recorded on the out side of tube. The tubes were transferred to the laboratory.

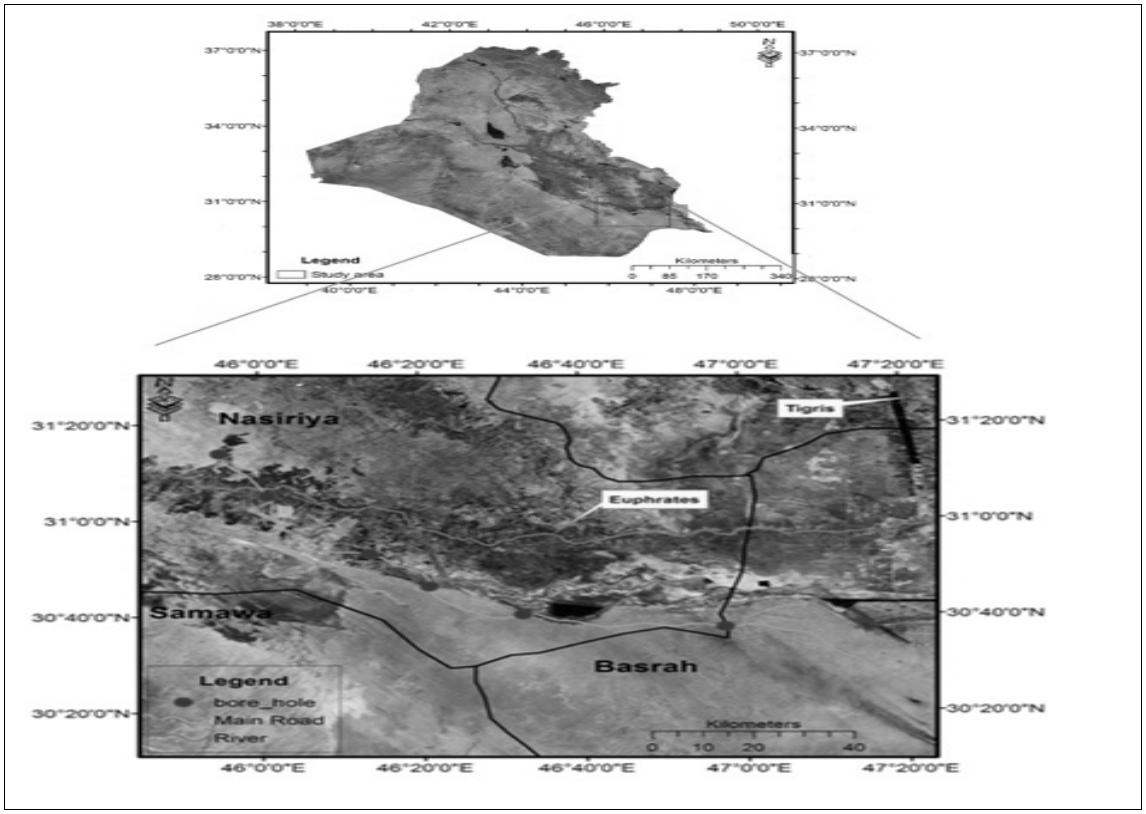

Figure (1): the location map of the study area

Physical and chemical analysis of soil samples:

The Grainsize analysis of 18selected samples was conducted from the study site at the Department of EarthSciences/college of Science- Basra according to the American Standard for testing and materials Classification ASTM: C136, 2003 (0.2, 0.1, 0.500, 0.250, 0.125. 0.063) mm, pipette method were used to separating the silt from clay fraction according to Folk,1974.The contentof total organic carbon analyzed by using the method ofWalkly and Black,1934. pH and EC of soil were determined using pH and EC meter type HANNA-HI 9811according to method of McLean,1982.

PAHs analysis:

The extraction method of PAHs from soil samples was applied using the method of Grimalt and Olive (1993) and Wang *et al.,* (2011). Twenty five grams of soil were soxhlet extracted for 24 hours with 250 ml methanol: benzene (1:1). Sulfur element was removed from the extracts using activated elemental copper in order to avoid sulfur interferences when using HPLC device. The extracts were then fractionated into aliphatic and aromatic hydrocarbons by columnchromatography. The column was prepared by slurry packing 10 g of silica (100-200 mesh), followed by 10 g of alumina (100-200 mesh) (silica-gel and alumina were activated at 200° C for 4 hours and then partially deactivated with 5 % water) and finally 1 g of anhydrous sodium sulphate was added to the surface to avoid disturbance of the top layer when adding the solvent. The extract was then applied to the head of the column and eluted 25 ml of benzene to yield the aromatic hydrocarbons. The aromatic fractions were concentrated using rotary evaporator, transferred to a vial, after that 5-10 ml of n-hexane were added to the a vial containing (1) gm of the dried powdered sample, then the samples was transferred to HPLC (A high– performance liquid chromatography system), (Agilent 1200,USA) the work of this device relies on the physical separation of the active material through two phases, the first is static and the second is active, the solution sample and mobile phase solution are placed in the device, the mobile phase is passed on the separation column for a period not less than half an hour, the device then inject a small quantity from the sample solution(Microliter) and pass through the mobile phase and separated through the separation column. And the results of concentrations of PAHs and chromatograms were compared to the standard samples.

RESULTS AND DISCUSSION

The grain size analysis showed that the soil of the study area consisting of silty sand and sandy silt with a little proportion of clay, the silt fraction represents the principle component of soil by mean (60%), while the sand fraction (29%), and the clay (11%) (Table 1, Figure 2). The percentage of organic matter in range from 1.199 to 5.59% by mean 4.48%. The soil of the study area was classified as a weak alkaline soil to a strong alkalinity,pH range between7.51 and 8.5 by mean 8.03. From the other hand, the high-salinity of soil (1.37- 8.92)ms/cm related to the high salt content (Table 2).

Table (1): Grain Size analysis (%) in Studied Boreholes.

Station	Sample	Depth	Sand%	Silt%	Clay%	Texture
N1(BH.1)	S1	0-20	73	25	2	Silty Sand
	S2	20-40	76	22	2	Silty Sand
	S3	40-50	76	21	3	Silty Sand
N2(BH.2)	S1	0-20	34	61	5	Sandy Silt
	S2	20-40	20	73	7	Sandy Silt
	S3	40-50	23	69	8	Sandy Silt
N3(BH.3)	S1	0-20	30	60	10	Sandy Silt
	S2	20-40	22	66	12	Sandy Silt
	S3	40-50	20	12	68	Sandy Clay
N5(BH.4)	S1	0-20	14	74	12	Sandy Silt
	S2	20-40	9	78	13	Silt
	S3	40-50	8	87	5	Silt
N6(BH.5)	S1	0-20	18	72	10	Sandy Silt
	S2	20-40	31	65	4	Sandy Silt
	S3	40-50	30	59	11	Sandy Silt
N7(BH.6)	S1	0-20	22	68	10	Sandy Silt
	S2	20-40	10	80	10	Sandy Silt
	S3	40-50	10	78	12	Sandy Silt

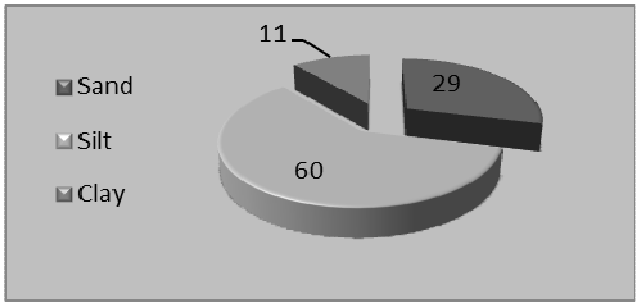

Figure (2): The percentages of Sand, Silt and Clay in soils of Study Area

Table (2): Min, Max, Mean and St.dev of some physical properties in the study area.

	Min	Max	Mean	St.dev
pH	7.51	8.5	8.03	0.23
EC ms/cm	1.37	8.92	3.97	1.98
TOC%	1.99	5.59	4.39	0.83

The concentration of polycyclic aromatic hydrocarbons were variable with depths. The (LMW) and (HMW) have been distinguished in all soil samples. The highest concentration of PAHs (LMW and HMW) was recorded at BH.6 in Samawa station 531.021 ppb at depth (40-50) cm with total concentration 1939. 571ppb, PAHs have been identified: Acenaphylene, Flourene, Phenanthrene, Anthracene, Flouranthene, Pyrene, Chrysene, Benzo(b,k) Flouranthene, Benzo(a) Pyrene, Dibenz(ah) Anthracene, Benzo(ghi)Perylene. Whereas the lowest concentration of PAHs was found at BH.1 inNasiriya station (0.29 ppb) at depth (30-40) cm, the total concentration (240.2909 ppb), and the PAHs have been identified: Acenapthene, Phenanthrene, Flouranthene, Pyrene (Table 3, Figure 3).

