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EFFECT OF ADMINISTRATION OF *SOLANUM NIGRUM* FRUIT EXTRACT ON KIDNEY, LIVER, LUNGS AND HEART OF PARKINSON'S DISEASE RAT MODEL

Farzana Iftikhar[1], Shazia Perveen[2*], Sumaira Kanwal[3], Iram Qadeer[4], Muhammad Mazhar Ayaz[5]

[1'2*] Department of Zoology, The Women University Multan, Matital Campus.
[3] Department of Biosciences, COMSATS University Islamabad, Sahiwal Campus.
[4] Department of Zoology, Government Sadiq College Women University Bahawalpur.
[5] Department of Parasitology, Cholistan University of Veterinary and Animal Sciences, Bahawalpur.

***Corresponding Author:** Dr Shazia Perveen
*Department of Zoology, The Women University Multan, Matital campus,
drshazia.zool@wum.edu.pk

ABSTRACT
Solanum nigrum is used as a traditional medicinal plant to treat pneumonia, asthma and cancer. It has a widespread antioxidant, antimalarial, antimicrobial, wound healing, and anti-inflammatory activities. These activities are due to the presence of alkaloids, steroids, triterpenes, tannins, flavonoids, flavones, phenols, and glycosides. Parkinson disease (PD) is a most chronic and most progressive disease of the central nervous system. On a daily basis more than 100 people are diagnosed with Parkinson's disease. To study the effect of *Solanum nigrum* polyphenolic compounds on Parkinson's disease rotenone induced Parkinson's model was prepared. *Solanum nigrum* fruit extract contents were identified by Gas chromatograph mass spectrometry (GCMS) analysis. Rats were divided into four groups. First group as control group given sun flower oil, second group was given rotenone third group was given rotenone + *Solanum nigrum* fruit extract and the fourth group was treated with *Solanum nigrum* fruit extract. The second group showed Parkinson disease which was confirmed by different behavioral and chemical tests The third and fourth group showed therapeutic effect as compared to rotenone treated group. At necropsy, organ weight measurement and macroscopic evaluations of the kidney, liver, lungs and heart. Data analysis indicated that rotenone treated rats' damages body vital organs liver, kidney, heart and lungs tissues badly. The *Solanum nigrum* treated group histopathology showed that polyphenolic compounds have therapeutic effect on of kidney, liver and heart and not significant therapeutic effect on lungs.

Key Words: *Solanum nigrum*, Rotenone, Histopathology, Fruit extract. Tissue damage, Therapeutic effect.

Introduction
The use of herbal products has a marvelous contribution in the treatment and prevention of various diseases. Plant products have been used for a long time because they are a natural source of therapeutic agents[3]. *Solanum nigrum* plant is historically medicinal being its use by ancient Greece. All parts of Plant like stem leaves and fruits are used in traditional medicine. The juice of the plant is

used for treatment of ulcers and other skin diseases. The fruits are used as a laxative, appetite stimulant, tonic, and for treatment of excessive thirst and asthma. In oriental medicine *Solanum nigrum* (black night-shade) is most widely used plant, where it is considered to be antioxidant, anti-inflammatory, antitumor, hepatoprotective, anti-diuretic, and antipyretic antibacterial, mycotic infection, cytotoxicity, anti-convulsant and antiulcerogenic. It's also effective against HIV/AIDS and other STDs [4]. Alkaloids, tennis, flavonoids, paleobotanies, reducing sugars and steroids were all detected in the crude extract of the plant through phytochemical analysis. Alcohols, ethers, esters, carboxylic acids, Alkyl groups, methyl groups and anhydrides were all found in the extract after being analyzed with an infrared spectrophotometer to determine their respective functional group compositions [2]*Solanum nigrum* Linn. dried fruit ethanolic extract was tested for antioxidant and cytotoxic activities. The extract scavenged free radicals in a qualitative DPPH (1, 1- diphenyl-2-picryl hydrazyl) test. The anticonvulsant effects of an intraperitoneally administered aqueous extract of S. nigrum leaves were studied in chickens, mice, and rats[2].
Several studies have shown that variety of medicinal plants have toxic effects on animals and humans. Their toxicity alter cellular and biochemical components of blood and also change histopathology of internal vital organs [3]. This study was designed to check the toxic effect of rotenone and therapeutic effect of *Solanum nigrum* on rat vital organs by histopathological study.

Plant collection:
I have collected fresh leaves of *Solanum nigrum (*thorn apple) plants that belongs to the family *Solanaceae* from different areas of district Multan and Vehari Punjab, Pakistan. This plant grows in well drained, humus rich and wet soil. Collected plants put in plastic bags for further processing.

