Hepatoprotective Potential of *Curcuma zedoaria* Roscoe against CuSO4 Pentahydrate Destruction in Wistar strain

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Abstract

The public is aware of the many health benefits of white turmeric, including its role as hepato-protector that works to eliminate toxins that penetrate the body, including contact to copper-Pentahydrate ($CuSO_4$), which is frequently encountered in daily life. Histopathological analysis of the livers of male-wistar rats was used to determine the effectiveness of an ethanol extract of white turmeric-rhizome (C.zedoaria) in protecting against copper-induced liver damage as well as the optimal dosage of the extract (C.zedoari). Simple random sampling is used to collect samples. After the data's normal distribution was established, the ANOVA assessment was performed, and a P. value of 0.001 (d"0.05) was achieved. The following values represent the average variations in the histologic structure of the wistar rat's liver: P.1 = 0.00/ 0.000, P.2 = 0.00/0.000, P3 = 2.00/1.42 (0.5g), P.4 (750mg/kg) 6.00/0.00, P.5=4.45/1.50; P.6(1g/ kg)6.00/0.000. This demonstrates that the P4 treatment group experienced the greatest degree of change in liver function, with an average of 6.00, and the P6 treatment group experienced the least change, with an average of 3.75. Our findings show that a 1000 mg dose of the ethanoic extract has significant hepatoprotective action.

Keywords

Curcuma zedoaria, hepatoprotection, copper.

1. INRODUCTION

The body of a human plays a crucial role for copper (Ahmed Hamdi *et al*., 2014). This metal can serve as the primary atom and is essential for controlling the movement of water throughout the human body. Hence, copper has been widely used for health benefits in the form of complexes and extra protein (Duncan *et al*., 2012). Hemoglobin production and growth are inhibited when the body lacks copper. The body requires copper for metabolism, the production of haemo-

globin, and several physiological processes (Ebner *et al.*, 2019). There are three forms available in Pakistan: white-turmeric gombyok (Kaempferiarotunda), mango-white turmeric (Curcumamango) and zedoaria white-turmeric (C.zedoaria, Roscoe).

One of the farming products derived from white turmeric, C. zedoaria, is utilised to protect the liver and possesses anti-tumor and antioxidant characteristics (Gafar *et al*., 2020). Curcuma zedoaria contains curcuminoids, which are bioactive substances. Examples include curcumin, dimethoxy curcumin, and bisdemethoxycurcumin. The methanol extract of Curcuma zedoaria, according to study, generated a pale-yellow oily solid that was non-crystalline, fragrant, and had an 8.7% yield (Gurrapu *et al*., 2016). Curcuma zedoaria was extracted with ethanol to provide an 8.2% extract yield, which resulted in a non-crystalline, pale yellow oily solid (Kaler *et al*., 2013). According to research C. zedoaria generated a maroon-brown (gummy), non-crystalline solid with a yield of 11.4% (Kimura *et al.*, 2013).

C. Zedoaria, according to research (Naqvi *et al*., 2012), may be used as remedial plants for a variety of ailments, including wounds, bruised teethaches, sore throats, increasing the effectiveness of radiation and chemotherapy for tumor patients, discomfort during periods (dysmenorrhea), amenorrhea, gastral disorders (dyspepsia), and liver swelling (Osorio-Tobón *et al*.,2016). Additionally, Curcuma Zedoaria shows immunostimulatory and cytostatic features. (Osredkar *et al*., 2011). The aim of this research was to compare the effects of $CuSO_4$ pentahydrate-induced liver damage with the use of extract in male rats' histopathological description. This was done to determine the opti-mal dose of extract that can prevent liver damage.

