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STUDY OF ANTIULCER ACTIVITY OF AQUEOUS EXTRACT OF LEAVES OF PYRENEACANTHA STAUDTH (FAMILY IACINACEAE) USING VARIOUS MODELS OF EXPERIMENTAL GASTRIC ULCER IN RATS

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The antiulcer activity of an aqueous extract of Pyreneacantha staudthii was studied in rats and was compared with that of cimetidine. Ulcers were induced in rats by means of various experimental models: aspirin, indomethacin, serotonin and reserpine. The extract was found to have significant antiulcer activity against all the models studied. Cimetidine was found to be ineffective against serotonin- and reserpine-induced ulcers.

### Table

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<th>Antiulcer activity</th>
<th>Pyreneacantha staudthii</th>
<th>Gastric ulcer</th>
<th>Ulcer index</th>
<th>Cimetidine</th>
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1. Introduction

*Pyreneacantha staudthii* (family Iacinaceae) is a perennial woody climber. Its leaves are used by herbalists in different parts of Imo State of Nigeria for relief of stomach ache. The botanical character of the plant and some of its uses have been described by Hutchinson and Dalziel (1958). The preliminary pharmacology of this plant has been studied by Akubue et al. (1981) and an aqueous extract of the leaves was found to have significant (P<0.05) antiulcer activity against histamine-induced gastric ulcers in rats.

The present study was aimed to further establish the antiulcer activity of the plant by using various models of experimental gastric ulcer in rats.

2. Materials and methods

2.1. Identification

The plant was identified by Mr. K.K. Agwu of Department of Pharmacognosy and a specimen has been preserved in the herbarium of Department of Pharmacognosy for future reference.

2.2. Preparation of the extract

The leaves were collected in the month of August and dried in the shade. They were ground and a cold water extract was prepared by the method described in B.P.C. (1973) in such a manner that 1 ml of extract represented 0.5 g of dried leaves. The extract was stored in a refrigerator and used when required.

2.3. Animals

Albino rats of either sex weighing between 100–200 g were used for all the experiments.

2.4. Drugs and chemicals

The following drugs and chemicals were used: Cimetidine (SK&F), aspirin (Merck), indomethacin (Polfar), serotonin (serotonin creatinine sulphate, Koch-Light) and reserpine (Ciba).

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2.5. Anti-ulcer activity

Four models for inducing experimental gastric ulcer in rats were used to assess the antisclerotic activity of the extract. Thirty rats were used for each experiment. They were divided at random into groups of 10 each. Group A rats served as controls and were injected i.p. with normal saline 0.5 mL/100 g. The extract was administered to group B i.p. in the same volume and group C was given cimetidine (100 mg/kg) i.p. as a 2% suspension in normal saline for comparison.

2.5.1. Aspirin-induced ulcers

The rats were fasted for 18 h but water was allowed. They were divided into 3 groups. Saline, a extract and cimetidine were administered in the doses mentioned above. Thirty min later aspirin was given orally in the dose of 200 mg/kg as a 4% suspension in 1% carboxy methyl cellulose (CMC). After 6 h, the animals were killed and the stomach of each was removed. After being opened along the greater curvature, the stomach was rinsed under a stream of water and pinned flat on a cork board. The stomachs were coded to prevent observer’s bias and studied with a hood lens (X10). Erosions formed on the glandular portion of the stomach were counted and each one given a severity rating on a 1–3 scale (Main and Whittle, 1975). The overall total divided by a factor of 10 was designated as the ‘ulcer index’ for that stomach.

2.5.2. Indomethacin-induced ulcers

The ulcers were induced by the method described by Urushidani et al. (1979). The rats were fasted for 24 h but water was allowed. Saline, indomethacin and cimetidine were injected into the 3 groups as before. After 30 min, indomethacin was injected s.c. in the dose of 20 mg/kg as a 1% suspension in CMC with a trace of Tween 80. After 7 h of indomethacin administration, the animals were sacrificed by a blow on the head and examined for ulcers as described above.

