Evaluation of Effectiveness of Anti-diabetic Folk Medicines

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Abstract

The present study was to evaluate the effectiveness of anti-diabetic folk medicines. Four types of anti-diabetic folk medicines were collected from two locally established folk medicine practitioners. The *in-vitro* study of anti-diabetic activity was evaluated by α-amylase inhibition technique which included two methods namely Iodine-starch method and DNSA method. All the folk medicines had α-amylase inhibition activity and hypoglycemic activity. Among all the samples, sample-1 was found to have most significant α-amylase inhibition activity ($P<0.01$). 1.1 µg/mL of sample -1 showed highest % inhibition of 46.25±0.002 in Iodine-starch method and in case of DNSA method, 1.3 µg/mL sample revealed 33.61±0.003% inhibition ($P<0.01$). *In-vitro* anti-inflammatory evaluation study was carried out through HRBC-membrane stabilization method. Sample-3 showed significant percent inhibition of about 64.195±0.003 at concentration 125 µg/mL($P<0.001$). Anti-oxidant activity was also evaluated through Hydrogen peroxide and DPPH radical scavenging activity study. Prominent radical scavenging capacity was revealed in all collected folk medicines. In future, *in-vivo* alloxan-induced diabetic method may be carried out with these folk medicines and analytical study may be performed to isolate, characterize and elucidate the structure of responsible active compound for anti-diabetic activity.

Keywords: Folk medicine; anti-diabetic activity; anti-inflammatory activity; antioxidant activity.

1. Introduction

Folk medicine offers the treatment of ailment at home by remedies and simple measures based upon experience and knowledge handed over by generation by word of mouth. Practices of traditional medicine vary greatly from country to country, and from region to region, as they are influenced by factors such as culture, history, personal attitudes and philosophy [1]. According to WHO, "Traditional medicine is the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness" [2].

The WHO Tradition medicines Strategy 2014- 2023 thus reappraises and builds on the WHO traditional medicine strategy 2002-2005, and sets out the course of traditional medicine in the next decade. The present study is carried out to evaluate the effectiveness of anti-diabetic, anti-inflammatory and anti- oxidant activity of four anti-diabetic folk medicines collected from a traditional medicine practitioner. They are locally called "Vaidya". Three types of tablets (locally called BORI) and a liquid preparation were collected from two locally established folk medicine practitioners for the evaluation study. The aim of work is to investigate whether the folk medicine

actually have the efficacy as it is claimed by the practitioner or not. Along with anti-diabetic activity, anti- inflammatory and anti-oxidant activity were also investigated because some natural compounds having anti-diabetic activity, also give anti-inflammatory and anti-oxidant activity simultaneously. Therefore, evaluation is performed for not only anti-diabetic activity but also anti-inflammatory and anti-oxidant activity.

2. Materials and Methods

Four anti-diabetic folk medicines were collected from locally established folk medicine practitioners of Chittagong hill tract, Rangamati, Banarupa. Among all the medicines, Sample-1, sample-2 and sample-3 were solid preparation and sample-4 was a liquid preparation. A large variety of qualitative tests are available for phytochemical screening of medicinal plants used as folk medicines. These tests were done to find the presence of active chemical constituents such as alkaloids, glycosides, terpenoids and steroids, flavonoids, reducing sugar and tannins. The *in-vitro* α-amylase inhibition assay for evaluation of anti-diabetic activity was done by using two methods namely Iodine-starch method and DNSA method. In both methods, 1mL of sample of different concentrations (0.1, 0.3, 0.5, 0.7, 1.0, 1.3, 1.5, 1.7, 2.0 mg/mL) was taken for test and compared to respective concentrations of standard (acarbose) [3]. The *in-vitro* anti-inflammatory study was developed by using human red blood cell membrane stabilization method [4]. For test groups 10 mg sample was dissolved in 10 mL distilled water to get (1000 µg/mL), and from this 500 µg/mL, 250 µg/mL and 125 µg/mL solutions were prepared. Anti-oxidant property was evaluated by investigating Hydrogen peroxide radical scavenging activity of collected folk medicines [5]. Free radical scavenging abilities of the test samples were determined by measuring the change in absorbance of DPPH at 517 nm by the spectrometric method described by Braca *et al* [6].

