HISTOPATHOLOGICAL STUDY OF THE TOXICITY EFFECT OF SILK DYE WASTE ON KIDNEY OF SWISS ALBINO MICE *MUS MUSCULUS* AND MITIGATION BY USING *MORINGA OLEIFERA* LEAF POWDER.

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ABSTRACT

The silk dye (Azo dye) waste is one of the most potential harmful chemicals liberated in the environment in an unexpected manner. Silk dye waste is widely used as a potent dyeing of yarn and fabrics in many countries and has been shown to produce some adverse health effects. The present study was undertaken to investigate the toxic effects of the silk dye waste on kidney and mitigation using *Moringa oleifera* leaf powder. Five sets of animals i.e. Group-I (Control), Group-II (fed with 50% silk dye), Group-III (fed with 100% silk dye), Group-IV (mice fed with 50% dye treated with *M. oleifera* leaves powder), Group-V (mice fed with 100% dye treated with *M. oleifera* leaves powder) have been taken for experiment. The dose of silk dye was 2ml/day to both groups II and III and *M. oleifera* leaf is given as per the standard dose (300mg/kg b.w) to both animals of group IV and V. The result was demonstrated when treated with silk dye waste showed some changes including glomerular degeneration, tubular collapse, haemorrhage, infiltration, hydropic changes, glomerular shrinkage and compressed blood vessel but their completely mitigation using *M. oleifera* leaf powder. These results, along with previous observation, suggest that *M. oleifera* may be useful in kidney tissues damage that is a result of silk dye waste effluent toxicity.

Keywords:

Silk dye waste effluent,
Moringa oleifera leaf powder,
Histopathology,
Kidney,
Swiss albino mice *Mus musculus.*

I. INTRODUCTION

The human are exposed to various type of environmental contaminants at different stage of their life span, widely held of them are harmful. Silk dye waste is one of the major sources of hazardous pollutants. Industrialization is a godsend of independent India but that is allied with hazardous effluents and discharges polluting the environment. Silk industry as textile provides an important economic stand to the artisans but the dye waste or spent wash arising from the manufacturing unit cause great menace ,if released in the open. Silk dye waste effluents are more toxic to environment than the domestic sewage. Bhagalpur (25˚17'N latitude and 86˚83'E longitude) is endowed with age old silk fabric and yarn production units. Here, the manufacturers use mostly synthetic dye such as azo dyes as colorant for their products. Azo dye forms the largest and most important Silk industry provides an important economic group of synthetic dyes (Mathur et al., 2005).

Moringa oleifera leaf extract is from *Moringa oleifera* Lamark tree. It is considered one of the world's most useful trees, as almost every part of the tree can be used for food, or has some other beneficial medicinal properties. It is commonly known as 'drumstick' and is being used as antiulcer, diuretic, anti- inflammatory, anti-microbial, potent- antioxidant and wound healing agent (Caceres et al., 1991; Udupa et al., 1994; Kurma and Mishra, 1998; Saalu et al., 2011 Bassey et al., 2013), pharmacological properties (Oliveira et al, 1999), it's an exceptional nutritious vegetable (Ram,1994). Its leaves are used as nutrional supplement and growth promoter because of significant presence of protein, selenium, calcium, phosphorus, β-carotene and γ-tocopherol in it (Nambiar and Seshadri, 2001; Lakshminarayana et al., 2005; Sanchez- Machado et al., 2006).

The kidney is a major component of the urinary system, which maintains body homeostasis through filtration, active and passive absorption, and secretion. The final product of the filtration processes is urine which contains eliminated waste metabolic products. The kidneys are equally involved in the regulations of fluid and electrolyte balance, blood pressure and erythropoiesis (Junqueira & Carneiro, 2007). The potential toxicity of medicinal plants is, however, of great concern (Adedapo *et al*, 2009).

This study was therefore designed to investigation the effect of *Moringa oleifera* on silk dye waste effluent induced kidney in mice *Mus musculus*.

II. MATERIAL AND METHODS:

Animals: Experiment was performed on 6 to 8 weeks old healthy laboratory inbreed mice *Mus musculus* weighing about 25-30 grams. The animals were obtained from University Department of Zoology, Bhagalpur. Mice were reared and maintained at the animal house of University Dept. of Zoology, T.M.Bhagalpur University, and Bhagalpur under standard conditions and fed with nutritional diet and water.