Table (3): Concentrations of Polycyclic Aromatic hydrocarbons (PAHS) in the study area (ppb) dry weigh

Depth (cm)	PAHs.Con(ppb)-BH.1																16-PAHs∑	Car-PAHs∑
	NAP	ACY	ACE	FLU	PHE	ANT	FLUA	PYR	B(a)A	CHR	B(b)F	B(k)F	B(a)P	Dib(ah)A	Ind p	B(ghi)P		
0-10	12.25	50.83	ND	0.71	5.36	3.15	1.67	0.06	2.19	0.03	0.0092	0.06	0.0484	0.0073	0.17	0.036	**76.5809**	**2.5149**
10-20	ND	ND	0.96	ND	ND	ND	0.03	1.10	ND	ND	0.09	ND	ND	ND	ND	ND	**2.18**	-
20-30	ND	40.17	ND	ND	ND	8.18	ND	ND	0.03	0.13	ND	0.97	0.05	3.10	0.03	0.16	**52.82**	**4.31**
30-40	ND	ND	0.09	ND	0.07	ND	0.06	0.07	ND	ND	ND	ND	ND	ND	ND	ND	**0.29**	-
40-50	0.62	100.6	ND	1.65	ND	3.40	ND	ND	0.21	0.34	0.04	0.26	0.010	ND	1.2	0.09	**108.42**	**2.06**
Total	**12.87**	**191.6**	**1.05**	**2.36**	**5.43**	**14.73**	**1.76**	**1.23**	**2.43**	**0.5**	**0.1392**	**1.29**	**0.1084**	**3.1073**	**1.4**	**0.286**	**240.2909**	**8.8849**
Depth (cm)	PAHs.Con(ppb)-BH.2																16-PAHs∑	Car-PAHs∑
	NAP	ACY	ACE	FLU	PHE	ANT	FLUA	PYR	B(a)A	CHR	B(b)F	B(k)F	B(a)P	Dib(ah)A	Ind p	B(ghi)P		
0-10	16.60	30.16	0.35	0.31	5.36	1.66	2.19	0.23	1.95	0.09	0.03	0.02	0.04	0.01	0.03	0.06	**59.09**	**2.23**
10-20	0.52	ND	ND	ND	0.45	1.98	0.071	0.81	ND	ND	ND	ND	ND	ND	ND	ND	**3.831**	-
20-30	ND	8.16	0.63	15.33	ND	ND	ND	ND	0.011	0.09	ND	0.125	ND	1.10	0.60	ND	**26.046**	**1.926**
30-40	ND	256.508	1.903	4.414	0.07	2.154	0.043	0.054	ND	0.027	0.08	ND	0.07	ND	ND	0.09	**265.413**	**0.267**
40-50	0.031	ND	ND	ND	ND	ND	ND	ND	0.18	ND	0.02	0.19	ND	0.03	ND	0.31	**0.761**	**0.73**
Total	**17.151**	**294.828**	**2.883**	**20.054**	**5.88**	**5.794**	**2.304**	**1.094**	**2.141**	**0.207**	**0.13**	**0.335**	**0.11**	**1.14**	**0.63**	**0.46**	**355.141**	**5.153**
Depth (cm)	PAHs.Con(ppb)-BH.3																16-PAHs∑	Car-PAHs∑
	NAP	ACY	ACE	FLU	PHE	ANT	FLUA	PYR	B(a)A	CHR	B(b)F	B(k)F	B(a)P	Dib(ah)A	Ind p	B(ghi)P		
0-10	17.627	103.846	0.612	0.09	9.558	2.10	4.12	0.27	2.30	0.07	0.192	0.04	0.14	0.06	ND	0.09	**141.115**	**2.802**
10-20	0.036	0.033	0.811	0.864	0.215	2.284	ND	0.031	ND	0.08	ND	ND	ND	ND	0.01	0.53	**4.894**	**0.09**
20-30	0.80	490.662	11.004	6.379	7.12	ND	0.156	ND	0.02	ND	0.098	1.35	ND	0.80	ND	ND	**518.389**	**2.268**
30-40	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.06	0.07	ND	0.13	0.06	1.36	ND	**1.68**	**1.68**
40-50	0.050	54.28	0.48	ND	0.11	5.18	0.15	0.67	0.31	ND	ND	0.45	0.12	ND	ND	0.01	**61.81**	**0.88**
Total	**18.513**	**648.821**	**12.907**	**7.333**	**17.003**	**9.564**	**4.426**	**0.971**	**2.63**	**0.21**	**0.36**	**1.84**	**0.39**	**0.92**	**1.37**	**0.63**	**727.888**	**7.72**
Depth (cm)	PAHs.Con(ppb)-BH.4																∑16 – PAHs	∑Car – PAHs
	NAP	ACY	ACE	FLU	PHE	ANT	FLUA	PYR	B(a)A	CHR	B(b)F	B(k)F	B(a)P	Dib(ah)A	Ind p	B(ghi)P		
0-10	10.65	0.192	ND	0.073	6.60	0.80	1.66	0.255	0.23	0.07	ND	0.029	0.103	0.129	0.06	0.024	**20.875**	**0.621**
10-20	18.311	29.268	2.154	1.783	0.202	ND	ND	ND	ND	0.109	0.093	0.61	0.04	0.02	ND	ND	**52.59**	**0.872**
20-30	0.941	41.878	17.064	29.813	ND	7.081	0.102	0.0488	ND	0.026	0.238	ND	ND	0.70	1.35	ND	**99.2418**	**2.314**
30-40	ND	ND	ND	ND	0.08	3.11	ND	ND	1.33	ND	ND	0.21	ND	ND	ND	ND	**4.73**	**1.54**
40-50	ND	ND	0.53	10.75	ND	ND	ND	1.08	ND	0.30	0.023	ND	0.06	0.03	0.03	0.16	**12.963**	**0.443**
Total	**29.902**	**71.338**	**19.748**	**42.419**	**6.882**	**10.991**	**1.762**	**1.3838**	**1.56**	**0.505**	**0.354**	**0.849**	**0.203**	**0.879**	**1.44**	**0.194**	**190.3998**	**5.79**
Depth (cm)	PAHs.Con(ppb)-BH.5																∑16 – PAHs	∑Car – PAHs
	NAP	ACY	ACE	FLU	PHE	ANT	FLUA	PYR	B(a)A	CHR	B(b)F	B(k)F	B(a)P	Dib(ah)A	Ind p	B(ghi)P		
0-10	14.31	ND	0.40	0.15	3.56	1.61	2.17	0.09	0.25	0.075	0.29	0.07	0.08	0.09	0.08	0.316	**23.541**	**0.935**
10-20	ND	30.61	1.10	1.76	ND	ND	ND	ND	ND	ND	ND	ND	0.029	0.061	0.07	ND	**33.63**	**0.16**
20-30	ND	ND	ND	ND	ND	7.16	0.14	ND	0.09	ND	0.07	ND	ND	ND	ND	0.26	**7.72**	**0.16**
30-40	0.68	ND	0.335	0.236	0.035	ND	ND	0.289	0.142	0.0125	0.10	0.16	59.894	2.29	ND	ND	**64.1735**	**2.5625**
40-50	ND	70.15	ND	ND	0.17	ND	0.081	1.23	0.23	0.08	0.015	ND	0.035	ND	ND	0.03	**72.021**	**0.36**
Total	**14.99**	**160.66**	**1.835**	**2.146**	**3.765**	**8.912**	**2.391**	**1.609**	**0.57**	**0.1675**	**0.375**	**0.23**	**0.144**	**2.441**	**0.25**	**0.606**	**201.0855**	**4.1775**
Depth (cm)	PAHs.Con(ppb)-BH.6																∑16 – PAHs	∑Car – PAHs
	NAP	ACY	ACE	FLU	PHE	ANT	FLUA	PYR	B(a)A	CHR	B(b)F	B(k)F	B(a)P	Dib(ah)A	Ind p	B(ghi)P		
0-10	12.50	29.35	0.09	0.08	4.61	0.93	3.17	0.17	0.11	0.03	0.07	ND	0.036	0.03	0.31	0.09	**51.576**	**0.586**
10-20	8.25	428.871	0.394	1.953	ND	4.502	ND	ND	0.554	0.122	0.349	0.0139	0.035	ND	0.10	ND	**445.1439**	**1.1739**
20-30	ND	ND	ND	ND	3.46	ND	1.10	ND	ND	ND	ND	ND	ND	3.15	0.01	ND	**7.72**	**3.16**
30-40	ND	ND	1.25	ND	ND	ND	ND	0.73	0.80	ND	0.09	0.09	ND	ND	ND	1.15	**4.11**	**0.98**
40-50	ND	515.924	ND	5.365	0.163	6.884	0.078	1.09	ND	0.111	0.098	0.246	0.046	0.986	ND	0.03	**531.021**	**1.487**
Total	**20.75**	**974.145**	**1.734**	**7.398**	**8.233**	**12.316**	**4.348**	**1.99**	**1.464**	**0.263**	**0.607**	**0.3499**	**0.117**	**4.166**	**0.42**	**1.27**	**1039.571**	**7.3869**

*∑**16-PAHs**: means concentration of 16 kinds of PAHs.

*∑**Car-PAH**: means concentrations of carcinogenic PAHs, including Benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(123cd)pyrene and dibenzo(ah)anthracene (USEPA, 2002).

