ABSTRACT

Objective: The aim of the present study was to investigate the anti-arthritic and acute anti-inflammatory effects of petroleum ether, chloroform, methanol, ethanol and aqueous extract of Curcuma zedoaria root and its formulation from potent extracts on Freund’s Complete Adjuvant (FCA) induced arthritis, carrageenan and histamine induced paw edema in rats. The separation and characterization of phytoconstituents from potent extract was carried out along with the accelerated stability study of formulations.

Methods: Roots of C. zedoaria were collected, shade dried and the dried powdered material was subjected to successive extraction with increasing polarity of solvent such as petroleum ether (40-60), chloroform, methanol and ethanol. Aqueous extract was obtained by subjecting the dried ethanol marc by cold maceration.

The present study was undertaken as per FDA-USA guidelines for industrial preclinical anti-arthritic research. The anti-arthritic activity was evaluated by using Freund’s Complete Adjuvant induced arthritic rat model and the process of recovery was studied by considering clinical, behavioral, histopathological and radiographic changes. The change in body weight, and hematological studies such as WBC, RBC, ESR and hemoglobin content were considered as parameter for health profile. The effect on vascular permeability and synthesis of nitric oxide were used to evaluate the possible molecular mechanism of action. The carrageenan and histamine induced paw edema were used to evaluate the acute anti-inflammatory effects.

Results: No toxic effects were observed at 2000 mg/kg body weight of each extract of C. zedoaria. The statistical data indicates that, petroleum ether, chloroform and ethanol extracts at 200 and 400 mg/kg showed potent antiarthritic and acute anti-inflammatory activity. These extracts reduced FCA-induced paw edema in arthritic rats and significant (p<0.001) recovery in hematological (ESR and HB), and behavioral changes. Apart from this, it also significantly (p<0.001) reduced nitric oxide (NO) generation, and vascular permeability. In addition, these
extracts showed significant \((p<0.01)\) reduction in swelling, and protective effects on the rat joints. No abnormalities were observed in biochemical parameters. Organs specific studies revealed significant \((p<0.001)\) improvement in organ weight that was observed after 42 days of the treatment with petroleum ether, chloroform and ethanol extract. Amongst these petroleum ether extract showed highly potent anti-arthritic effect at both doses. However, methanol and aqueous extracts have failed in all these aspects.

Petroleum ether, chloroform and ethanol extracts at both doses showed significant \((p<0.001)\) reduction of paw edema in rats induced by carrageenan and histamine from 1\(^{st}\) to 6\(^{th}\) hour of study. However, methanol and aqueous extracts showed no significant effects.

Phytochemical analysis revealed that petroleum ether, chloroform and ethanol extracts showed the presence of active constituents such as steroids, terpenoids, glycosides, alkaloids, tannins and other phenolic compound. In the present study it was concluded that the separated compound was curcumin separated from the potent petroleum ether extract.

Formulations SHF-A, SHF-C, and SHF-D showed significant anti-arthritic and acute anti-inflammatory activities but SHF-B showed less effective. All the formulations were stable at room temperature and also at 40 °C.

**Conclusions:** The petroleum ether, chloroform and ethanol extracts of *C. zedoaria* 200 and 400 mg/kg and its formulations A, C and D may be helpful for the treatment of arthritis.

**Key words:** *Curcuma zedoaria* Rosc, Arthritis, Freund’s Complete Adjuvant, Griess assay, Vascular permeability, Carrageenan, Histamine, Formulations, Stability study.