3. Results

Phytochemical screening results- Sample-1 contains alkaloids, glycosides, tannins, flavonoids and phenol. Sample-2 contains alkaloids, glycoside, tannins and flavonoids. Sample-3 contains alkaloids, tannins, flavonoid and phenol. Sample-4 contains alkaloids, glycoside, tannin, flavonoids, phenol and saponins.

- Anti-diabetic method
- Iodine- starch method

The folk medicine was tested for α-amylase inhibition activity determination. % inhibition of the α-amylase activity can be calculated by using the following equation-

$$\% \text{ inhibition of the } \alpha\text{-amylase activity} = \frac{(1-\text{Abs(control)}) - (1-\text{Abs(sample)})}{1-\text{Abs(control)}} \times 100$$

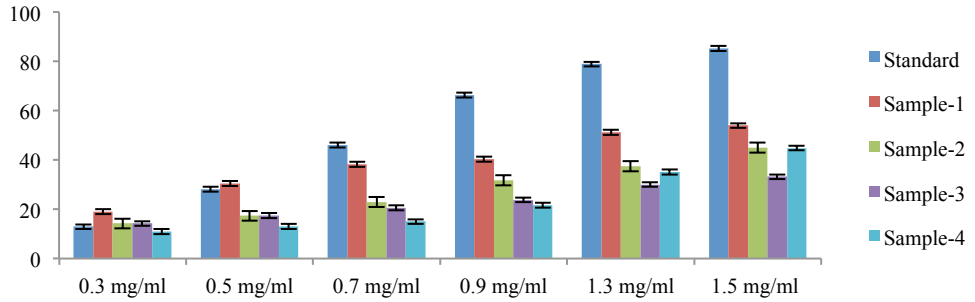


Fig.1. Comparative study of *in-vitro* α-amylase inhibition activity of Sample-1, Sample-2, Sample-3 & Sample-4 with standard through Iodine starch method.

DNSA method

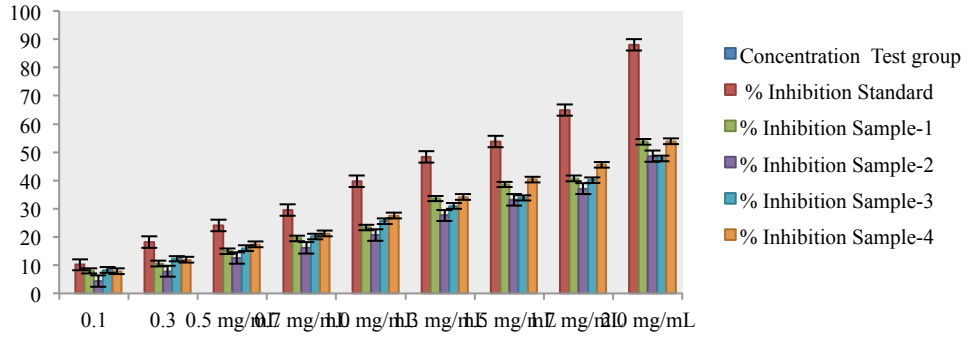


Fig.2. Comparative study of in vitro α-amylase inhibition activity of Sample-1, Sample-2, Sample-3 & Sample-4 with standard through DNSA method.