Collection of Plant material: *Moringa oleifera* leaf powder has been procured from own home product (with the help of ECHO Technical Note, By Beth Doerr and Lindsay Cameron, 2005, North Fort Myer, FL 33917, USA) Bhagalpur, Bihar, India.

Collection of silk dye waste: Silk dye waste effluents were collected directly from discharge point of silk dye industries of Nathnagar, Bhagalpur at regular interval.

Experimental Design: The mice were divided into 5 groups of 8 animals each. Gr-I (control mice), Gr-II (mice treated with 50% silk dye waste), Gr-III (mice treated with 100% silk dye waste), Gr-IV (mice fed with 50% dye treated with *M. oleifera* leaves powder), Gr-V (mice fed with 100% dye treated with *M. oleifera* leaves powder).

Dosage: The control group was given normal food and water. Silk dye waste was administered orally 2ml/day (Chaurasia et al, 2005) group II and III for 30 and 60 days duration. M. oleifera leaf powder was also fed orally 300mg/kg b.w to both the group IV and V for 30 and 60 days exposure as per the method suggested by Chatterjee et al, 2013.

Biological assays: Histopathological observation on kidney.

Tissue processing and staining: After 30 and 60 days of experiment, mice were sacrificed and their organs were removed, were fixed in fixative and paraffinised, Haematoxylin-Eosin stained section of Kidney were observed under light microscope (Pears, 1985) on 40X magnification.

III. RESULTS

Histopathological Observation on Kidney: Histopathological study on the kidney of control (Group-I) mice showed normal histoarchitecture with capillaries, tubules, glomerulus and Bowman's capsule (Fig-1). In case of Group-II treated with 50% silk dye waste at 30 days showed glomerular worsening and tubular degeneration (Fig-2). Group-IV treated with *M. oleifera* leaves powder at 30 days showed regeneration of glomerulus and tubules (Fig-3). Treated with 100% silk dye waste (Group-III) at 30 days showed haemorrhage, infiltration, hydropic change and tubular collapse (Fig-4). Group-V treated with *M. oleifera* leaf extract at 30 days showed tubular regeneration, amelioration of haemorrhage and more or less normal filtration (Fig-5). In case of Group-II treated with 50% silk dye waste at 60 days showed tubular amplified lumen, tubular erosion and glomerular shrinkage (Fig-6). Group-IV treated with *Moringa oleifera* leaf extract at 60 days showed narrowed tubules lumen, tubular regeneration and glomerular growth (Fig-7). Treated with 100% silk dye waste (Group-III) at 60 days showed glomerular erosion, hydropic changes, tubular degeneration, and tubular broadened lumen and compressed blood vessel (Fig-8). In case of Group-V treated with M. oleifera leaf extract at 60 days showed glomerular regeneration, narrowed tubular lumen and like of normal tissue architecture (Fig-9).

Group-I (Fig-1)

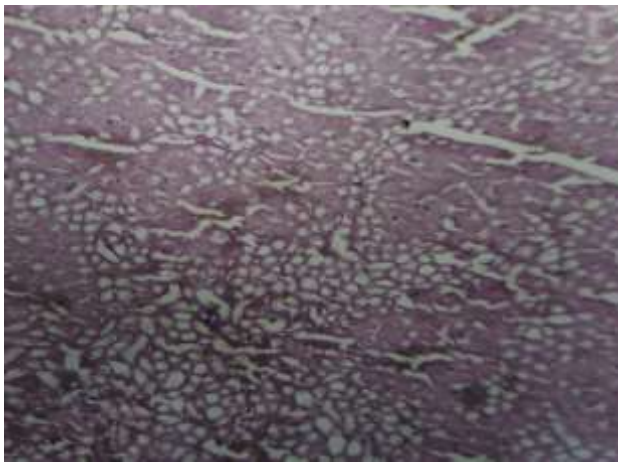

Figure:-1. Photomicrograph of kidney section of mice showed, normal histoarchitecture. (x40, H&E).

