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Hepatoprotective and antioxidant activity of the ethanol extract of *Cassia fistula* L. Barks

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Abstract

Cassia fistula L., usually used as an alternative medicine in Indonesia, is one of medicinal plants indicated for various efficacies. Pharmacological studies on the leaves of this plant have been carried out and they indicated that the leaves have several pharmacological activities, one of which is hepatoprotective activity against hepatoxicity induced by isoniazid and rifampicin or paracetamol. This study was carried out to investigate hepatoprotective activity of the ethanol extract of barks of this plant against hepatoxicity induced by paracetamol on rats and antioxidant activity of the extract by the DPPH radical scavenging method. In addition, acute toxicity of the extract was also examined. The results indicated that the ethanol extract at doses of 150 and 300 mg/kg of body weight gave hepatoprotective effects with SGPT levels of 60.83 and 56.95 IU/L, respectively, and SGOT levels of 134.30 and 110.17 IU/L, respectively, significantly different from the control. The extract had radical scavenging activity with IC_{50} of 10.613 µg/ml lower than that of ascorbic acid (4.716 µg/ml). The acute toxicity test revealed that the ethanol extract had LD_{50} values of 14.52 g/kg in male mice and 16.14g/kg in female mice, indicating that the ethanol extract of *C. fistula* barks belonged to practically non-toxic category according to the criteria of toxicity. These results provide evidence of the potential of *C. fistula* barks as hepatoprotector.

Keywords: *Cassia fistula* L., hepatoprotector, acute toxicity, ethanol extract.

INTRODUCTION

The liver plays a very important role in converting and clearing chemicals entering the blood circulation in the body, but it is also susceptible to the toxicity from these agents. Certain agents, when taken in overdoses, may injure the organ and lead to liver diseases. These diseases are associated with cellular necrosis, increase in tissue lipid peroxidation, and depletion in the tissue GSH levels, which are indicated by the elevation of serum levels of many biochemical markers like SGOT, SGPT, triglycerides, cholesterol, bilirubin, and alkaline phosphatase (Mascolo et al., 1998). Hepatoprotective agents are available and are used clinically, but no agent is really effective to protect liver from the injury caused by toxic chemicals. So, use of medicinal plants as alternative drugs for the hepatoprotective purpose has long been applied and search for effective hepatoprotective agents from natural sources are continually conducted.

Cassia fistula L. belonging to the family of Leguminosae is usually used in traditional medicine for various indications. Some investigations revealed that all parts of the plant have various pharmacological activities. It has been reported that this plant has wound healing (Bhakta *et al*., 1998), antifertility (Yadav and Jain, 1999), antitumor (Gupta *et al*., 2000), antioxidant (Siddhuraju *et al*., 2002; Ramma *et al*., 2002), and hepatoprotective properties (Bhakta *et al*., 1999; Jehangir *et al*., 2010). The n-heptane extract of Cassia fistula leaves was investigated in rats by inducing hepatotoxicity with carbon tetrachloride:liquid paraffin (1:1). The extract has been shown to possess significant protective effect by lowering the serum levels of transminases (SGOT and SGPT), bilirubin and alkaline phosphatase (ALP). The extract of C. fistula at a dose of 400 mg/kg showed significant hepatoprotective activity which was comparable to that of a standard hepatoprotective agent. The n-heptane extract of Cassia fistula leaves was investigated in rats by inducing hepatotoxicity with carbon tetrachloride:liquid paraffin (1:1).

Concerning the hepatoprotective activity, the n-heptane extract of the *C. fistula* leaves at a dose of 400 mg/kg shows significant protection against hepatotoxicity induced by carbon tetrachloride or paracetamol in rats (Bhakta *et al.* 1999; Bhakta *et al*. 2001). Further study carried out by Jehangir et al. (2010) revealed that the ethanol extract of the *C. fistula* leaves also prevents hepatotoxicity induced by isoniazide and rifampicine in rats. The constituents of this plant especially flavonoids and anthraquinones have strong antioxidant activity which give protection against drug-induced hepatotoxicity. Furthermore, hepatoprotective effects of the ethanol extract of the *C. fistula* barks at the doses of 200 and 400 mg/kg of body weight are evidently shown in animals treated with CCl4 as an hepatotoxicity inducing agent (Patwardhan, et al., 2009).

In this study, we examined hepatoprotective activity against paracetamol overdose-induced hepatotoxicity in rats, free radical scavenging activity, and acute toxicity in mice of the extract of *C. fistula* barks.

MATERIALS AND METHODS

Plant materials and preparation of the extract

The barks of *Cassia fistula* used in this experiment were collected in Manoko plantation, West Java, Indonesia. The barks were air-dried away from direct sunlight. The dried barks were crushed into a coarse powder. The powdered barks of *C. fistula* (1.4 kg) were extracted with ethanol 70 % (three times, each 24 hr) by a maceration method. The solvent of the extract was then evaporated under reduced pressure to yield a concentrated extract (360 g).

Animals

Rats used in the hepatoprotective examination were male rats of Wistar strains weighing 150-200 grams each. The toxicity test used male and female mice of Swiss Webster strains weighing 20-25 grams each. The animals were kept for one week in an air-conditioned room at a temperature of 22°C and received nutritionally standard diet and tap water.

Phytochemical screening

The extract obtained was subjected to a screening procedure to identify secondary metabolites contained in the extract by a means of Farnsworth method (1966). The metabolites screened were alkaloid, flavonoid, tannin, saponin, quinone, monoterpene, sesquiterpen, triterpenoid, and steroid.

Experimental procedure

Rats were devided randomly into control, paracetamol, and experimental groups. Each group consisted of 5 rats. In seven consecutive days, rats in the control and paracetamol groups received a 1 % Arabic gum suspension orally and those in the experimental group were given the extract orally at doses of 150 and 300 mg/kg of body weight. In days eight and nine, all animals in the paracetamol and experimental groups were administered paracetamol orally at a dose of 1500 mg/kg of body weight, except those in the control group were fed on standard diet and tap water only.