2. MATERIALS AND METHODS

This experimental study was carried out using a control group with a posttest only methodology. A straightforward random sample method was used for the sampling process. This experiment was run from December 2022 to February 2023 for a duration of two months. In the Pharmacology & Toxicology Laboratory of the department of Zoology, Emerson University Multan, where white turmeric rhizome ethanolicextract was made and test animals were treated. The herb was purchased from local market and identified by department of botany, Emerson University Multan. The Department of Histology, Emerson University Multan, produced liver histopathology. 24 male rats (Rattusnoverticus) of the wistar strain, aged 6 to 8 weeks, and weighing between 160 and 200 grammes served as the study's test subjects. Based on the Federer formulary for investigational tests, the size of the sample for this investigation was decided.

Group 1: Treatment of Test Animals: Standard fare and beverages were only provided to the normal group. Group 2: Negative control group received ordinary fare and beverages along with 500mg/kgBW of tested extract. Group 3: A positive-control group that received regular food and beverages devoid of tested extract but was given an oral solution containing $CuSO_4$pentahydrate at a dose of 4 mg per kg of body-weight once daily on days 10-14.

Group 4 received regular food and beverages, white turmeric extract 500 mg/kg ad-

ministered orally once daily for a total of 14 days straight using an intragastric oral tube, and a solution holding $CuSO_4$ pentahydrate 4m/kgBW on days 10, 11, 12, 13, and 14.

Group 5received regular food and beverages, tested extract at a dose of 750 mg/kgBW orally once daily for 14 days, and a solution holding 4 mg/kgBW of $CuSO_4$ pentahydrate on days 10, 11, 12, 13and 14.

Group 6 for 14 straight days, received tested extract orally via an intragastric oral tube at a dose of 1000 mg/kgBW along with regular meals and beverages. On days 10, 11, 12, 13, and 14, participants were administered a solution holding 4 mg/kgBW of $CuSO_4$ pentahydrate. The rats would be put down on day 15, followed by Persian surgical preparations, liver histology preparations, and microscopic examinations.

3. RESULTS AND DISCUSSION

This study observed the effects of tested extract as a liver protector in rats that were induced by $CuSO_4$ pentahydrate. The rats were separated into six groups: a control group, a negative control group, a positive control group, and three treatment groups that received different doses of the extract (500mg, 750mg, and 1000mg). The researchers analyzed the histopathological structure of the rat liver for each group and compared the changes that occurred. The results were described using a descriptive analysis.

The first group (control group) was only given normal food & drink, while the second group was given food, drink along with 500mg of tested extract. Both groups showed a usual liver-histology structure, wheresinusoidal clefts and hepatocyteswere clearly visible without any vacuoles. However, some impairment to the nucleus of cells were notorious, such as caries or-exand pyknosis which may ensue due to aging and cell death, and this is a normal physiological occurrence in all normal cells.

The positive-control group, which was only given $CuSO_4$, showed noteworthy liver impairment, including parenchymatous degeneration, hydropic degeneration and cell necrosis categorized by pyknosis. The core of the liver solidified, and its color became darker.

Groups 4 and 5 showed a lot of impairment in the form of parenchymatous-degeneration, hydropic-degeneration, necrosis characterized by pyknosis, vacuole (VA), and hemorrhagic (HM). It is worth noting that the degenerative changes are reversible, but sustained degeneration can lead to irreversible cell death (necrosis). The occurrence of cytoplasmic changes can indicate this transition. For hydropic degeneration, the cytoplasm undergoes vacuolization, while for degeneration, fat-filled vacuoles push the nucleus towards the edge of the cell (Puspita *et al*.,2019).

The treatment group 6 that received 1000mg of white turmeric extract (C. zedoaria) showed an improvement in terms of reduced parenchymatous degeneration and hydrophilic degeneration, although some abnormal liver structures remained. The curcumin component in white turmeric extract provides an antioxidant action, which is crucial for capturing free radicals that may harm the body (Saputra *et al.*, 2020). The positive control group, which only received CuSO4, showed significant liver damage.