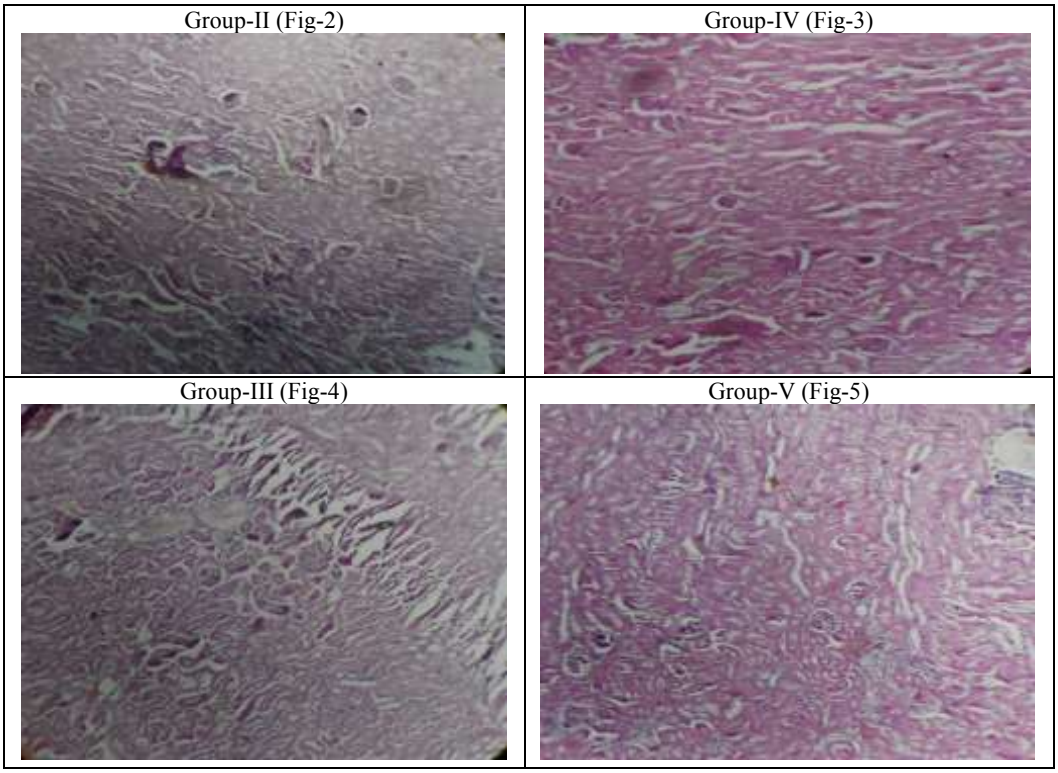

Figure:-2. Photomicrograph of kidney section of mice showed, Glomerular worsening and tubular degeneration. **(x40, H&E). Figure:-3.** Photomicrograph of kidney section of mice showed, regeneration of glomerulus and tubules. **(x40, H&E). Figure:-4.** Photomicrograph of kidney section of mice showed, haemorrhage, tubular erosion and infiltration. **(x40, H&E). Figure:-5.** Photomicrograph of kidney section of mice showed, amelioration of haemorrhage and mitigation of filtration. **(x40, H&E).**