*Naphthalene **(NAP),**Acenapthylene**(ACY),**Acenapthene**(ACE),**Flourene**(FLU),**Phenanthrene**(PHE),**Anthracene**(ANT),**Flouranthene**(FLUA),**Pyrene**(PYR),**Benz[a]anthracene**(B[a]A),**Chrysene **(CHR),**Benzo[b]flouranthene**(B[b]F),**Benzo[k]flouranthene**(B[k]F),**Benzo[a]pyrene**(B[a]P),**Dibenz[a,h]anthracene**(Dib[ah]A),**Benzo[ghi]perylene**(B[ghi]P),**Indeno[1,2,3-cd]pyren**(Ind p).ND**, not detected.

PAHs were commonly occurred in soils of study area and in all different depths. Variation in the concentration may be due to: the nature of the soil texture, the proximity to the source of pollution, the concentration are decreased with increasing particle size of soil, the smaller particles (clay and silt) had higher PAHs (Xiaoyong *et al.,* 2013). The high organic content of soil can adsorbed PAHs on surface of soil (Maruya *et al.,*1996). Heat and evaporation rate are important factor controlling the concentration of PAHs at the surface(Al-Hassen, 2013). Besides the presence of residues of tires, oil hydrocarbon spill and emission of vehicles near high way, the carcinogenic hydrocarbons have vary concentrations in different depths. The highest concentration observed at BH.1(Nasiriya Station) about 4.31ppb in depth (20-30)cm with total concentration about 8.8849 ppm and the lowest value observed in BH.3 (Nasiriya Station) about 0.09ppm in depth (10-20) cm. The high concentration of carcinogenesis PAHs (Benzo(a) Anthracene, Chrysene, Benzo(b)flouranthene, Benzo(k)flouranthene, Benzo(a) pyrene, Indeno(1,2,3cd) pyrene and dibenzo(ah) anthracene) may be attributed to the presence of the remain of cars exhausts and the industrial oils that spread in the study area as well as the distance of sample from high way. The positive correlation between TOC% and total PAHs ($r= 0.178$, $P<0.05$), explains the effect of organic matter that controlling the distribution of aromatic compounds in soil and sediments (Chiou *et al.,*1998). From the other hand the weak negative correlation was found between the acidic pH and electrical conductivity EC with values of aromatic compounds PAHs mean that the acidic pH and electrical conductivity EC did not have a clear effect on the behavior of aromatic compounds.

A weak correlation between PAHs, pH, EC and a weak positive correlation with TOC at level ($p<0.05$) indicates that the source of PAHs in the study area is not a natural source butalso a result of human activities(Zhang *et al.,* 2006) (Table.4).

Most of the concentration of PAHs compounds in study area have been exceeded the international and local permitted limits especially for carcinogenic compounds (Benzo (a) Anthracene B(a)A, Chrysene (Chr), Benzo (b)Fluoronthene B(b)F, Benzo(k) Fluoronthene B(k)F, Benzo (a) Pyrene B(a)P, Indeno(1,2,3-cd) Pyrene (Indp) Pyren and Dibenzo (a,h) Anthracene, such as (Italian legislation, 1999), (Netherlands-(Kalf *et al.,*1997), (Wang *et al.* 2010), (Samimi *et al.*,2009), (Larsson and Sahlberg, 1982) and (Al- Dabbas *et al.,*2014), (Husain, 2003), (Shihab-Aldin and Aziz, 2013), (Abdal-Kader *et al.,* 2013), (Mohammad *et al.,*2017) (Tables 5 and 6).

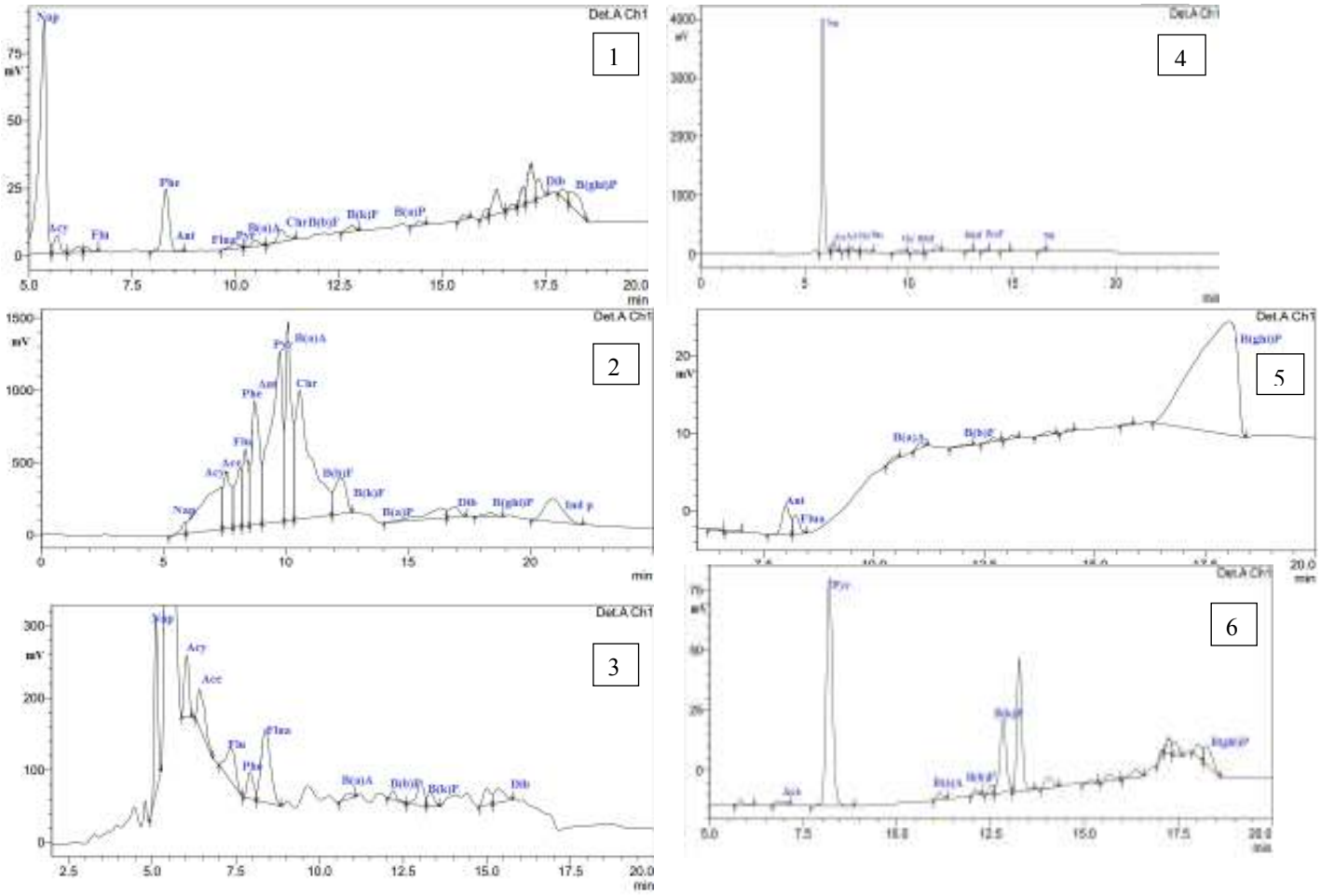

Figure (3): The HPLC analysis of some selected samples of study area.

1. **Concentration of PAHs in BH.1 with depth(0-10)cm.**
2. **Concentration of PAHs in BH.2 with depth(10-20)cm.**
3. **Concentration of PAHs in BH.3 with depth(20-30)cm.**
4. **Concentration of PAHs in BH.4 with depth(10-20)cm.**
5. **Concentration of PAHs in BH.5 with depth(20-30)cm.**
6. **Concentration of PAHs in BH.6 with depth(30-40)cm.**

Table (4): Correlation coefficient (r) between different parameters in soil at study area.

Pearson Correlation	PAHs	TOC	pH	EC
PAHs	1			
TOC	0.178	1		
pH	-0.064	0.115	1	
EC	-0.012	-0.419-**	-0.296-*	1

*** . Correlation is significant at the 0.01 level (2-tailed)*
**. Correlation is significant at the 0.05 level (2-tailed)*

Table (5): Comparison the concentrations of polycyclic aromatic hydrocarbon (ppb) in study area with their allowed limits in international studies

Comp / Ref	Nap	ACY	ACE	FLU	PHE	ANT	FLUA	PYR	B(a)A	CHR	B(b)F	B(k)F	B(a)P	Dib(ah)A	Ind (1,2,3) p	B(ghi)P
WHO and IPCS, 1998).	±	±	±	-	±	-	-	±	±	+	+	±	+	+	±	-
Italian legislation, 1999	-	-	-	-	-	-	-	5	0.5	5	0.5	0.5	0.1	0.1	0.1	0.1
Netherlands	0.14	-	-	-	0.51	0.12	2.6	-	0.25	10.7	-	2.4	0.26	-	-	7.5
Present study	114.176	2341.392	40.157	81.71	47.193	62.307	17.011	8.2778	10.795	1.8525	1.9652	4.8939	1.0724	12.6333	5.51	3.446

Italian legislation, 1999 :Maximum concentrations allowed by the Italian legislation for industrial uses of soils (GazzettaUfficialeRepubblicaItaliana no. 293 del 15-12-1999).
Netherlands: "Maximum Permissible Concentrations" (MPCs) for PAHs in soil (Kalf et al.,1997).
+ - ± : PAHs compounds and their carcinogenic effects according to (WHO and IPCS, 1998). Where +, positive evidence of carcinogenic effects, -, negative , ±, questionable.

