Original Article

Lack of alpha amylase inhibitory activity of monoammonium glycyrrhizinate

Harish Chandra Rodda, Ramya Bubuk, Fathima Kaneez-e-Kubra

Department of Pharmacognosy and Phytochemistry, Vaagdevi College of Pharmacy, Ramnagar, Hanamkonda, Warangal, Andhra Pradesh, India

Abstract

Introduction: Monoammonium glycyrrhizinate (MAG) is used as a sweetener and also as a flavoring agent to enhance the flavor of dairy products, confectioneries, baked foods and beverages. It is used in cough drops, cough syrups and cosmetics. It is reported to have antioxidant, antitussive and antiviral activities. **Materials and Methods:** The *in-vitro* α - amylase inhibitory activity was performed using 3,5-dinitrosalicylic acid assay. Different concentrations (1 µg/ml, 3 µg/ml, 5 µg/ml, 10 µg/ml, 30 µg/ml and 50 µg/ml) of MAG were analyzed for the α - amylase inhibitory potential. **Results:** The results of this study revealed that MAG lacks α - amylase inhibitory potential. **Conclusion:** Documentation of pharmacological activities of phytochemicals, which have either positive or negative outcome, is required to create a database for phytopharmacological research. The result of this study can serve as one of the components of phytochemical research database.

Key words: add-on therapy, enzyme inhibitors, *Glycyrrhiza glabra*, monoammonium *glycyrrhizinate*

INTRODUCTION

Monoammonium glycyrrhizinate (MAG) is an aglycone of glycyrrhizin obtained from liquorice (*Glycyrrhiza glabra*, *Leguminosae*). In Chinese traditional medicine, *Glycyrrhiza* root is used as a source of glycyrrhizin. Glycyrrhizin is also called glycyrrhizic acid, which is 50-60 times sweeter than sucrose.[1] It is used as a flavoring agent in dairy products, confectioneries, baked foods and beverages.[2] It is also used in the cough drops, cough syrups and cosmetics.[3] It is chemically glycyrrhizinic acid monoammonium salt which after oral administration is hydrolyzed by the glucuronidase of the intestinal bacteria to an active principle aglycone, 18β - glycyrrhetinic acid and then absorbed into the blood.[4] It is reported to have hepatoprotective, antiulcer, antioxidant, antitussive, antiviral and cytotoxic activities.[5-14]

Access this article online	
Quick Response Code:	Website: www.pnrjournal.com
	DOI: 10.4103/0976-9234.136777

In addition, it is also used in toothpastes for treatment of dental plaques.[15] If the natural sweetening agents have additional pharmacological activities, they can be beneficial to diabetic patients because they can be used as add-on therapy. Currently, many of the phytochemicals have been proven to have inhibitory activity on several enzyme systems, which are serving as tools for the therapeutic management of diabetes.[16] In view of this, the present study was carried out to evaluate α - amylase inhibitory activity of MAG.

MATERIALS AND METHODS

Materials

Starch, 3,5-dinitrosalicylic acid, sodium potassium tartrate, sodium hydroxide, sodium dihydrogen phosphate, sodium chloride and α - amylase were purchased from HiMedia (Mumbai). Acarbose was purchased from Sigma Aldrich, Bangalore.

Methodology

Different concentrations (1 µg/ml, 3 µg/ml, 5 µg/ml, 10 µg/ml, 30 µg/ml and 50 µg/ml) of MAG were prepared with phosphate buffer. All samples were prepared in

Address for correspondence:
Dr. Harish Chandra Rodda, Department of Pharmacognosy and Phytochemistry, Vaagdevi College of Pharmacy, Ramnagar, Hanamkonda, Warangal - 506 001, Andhra Pradesh, India. E-mail: hcrodda@hotmail.com

triplicate. To 0.2 ml of the each dilution, 0.4 ml of enzyme solution containing 10 mg of α - amylase in 100 ml of phosphate buffer pH 6.9 (20 mM sodium dihydrogen phosphate containing 6.7 mM of sodium chloride) was added. To the above solution, 0.2 ml of buffer was added and the solution was incubated for 20 min. Later on, starch solution (1% w/w in water) was prepared by heating on water bath for 15 min and then 0.2 ml of this starch solution was added to the above solution. Then, 1ml of DNS reagent [3,5-dinitrosalicylic acid (1.5%), sodium potassium tartrate (12%) and sodium hydroxide 0.4 M in 100 ml distilled water] was added and the solution was boiled for 5 min and cooled under running tap water. The absorbance of the samples was measured at 540 nm using a spectrophotometer (Schimadzu UV-1800).

Control values were recorded replacing MAG with vehicle. The results were expressed as % inhibition calculated using the formula.

$$\% \text{ Inhibition} = \frac{(\text{Absorbance of control} - \text{Absorbance of test})}{\text{Absorbance of control}} \times 100$$

The IC_{50} values were determined from plots of percentage inhibition versus concentration. The total experiment was performed in triplicate.[17]

RESULTS

The percentage inhibition of α - amylase by acarbose and MAG is shown in Table 1. The IC_{50} value of acarbose was found to be 59.63 μg/ml and that of MAG was found to be 80.51 μg/ml. The IC_{50} value of MAG indicates that it doesn't have α - amylase inhibitory activity.

