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Original Research Paper

Toxicology

# IN VIVO STUDY TO EVALUATE THE HEPATOPROTECTIVE ACTIVITY OF ROHITAKADI VATI AGAINST ALCOHOL INDUCED SUBACUTE HEPATOTOXICITY IN RATS

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**ABSTRACT** This study evaluated the hepatoprotective activity of Rohitakadi Vati, an Ayurvedic formulation, against alcohol-induced subacute hepatotoxicity in Wistar rats. A total of 24 rats were divided into four groups: control, disease control (alcohol), standard control (alcohol + Silymarin), and test (alcohol + Rohitakadi Vati). Over a 28-day period, parameters such as body weight, clinical signs, organ weights, biochemical markers, and histopathological changes were assessed. Results showed that Rohitakadi Vati significantly reduced alcohol-induced liver damage, as evidenced by improved biochemical parameters and reduced histopathological alterations compared to the disease control group. The study concludes that Rohitakadi Vati exhibits significant hepatoprotective effects comparable to Silymarin, supporting its potential use in managing alcohol-induced liver damage.

**KEYWORDS :** Alcohol, Rohitakadi Vati

## INTRODUCTION

The consumption of alcohol is widespread globally, with significant health implications, particularly concerning liver function. The World Health Organization (WHO) reports that 38.3% of the global population regularly consumes alcohol, with an average consumption of 6.4 litres per person annually. In India, about 30% of the population consumes alcohol frequently, with an average consumption of 4.3 litres per person annually, reaching as high as 11.4 litres in rural areas. [1]

Excessive alcohol consumption is a leading cause of liver diseases, including alcoholic liver disease (ALD), which can progress to cirrhosis and liver failure. Alcohol is metabolized predominantly in the liver, where it exerts toxic effects through its metabolic byproducts, leading to hepatocellular damage and inflammation. The enzyme alcohol dehydrogenase (ADH) metabolizes alcohol to acetaldehyde, a toxic compound that further contributes to liver injury. Chronic alcohol intake also induces oxidative stress and depletes hepatic antioxidants, exacerbating liver damage. [2,3]

In the context of liver disease management, Ayurveda offers several therapeutic formulations aimed at detoxifying the liver and preventing further damage. Rohitakadi Vati is one such Ayurvedic formulation noted for its hepatoprotective properties. Derived from the classical text 'Bhaishajya Ratnavali', from the chapter 'Pliha-Yakrutrog Chikitsa', Rohitakadi Vati has said to have tremendous action on liver diseases. [4,5] This study aims to investigate the hepatoprotective effects of Rohitakadi Vati in a rat model of alcohol-induced subacute hepatotoxicity, comparing its efficacy with Silymarin, a standard hepatoprotective agent.

## MATERIALS AND METHODS

### Sample Preparation

**1. Rohitakadi Vati:-** Administered at a dose of 45 mg/kg, prepared in carboxymethylcellulose (CMC).

**Table No.1 - Contents & Quantity of each Dravya in Rohitakadi Vati** [5]

| Name & Parts used | Quantity in Vati |
|---|---|
| Rohitak twak | 10 parts |
| Chitrak mooltwak | 10 parts |
| Yavani beej | 10 parts |
| Ikshurbeej (Kokilaksha beej) | 10 parts |
| Saindhav Lavan | 2 parts |
| Shuddha Navasagar | 1 part |
| Karanja Patra Swaras | Yathavashyak |

**Anupan** [5] **:-** Karavellak Swaras ~ Yathavashyak

**2. Silymarin** [6] **:-** Administered at a dose of 25 mg/kg, prepared in CMC.

**3. Alcohol** [7] **:-** Administered at 2 ml/100 g body weight, with a concentration ranging from 20-40%.

### Dose Calculation

- **Anaesthesia:-** Ketamine (75 mg/kg) and xylazine (10 mg/kg) were administered intraperitoneally for anaesthesia during blood sampling.
- **Rohitakadi Vati Dosage:-** Calculated using a human equivalent dose (500 mg) adjusted for a 200 g rat with a conversion factor of 0.018, resulting in a dose of 9 mg/200 g body weight (equivalent to 45 mg/kg) [8].

