Studies on Anti-tussive Activity of *Xanthium strumarium* L. Extract

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Abstract

The water extract of the entire plant *Xanthium strumarium* has been evaluated for its effect on cough induced by sulphur dioxide gas in mice. The extract shows significant anti-tussive activity in a dose dependent manner. The anti-tussive potential of extract was comparable to that of codeine phosphate (10 mg/kg) a standard drug. The extract at a dose level of 100, 200 mg/kg (p.o) showed significant inhibition of cough reflex by 39.75 and 65.58 respectively during 2h of the experiment.

INTRODUCTION

Xanthium strumarium Linn (Compositae) an herb commonly known as Banokra (Bengali and Hindi), Arishta, Bhulanga, Chanda and Itara (Sanskrit), grows throughout India, Ceylon, and other warm parts of the world. All parts of the herb are medicinally important in the traditional systems of Indian medicine, mentioned for use as cooling and fattening agents, as a laxative, anthelmintic, alternative, tonic, digestive aid, antipyretic and to improve appetite, voice, complexation, and memory. The whole plant is thought to possess powerful diaphoretic a sedative property. In China, buds of *Xanthium stumarium* are used as a tonic, diuretic, and sedative.

The root is a bitter tonic useful in the treatment of cancer and tumors. The prickly fruit, considered a cooling agent and demulcent, is given to patients with small pox (Kirtkar and Basu, 1935).Tribal people of India (Santal, Kheria and Moora of Khatra region of Bankura district, West Bengal) have been observed to use an infusion of the whole plant to recover from cough.

MATERIALS AND METHODS

Plant Material

The above ground portions of several plants of *Xanthium strumarium* Linn. (Compositae) were collected from Khatra region of the district of West Bengal, India in September, 1998 and identified by Dr. Subhash C. Mandal, Division of Pharmacognosy, Department of Pharmaceutical Technology, Jadavpur university, Calcutta, India. A voucher specimen (JU/DPT/DPHS – 4/1998) is kept in our laboratory for further reference. After collection, the plants were cut into small pieces (1-1.5 cm), dried under shade, pulversied with a mechanical grinder and stored in a closed plastic container until used.

Extract Preparation

The dried, pulverised tissue (9 700 g) was extracted with methanol (SD Fine Chemicals, Bombay, India) in a Soxhlet apparatus and then distilled under reduced pressure to yield a brownish – colred semisoid extract (yield 8.65% with respect to dry material). The extract was subsequently stored at 4°C until used. Just prior to use, the extract was dissolved in aqueous tween 80 solution.

Test Animals

Swiss albino mice (22-25 gms) of both the sexes were used as test animals in the experimental animals. The animals were maintained at 25 ± 1°C under natural day light/night conditions for atleast 10 days of acclimation using in the test procedure.

Antitussive Evaluation

The experiment model has been shown in Fig. 1. (Miyagoshi et al., 1986), where A is a 500-ml 3-necked flask containing aqueous saturated sodium hydrogen sulfite solution. By opening the stopcock of a burette B concentrated sulfuric acid was introduced to generate sulfur dioxide gas. Sulfur dioxide gas was filled previously in A and C the gas reservoir. And by opening cocks C and B pressure in the gas reservoir C is elevated which is recorded by the water manometer D. The chemical reaction occurring in flask A is

$$2\ NaHSO_3 + H_2SO_4 \rightleftharpoons 2SO_2\uparrow + Na_2So_4 + 2H_20$$

Then the stop cock B was closed and the stopcock D was opened slightly till pressure in D (11 mm I.D.) reaches to 75 mm water, when the cock is closed. These procedure were operated in a draught. Then each drug and extracts were orally administered to mice.

The animals were divided into 4 groups, each containing 10 mice. One served as control group. One group for codeine phosphate (standard antitussive agent) and another 2 groups for methanol extract of *Xanthium strumarium* Linn. Codeine phosphate was administered in a dose of 10 mg/kg. Methanol extract administered in a dose of 100 mg/kg, 200 mg/kg. Both the extract and codeine phosphate were suspended in aqueous tween 80 solution. The control group received neither extract nor codeine phosphate but aqueous tween 80 solution only. Initially the cough response of all the groups were observed by placing the animals in desiccator E. The cocks C, F and E were opened in order when the pressure in D became 0 mm of water, all the cocks were closed immediately certain amount of sulphur dioxide gas was introduced in this way. After a minute of introducing the gas in E and the mice were taken out of the desiccator and frequency of cough was observed for 5 min in an open ended filter funnel with a stethoscope at the tip in which the mouse was confined. In the same fashion the frequency of cough was observed for the methanol extract (100 and 200 mg/kg) and codeine phosphate (10 mg/kg) treated groups of animals at 1h, 2h, 3h intervals (after drug administration).