Preparation of extract:
After collection of plants washed with distilled water and air dried these parts of plants at room temperature for 10 days. Dried leaves of *Solanum nigrum* crushed in laboratory blander. The grinded powder of both plants was soaked in methanol for 15 days. After 15 days the leaves extract was filtered by filter paper. After filtration the rotary evaporator was used to concentrate the plant extracts and obtained pure extracts that were free from methanol[7]. The overall plant extraction was performed following the protocol described by Abebe et al[1].

Rats as an Experimental Animal
The male albino rats were divided into 4 groups, Group 1: control (treated with sunflower oil), Group 2: Rotenone group, Group 3: *Solanum nigrum,* Group 4: *Solanum nigrum* + Rotenone. All groups were containing 6 rats (n=6).
Experiment was carried out with the administration of *Solanum nigrum* leaves extract after dissolving sunflower oil with the concentration (100 mg/ kg) of the *Solanum nigrum* leaves extract. After three days of acclimatization the control groups were started with administration of sun flower oil orally and *Solanum nigrum* leaves extracts were dissolved in sun flower oil and administered to polyphenols and *Solanum nigrum* + rotenone group orally. After the 15 days the polyphenols + rotenone group was administered with rotenone intraperitonially. The fourth group was administered with rotenone at 15 days. The weight of bodies and the intake of food was monitored before the experiment and then *Solanum nigrum* leaves extract and rotenone administration.

Results and Discussion
No abnormal theological change in the color, texture, and weight of kidney, liver, heart and lungs was recorded. Weight gain was not significantly affected by treatment with a *Solanum nigrum* but greatly affected rotenone. Following 28 days of administration shown specific change in the behavior in addition, no mortality was recorded all around the treatment period. Gross Examination and Weight of Organs. Macroscopic examination of liver, kidney, heart and lungs tissues did not reveal any gross structural alterations (Figure 1). The kidney functions in blood filtration, urine concentration, and

metabolic activation of exogenous chemicals [19]. The value of kidney function tests that we have recorded show significant variation between rotenone, *Solanum nigrum* and *Solanum nigrum*+ rotenone groups as compared to control. In rotenone group nephrons shape and function altered and visible in histopathological. Meanwhile *Solanum nigrum* showed therapeutic effect on kidney and significant difference can be observed. (Figure 1a). Similar effect of rotenone on the renal tubular epithelial cells was observed by Jiang et al. (2017) also suggested that rotenone alters oxidative stress and induced damage in the kidney tissues[5].

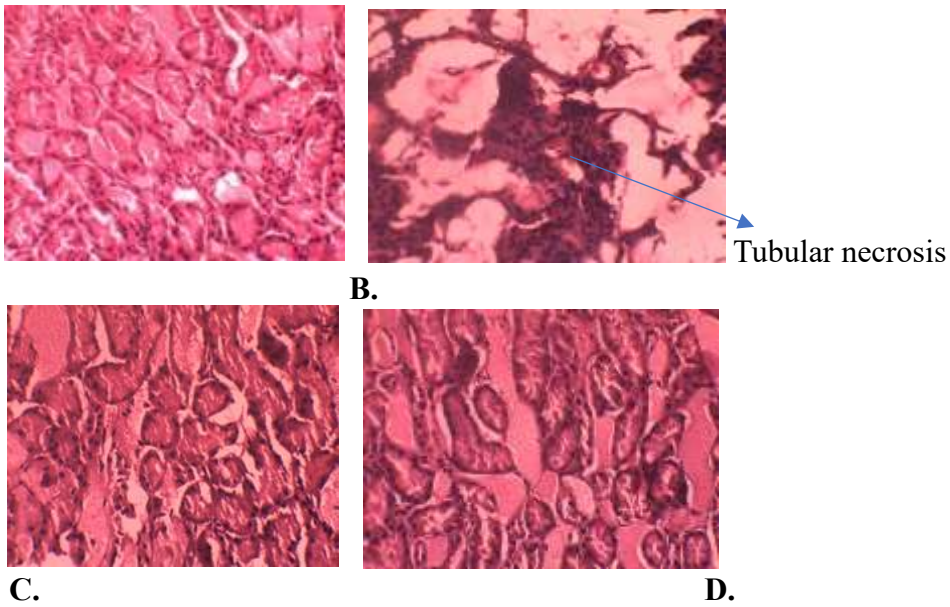
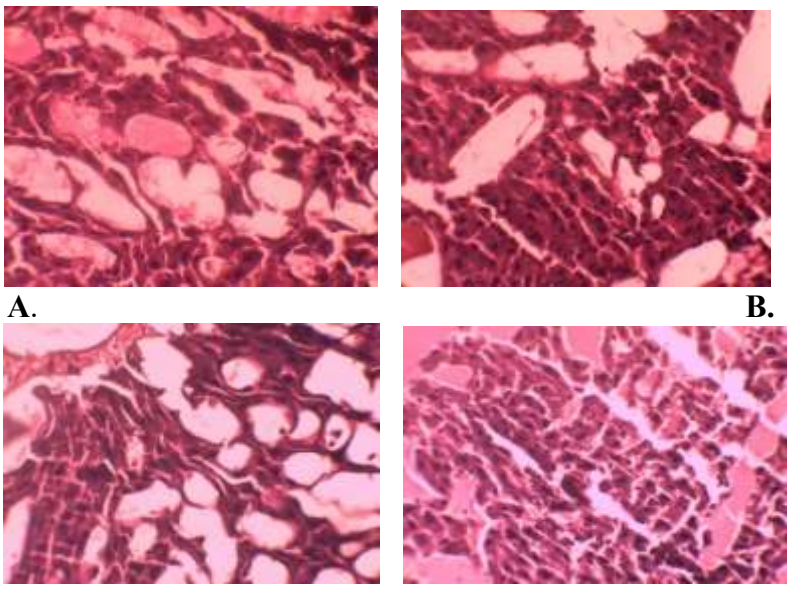