Table 1: α-Amylase inhibitory activity of acarbose and monoammonium glycyrrhizinate (*n*=3)

Sample	Concentration (μg/ml)	% Inhibition	IC_{50} (μg/ml)
Acarbose	1	11.16	59.63
	3	18.14	
	5	24.41	
	10	30.04	
	30	35.22	
	50	40.26	
	100	72.93	
Monoammonium glycyrrhizinate	1	21.34	80.51
	3	24.12	
	5	33.36	
	10	38.94	
	30	41.83	
	50	46.01	
	100	51.07	

CONCLUSION

The results indicate that MAG lacks α - amylase inhibitory activity and this data can used as one component of phytopharmacological database.

REFERENCES

1. Couteau C, Coiffard LJ. Determination of photostability of monoammonium glycyrrhizhinate. Food Chem 2001;73:497-500.
2. Davis EA, Morris DJ. Medicinal uses of licorice through the millennia: The good and plenty of it. Mol Cell Endocrinol 1991;78:1-6.
3. Wen K, Chen H, Chang C, Lin Y, Hsiu S, Chang H. Development of an assay method for natural products containing cosmetics (II) - Licorice. J Food Drug Anal 2011;19:230-7.
4. Takeda S, Ishthara K, Wakui Y, Amagaya S, Maruno M, Akao T, *et al*. Bioavailability study of glycyrrhetic acid after oral administration of glycyrrhizin in rats; relevance to the intestinal bacterial hydrolysis. J Pharm Pharmacol 1996;48:902-5.
5. Okamoto T. The protective effect of glycyrrhizin on anti-Fas antibody-induced hepatitis in mice. Eur J Pharmacol 2000;387:229-32.
6. Dehpour AR, Zolfaghari ME, Samadian T, Kobarfard F, Fazi M, Assari M. Antiulcer activities in liquorice and its derivatives in experimental gastric lesion induced by ibuprofen in rats. Int J Pharm 1995;122:133-8.
7. Fujioka T, Kondou T, Fukuhara A, Tounou S, Mine M, Mataki N, *et al*. Efficacy of a glycyrrhizin suppository for the treatment of chronic hepatitis C: A pilot study. Hepatol Res 2003;26:10-4.
8. Kimura M, Inoue H, Hirabayashi K, Natsume H, Ogihara M. Glycyrrhizin and some analogues induce growth of primary cultured adult rat hepatocytes via epidermal growth factor receptors. Eur J Pharmacol 2001;431:151-61.
9. Haraguchi H, Ishikawa H, Mizutani K, Tamura Y, Kinoshita T. Antioxidative and superoxide scavenging activities of retrochalcones in *Glycyrrhiza inflata*. Bioorg Med Chem 1998;6:339-47.
10. Kamei J, Nakamura R, Ichiki H, Kubo M. Antitussive principles of *Glycyrrhizae radix*, a main component of the Kampo preparations Bakumondo-to (Mai-men-dong-tang). Eur J Pharmacol 2003;469:159-63.
11. Chan HT, Chan C, Ho JW. Inhibition of glycyrrhizic acid on aflatoxin B1–Induced cytotoxicity in hepatoma cells. Toxicology 2003;188:211-7.
12. Cinatl J, Morgenstern B, Bauer G, Chandra P, Rabenau H, Doerr HW. Glycyrrhizin, an active component of liquorice roots, and replication of SARS-associated coronavirus. Lancet 2003;361:2045-6.
13. Lin JC. Mechanism of action of glycyrrhizic acid in inhibition of Epstein-Barr virus replication *in vitro*. Antiviral Res 2003;59:41-7.
14. Hu CC, Chen WK, Liao PH, Yu WC, Lee YJ. Synergistic effect of cadmium chloride and acetaldehyde on cytotoxicity and its prevention by quercetin and glycyrrhizin. Mutat Res 2001;496:117-27.
15. Goultschin J, Palmon S, Shapira L, Brayer L, Gedalia I. Effect of glycyrrhizin-containing toothpaste on dental plaque reduction and gingival health in humans. A pilot study. J Clin Periodontol 1991;18:210-2.
16. Sunil K, Vipin K, Monika R, Dinesh K. Enzymes inhibitors from plants: An alternate approach to treat diabetes. Pharmacogn Commun 2012;2:18-33.
17. Miller LG. Use of dinitrosalicylic acid for determination of reducing sugars. Anal Chem 1959;31:426-8.

How to cite this article: Rodda HC, Bubuk R, Kaneez-e-Kubra F. Lack of alpha amylase inhibitory activity of monoammonium glycyrrhizinate. J Pharm Negative Results 2014;5:13-4.

Source of Support: Nil. **Conflict of Interest:** None declared.