Table (6): Comparison the concentration of TPAHs study area (ppb) with other local studies

Studied Areas	PAHs	References
Kirkuk- Iraq	0.14-39.33	Al- Dabbas et al.,2014
Baghdad City	0.3–5.17	Husain, 2003
Basra City	0.3–7.0	Shihab-Aldin and Aziz, 2013
Iraq Marshe	1.3-4.65	Abdal-Kader et al., 2013
street dust-Beijing (China)	0.27–1.30	Wang et al. 2010
Vicinity- Highway USA	164-812	Samimi et al.,2009
New york- Highway USA	17-90	Larsson and Sahlberg, 1982
Surface Soil Gwangju City- Korea	95-212	Mohammad et al.,2017
Highway Between Basra- Nasiriya and Samawa	190.3998-1039.571	Present Study

CONCLUSION

Polycyclic aromatic hydrocarbons (PAHs) contain the largest class of hazards and cancerous , while un carcinogenic may act as synergists. The increases of PAHs concentrations are due to the high emission of exhausts cars in the high ways, the remains of tires and industrial oil wastethat on road side area are considered the main pollution source of PAHs in soil. Soil have high concentration of TOC and contain high proportionof silt represent about 60% and 29% of clay.

The natural and human activities played an important role in increases the concentration of PAHs in soil. In study area the concentration of LMW and HMW had exceeded the international allowable limits in soil, especially for the areas closest to the highway where the highest total concentration of aromatic compounds reach1039.571ppb and 727.888 in Samawa and Nasiriya stations respectively. So the study area is highly polluted with polycyclic aromatic hydrocarbons, due to the car exhaust, the residues of tires, industrial oils and other industrial waste dumped near the high way which increase the concentrations of these contaminants.

REFERENCES

Abdal-Kader, S. L., Reyam, N. A. and Huda, F. Z. (2013). Distribution of Polycyclic Aromatic Hydrocarbons in Marsh, Plants and Sediments in Iraq. *Journal of Environmental Sciences and Engineering*. B., 2, 532-537.

Al-Dabbas, A.M., Lamyaa A.A. and Adnan, H. A. (2014). Determination of heavy metals and polycyclic aromatic hydrocarbon concentrations in soil and in the leaves of plant (Eucalyptus) of selected locations at Kirkuk—Iraq. *Arab Journal for Geosciences.* 1453-1455.

Al-Hassen, Sh. I. (2013). An Assessment of Noise Pollution and Associated Health Impacts at Selected Schools in Basra City, Southern Iraq. *Journal of Basrah Research.* 39(4),19-31.

Aditya, K. P., Rakesh, K., Pawan, K. and Sudesh, Y. (2015). Sources apportionment and spatio-temporal changes in metal pollution in surface and sub-surface soils of a mixed type industrial area in India. *Journal of Geochemical Exploration.* 159,169-177.

Arias, A.H., Vazquez-Botello, A., Tombesi, N., Ponce-Vélez, G., Freije, H. and Marcovecchio, J. (2010). Presence, distribution, and origins of polycyclic aromatic hydrocarbons (PAHs) in sediments from Bahía Blanca estuary, Argentina. *Environment Monitoring and Assessment.* 160, 301-314.

ASTM (American Society for Testing and Materials).(2003). Standard Specification for Concrete Aggregates, ASTM C33-03. American Society for Testing and Materials, Philadelphia, PA.

Boffetta, P., Jourenkova, N. and Gustavsson, P.(1997). Cancer risk from occupational and environmental exposure to polycyclic aromatic hydrocarbons. *Cancer Causes Control*. 8, 444–472.

Burstyn, I., Kromhout, H., Partanen, T., Svane, O., Langård, S., Ahrens, W., Kauppinen, T., Stücker, I., Shaham, J., Heederik, D., Ferro, G., Heikkilä, P., Hooiveld, M., Johansen, C.,Randem, B.G. and Boffetta, P.(2005). Polycyclic aromatic hydrocarbons and fatal ischemic heart disease. *Epidemiology.* 6 (6),744–750.

Chiou, C.T., McGroddy, S.E. and Kile, D.E. (1998). Partition characteristics of polycyclic aromatic hydrocarbons on soils and sediments. *Environmental Science and Technology.* 32,264–269.

Dao, L., Morrison, L., and Zhang, C. (2010). Spatial variation of urban soil geochemistry in a roadside sports ground in Galway, Ireland. *Science of the Total Environment.* 408, 1076–1084.

De Kimple, C.R., Morel, J.L.(2000). Urban soil management: a growing concern. *Soil Sciences*. 165, 31–40.

Diggs, D.L., Huderson, A.C., Harris, K.L., Myers, J.N., Banks, L.D., Rekhadevi, P.V., Niaz, M.S., Ramesh, A.(2011). Polycyclic aromatic hydrocarbons and digestive tract cancers: a perspective. *Ecotoxicological Review.* 29 (4), 324–357.

Folk, R.l.(1974). Petrology of sedimentary Rocks. Henphill Publ. Co. Texas.P.:182.

Grimalt, J.O. and Olive, J. (1993). Source input elucidation in aquatic systems by factor and principal component analysis of molecular marker data. *Analytical. ChimicaActa.* 278,159-176.

Husain, K.I .(2003) . Separation and determination of polycyclic aromatic hydrocarbons in Iraqi environmental samples. PhD. Thesis. College of Education– Ibn Al-Haitham, University of Baghdad. p.:104.

Jang, E., Alam, M.S. and Harrison, R.M.(2013). Source apportionment of polycyclic aromatic hydrocarbons in urban air using positive matrix factorization and spatial distribution analysis. *Atmosphere and Environment.* 79, 271–285.

Jeng, A., Pan, C.H., Diawara, N., Chang-Chien, G.P., Lin,W.Y., Huang, C.T., Ho, C.K. and Wu, M.T.(2011). Polycyclic aromatic hydrocarbon-induced oxidative stress and lipid peroxidation in relation to immunological alteration. *Occupational and Environmental Medicine.* 68 (9),653–658.

Kalf, D.R., Crommentuijn, T. and Van de Plassche, E. (1997). Environmental quality objectives for 10 polycyclic aromatic hydrocarbons (PAHs). *Ecotoxicological and Environmental Safety.* 36,89-97.

Kamal, A., Cincinelli, A., Martellini, T. and Malik, R.N.(2015). Review of PAH exposure from the combustion of biomass fuel and their less surveyed effect on the blood parameters. *Environmental Sciences and Pollution. Research.* 22(6),4076-4098.

Kim, K.H., Jahan, S.A., Kabir, E. and Brown, R.J.(2013). A review of airborne polycyclic aromatic hydrocarbons (PAHs) and their human health effects. *Environmental International*. 60, 71–80.

Kuang, D., Zhang,W., Deng, Q., Zhang, X., Huang, K., Guan, L., Hu, D.,Wu, T. and Guo, H.(2013). Dose-response relationships of polycyclic aromatic hydrocarbons exposure and oxidative damage to DNA and lipid in coke oven workers. *Environmental Sciences and Technology.* 47 (13), 7446–7456.

Larsson, B. and Sahlberg, G. (1982). Polycyclic aromatic hydrocarbons in lettuce. Influence of a highway and an aluminium smelter. In: Cooke M,

Dennis AJ, Fisher GL (eds) Polynuclear aromatic hydrocarbons: physical and biological chemistry. Springer, New York, pp.: 417–426.

Lee, M.S., Magari, S. and Christiani, D.C.(2011). Cardiac autonomic dysfunction from occupational exposure to polycyclic aromatic hydrocarbons. *Occupational and Environmental Medecine.* 68 (7), 474–478.

Li, J.W., Shang, X., Zhao, Z.X., Tanguay, R.L., Dong, Q.X. and Huang, C.J.(2010). Polycyclic aromatic hydrocarbons in water, sediment, soil, and plants of the Aojiang River waterway in Wenzhou, China. *Journal of Hazardous Matererials.* 173, 75-81.

Mahugija, J.A.M., Henkelmann, B., Schramm, K. (2015). Levels and patterns of organochlorine pesticides and their degradation products in rainwater in Kibaha Coast Region, Tanzania. *Chemosphere.* 118, 12-19.

Maruya, K. A., Risebrough, R. W., & Horne, A. J. (1996). Partitioning of polynuclear aromatic hydrocarbons between sediments from San Francisco Bay and their porewater. *Environmental Science and Technology.* 30, 2942–2947.

Mclean, E.O. (1982). Soil pH and line requirements. In Methods of SoilAnalysis, Part 2. Chemical and Microbiological Properties. Ag. Monograph No. 9, 2nd ed.

Mohammad, N. I., M. P., Young, T. J., Xuan, P. N., Seung, S. P., Seon, Y. C., Jeong, H. P.(2017). Distribution, sources, and toxicity assessment of polycyclic aromatic hydrocarbons in surface soils of the Gwangju City, Korea. *Journal of Geochemical Exploration.* 180,52-60.

