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EVALUATION OF LIQUORICE (GLYCYRRHIZA GLABRA) EXTRACT AS AN ANTI-INFLAMMATORY AGENT USING IN-VITRO PROTEIN DENATURATION ASSAY

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ABSTRACT

Inflammation is a protective biological response to harmful stimuli; however, persistent inflammation contributes to chronic disorders. The present study aimed to evaluate the in-vitro anti-inflammatory activity of Glycyrrhiza glabra root extract using a heat-induced protein denaturation assay. The extract was prepared by maceration and tested at concentrations of 125, 250, 500 and 1000 microgram per milliliter. Bovine serum albumin was used as the protein substrate, and diclofenac sodium served as the standard drug. The absorbance was measured spectrophotometrically, and percentage inhibition of protein denaturation was calculated. The extract exhibited concentration-dependent inhibition with maximum inhibition of 68.75 percent at 1000 microgram per milliliter. The results indicate that Glycyrrhiza glabra possesses significant in-vitro anti- inflammatory activity. The findings support its traditional use in inflammatory conditions and suggest its potential as a natural alternative for managing inflammation.

KEYWORDS: Glycyrrhiza glabra; Liquorice; Anti-inflammatory activity; Protein denaturation; In-vitro assay.

INTRODUCTION

Inflammation is a complex biological response of vascular tissues to harmful stimuli such as pathogens, irritants, and damaged cells.[1,2] Although it is a protective mechanism, chronic inflammation is associated with diseases such as arthritis, cardiovascular disorders, and inflammatory bowel disease.[3,4] Protein denaturation is one of the well-documented causes of inflammation, leading to auto-antigen production. Inhibition of protein denaturation is therefore considered an important mechanism in the screening of anti-inflammatory agents.[5,6]

Glycyrrhiza glabra, commonly known as liquorice, is widely used in traditional medicine for its anti-inflammatory, antioxidant, and immunomodulatory properties.[7,8] The plant contains bioactive constituents such as glycyrrhizin, flavonoids, and saponins, which contribute to its pharmacological activities.[9,10] This study was designed to evaluate the in-vitro anti-inflammatory activity of liquorice extract using a protein denaturation model.[11]

MATERIALS AND METHODS

Plant Material and Extraction

Dried liquorice roots were coarsely powdered and extracted by maceration using hydroalcoholic solvent in a 1:5 ratio. The mixture was kept in a closed container for four weeks with occasional shaking, filtered, and concentrated.

Preparation of Solutions

Bovine serum albumin solution (0.5 percent) was prepared in buffer solution. Diclofenac sodium was prepared at a concentration of 1 milligram per milliliter. A stock solution of liquorice extract (10 milligram per milliliter) was prepared and further diluted to obtain 125, 250, 500 and 1000 microgram per milliliter.

Protein Denaturation Assay

The reaction mixture consisted of bovine serum albumin, test extract or standard drug, and distilled water to make a final volume of 2 milliliters. The mixtures were incubated and heated to induce denaturation. After cooling, absorbance was measured at 660 nanometer using a ultraviolet spectrophotometer. Percentage inhibition was calculated using the formula: % Inhibition = (Absorbance of Control – Absorbance of Sample) / Absorbance of Control × 100.

RESULTS

Phytochemical screening of **GLYCYRRHIZA GLABRA (LIQUORICE)** extract was found to be:

Table 1.1

SL.NO	PLANT CONSTITUENTS	TEST	RESULT
1	Alkaloids	Dragondroff	positive
2	Flavonoids	Shinoda	positive
3	Tannins	Ferric chloride	Positive
4	Saponins	Foam test	Positive
5	Glycosides	Keller -Killian	Positive
6	Phenols	Fecl3	Positive
7	Coumarins	Uv fluorescence	Positive
8	Carbohydrates	Molisch ‘s test	Positive