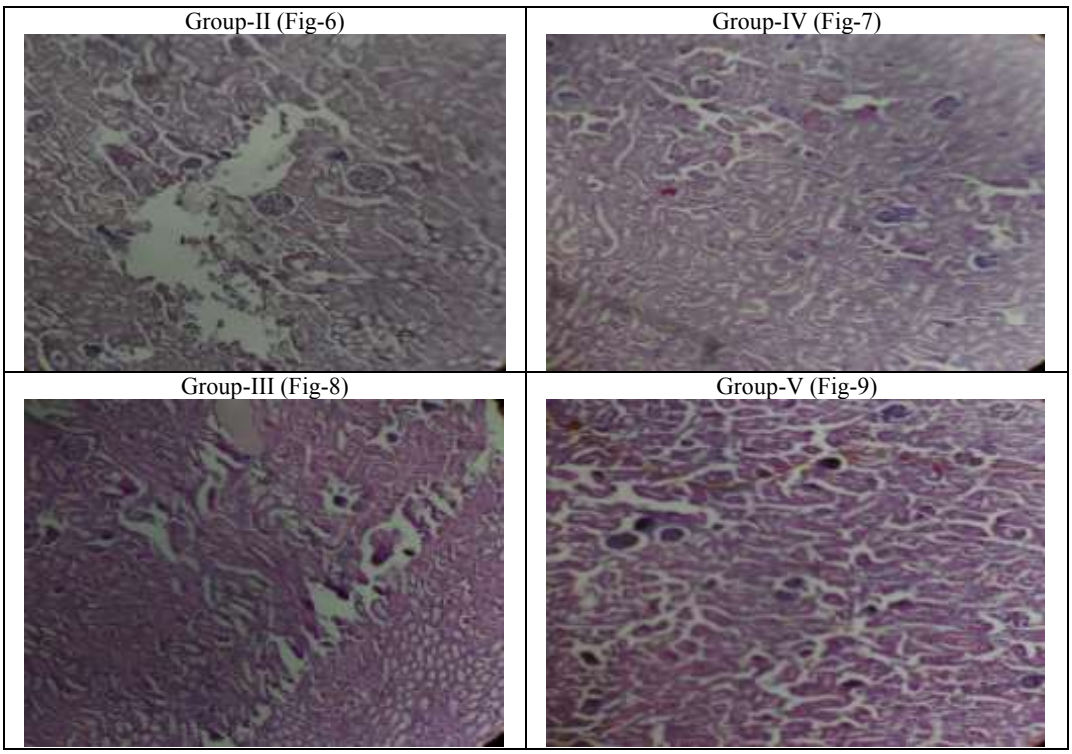

Figure:-6. Photomicrograph of kidney section of mice showed, tubular amplified lumen and glomerular shrinkage. **(x40, H&E). Figure:-7.** Photomicrograph of kidney section of mice showed, narrowed tubules lumen and glomerular growth. **(x40, H&E). Figure:-8.** Photomicrograph of kidney section showed, glomerular erosion, hydropic changes, tubular broadened lumen and compressed blood vessel. **(x40, H&E). Figure:-9.** Photomicrograph of kidney section of mice showed, normal architecture of glomerulus and kidney tubules. **(x40, H&E).**

IV. DISCUSSION

In the present experimental study were investigated, the histopathological effects of silk dye waste effluent on mice kidney and their significant mitigation using *Moringa oleifera* leaf extract. The results in this study agree with the finding of Kerem et al (2007) and Afshar et al (2008) they reported kidney damage such marked tubular dilation, hydropic degeneration in lining epithelium, moderate congestion and haemorrhage in the cortical male Wistar rats exposed some organophosphate pesticides. Tubular degeneration, glomerular atrophy, leucocytic infiltration and congestion of renal blood vessels were noticed during deltamethrin- intoxication in kidneys of male Wistar rats (Sakr and Al-Amoudi, 2012). It appeared results of Al-Sharqi et al (2012) noticed large haemorrhagic areas, lobulated glomeruli, congested blood vessels, degenerative changes and infiltration of inflammatory cells in kidneys of insecticide treated mice. It has been reported that C. tinctorius has immense medicinal and therapeutic properties (Bahmanpour et al, 2012). It has been demonstrated that herbal toxicity clearly represents a serious human health threat and is an important issue to be tackled (Chen et al, 2011). Estimation of renal excretion of waste metabolites and histological changes in the kidney has provided useful information on the health status of the kidney (Panda, 1989).

Moringa oleifera's leaves have been traditionally used as anti-diabetic, anti-bacterial, anti-headache, antihypertensive, anti-fever and anti-inflammatory herbal drug (Fahey, 2007; Paliwal *et al*, 2011; Anwar *et al*, 2009). Due to cheap affordability by low-income earners, *Moringa oleifera* leaves have similarly been promoted as components of foods, nutritional supplements or medicines by patients with HIV/AIDS by several African governments (Monera *et al*., 2008) and as supplement to maize traditional complementary food to improve iron status in infants in Nigeria (Nnam, 2009). The widespread public use of *Moringa oleifera* leaves provides the reasons for the need to establish its safety and toxicological profile. Alanine and Aspartate Transaminases are primary enzymes of the liver but are also present in the kidney (Nwangwu Spencer *et al*., 2011, Nwagwa, 2012). Elevated levels of Alanine and Aspartate Transaminases are, therefore, possible indicators of liver and kidney damage (Nwangwu Spencer *et al*, 2011; Nwagwa, 2012). Similarly, urea concentrations provide one of the direct measurements of glomerular filtration rate and when elevated is indicative of kidney damage (Nwangwu Spencer *et al*, 2011; Nwagwa, 2012). The observed elevated levels of urea, Alanine and Aspartate Transaminases implied that administrations of extract doses of *Moringa oleifera* leaves resulted in adverse effects on the blood filtration capacity of kidneys due to possible compromise of the integrity of glomerular membranes.