Nikolaou, K., Masclet, P. and Mouvier, G.(1984). Sources and chemical-reactivity of polynuclear aromatic-hydrocarbons in the atmosphere - a critical-review. *Sciences of Total Environment.* 32,103–132.

Ong, S., Ayoko, G.A., Kokot, S. and Morawska, L.(2007). Polycyclic aromatic hydrocarbons in house dust samples: source identification and apportionment. In: Proceedings of 14th IUAPPA World Congress, Brisbane, 9e13 September 2007.

Poirier, M.C.(2004). Chemical-induced DNA damage and human cancer risk. *Natural Review of Cancer.* 4, 630–637.

Rinawati, Koike, T., Koike, H., Kurumisawa, R., Ito, M., Sakurai, S., Togo, A., Saha, M., Arifinc, Z. and Takada, H.(2012). Distribution, source identification, and historical trends of organic micropollutants in coastal sediment in Jakarta Bay, Indonesia. *Journal of Hazardous Materials*. 217-218, 208-216.

Rota, M., Bosetti, C., Boccia, S., Boffetta, P. and La Vecchia,C.(2014). Occupational exposures to polycyclic aromatic hydrocarbons and respiratory and urinary tract cancers: an updated systematic review and a meta-analysis to 2014. *Archieve of Toxicology.* 88(8), 1479–1490.

Samimi, S.V., Akbari , R.R. and Ghanizadeh, F. (2009). Polycyclic Aromatic Hydrocarbon Contamination Levels in Collected Samples From Vicinity of Highway, Iran. *Journal of Environment and Health. Sciences and Engineering.* 6(1), 47-52.

Shihab-Aldin, and Aziz. (2013). The polycyclic aromatic hydrocarbons (PAHs) concentrations in dust samples of selected locations at Basrah City-Iraq.

Sultana, J., Syed, J.H., Mahmood, A., Ali, U., Rehman, M.Y.A., Malik, R.N., Li, J. and Zhang, G. (2014). Investigation of organochlorine pesticides from the Indus Basin, Pakistan: Sources, air-soil exchange fluxes and risk assessment. *Sciences of Total Environment.* 497-98, 113-122.

Tobiszewski, M., Namiesnik, J.(2012). PAH diagnostic ratios for the identification of pollution emission sources. *Environmental Pollution*. 162, 110e-119e.

USEPA. (2002). Polycyclic organic matter. US Environmental Protection Agency. Available at: http://www.epa.gov/ttn/atw/hlthef/polycycl.html.

Walkley, A. and Black, I.A.(1934). An examination of the Degtjareff method for determining organic carbon in soils: Effect of variations in digestion conditions and of inorganic soil constituents. *Soil Sciences*. 63,251-263.

Wang, C., Wu, S., Zhou, S., Shi, Y. and Song, J.(2017). Characteristic and source identification of polycyclic aromatic hydrocarbons (PAHs) in urban soils: a review. *Pedosphere*. 27, 17–26.

Wang, X., Yao, T., Cong, Z., Yan, X., Kang, S. and Zhang, Y.(2007). Concentration level and distribution of polycyclic aromatic hydrocarbons in soil and grass around Mt. Qomolangma, China. *Chinese Science Bulletin.* 52, 1405–1413.

Wang,C., Li, Y., Liu, J., Xiang, L., Shi, J. and Yang, Z. (2010). Characteristics of PAHs adsorbed on street dust and the correlation with specific surface area and TOC. *Environmental Monitoring and Assessment.* 169,661–670.

Wang, C., Wang, W., He, S., Due, J. and Sun, Z. (2011). Sources and distribution of aliphatic and polycyclic aromatic hydrocarbons in Yellow River Delta Nature Reserve. *China Applied Geochemistry.* 26,1330- 1336.

Wei, B. and Yang, L.(2010). A review of heavy metal contaminations in urban soils, urban road dusts and agricultural soils from China. *Microchemical Journal.* 94, 99–107.

WHO/IPCS, (1998). Environmental Health Criteria 202: Selected Non-Heterocyclic Polycyclic Aromatic Hydrocarbon. International Program on Chemical Safety, United Nations Environmental Program, World Health Organization. Geneva.

WHO (World Health Organization). (2010). WHO Guidelines for Indoor Air Quality: Selected Pollutants. Regional Office for Europe of TheWorld Health Organization, Copenhagen, Denmark.

Xiaoyong, L., Dong, M. and Xiulan, Y.(2013). Distribution pattern of polycyclic aromatic hydrocarbons in particle-size fractions of coking

plant soils from different depth. *Environmental Geochemical Health.* 35,271–282.

Ye, B., Zhang, Z. and Mao, T. (2006). Pollution sources identification of polycyclic aromatic hydrocarbons of soils in Tianjin area, China. *Chemosphere.* 64, 525-534.

Zhang, H. B., Luo, Y. M., Wong, M. H., Zhao, Q. G. and Zhang, G. L. (2006). Distributions and concentrations of PAHs in Hong Kong soils. *Environmental Pollution.* 141,107–114.

Zhi, H., Zhao, Z.H. and Zhang, L.(2015). The fate of polycyclic aromatic hydrocarbons (PAHs) and organochlorine pesticides (OCPs) in water fromPoyang Lake, the largest freshwater lake in China. *Chemosphere*. 119, 1134-1140.

قسم الدراسات والبحوث العربية

ARABIC STUDIES AND RESEARCHES SECTION

الدور الواقي للمستخلص الكحولي لمياسم الزعفران من التأثير التأكسدي لأحد السموم الفطرية في حوامل الفئران البيض السويسرية (*Mus musculus*)

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الملخص باللغة العربية

سعت الدراسة إلى تحديد تأثير الزعفران في إزالة التأثير التأكسدي للأوكراتوكسين-A . شملت عينة الدراسة 15 أنثى من الفئران البيضاء جرى تقسيمها إلى ثلاث مجموعات . تم استخدام المستخلص الكحولي لمياسم الزعفران بتركيز 100 mg/kg ، كما استخدم الاوكراتوكسين- A بتركيز 1mg/kg. جرعت المجموعة الأولى من الحيوانات فموياً بمادة الاوكراتوكيين -A مرة واحدة في اليوم وللمدة من 1-14 يوما من بدء الحمل. أما المجموعة الثانية فقد جرعت فموياً بمادة الاوكراتوكيين -A مع المستخلص الكحولي للزعفران وبالتزامن مع السم الفطري . أما مجموعة السيطرة فقد جرعت بالمستخلص الكحولي للزعفران فقط. تم دراسة معايير شملت التغيرات في وزن الجسم للحوامل قبل التزاوج وبعد مدة التجربة ، وقياس مستوى الإنزيمات التأكسدية ، ومنها إنزيمي Arginase وMalonedialdehyede والمضادة للتأكسد، منها إنزيمي Catalase و Peroxidase في مصل دم الأمهات الحوامل بعد مدة الحمل . بينت نتائج الدراسة وجود انخفاض معنوي في معدل أوزان الأمهات الحوامل المجرعة بالاوكراتوكسين- A بتركيز 1mg/kg. كما تبين وجود انخفاض معنوي في معدل أوزان الأمهات الحوامل المجرعة بالاوكراتوكسين- A بالتركيز 1mg/kgمع مستخلص الزعفران بتركيز 100 mg/k . من ناحية أخرى، أظهرت النتائج حدوث ارتفاع معنوي في معدل تركيز أنزيمي Arginase و Malonedialdehyede ، وانخفاض معنوي في معدل تركيز إنزيمي Catalase و Peroxidase بعد المعاملة بالاوكراتوكسينA . وقد بينت النتائج دور المستخلص الكحولي للزعفران في التقليل المعنوي في معدل تركيز الإنزيمات التأكسدية، والزيادة المعنوية في معدل تركيز الإنزيمات المضادة للأكسدة. وبذلك تستخلص الدراسة أن للأوكراتوكسين –A تأثيرا سلبيا في الفئران الحوامل، وللزعفران دورا في التقليل من هذا التأثير كونه عامل وقاية.

الكلمات المفتاحية: الزعفران، الاوكراتوكسين-A، الانزيمات التأكسدية والمضادة للتأكسد.

The protective role of saffron stigmas alcohol extract from oxidative effect of a fungal toxins in pregnant albino swiss mice (*Mus musculus)*

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ABSTRACT

This study sought to determine the effect of saffron on the elimination of oxidative effect of Ochratoxin-A. Fifteen female mice were divided into three groups, Sublethal concentration of saffron 100 mg / kg, and sub lethal concentrations of Ochratoxin-A 1mg/kg . The animals were given Ochratoxin-A once a day during days (1-14) of pregnancy , and the second group was given Ochratoxin-A with saffron extract and in conjunction with the fungal toxin once a day during days (1-14) of pregnancy. The control group animals were given saffron extract only. A number of parameters were studied including differences in body weight of the mice before mating and after the end of the experiment , and measurement of the level of oxidative enzymes, Arginase and Malonedialdehyde enzymes and their antioxidant enzymes, Catalase and Peroxidase in postpartum pregnant mice after the period of pregnancy . The study shows a significant decrease in the weight of pregnant mice in the group Ochratoxin-A group at 1mg / kg. The results show a significant decrease in the weight of pregnant mice with the groups of Ochratoxin-A in 1 mg / kg concentration and saffron extract.