2.5.3. Serotonin-induced ulcers

The method described by Hashizume et al. (1979) was used to induce ulcers. The rats were deprived of food for 24 h but water was allowed. Saline, extract and cimetidine were administered to the three groups respectively in the doses described before. After 1 h, serotonin was given s.c. 20 mg/kg as a 1% solution in normal saline. The rats were killed after 4 h by a blow on the head and examined for ulcers as above.

2.5.4. Reserpine-induced ulcers

The technique described by Tanaka et al. (1976) was followed to induce ulcers. The rats were fasted for 48 h but water was allowed. Reserpine was given i.p. 8 mg/kg as a 0.1% solution in normal saline. Saline, extract and cimetidine were injected immediately after reserpine in the manner described before. The animals were sacrificed after 18 h by a blow on the head and the stomach of each was examined for ulcers as stated above.

2.6. Statistical analysis

The results are shown as the mean ulcer index ± standard error of the mean. The significance of the data was evaluated using Student’s t-test. The percentage of animals with ulcers was also determined.

3. Results

3.1. Aspirin-induced ulcers (table 1)

The extract had a significant (P<0.01) anti-ulcer activity. Aspirin induced ulcers in 100% of the animals. But after the administration of the extract and cimetidine ulcers only developed in 40% and 30% of the animals respectively. The ulcer index was reduced from 0.68±0.11 to 0.08±0.03 and 0.08±0.04 respectively. There was no significant (P>0.05) difference between the anti-ulcer activity of the extract and of cimetidine.

3.2. Indomethacin-induced ulcers (table 2)

Indomethacin (20 mg/kg) induced ulcers in 100% of the animals. The ulcer index was 1.12±0.27. Price administration of extract and cimetidine significantly (P<0.01) reduced the ulcerogenic activity of indomethacin. The ulcer index
was reduced to 0.10±0.05 and 0.22±0.10 respectively. Only 30% and 50% of the animals developed ulcers when indomethacin was given after the administration of the extract and of cimetidine respectively. The antulcer activity of the extract was even greater than that of cimetidine, however the difference was not significant (P>0.05).

3.3. Serotonin-induced ulcers (table 3)

Serotonin induced ulcers in 80% of the rats and the ulcer index was 1.04±0.30. The extract significantly (P<0.05) protected the animals from serotonin-induced ulcers. The ulcer index was reduced to 0.24±0.09. However, the previous administration of cimetidine did not protect the animals from serotonin-induced ulcers, instead it increased the incidence of ulcers from 80% to 100% and the ulcer index was increased to 1.40±0.24, although the difference was not significant (P>0.05).

3.4. Reserpine-induced ulcers (table 4)

Reserpine induced ulcers in 70% of the rats. The ulcer index was 0.90±0.29. The administration of the extract significantly (P<0.05) reduced the incidence of reserpine-induced ulcers. The ulcer index was reduced to 0.16±0.09 and only 30% of the animals developed ulcers. Cimetidine did not
prevent reserpine ulcers, instead it increased the ulcer index to 1.38±0.45, although the difference was not statistically significant (P>0.05).

4. Discussion

The extract of Pyrenacantha staudtii had significant antinocic activity against various models of experimental drug-induced gastric ulcers (fig. 1). The effect of the extract on stress-induced ulcers and pylorus-ligated ulcers is being studied and its effect on gastric secretions and acidity is also being determined. Preliminary observations in this area are encouraging. The effect of oral administration of the extract and chronic toxicity studies are also in progress.

The mechanism of action by which the extract prevents ulcer development has not been elucidated. The extract has a direct smooth muscle relaxant and antispasmodic activity (Akbue et al., 1981) which may contribute in part to its antinocic effect. Cimetidine potentiates the ulcerogenic activities of serotonin and reserpine (P>0.05). This observation is being explored further and its mechanism of action is being studied.

In conclusion, the aqueous extract of Pyrenacantha staudtii had significant antinocic activity as studied with aspirin-, indomethacin-, serotonin- and reserpine-induced gastric ulcers. The plant appears to be potentially useful for treatment of gastric ulcer and there is need for further study with other models of experimental ulcer. Its mechanism of action should be explored.

Acknowledgements

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References