Anti-inflammatory activity

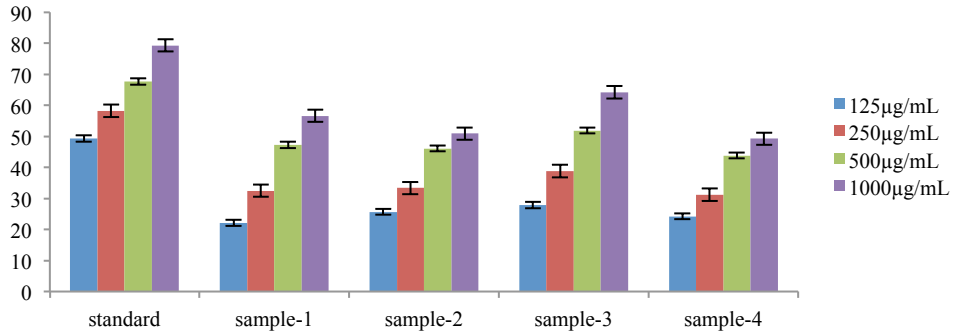


Fig. 3. Comparative study of in vitro anti-inflammatory activity of Sample-1, Sample-2, Sample-3 & Sample-4 with standard (Diclofenac) through HRBC-membrane filtration method.

Anti-oxidant activity (Hydrogen peroxide radical scavenging activity)

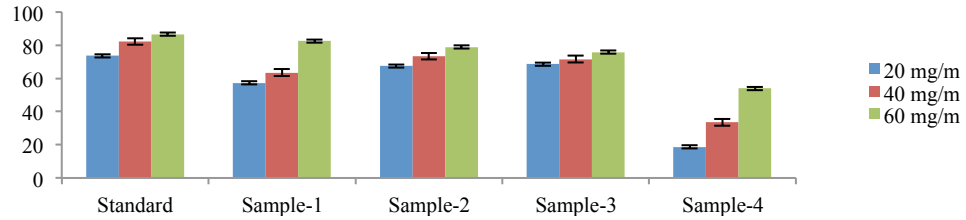


Fig.4. Comparative Hydrogen peroxide scavenging activity of collected folk medicines with standard (Ascorbic acid).

DPPH radical scavenging activity

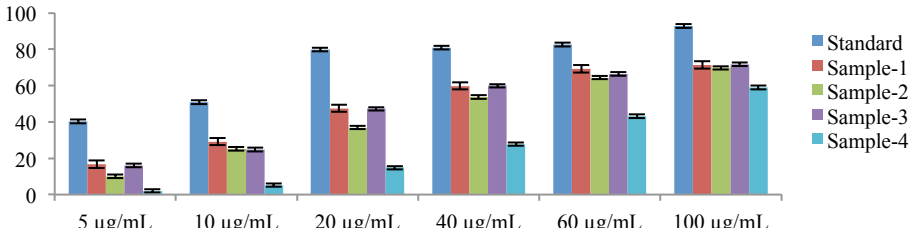


Fig.5. Comparative DPPH scavenging activity of collected folk medicines with standard (Ascorbic acid).

4. Discussions

By analyzing the above data, it revealed that Sample-1, Sample-2 and Sample-4 might have significant effect on Hyperglycemia in case of DNSA method which is probably mediated by α-amylase enzyme inhibition. Qualitative Iodine-starch method analysis revealed that sample-1, sample-2 & sample-4 might show α-amylase enzyme inhibition any molecular mechanism of hypoglycemic activity. Among all the collected folk medicines, sample-3 produced moderate inhibition by 64.195 % in *in vitro* anti-inflammatory test compared to standard Diclofenac sodium (79.29%). Sample-1 showed significant Hydrogen peroxide scavenging activity by 82.54 % *test* compared to standard Ascorbic acid (86.55%). Sample-1 and sample-2 showed significant DPPH scavenging activity by 71.35 % and 71.92 % respectively in DPPH radical scavenging activity test.

5. Conclusion

The overall results of the study indicated significant anti-diabetic, anti-inflammatory and antioxidant activity of collected folk medicines. Among all the anti- diabetic folk medicines, sample-1 showed significant α-amylase inhibition activity.Sample-1 and sample-3 had significant anti-inflammatory activity and prominent antioxidant activity. But further studies are also required to evaluate *In-vivo* hypoglycemic activity study by alloxan-induced & sterptozotocin induced diabetic methods and to isolate, characterize and elucidate the structure of responsible anti-diabetic active compounds through analytical studies.

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