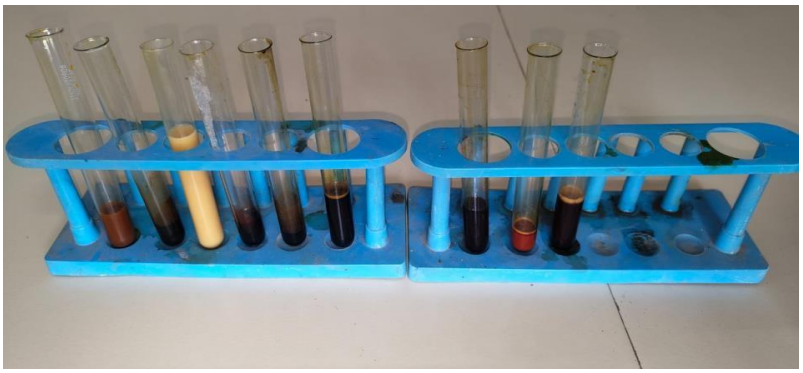

Figure 1: Phytochemical Screening of Liquorice.

Protein Denaturation Assay

Each tube will have 2 ml final volume:

Table 1.2

Tube	BSA 0.5%	SAMPLE / DRUG	WATER
Blank	0ml	0ml	2ml
Control	1ml	0ml	1ml
Standard	1ml	0.5ml diclofenac	0.5ml
Extract 1	1ml	0.5ml extract	0.5ml
Extract 2	1ml	0.5ml extract	0.5ml

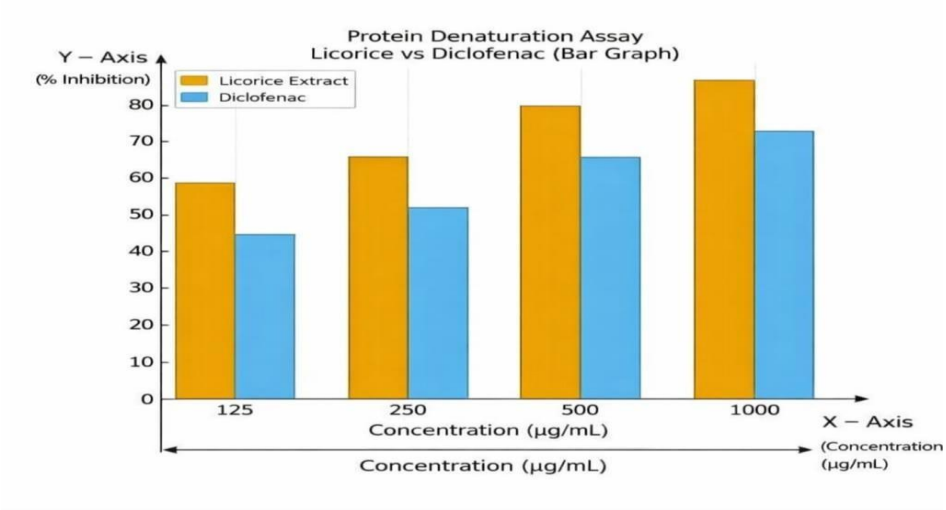

Figure 2: Concentation V/S % Inhibition.

DISCUSSION

The liquorice extract demonstrated concentration-dependent inhibition of protein denaturation. At 1000 microgram per milliliter, the extract showed 68.75 percent inhibition. At 500 microgram per milliliter, 65 percent inhibition was observed.

At 250 microgram per milliliter, inhibition was 56.25 percent, and at 125 microgram per milliliter, inhibition was 47.5 percent. Diclofenac sodium showed higher inhibition compared to the extract.

These findings indicate that liquorice possesses significant anti-inflammatory activity, possibly due to glycyrrhizin and flavonoids. The results are consistent with previous studies reporting anti-inflammatory effects of Glycyrrhiza glabra. However, the study is limited to in-vitro evaluation and requires in-vivo confirmation.

CONCLUSION

The present study confirms that Glycyrrhiza glabra extract exhibits significant in-vitro anti-inflammatory activity by inhibiting protein denaturation. The activity increases with concentration and supports its traditional medicinal use. Further pharmacological and clinical studies are recommended to validate its therapeutic potential.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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