Statistical Analysis

The experimental results were expressed as the mean ± standard error mean (SEM). Significance was calculated by the Students *t*- test. *P*-values less than 0.001 imply significance of the pharmacological effects in the experiment (Woodson, 1987).

RESULTS AND DISCUSSION

The extract showed significant activity in inhibiting the cough reflex at dose of 200 mg/kg when compared with saline control treated (Table 1). It also produced significant effect at 100 mg/kg dose at the end of 2h. Codeine phosphate was used as standard drug for comparison. Produced significant inhibition. It was observed that the extract at doses of 100 mg/kg p.o, showed maximum inhibition of cough 39.75% at the end of 2h after administration of the and at a dose 200 mg/kg it showed inhibition by 65.85% at the end of 2h administration of the same. Codeine phosphate produced maximum inhibition by 67.72% at 2h after administration of the same. Then it was observed that oral administration of the extract reduced the frequency of cough in a dose related fashion which was statistically significant when compared with control (Woodson, 1987). So it can be concluded that this leaf extract has significant anti-cough effect in

experimentally induced cough reflex in mice like the standard drug (codeine phosphate). Thus it could be assumed that the extract might be acting via the central nervous system. Further work relating to the isolation and characterization of the active constituents as well as evaluation of the mechanism of antitussive effect is under way in our laboratory.

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Tables

Table 1. Effects of *Xanthium strumarium* extract and codeine phosphate on the cough induced by sulphur oxide gas in mice (N = 10).

Treatment	Dose (mg/kg)	Frequency of cough (mean ± SEM)		
		1hr	2hr	3hr
Control	-	158.60 ± 2.0	160.90 ± 1.79	162.40 ± 2.5
Codeine phosphate	10	87.00 ± 2.38 * **(45.14)**	52.70 ± 2.3 * **(67.72)**	74.70 ± .82 * **(54.00)**
MEXS	100	126.0 ± 2.17 * **(20.55)**	96.93 ± 1.8 * **(39.75)**	108.30 ± 2.84 * **(33.31)**
MEXS	200	98.30 ± 1.98 * **(38.02)**	54.94 ± 2.26 * **(65.85)**	93.60 ± 2.41 * **(42.36)**

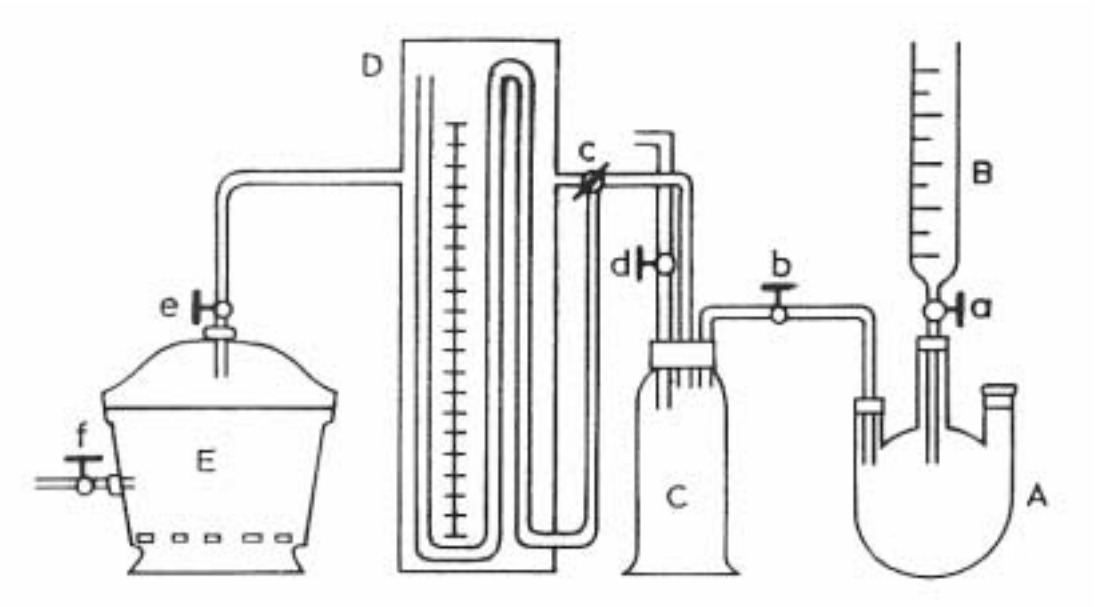
*$P < 0.001$ vs. control by students *t*- test

Figures in parenthesis indicate percentage inhibition of cough reflex.

The frequency of cough was counted for 5 min after SO_2 gas challenge.

MEXS: Methanol extract of *Xanthium strumarium* Linn

Figures



A. Saturated $NaHSO_3$ solution in 500 ml flask.
B. Concentrated H_2SO_4 in a burette.
C. Gas cylinder.
D. Water manometer.
E. Dessicator.

Fig. 1. Apparatus for anti-tussive evaluation by sulphur dioxide gas production.