The results showed significant increase in the Arginase and MDA concentrations, and a significant decrease in the level of the Catalase and Peroxidase concentration after the treatment of Ochratoxin-A. The results also showed that the saffron extract significantly reduced the concentration of oxidant enzymes, and significant increase in the concentration of antioxidant enzymes.

The study concluded that Ochratoxin-A has a negative effect on pregnant mice, and saffron has a role in reducing this effect as a protective agent.

المقدمـــــة

الزعفران نبات بصلي من فصيلة السوسنيات (Iridaceae)، حيث يعرف علميا باسم الزعفران السوسني (*Crocus sativus*) . والجزء المهم فيه تمثله أعضاء التلقيح الأنثوية التي تحمل اللون الأحمر وتسمى المياسم (stigmas) والتي تنزع من الزهور المتفتحة (Nilakshi *et. al.*, 2011). يوجد في الزعفران أكثر من 150 عامل كيميائي، منها مركبات طيارة (volatile components)، ومنها مركبات عطرية (aromatic compounds) . كما يحتوي الزعفران على مركبات فعالة غير طيارة (nonvolatile active component)، تتمثل العديد منها بالكاروتينات (carotenoids) ، والتي تشمل zeaxanthin ، lycopene وβ α carotenes (Jan *et. al.,* 2014) . و يعود اللون الأصفر الذهبي – البرتقالي للزعفران إلى وجود مادة ألفا- كروسين (α-crocin) . كذلك يحتوي الزعفران على مادة الكروسيتين (crocetin) (polyene dicarboxylic acid) وهي مادة ذائبة بالدهون . ويعود الطعم المر المميز للزعفران إلى مادة البايكروكروسين (picrocrocin) ومادة السافرانال (safranal) التي تعطي للزعفران الرائحة المميزة له (Khorasany and Hosseinzadeh, 2014). وقد بينت إحدى الدراسات أن الزعفران من النباتات المضادة للأكسدة (antioxidant plants) (Makhlouf, 2011)، وأن خاصيته في تعزيز الصحة تعود إلى وجود مادة مضادة للأكسدة هي الكروسين (crocin) المتمثلة بالكاروتينويدات (carotenoids)، التي تكسب المياسم اللون الأصفر البراق . وتأتي خاصية الزعفران المضادة للأكسدة نتيجة لقدرته على إزالة الجذور الحرة المتولدة خاصة، بيروكسيدات الدهون (lipid peroxidate)، وزيادة فعالية الإنزيمات المانعة للأكسدة مثل أنزيم superoxide dismutase . وقد أشار (Linardaki *et. al*, 2013) إلى دوره في حماية المادة الوراثية DNA للخلية من التلف والطفرات التي يتعرض إليها نتيجة العوامل الداخلية والخارجية. وقد أكدت دراسة (Magdalini *et. al.*, 2011) على الدور الذي يلعبه الزعفران في تثبيط فعالية الإنزيمات المسببة للعمليات التأكسدية خاصة إنزيمي caspase-3 و acetylcholinesterase (AChE) . يمتازالزعفران بقابليته الكبيرة في معالجة السموم الفطرية (mycotoxins) والتي تنتج من أنواع كثيرة من الفطريات الملوثة للطعام والمواد الغذائية (Ziaee *et. al.*, 2014) . فقد أشارت دراسة (Tzanidi *et. al.*, 2012) إلى قدرة الزعفران على التقليل من إنتاج سموم الأفلاتوكسين خاصة Aflatoxin B1 (AFB1) من فطر الاسبرجلس (*Aspergillus parasiticus*) . كما أظهرت نتائج دراسة (Qusti and Qahtani, 2015) دور الزعفران في إزالة السمية من دماغ بالغات الفئران البيضاء السويسرية، وذلك من خلال تنشيط الإنزيمات المضادة للأكسدة. وقد توصلت نتائج العديد من الدراسات ومنها دراسة (Zhu *et. al.,* 2016) إلى وجود جهد تأكسدي (oxidative stress) للأوكراتوكسين-A تظهر سميته (toxicity) وتأثيره المسرطن (carcinogenicity effect) على الحيوان ، إذ يتسبب في زيادة تكوين الجذور الحرة Reactive Oxygen Species (ROS) (Schaff *et. al.*, 2002).

المواد وطرق العمـــــل

تم تطبيق هذه الدراسة على عينة من الفئران البيضاء السويسرية من الإناث قوامها 15 أنثى (*Mus musculus*)، بأعمار تراوحت ما بين (8-10) أسابيع و بمعدل أوزان تراوح ما بين (25-30) غرام. وقد تم الحصول عليها من البيت الحيواني التابع لمركز التقانة الإحيائية في جامعة النهرين . قسمت الإناث إلى ثلاث مجموعات بواقع (5 إناث لكل مجموعة). تم وضع الذكور مع الإناث بنسبة ذكر واحد مع اثنتين في كل قفص، وقد تم التأكد من حصول التزاوج بمشاهدة السدادة المهبلية (Vaginal plug) في الصباح الباكر التالي، وعُدّ يوم التزاوج هو اليوم صفر من الحمل والذي يليه اليوم الأول من الحمل (Walter *et. al.*, 2005).

تم الحصول على المستخلص الكحولي لمياسم الزعفران saffron stigmas بنسبة 10:1 وزن : حجم ، من خلال مزج 1غم من المياسم مع 10 مل من الميثانول المطلق تركيز 99.9 % باستعمال جهاز السكسوليت (Soxhlet extractor) بدرجة حرارة 40 م°، و لمدة تتراوح ما بين 6–8 ساعة. ثم رشح المستخلص بوساطة أوراق ترشيح نوع واتمان (Whatman no.1) . تم صب الراشح في أطباق بتري (Petri dishes) وترك ليجف بدرجة حرارة الغرفة . تم حفظ المستخلص الجاف لحين الاستعمال . حضرت الجرعة الفموية للفئران بالاعتماد على الجرعة المميتة لنصف العدد (Lethal Dose 50) (LD50) للزعفران، والتي تبلغ 556 mg/kg للمستخلص الكحولي للمياسم (Mahmoud *et. al.*, 2014). تـم اختيار التركيز تحت المميت للزعفران Sublethal (concentration) وهو 100 mg/kg.

استعمل في هذه الدراسة أحد السموم الفطرية وهو الأوكراتوكسين-A، حيث حضرت الجرعة الفموية بتركيز 1mg/kg بالاعتماد على الجرعة المميتة لنصف العدد (LD50)، والتي تبلغ 58-48 mg/kg (Brien and Dietrich, 2005) ، وعلى أساس وزن الفئران . قسمت الفئران الحوامل إلى ثلاث مجاميع بواقع 5 فئران للمجموعة الواحدة. جرعت المجموعة الأولى فمويا بواسطة الأنبوبة الفموية- المعدية (gavage tube)، وبحجم (0.1) مل لكل 10 gm من وزن الجسم من مادة الأوكراتوكيين -A تركيز1mg/kg مرة واحدة في اليوم وللمدة من (1-14) يوم من بدء الحمل. أما المجموعة الثانية، فقد جرعت فمويا بالأوكراتوكسين-A تركيز 1mg/kg مع جرعة من المستخلص الكحولي للزعفران مقدارها 100mg/kg وبالتزامن مع الأوكراتوكسين-A ولنفس مدة الحمل. اعتبرت المجموعة الثالثة سيطرة، وقد تم تجريعها بالزعفران تركيز 100 mg/kg فقط. جرى بعد ذلك تشريح الفئران في اليوم 18 من الحمل، وتم أخذ أوزان الأمهات قبل التزاوج وبعد انتهاء مدة التجربة. تم استئصال أرحامها وفحصت. جُمع الدم من الفئران الحوامل بعد انتهاء مدة التجربة عن طريق إحداث شق في رقبة الفأرة الحامل لقطع الشريان السباتي (carotid artery) والوريد الوجي الداخلي (internal jugular vein) . تم الحصول على مصل الدم عن طريق جهاز الطرد المركزي ، أعقب ذلك استخدام بعض من المعايير الفسلجية لدم الأمهات المجرعة ، تمثلت بقياس مستوى الإنزيمات التأكسدية (oxidant enzymes) منها، إنزيم الأرجنيز (Arginase enzyme) و إنزيم المالون داي الديهايد (Malonedialdehyede enzyme) ، والإنزيمات المضادة للتأكسد (antioxidant enzymes) منها ، إنزيم الكاتيليز (Catalase enzyme) ، وإنزيم البيروكسيديز peroxidase (enzyme).

