Abstract

Diabetes is a chronic disease characterized by hyperglycemia and usually comprises various collection of diseases that differ in their clinical characteristics, etiology and epidemiological characteristics. Foot ulcer is the most common complication in diabetes caused due to mechanical stress, or due to loss of sensation and peripheral neuropathy. Further, microbial infections and peripheral vascular diseases delay wound healing and increase the chances of substantial morbidity. The progressive nature of this disease necessitates the constant research to control glycemic index and regular adjustment of therapeutic regimes.

In this regard, a survey was carried out to determine the number of patients with diabetes in Mysore during Dec 2010 to January 2012. During this period of one year, variation with relation to age, sex, group were observed. Cases were studied with foot ulcer or wounds and their associated clinical symptoms. Microbial cultures associated with wounds were isolated and characterized by biochemical assays. Staphylococcus aureus, Streptococcus sp, E. coli, Klebsiella sp, Enterobacter, Proteus sp, Psuedomonas sp, Citrobacter sp. were the predominant pathogens associated with wound infection. Further, antibiotic susceptibility test determined the presence of 59.46% of the total isolates were methicillin resistant Staphylococcus aureus (MRSA). Among E. coli and Klebsiella sp, 55.56% were ESBL producers.

Reduction in hyperglycemic status and prevention of pathogenic load in wounds are the major target for curing diabetes and associated complication. During the last decades enormous drugs and antibiotics are being used and new drugs are being invented every year, but unfortunately still today no cure is obtained for diabetes. In addition, regular usage of antibiotics has given rise to resistant strains and have increased the percentage of complications. Hence a novel effective drug that can reduce glycemic content and safer for consumption on long-
term usage is mandatory for the present world. In this regard herbal medicine are being widely accepted because of their lesser side effects and are economically feasible.

Herbal drugs or the traditional medicine is the knowledge and practices followed from generations based on the beliefs and experience of indigenous culture. India being the most diverse country with culture and tradition is also rich in vegetation. Application of these herbal drugs are used in various ailments. Considering this, *Rotula aquatica* Lour a lotic plant extensively available in river stream was selected for the present study for analyzing its effect on bacterial pathogens associated with wound and for determining the effect on diabetics condition *in vivo*. The dried stem and roots of *R. aquatica* was extracted with various solvents including petroleum ether, methanol and ethyl acetate. Phytochemical and pharmacognostic investigation of *R. aquatica* extract revealed the presence of phenols, flavonoids, terpenoids, steroids, and glycosides. The present study confirms that the methanolic extract of *R. aquatica* have significant antibacterial and antifungal activity.

In the present day world, the fast life-style and food habit and work load has created oxidative stress, hence antioxidant agents have gained much attention due to its importance in the field of medicine as well as in food processing industries, nutri-cosmetic and pharmaceutical companies to protect products from aging and decay. Antioxidants relieve from oxidative stress caused due to reactive oxygen species generated in biologic systems under certain abnormal condition. In this regard, methanolic extract of *R. aquatica* was analyzed for antioxidant activity using various in-vitro assays. The extract exhibited significant (*p*<0.05) increase in the antioxidant activity with increase in concentration. The extract showed 91.89% DPPH scavenging activity and 74.35% inhibition of nitric oxide at a concentration of 128 μg/mL. Superoxide scavenging activity indicated that 38 μg/mL of extract could inhibit 50% of superoxides. FRAP assay and total reducing potential also signifies the antioxidant potential of the plant extract.
Abstract

The antidiabetic therapy includes the reduction of dietary starch degradation through inhibition of glycosidases such as α-amylase and α-glucosidase. In this view, the study was undertaken to determine the glycosidase inhibitory activity of methanolic extract of *R. aquatica*. According to the results obtained 50% inhibition of amylase activity was observed with 800μg methanolic extract and 50% α-glucosidase with 270 μg. Hence the study confirmed the potency of *R. aquatica* extract as an attractive therapeutic approach for treatment of postprandial hyperglycemia by decreasing release of glucose.

Further, the study was designed to investigate the hypoglycemic and antidiabetic effect of methanolic extract of *R. aquatica* using diabetes induced albino Wister rats model. Acute toxicity study revealed the non-toxic nature of extract even at a higher dose of 5000 mg/kg BW. In sub-chronic study, diabetes induced by streptozotocin and nicotinamide was used as experimental model. *R. aquatica* extract at a dose of 200 and 400 mg/kg BW was feed and observed for its effect on blood glucose level. After 21 days, a significant reduction (24.8%) in blood glucose level was observed with simultaneous increase in insulin level. Serum lipid profile depicted decrease in total cholesterol, triglycerides, LDL with simultaneous increase in HDL. Further a remarkable increase in antioxidant enzyme activity including catalase and superoxide dismutase was observed. Histopathological studies revealed the improvement in cellular structure and morphology in the group treated with plant extract.

Overall the study signifies that the methanolic extract of *R. aquatica* has remarkable antimicrobial, antioxidant, hypoglycemic, antidiabetic effect.