EXPECTORANT ACTIVITY OF *ALPINIA GALANGA* WILLD

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Expectorant activity of *Alpinia galanga* Willd. was best extracted with petroleum ether. The steam volatile portion of the extract stimulated the bronchial glands directly while the non-volatile portion acted by reflex through gastric mucosa. The anise oil and dil oil also acted by reflex action.

The rhizomes, of *Alpinia galanga* Willd, a parenial plant, are recommended in idigenous medicine for bronchial catarrh, tuberculosis, and whooping cough (Chopra *et al.*, 1955, 1956, 1958). It has been suggested that volatile oil is responsible for the expectorant activity (Chopra *et al.*, 1954) of the drug.

In this paper a study of the expectorant activity of the drug by the method of Boyd *et al.*, (1946) with slight modifications (Inamdar *et al.*, 1960) is reported.

METHODS

The rhizomes of *Alpinia galanga* Willd were obtained from the market, varified, dried and powdered so as to pass through a 64 mesh seive. The powdered drug (500 g) was successively extracted by percolation with petrolium ether, 80 per cent alcohol and distilled water. All the extracts were concentrated *in vacuo* and dried in a desiccator to constant weight. The volatile oil was obtained from a separate lot of powdered drug (100 g) by steam distillation. The percentage yields of the various extracts were (i) petroleum ether ext., 2.9 (ii) ether ext., 0.75 (iii) 80 per cent alcohol ext., 3.00 (iv) water ext., 3.5 and (v) volatile oil, 0.18.

The expectorant activity was studied on rabbits partially anaesthetised with intravenous injection of urethane (7 ml of 25 per cent solution per kg body wt). The respiratory tract fluid (R.T.F.) was collected hourly for 7 hrs by the method of Boyd *et al.*, with slight modifications. The drug was administered at the end of the second hrs. The extracts were dissolved or suspended in 2 or 5 ml of normal saline with the help of Tween-80, and administered orally, intraperitoneally or intravenously as required. Dil oil and

anise oil were used for comparative studies. Results of studies with ammonium chloride, eucalyptol and *Vasaka* have been already published (Inamdar, 1960). The R.T.F. collected for the second hour was considered as normal and the changes in R.T.F. were calculated on the basis of this figure. The highest figure in the remaining five hrs was taken to represent the peak of activity. Five rabbits were used for each extract and the R.T.F. output was expressed as ml/24 hrs/kg of body weight.

For determination of the mode of action of *Alpinia galanga* Willd, the rabbits were given the drug by different routes viz., (i) orally, (ii) intraperitoneally, (iii) intravenously and (iv) orally after atropinisation (with 2 mg/kg). The emulsions of dil oil and anise oil were given orally as well as intraperitoneally to determine their mode of action.

RESULTS

Of the four extracts tested orally, only the petroleum ether extract showed stimulation of R.T.F. (Table I). The results indicate that with the given dose, petroleum ether ext. produced 82.9 per cent increase in R.T.F. The volatile oil produced an increase of 36.5 per cent. Dil oil and anise oil produced an increase of 50 per cent and 37.2 per cent respectively.

TABLE I

Expectorant activity of different drugs ; R.T.F. (respiratory tract fluid) excretion in rabbits ml/kg body wt/24 hrs

Dose	Dose mg/kg	Hourly rate of R.T.F. excretion							Increase in R.T.F. %
		I	II	III	IV	V	VI	VII	
Petroleum ether ext.	116[1]	1.6	3.6	6.6	4.1	3.0	2.3	1.6	82.9
Ether ext.	30[1]	3.9	5.0	5.1	4.6	4.1	2.6	2.6	3.3
80% Alcohol ext.	120[1]	1.7	3.8	3.8	3.1	3.1	2.1	1.5	—
Water ext.	140[1]	3.0	4.1	3.8	2.8	3.0	2.2	1.2	—
Volatile oil	7.2	3.1	4.2	5.8	4.2	3.4	2.4	2.0	36.5
Dil oil	20	4.1	5.0	7.5	3.6	4.6	3.2	1.7	50.0
Anise oil	20	3.0	3.3	4.5	4.3	3.0	2.7	2.8	37.2

1 Quantities represent 5 g of crude drug (*Alpinia galanga*).

When the same dose of petroleum ether extract was given orally after atropinisation only about 36 5 per cent increase in R.T.F. was observed

(Table II). The volatile oil produced 36.5 per cent increase even after atropinisation. The petroleum ether extract produced 50 per cent increase on intraperitoneal administration and 48.6 per cent increase on intravenous administration.

TABLE II

Studies on mode of action of expectronant activity ; R.T.F. (respiratory tract fluid) in rabbits, ml/kg body wt/24 hrs

Drug	Dose mg/kg	Route of administration	Hourly R.T.F. excretion							Increased n R.T.F. %
			I	II	III	IV	V	VI	VII	
Petroleum ether ext.	25	Intraepritoneal	3.0	4.9	7.5	6.2	3.7	2.5	2.3	50.0
Petroleum ether ext.	15	Intravenous	2.3	3.6	5.4	4.3	2.0	—	—	48.6
Petroleum ether ext.	116	Oral after atropinisation	2.0	3.4	4.8	3.5	2.5	2.2	1.1	36.6
Volatile oil	7,2	Oral after atropinisation	3.4	5.1	6.9	5.8	5.3	3.6	3.3	37.1
Dil oil	20	Intraperitoneal	3.6	6.0	4.7	4.5	3.5	2.7	2.4	—
Anise oil	20	Intraperitoneal	2.8	3.8	3.8	3.3	2.0	2.1	2.0	—

Dil oil and anise oil did not show any increase in R.T.F. on intraperitoneal administration.

DISCUSSION

Only the petroleum ether extract and the volatile oil of *Alpinia galanga* have expectorant activity. Since the petroleum ether extract contained the volatile oil, part of its activity should be due to the active fraction present in the volatile oil. There was a difference in the potency of the petroleum ether extract and the volatile oil. Petroleum ether extract was more than twice as active as volatile oil. Therefore, it is to be inferred that either the active principle is not so steam volatile and is only partly extracted by steam distillation or there are two active principles in the petroleum ether extract one of which is present in the volatile oil.

With regard to the mode of action, the volatile oil was active orally, both before and after atropinisation. Therefore, reflex activity through the stomach was ruled out. Probably the activity is directly on the bronchial glands.

The petroleum ether extract showed variation in degree of activity in atropinised rabbits. There was a fall by 46 3 per cent. This fall can be accounted for as loss of reflex activity that has been blocked by atropine. The remaining activity is approximately equal to that of the volatile oil. Therefore, it is to be inferred that there is a second active principle present in the petroleum ether extract acting as a reflex stimulant. This fraction is not extracted by the steam distillation.

Dil oil and anise oil are mildly active. Their activity seems to be due to gastric irritation since there was complete loss of activity on intraperitoneal administration of the drugs.

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