النتـــــــائج والمناقشـــــة

تأثرت إناث الفئران البيضاء في المجموعة الأولى والمجرعة فمويا بالاوكراتوكسين-A بتركيز 1mg/kg من وزن الجسم وللمدة من (1-14) من بدء الحمل، والمجموعة الثانية المجرعة بالاوكراتوكسين-A تركيز 1mg/kg والمعاملة بالمستخلص الكحولي لمياسم الزعفران تركيز 100 mg/kg وللمدة (1-14) يوم من بدء الحمل، حيث أظهرت البيانات الإحصائية الموضحة في الجدول رقم (1) حصول انخفاض معنوي عند مستوى ($P < 0.05$) في معدل وزن الجسم في الفئران الحوامل المجرعة بالاوكراتوكسين وللتركيز 1mg/kg ، وكان معدل أوزان الأمهات عند تركيز 1mg/kg (27.19 ± 1.02) . كما بينت النتائج وجود فروقات معنوية في معدل أوزان الأمهات الحوامل بعد المدة (1-14) يوما من بدء الحمل عند مستوى ($P < 0.05$) بين المجاميع المجرعة بالاوكراتوكسين- A بالتركيز 1mg/kg مع مستخلص مياسم الزعفران بتركيز 100 mg/kg مقارنة مع مجموعة السيطرة (المجرعة بالزعفران فقط) . حيث يوضح الجدول رقم (1) وجود انخفاض معنوي عند مستوى ($P < 0.05$) مقارنة مع السيطرة التي سجلت (38.94 ± 0.05) غرام بعد المدة (1-14) يوم من بدء الحمل. وكان معدل أوزان الأمهات عند تركيز 1mg/kg (26.72 ± 2.29) غرام . ويعود السبب في الانخفاض في أوزان الأمهات في المجموعة الأولى إلى عدم تكون أجنة في القرون الرحمية للفئران المعاملة بالاوكراتوكسين-A بتركيز 1mg/kg، بفعل التأثير التأكسدي للاوكراتوكسين الذي تسبب في منع تكون الأجنة وانغراسها في القرون الرحمية للفئران المعاملة بالاوكراتوكسين-A . حيث يتسبب في زيادة تكوين الجذور الحرة Reactive Oxygen Species (ROS) (Provos, 2015). وقد بحثت دراسة (Kuan *et. al.*, 2011) تأثير الجذور الحرة مثل جذور

الهيدروكسيل (hydroxyl radicals) واوكسيد النتريك (nitric oxide) بصورة مباشرة في القواعد النيتروجينية للحمض النووي DNA ، مما يؤثر على الجنين في مرحلة تكوين الكيس الأرومي (blastocyst stage)، كما يؤثر في عملية غرس الجنين (implantation) . فقد أثبتت دراسة (Hsuuw et. al., 2013) أن السم الفطري يؤثر على تكاثر ونمو الخلايا الجنينية وعلى عملية الغرس والتكوين ما بعد الغرس (post-implantation development) ، مسببا موت عدد كبير من الخلايا. إذ تسبب الاستجابة للمعاملة بالسم الفطري تحفيز الإنزيمات caspase-3 وcaspase-9 . وهذه الإنزيمات تحدث موتا مبرمجا للخلايا و يتسبب الفعل التأكسدي للاوكراتوكسين-A في زيادة مستوى إنزيمات التأكسد خاصة إنزيم Malondialdehyde (MDA) الذي يعمل على تحطيم DNA الخلايا .

أما في المجموعة الثانية من الفئران، فقد بينت النتائج وجود انخفاض معنوي في معدل أوزان الأمهات الحوامل المعاملة بالاوكراتوكسين-A بتركيز 1mg/kgمع المستخلص الكحولي لمياسم الزعفران بتركيز 100 mg/kg وللمدة (1-14) يوما من بدء الحمل مقارنة مع مجموعة السيطرة (الجدول رقم 1) . ويعود السبب في ذلك إلى حدوث إجهاض كلي (Total Abortion) في الفترات (1-11) (13-1) (15-1) يوما من بدء الحمل . تم تشخيص الإجهاض من ملاحظة الأجنة مع المشيمة على فرشة الفئران، وخروج الدم من المهبل، وملاحظة تثخن القرون الرحمية (Thick Uterus Horns) الخالية من الأجنة، وتعرج سطحها (Wrinkle)، بعد تشريح الفئران واستئصال قرونها الرحمية .

أشارت دراسة (Kirkbride *et. al*, 1992) إلى أن نسبة حدوث الإجهاض في الأبقار المتغذية على الأعلاف المصابة بفطر الزيرالينون (Zearalenone) تتراوح 3.53 %- 5.3% . وقد عزا ذلك إلى تأثير السموم الفطرية على إفراز وعمل هرمون الاسترادايول -17(Esradiol-17) في تهيئة الرحم لغرس الجنين.

جدول رقم (1): تأثير الاوكراتوكسين-A بتركيز 1mg/kg والاوكراتوكسين-A مع مستخلص الزعفران تركيز 100 mg/kg في معدل أوزان جسم الامهات الحوامل للمدة (1-14) يوما من بدء الحمل

المجاميع المعاملة التركيز: (mg/kg)	المتوسط ± الخطأ القياسي	
	الوزن الابتدائي (قبل التجربة)	الوزن النهائي (بعد التجربة)
السيطرة (مستخلص الزعفران)	25.51 ±.26 a	38.94 ± 0.05 a
الاوكراتوكسين-A تركيز 1mg/kg	27.13 ± 0.79 a	27.19 ±1.02 b
الاوكراتوكسين-A +مستخلص الزعفران تركيز 100 mg/kg	25.10 ±2.44 a	26.72 ±2.29 b

المتوسطات التي تحمل حروف مختلفة ضمن العمود الواحد تختلف معنويا فيما بينها عند مستوى (P<0.05)

أظهرت نتائج معاملة الفئران الحوامل بالاوكراتوكسين-A بتركيز 1mg/kgوللمدة (1-14) يوما من بدء الحمل وجود فروق معنوية في معدل تركيز الإنزيمات التأكسدية وهي (Arginase , MDA)، ومعدل تركيز الانزيمات المضادة للتأكسد وهي (Catalase , Peroxidase) في مصل دم الحوامل المعاملة مقارنة مع مجموعة السيطرة (المجرعة بمستخلص الزعفران) (الجدول رقم 2) . بينت النتائج حصول ارتفاع معنوي في معدل تركيز إنزيم MDA عند مستوى (P≤ 0.05) لحيوانات المجاميع التجريبية بعد المعاملة بالاوكراتوكسين- A وعند التركيز 1mg/kg ، وللمدة (1-14) يوما من بدء الحمل، مقارنة مع مجموعة السيطرة . كما أظهرت النتائج حدوث ارتفاع معنوي عند مستوى (P≤ 0.05) في معدل تركيز إنزيم Arginase بعد المعاملة بالاوكراتوكسين-A وبالتركيز 1mg/kg وللمدة (1-14) يوما من بدء الحمل، مقارنة مع مجموعة السيطرة. كما بينت نتائج المعاملة بالاوكراتوكسين- A وجود انخفاض معنوي عند مستوى (P≤ 0.05) في معدل تركيز إنزيمات CAT و Peroxidase وللتركيز 1mg/kg وللمدة (1-14) يوما من بدء الحمل (الجدول رقم 2) . وقد أشارت دراسة (Hou *et. al.,* 2013) إلى أن سموم الأفلاتوكسين (Aflatoxin) بتركيز 729 µg/kg والزيرالينون (Zealalenone) بتركيز 597 µg/kg تتسبب في إحداث جهد تأكسدي في الخلايا، مما يؤدي إلى زيادة مستوى إنزيمي MDA و glutathione peroxidase (GPx) التأكسدي، بينما ينخفض مستوى إنزيم الكاتاليز (CAT) في مصل دم الفئران المعاملة بالسموم الفطرية . إن زيادة تركيز الإنزيمات التأكسدية يتأتى من تكون الجذور الحرة (ROS) الناتجة عن السموم الفطرية ، حيث أشارت دراسة (Jun *et. al.*, 2015) (20) إلى أن تعرض إناث الخنازير (Borcines) من الحوامل إلى سموم الأفلاتوكسين B1 (AFB1) بتركيز 50 µM خلال الأيام الأولى من الحمل يتسبب في تثبيط نمو الكيس الأرومي (blastocyst) ومنع خلاياه من إكمال الانقسام، وسبب ذلك هو أن الإنزيمات التأكسدية تمنع تكون خيوط المغزل (spindle filaments) من الاكتين (Actin) المهمة لاصطفاف الكروموسومات عليها خلال أحد أدوار الانقسام الخلوي، مما يؤدي إلى توقف الانقسامات وعدم تكون الجنين .