Fig 1: Histological alterations in the kidney cells after administration of *Solanum nigrum* and rotenone. (A) Photomicrograph of a kidney in the control group. (B) Photomicrographs of kidney after administration of rotenone. (C) Photomicrograph of kidney after administration of *Solanum nigrum.* Photomicrograph of kidney after administration of *Solanum nigrum*+rotenone.

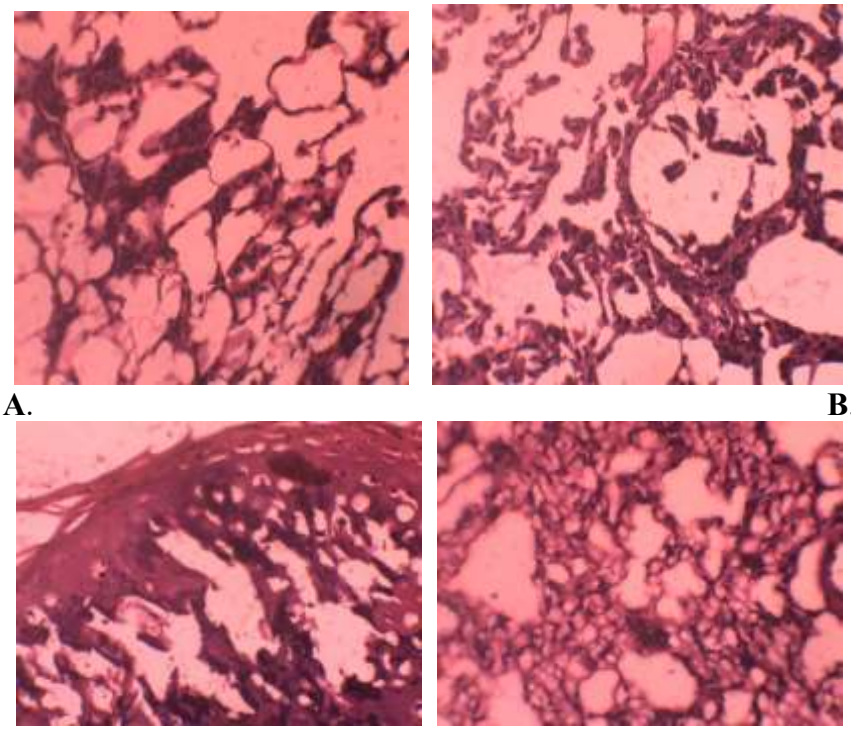
Liver is the main organs that prevents our body from Ingested body toxins. Changes in the liver function tests, usually due to liver cell impairment, has been communicated as a sign of hepatic toxicity. Effects on the Histopathology of Liver of all groups was not much significant as compared to other organs (Fig 2). In previous study the similar effect of rotenone on liver tissues was observed by [8].



C. **D.**

Fig 2: Histological alterations in the liver after administration of *Solanum nigrum* and rotenone. (A) Photomicrograph of a liver in the control group. (B) Photomicrographs of livers after administration of rotenone. (C) Photomicrographs of livers after administration of *Solanum nigrum.* (D*)* Photomicrographs of livers after administration of *Solanum nigrum*+rotenone. The blue arrow indicates central vein. The black arrows indicate hepatic cords.