### Study Design

The study included 24 Wistar rats, equally divided by sex, weighing between 150-250 grams and aged 8-14 weeks. The rats were acclimatized for 7 days before being randomly assigned to one of four groups:

- **Group I (Control):-** No alcohol administration.
- **Group II (Disease Control):-** Alcohol administration (20-40% v/v) for 28 days.
- **Group III (Standard Control):-** Alcohol + Silymarin (25 mg/kg).
- **Group IV (Test Group):-** Alcohol + Rohitakadi Vati (45 mg/kg).

The rats were observed daily for clinical signs of toxicity and weighed weekly. At the end of the study, biochemical parameters, including serum glutamic-oxaloacetic transaminase (SGOT), serum glutamic-pyruvic transaminase (SGPT), alkaline phosphatase (ALP), total proteins, total bilirubin, and gamma-glutamyl transpeptidase (GGT), were measured. Histopathological analysis of the liver, kidney, brain, heart, and spleen was conducted on two animals from each group.

## RESULTS

### Effect of Rohitakadi Vati on Body Weight :-

Rats in the disease control group exhibited a slight increase in body weight compared to the control and treatment groups. Both Rohitakadi Vati and Silymarin groups showed significant weight gain compared to the disease control group, indicating a protective effect against alcohol-induced weight loss.

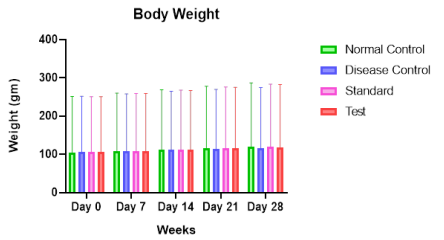


**Figure No. 1** Graphical Representation of Change in Body Weight

### Clinical Signs and Symptoms:-

Daily observations revealed no significant changes in skin, fur, eyes, mucous membranes, or major physiological systems. Animals in the disease control group appeared weak and lethargic, but no overt signs of toxicity such as hyperactivity, tremors, diarrhoea, or salivation were noted in any group.

### Effect on Organ Weight:-

The disease control group showed increased liver, spleen, and kidney weights compared to the control group, indicative of organ damage. Treatment with Rohitakadi Vati and Silymarin significantly reduced the weights of these organs, suggesting a protective effect against alcohol-induced organ enlargement.

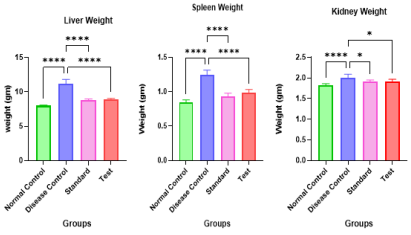


**Figure No. 2** Graphical Representation of change in Liver, Spleen & Kidney weight

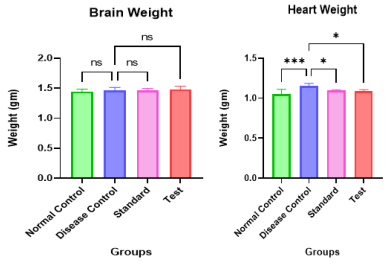


**Figure No. 3** Graphical Representation of Brain & Heart weight

### Effect on Biochemical Parameters:-

Alcohol administration resulted in elevated levels of AST, ALT, bilirubin, and ALP, along with reduced total protein levels, indicative of liver damage. Treatment with Rohitakadi Vati and Silymarin significantly ameliorated these changes, with reduced enzyme levels and increased total protein, demonstrating their hepatoprotective effects.