أظهرت النتائج وبعد معاملة الفئران الحوامل المجرعة بالاوكراتوكسين-A تركيز 1mg/kg بالمستخلص الكحولي لمياسم الزعفران بتركيز 100 mg/kg للمدة (1-14) يوما من بدء الحمل وجود ارتفاع معنوي عند مستوى (P≤ 0.05) في معدل تركيز إنزيمي MDA و Arginase، حيث بلغت قيمتهما (28.80 ± 0.61) و (2.03 ±0.09) على التوالي (الجدول رقم 2). كما تبين وجود انخفاض معنوي عند مستوى (P≤ 0.05) في معدل تركيز أنزيمي الكاتاليز والبيروكسيديز، وقد بلغت قيمتهما (27.91 ±0.38) و(70.69 ±0.93) على التوالي مقارنة مع مجموعة السيطرة. تسبب مستخلص الزعفران في التقليل من التأثير التأكسدي للأوكراتوكسين-A وتكوين الجذور الحرة التي تمنع تكوين الجنين وعمل الانزيمات التأكسدية في تثبيط تكون الكيس الأرومي (blastocyst) . كما بينت النتائج حدوث الإجهاض (abortion) في الفترات (1-11) (13-1) (15-1) يوما من بدء الحمل. وقد أشارت دراسة (Still *et. al.*,2011) إلى حدوث إجهاض للحيوانات كالأبقار (bovines) والأرانب (rabbits)، والتي تتغذى على الأعلاف الملوثة بالسموم الفطرية . وقد أكدت دراسة (Ribelin *et. al.*, 2013) على أن الاوكراتوكسين-A يتسبب في موت وإجهاض أجنة المواشي (Rominants) كالماعز (goats) بعد معاملة الأمهات الحوامل به بتركيز 3 mg/kg . وقد عزوا ذلك إلى حدوث حالة التسمم في كبد وكلى الأمهات الحوامل مع زيادة مستوى الإنزيمات التأكسدية (oxidant enzymes) في مصل الأمهات، والذي ينعكس تأثيرها على الأجنة . إن الاوكراتوكسين مركب ذو جزيئات صغيرة تستطيع النفوذ عبر المشيمة (placenta) ليتراكم في أنسجة الأجنة لحيوانات مختلفة وبالتالي يتسبب في سميتها مؤديا إلى حدوث الإجهاض في فترات مختلفة من الحمل (Diekman and Green, 2014). كما أشارت دراسة (Premkumar *et. al.*, 2001) إلى أن الزعفران من المواد الواقية للخلايا التي تحميها من التأكسد الحاصل بفعل كثير من المواد السامة والمؤثرة على المادة الوراثية DNA لها والمسماة بالسموم الجينية (genotoxin). فقد بين (Makhlouf, 2011) بأن

الزعفران من النباتات المضادة للأكسدة (antioxidant plants) ، وأن خاصيته في تعزيز الصحة تعود إلى وجود مادة مضادة للأكسدة هي الكروسين (crocin) المتمثلة بالكاروتينويدات (carotenoids) . وهذه المواد هي التي تكسب المياسم اللون الأصفر البراق . وتاتي خاصية الزعفران المضادة للأكسدة من فعاليته في إزالة الجذور الحرة المتولدة وبخاصة بيروكسيدات الدهون (lipid peroxidate)، وزيادة فعالية الإنزيمات المانعة للأكسدة مثل أنزيم superoxide dismutase.

جدول رقم (2): تأثير الاوكراتوكسين-A بتركيز 1mg/kg والاوكراتوكسين-A مع مستخلص الزعفران تركيز 100 mg/kg في معدل تركيز الانزيمات التأكسدية والمضادة للتأكسد للمدة (1-14) يوما من بدء الحمل

التركيز (mg/kg)	المتوسط ± الخطأ القياسي			
	MDA (nmol/ml)	Arginase (mg/ml)	CAT (U/L)	Peroxidase (U/L)
Control مستخلص الزعفران	0.58 ± 8.03 c	0.05 ± 1.423 c	1.47 ± 35.98 a	1.47 ± 85.71 a
الاوكراتوكسين-A تركيز 1mg/kg	a 3.86 ± 43.32	a 0.03 ± 3.70	0.25 ± 17.06 c	± 55.75 b 2.39
الاوكراتوكسين-A +مستخلص الزعفران تركيز 100mg/kg	0.61 ± 28.80 b	0.09± 2.03 b	0.38± 27.91 b	0.93± 70.69 c

المتوسطات التي تحمل حروفا مختلفة ضمن العمود الواحد تختلف معنويا فيما بينها عند مستوى (P<0.05)

المصـــــــــادر

Brien B. and Dietrich DR. (2005). Ochratoxin A: The Continuing Enigma. *Journal of Toxicology*. 35(1), 33-60.

Diekman MA. and Green ML. (2014). Mycotoxins and reproduction in domestic livestock. *Journal of Animal Sciences*. 70,1615-1627.

Hou, YJ., Zhao, YY., Xiong, B., Cui, WS., Kim, NH., Xu, YX. and Sun, SH. (2013). Mycotoxin-Containing Diet Causes Oxidative Stress in the Mouse. *Journal of Toxicology, Environment and Health*. 3(8), 374.

Hsuuw, YD., Chan, WH. and Yu, JS. (2013). Ochratoxin A Inhibits Mouse Embryonic Development by Activating a Mitochondrion-Dependent Apoptotic Signaling Pathway. *Journal of International Molecular Sciences*. 14(1), 935-953.

Jan, S., Wani, AA., Kamili, AM. and Kashtwari, M. (2014). Distribution, chemical composition and medicinal importance of saffron (*Crocus sativus L.*) . *African Journal of Plant Sciences*. 8(12), 537-545.

Jun Liu, J., Wang, QC., Han, J. and Sun, SC. (2015). Aflatoxin B1 is toxic to porcine oocyte maturation. *Journal of Medical Sciences*. 28, 200–213.

Khorasany, AR. and Hosseinzadeh, H. (2016). Therapeutic effects of saffron (*Crocus sativus* L.) in digestive disorders: a review. *Journal of Basic Medical Sciences*. 19 (5),455-469.

Kirkbride, CA. (1992). Etiologic agents detected in a 10-year study of bovine abortions and stillbirths. *Journal of Veterinary Diagnosis and Investment*. 4,175-180.

Kuan, MM., Ehrlich, V., Delatour,T., Cavin, C. and Schilter, B. (2011). Evidence for a Role of Oxidative Stress in the Carcinogenicity of Ochratoxin**.** *Ameriacn Journal of Toxicology***.** 51(1),61–99.

Linardaki, ZI., Orkoula, MG., Kokkosis, FN., Lamari, AG. and Margarity, M. (2013). Investigation of the neuroprotective action of saffron (*Crocus sativus* L.) in aluminum-exposed adult mice through behavioral and neurobiochemical assessment. *Food and Chemical Toxicology*. 52,163-170.

Magdalini, A., Papandreoua, M., Tsachakib, S., Efthimiopoulosb, P., Cordopatisc, FN., Lamaric, M. and Margaritya, R. (2011). Memory enhancing effects of saffron in aged mice are correlated with antioxidant protection . *Journal of Behavior Brain Research*. 219,197-204.

Mahmoud, B., Rafieian, M., Baradaran, A., Rafieian, S. and Kopaei, MR. (2014). Nephrotoxicity and hepatotoxicity evaluation of *Crocus sativus* stigmas in neonates of nursing mice. *Journal of Nephropathology*. 3(2),81-85.

Makhlouf, H. (2011). Determination of antioxidant activity of saffron taken from the flower of *Crocus sativus* grown in Lebanon. *Journal of Biotechnology*. 10(41), 8093-8100.

Nilakshi, N., Vijay, GR. and Abhyankar, MM. (2011) . Detailed Profile of *Crocus sativus*. *International Journal of Pharmacy and Biological Sciences*. 2(1),530.

Premkumar, K., Abraham, SK., Santhiya, ST., Gopinath, PM. and Ramesh, A. (2001). Inhibition of Genotoxicity by Saffron (*Crocus sativus*L.) in mice. *Drug and Chemical Toxicology*. 24(4),421-428.

Provos, J. (2015). Anticancer Properties of Saffron. *Current Pharmaceutical Biotechnology Journal*. 13(1),173-179.

Qusti, SY. and Qahtani, JM . (2015) . Neuroprotective role of Saffron against Acrylamide-Induced Neurotoxicity in Rats by Antioxidative Activity. *Journal of Environmental Sciences and Toxicology*. 3 (9),91-101.

Ribelin, WE., Fukushima, K. and Still, PE. (2013). The toxicity of ochratoxin to ruminants. *Canadian Journal of Comparative Medicine.* 42(2), 172–176.

Schaaf, GJ., Nijmeijer, SM., Maas, RF., Roestenberg, P., de Groene, EM. and Fink-Gremmels, J. (2002). The role of oxidative stress in the ochratoxin A – mediated toxicity in proximal tubular cells. *Biochimica et Biophysica Acta.* 1588, 149–158.

Still, PE., Macklin, AW., Ribelin, WE. and Smalley, EB. (2011) . Relationship of Ochratoxin A to Foetal Death in Laboratory and Domestic Animals. *American Veterinary Medicine Association*. 155, 500.

Tzanidi, C., Proestos, C. and Markaki, P. (2012). Saffron (Crocus sativus L.) Inhibits Aflatoxin B 1 Production by Aspergillus parasiticus. *Journal of Advancement in Microbiology*. 2,310-316.

Walter, LM., Rogers, PA. and Girling, JE. (2005). The role of progesterone in endometrial angiogenesis in pregnant and ovariectomised mice. *Research in Reproduction.*129,765 – 777.

Zhu, L. , Yu, T., Qi, X., Gao, J. , Huang, K., He, X., Luo, H. and Xu, W. (2016). Limited Link between Oxidative Stress and Ochratoxin A—Induced Renal Injury in an Acute Toxicity Rat Model. *Journal of Toxins.* 8(12),373.

Ziaee, T., Razavi, BM. and Hosseinzadeh, H. (2014). Saffron Reduced Toxic Effects of its Constituent, Safranal, in Acute and Subacute Toxicities in Rats . *Jundishapur Journal of Natural Pharmaceutical Products*. 9 (1), 3-8.