Rotenone dust inhalation showed non-significant effect on lungs[6].Lungs are also important and sensitive organs of the body. lungs provide oxygen to the whole body and blood continuous circulate from lungs so toxicity effect on lungs very Effects on the Histopathology of lungs of all groups was very much significant as compared to other organs (Fig 2) Rotenone altered the normal shape of lungs as shown in (figure 3 B) Solanum nigrum treatment showed not any significant effect on lungs therapy (Fig 3 C) similarly no any significant change was observed in Solanum nigrum+ Rotenone group (Fig 3 D).



A. **B.**

C. **D.**

Fig 3: Histological alterations in the lungs after administration of *Solanum nigrum* and rotenone. (A) Photomicrograph of a lungs in the control group. (B) Photomicrographs of lungs after administration of rotenone. (C) Photomicrograph of lungs after administration of *Solanum nigrum.* (D*)* Photomicrograph of lungs after administration of *Solanum nigrum*+rotenone.

Heart plays a vital role in body functioning. Heart provides energy and important nutrients to the body. Blood circulates thorough whole body by heart so any harmful chemical or thing effect heart tissues directly. Histopathological study of heart tissues showed that significant change in cardiac tissues observed as compared to other organs (Fig 2) Rotenone altered the normal shape of cardiac tissues by inflammation as shown in (Fig 3 B).

Solanum nigrum treatment showed not any significant effect on lungs therapy (Fig 3 C) similarly no any significant change was observed in *Solanum nigrum*+ Rotenone group (Fig 3 D).

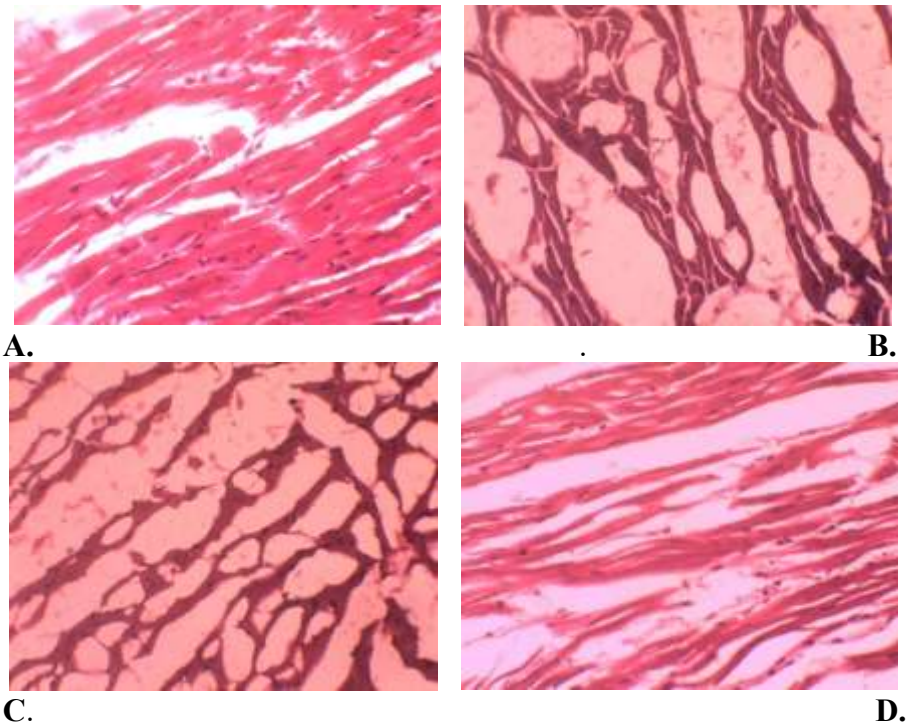


Figure 4: Histological alterations in cardiac tissues cells after administration of *Solanum nigrum* and rotenone. (A) Photomicrograph of a heart in the control group. (B) Photomicrographs of cardiac tissues after administration of rotenone. (C) Photomicrograph of cardiac tissues after administration of *Solanum nigrum*. (D*)* Photomicrograph of cardiac tissues after administration of *Solanum nigrum*+rotenone.

Conclusion

In conclusion, administration of rotenone altered the normal physiology of kidney liver and heart cells by creating oxidative stress in the cells in contrast Solanum nigrum have therapeutic effect on cells structure and function as well. There is no significant effect of Solanum nigrum on lungs tissues. It's concluded that *Solanum nigrum* phenolic compounds have ability to reduce oxidative stress and maintain the normal physiology of cells.

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