

ISOLATION OF A HYPOGLYCEMIC PRINCIPLE FROM THE BARK OF FICUS BENGALENSIS LINN.

A Preliminary Note

By

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INTRODUCTION

Ficus bengalensis is an indigenous plant possessing many reputed medicinal properties, which have been described in Ayurvedic literature. The bark of this tree, in the form of an infusion is used in the treatment of Diabetes mellitus (Chopra, 1933; Nadkarni, 1954; Kirtikar and Basu, 1933) and has been investigated by Gujral *et al.*, (1954) for its anti-diabetic action. The various parts of the tree have been studied for their chemical constituents by Sharma and Sheshadri (1953), Hussain *et al.*, (1952), Budhiraja and Beri (1943; 1944) and Walti (1938). The fruit, leaves and latex have been analysed, but it appears that no studies have been carried out on the bark.

We have studied the bark of *Ficus bengalensis* in the I.C.M.R. Drug Research Unit, for its reputed antidiabetic action, and have been impressed by its hypoglycemic properties Shrotri and Aiman, 1960). Other workers in our department have also demonstrated the effect of an extract of the bark on the absorption of glucose from the gut (Joglekar *et al.*, 1958). It was therefore decided to carry out detailed chemical studies on this plant material and to identify the hypoglycemic principle.

Chemical Studies :

The dry powdered bark was used. It was subjected to successive extraction with various solvents in a Soxhlet apparatus. The organic constituents and ash contents were determined by using standard methods. The defatted bark was extracted with ethanol and then subjected to the procedure given below for separation of the hypoglycemic principle.

I. Percentage extractives on successive extraction with various solvents :

Petroleum Ether	:	1.22%	Ethyl Alcohol	:	7.00%
Ether	:	0.57%	Water	:	4.54%

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II. Organic Analysis :

Coloring matter	:	2.0%	Tannins	:	10.00%
Saponin	:	1.4%	Crude fiber	:	43.5%
Wood gums	:	3.3%	Hydrocarbons	:	1.28%
Proteins	:	0.5%	Oxalic acid	:	0.088%

III. Ash Analysis :

Total ash	:	7.2 %
Acid-insoluble ash	:	1.75%
Calcium	:	2.41%
Potassium	:	1.59%

IV. Separation of the hypoglycemic principle :

Previously defatted dry powdered bark was extracted to exhaustion with ethanol. The extract was concentrated by distillation under reduced pressure, whereby a semisolid dark red mass was obtained. This was boiled with water and filtered. The water extract was treated with a 25% lead acetate solution to remove tannins and the precipitate was filtered under suction. It was then washed with water and the washings and the filtrate were treated with hydrogen sulphide, so as to precipitate out all the lead in the form of sulphide. This was filtered and washed with water under suction. The lead-free filtrate and washings were aerated for a long period to eliminate the excess of H_2S . This material was concentrated in a dish by heating on a water-bath. The concentrated tannin-free material was shaken with ether to remove the excess of acetic acid.

The concentrated filtrate was mixed with kieselguhr and dried to $60^\circ C$. The kieselguhr was then completely extracted with alcohol and the extract was evaporated under temperature and reduced pressure. It was then adsorbed on a column of alumina covered with a layer of active charcoal. The column was eluted with alcohol and the eluates were concentrated at room temperature. On addition of dry ether to this concentrated alcohol extract a precipitate was formed. This was filtered out, washed with ether and was allowed to dry in a desiccator, over phosphorus pentoxide. The resultant yellowish white powder which is very hygroscopic, turns into a semifluid mass on exposure to air. It gives the following reactions :

- On heating, it gives the odour of burnt sugar and leaves no residue on platinum.
- A violet color develops on addition of con. sulphuric acid.
- A pink-purple color is seen on performing the Liebermann-Burchard reaction.
- Molisch test for carbohydrates is positive.

The substance appears to be a glycoside, having a melting point of 160°C., it is soluble in alcohol and water, insoluble in ether and acetone; the approximate yield of the crude glycoside is about one percent. Further studies on its hydrolysis are in progress.

Hypoglycemic Activity of the Glycoside :

The isolated material dissolved in distilled water was given orally to normal and alloxan diabetic rabbits and dogs and to depancreatised dogs; the effect on the fasting blood sugar was noted hourly over a period of four hours in dogs and five hours in rabbits. Blood-sugar was determined by Folin and Malmros' micromethod (1932). The results were compared with control studies using distilled water. (Table I)

Table I

Showing hypoglycaemic effect of active principle from ficus bengalensis in normal and diabetic animals.

Animal	Dose (Gammes)	Max. % fall in Blood Sugar Level	Control
Normal Rabbits (5)	10	15	1
Normal Dogs (2)	25	8-10	9
(1)	50	16	
(5)	100	18	
Alloxan Rabbits (3)	10	Nil	4
Alloxan Dogs (2)	25	10	20
Pancrex Dogs (2)	100	5.5	4.4

The hypoglycemic potency of the purified material as compared to that of the simple water extract (Aiman, 1959) in terms of the original material is much less. The cause for this is under investigation. Further clinical studies are also contemplated.

SUMMARY

- (1) The bark of *Ficus bengalensis* was chemically analysed quantitatively.

- (2) A hypoglycemic principle was isolated.
- (3) The substance appears to be a glycoside. Its physical properties have been described.
- (4) In the doses employed, it has no hypoglycemic effect in diabetic animals, but lowers the fasting blood-sugar of the normal animals.

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