4. CONCLUSION

The results of this research shows that 1000 mg of white turmeric extract (curcuma zedoaria) has hepatoprotective action against the histological explanation of the liver of Wistar rats exposed to large dosages of $CuSO_4$ pentahydrate.

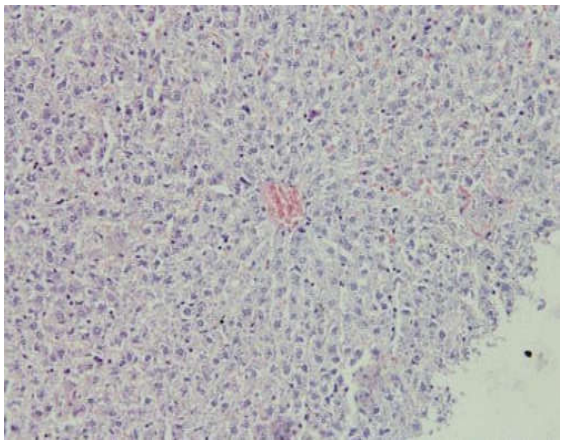

Fig.1*:* Microanatomical description of normal liver cells

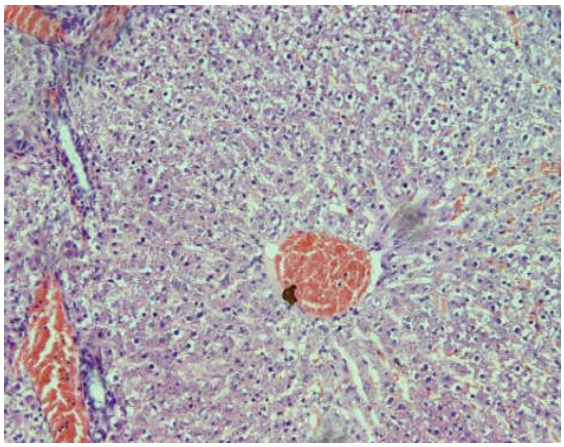

Fig.2: Microanatomical description of abnormal liver cells (*group 3)*

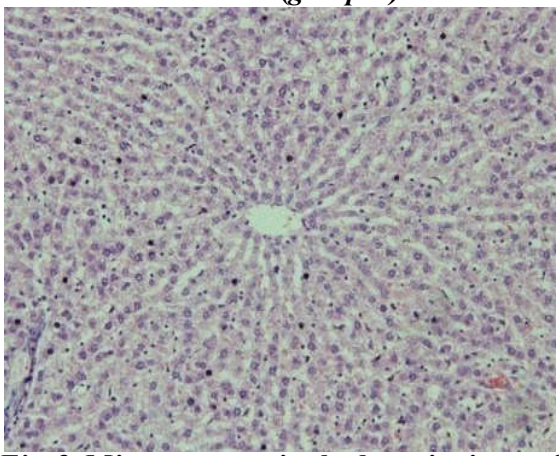

Fig.3*:*Microanatomical description of abnormal liver cells (*group 4, 5)*

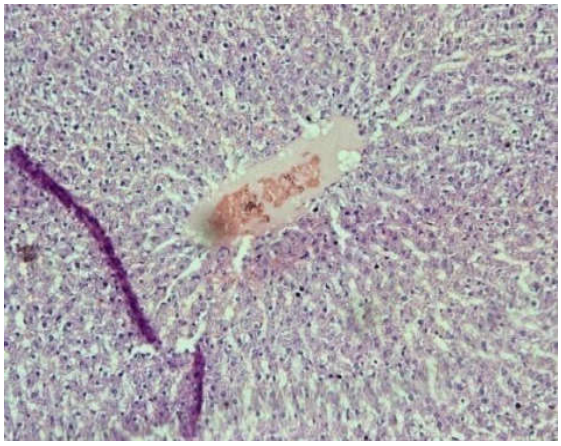

Fig.4 Microanatomy depiction of abnormal liver cells in the *group 6*

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