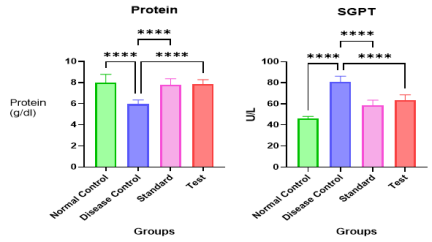


**Figure No. 4** Graphical Representation of change in Protein & SGPT values

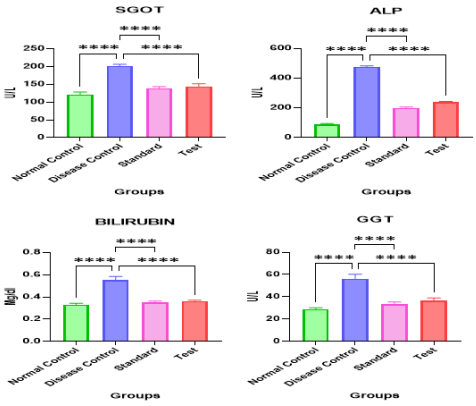


**Figure No. 5** Graphical Representation of change in SGOT, ALP, Bilirubin & GGT values

### Histopathological Analysis

- **Liver:-** The disease control group showed moderate to severe histopathological alterations, while the Rohitakadi Vati and Silymarin groups exhibited minimal changes, highlighting their protective effects.
- **Spleen And Kidney:-** Similar trends were observed, with the disease control group showing significant damage and the treatment groups showing mild to moderate protection.
- **Heart And Brain:-** Minimal changes were observed across all groups, indicating limited impact of the treatments on these tissues.

## DISCUSSION

The study demonstrates that Rohitakadi Vati exerts significant hepatoprotective effects against alcohol-induced subacute hepatotoxicity in rats, comparable to those of Silymarin. The reduction in liver enzymes and improvement in histopathological outcomes suggest that Rohitakadi Vati mitigates alcohol-induced liver damage through antioxidant and anti-inflammatory mechanisms.

## CONCLUSION

Rohitakadi Vati effectively mitigates alcohol-induced liver damage in Wistar rats, comparable to the standard hepatoprotective agent Silymarin. This study supports the use of Rohitakadi Vati in managing alcohol-induced liver damage, with no observed adverse effects, reinforcing its potential as a therapeutic agent in liver diseases.

## REFERENCES

1. World Health Organization. (2018). Global status report on alcohol and health 2018. World Health Organization.
2. Lieber, C. S. (2004). Alcoholic fatty liver: Its pathogenesis and mechanism of progression to inflammation and fibrosis. Alcohol, 34(1), 9-19. https://doi.org/10.1016/j.alcohol.2004.07.007
3. Singal, A. K., & Anand, B. S. (2013). Recent trends in the epidemiology of alcoholic liver disease. Clinical Liver Disease, 2(3), 53-56. https://doi.org/10.1002/cld.184
4. Sharma, A., & Shukla, R. (2016). Rohitakadi Vati: A potent herbal formulation for liver and spleen disorders. Journal of Ayurveda and Integrative Medicine, 7(1), 30-35. https://doi.org/10.1016/j.jaim.2015.09.001
5. Govind, D. (2006). Bhaishajya Ratnavali (Vol. II, 1st ed., Chapter 41/21-23). Chaukhamba Publications.
6. Nipanikar, S. U., Chitlange, S. S., & Nagore, D. (2017). Pharmacological evaluation of hepatoprotective activity of AHPL/AYTAB/0613 tablet in carbon tetrachloride-, ethanol-, and paracetamol-induced hepatotoxicity models in Wistar albino rats. Pharmacognosy Research, 9(Suppl 1), S41-S47. https://doi.org/10.4103/pr.pr_32_17
7. Balakrishna, V., & Lakshmi, T. (2017). Hepatoprotective activity of ethanolic extract of Terminalia chebula fruit against ethanol-induced hepatotoxicity in rats. Asian Journal of Pharmaceutical and Clinical Research, 10(11), 157-160. https://doi.org/10.22159/ajpcr.2017.v10i11.20941
8. Medhi, B., & Prakash, A. (2017). Introduction to experimental pharmacology. In Practical manual of experimental and clinical pharmacology (p. 24). Jaypee Brothers Medical Publishers.