On the basis of above discussed histopathological observations and facts it can be concluded that the *M. oleifera* leaf powder significantly reduce the alteration arisen in damage of kidney section and associated structures in the toxicity impact of silk dyes waste effluent induced mice *Mus musculus.*

REFERENCES

[1] **Adedapo, A. A.; Mogbojuri, O. M. & Emikpe, B. O. (2009).** Safety evaluations of the aqueous extract of the leaves of Moringa oleifera in rats. J. Med. Plants Res., 3(8):586-91.

[2] **Anwar, F.; Latif, S.; Ashraf, M. & Gilani, A. H. (2007)**. Moringa oleifera: a food plant with multiple medicinal uses. Phytother. Res., 21(1):17-25.

[3] **Fahey, J. W. (2005)**. Moringa oleifera: Moringa oleifera: A review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. Part 1. Trees for Life Journal.

[4] **Junqueira, L. C. & Carneiro, J. (2007).** Basic Histology: Text & Atlas. 11th Ed. New York, McGraw-Hill.

[5] **Monera, T. G.; Wolfe, A. R.; Maponga, C. C.; Benet, L. Z. & Guglielmo, J. (2008).** Moringa oleifera leaf extracts inhibit 6betahydroxylation of testosterone by CYP3A4. J. Infect. Dev. Ctries., 2(5):379-83.

[6] **Nnam M. N. (2009).** Moringa oleifera leaf improves iron status of infants 6-12 months in Nigeria. Int. J. Food. Saf. Nutr. Public Health, 2(2):158-64.

[7] **Nwangwa, E. K. (2012).** The reno-protective effects of coconut water on the kidneys of diabetic Wistar rats. J. Health Sci., 2(1):1-4.

[8] **Nwangwu Spencer, C. O.; Josiah Sunday, J.; Abubakar Teslimat, E.; Ajeigbe Kazeem, O.; Osakwe Eguagie, O. & Akintola Akinola, A. (2011).** Comparative effects of aqueous and ethanolic leaf extracts of gongronema latifolium on serum, kidney and liver biomarkers of normal male rats. Asian J. Biol. Sci., 4(7):540- 7.

[9] **Paliwal, R.; Sharma, V.; Pracheta; Sharma, S.; Yadav, S. & Sharma, S. (2011).** Anti-nephrotoxic effect of administration of Moringa oleifera Lam in amelioration of DMBA-induced renal carcinogenesis in Swiss Albino mice. Biol. Med., 3(2):27-35.

[10] **Caceres A, Cabrera O, Morales O, Mollinedo P, Mendia P, 1991**. Pharmacological properties of M. oleifera. 1: preminary screening for antimicrobial activity. Journal of Ethnopharmacology, 33(3):213-216.

[11] **Kumar NA and Pari L.2003.** Antioxidant Action of Moringa oleifera Lam. against peroxidation in rats. J Med Food, 6(3):255-259.

[12] **Lakshminarayana R, Raju M, Krishnakantha TP, Baskaran V, 2005**. Determination of major carotenoids in a few Indian leafy vegetables by high-performance liquid chromatography. Journal of Agricultural and Food Chemistry, 53(8):2838-2842.

[13] **Nambiar VS, Seshadri S, 2001**.Bioavailability trials of β-carotene from fresh and dehydrated drumstick leaves(M. oleifera) in a rat model. Plant Food for Human Nutrition, 56(1):83-95.

[14] **Neogy, S; Mahapatra, S; Mandal, S.K. and Somenath, R (2008):** Amelioratory effect of Andrographis paniculata Neem on liver, kidney, heart, lung and spleen during nicotine induced oxidative strees. Environ. Toxicol. Pharma. 25:321-328.

[15] **Sanchez-Machado DL, Lopez-Cervantes J, Vazquez NJ, 2006.** High-performance liquid chromatography method to measure α and γ-tocopherol in leaves flowers and fresh beans from M. oleifera. Journal of Chromatography A, 1105(1-2):111-114.

[16] **Udupa SL, Udupa AL,Kulkrni DR,1994.**Study on the anti-inflammatory and healing properties of M. oleifera and marmelos. Fitoterapia, 65(2):119-123.

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