

# A PHARMACOLOGICAL INVESTIGATION OF SOME INDIGENOUS DRUGS OF PLANT ORIGIN FOR EVALUATION OF THEIR ANTIPIRETTIC, ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES

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## Introduction

Several plants have been described in the indigenous medicine to be useful in fevers, pains and inflammatory swellings. Among these *Hibiscus rosa-sinensis*, *Withania somnifera*, *Tephrosia purpurea*, *Nigella sativa* and *Nerium indicum* have been commonly used in these conditions (Kirtikar and Basu, 1944; Chopra *et al.*, 1956). Considering their usefulness in these conditions, their antipyretic, analgesic and anti-inflammatory activities were evaluated in different experimental models in animals.

## Material and Methods

The alcoholic extracts of the plants under study were prepared by percolation at room temperature with 70% ethyl alcohol. Each extract was concentrated in vacuo below 50 ° C till a residue was obtained. The residue was suspended in normal saline for the pharmacological study. The pure glycoside (plumieride) obtained from roots of *Nerium indicum* (Singh *et al.*, 1976) was also used in this study. It

was dissolved in normal saline. The following plants were studied for their antipyretic, analgesic and anti-inflammatory activities. Acetylsalicylic acid or hydrocortizone was used as a reference control.

1. *Hibiscus rosa-sinensis* (leaves)
2. *Withania somnifera* (defatted seeds)
3. *Tephrosia purpurea* (whole plant)
4. *Nigella sativa* (seeds)
5. *Nerium indicum* (Plumieride from the roots).

## ANTIPIRETTIC ACTIVITY

### *Brewer's yeast induced pyrexia*

Healthy albino rats weighing 150-200 gm were used in groups of six animals each. Normal rectal temperature was recorded by a clinical thermometer and its hourly variation was noted over a period of three hours at the beginning of the experiment. Pyrexia was produced by injecting 15% suspension of dried Brewer's yeast in 2% gum acacia in normal saline according to the method of Gujral *et al.* (1955). Eighteen hours after Brewer's yeast

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injection, temperature was recorded and compounds were injected intraperitoneally. The rectal temperature was again recorded after two and four hours of drug treatment and the results were analysed.

### ANALGESIC ACTIVITY

#### *Aconitine induced writhing response in albino mice*

Albino mice weighing between 20 and 25 gm were divided in groups of ten animals each. The compounds were given per orally (p. o.) one hour before intraperitoneal injection of aconitine (2 µg/mice) according to method of Bhalla et al., (1969). The animals were observed for the characteristic 'writhing' response over a period of thirty minutes.

### ANTI-INFLAMMATORY ACTIVITY

#### *Carrageenin-induced oedema*

Adult albino rats weighing between 80-100g were divided into groups of ten animals each. Freshly prepared suspension of carrageenin 0.05 ml (1.0% in 0.9% of saline) was in-

jected under planter aponeurosis of right hind paw of the rats by the method of Winter et al. (1962). The animals were pretreated with the test drugs one hour before carrageenin injection. The volume of the root was measured before and three hours after carrageenin treatment by micropipette method described by Buttle et al. (1957). Percent anti-inflammatory effect was calculated.

### ACUTE TOXICITY

Acute intraperitoneal LD<sub>50</sub> was determined in albino mice according to the method of Smith (1960).

### Results

#### *Antipyretic activity*

The effect of the drugs on pyrexia induced by Brewer's yeast in albino rats has been given in table 1. Alcoholic extracts of *Habiseus rosa-sinensis* and *Withania somnifera* and the glycoside plumacride showed highly significant antipyretic activity, while other extracts had poor antipyretic activity.

TABLE 1

*Effect of various indigenous drugs on Brewer's yeast induced pyrexia in albino rats.*

Compound	Dose mg/kg i. p.	Rectal initial	Temperature 18hr aber yeast	of (Mean ± S. E.) After Drug	
				2 hr.	4 hr.
Normal saline (control)	0.5 ml	99.8±0.20	102.4±0.24	102.6±0.21	102.4±0.11
Acetylsalicylic acid	30	99.6±0.31	103.0±0.18	99.8±0.12*	98.8±0.23*
Hibiscus Rosa sinensis	100	99.4±0.32	102.6±0.26	98.6±0.16*	99.8±0.25*
Withania somnifera	100	99.2±0.16	101.8±0.3	98.8±0.22*	99.0±0.20*
Tephrosia purpurea	100	99.6±0.28	102.4±0.19	102.2±0.30	102.3±0.24
Nigella sativa	100	99.9±0.24	102.2±0.28	102.4±0.26	102.6±0.30
Nerium indicum (glycoside)	100	99.7±0.18	103.1±0.21	*100.0±0.28	100.2±0.30*

\*  $\angle P$  0.001

## Analgesic activity

The effect of drugs against aconitine induced writhing in mice has been given in Table 2. In this test, *Withania somnifera*, *Hibiscus rosa-sinensis* and plumieride showed significant analgesic activity, *Withania somnifera* being most potent amongst these. The order of potency was found to be acetyl salicylic acid  $\succ$  *Withania somnifera*  $\succ$  *Plumieride*  $\succ$  *Hibiscus rosa-sinensis*.

## 3. Anti-inflammatory activity

The anti-inflammatory activity of various drugs against exudative phase (carrageenin induced oedema) of inflammation in albino rats is shown in Table 3. Hydrocortisone served as a reference drug. *Withania somnifera*, *Hibiscus rosa-sinensis* and *Plumieride* had highly significant ( $P < 0.001$ ) anti-inflammatory activity while others showed poor activity.

Acute LD<sub>50</sub>

Acute i. p. LD<sub>50</sub> of these drugs in mice are shown in Table 4.

## Discussion

Five drugs (four crude extracts and one pure plant glycoside) were tested for their antipyretic, analgesic and anti-inflammatory activities in albino mice and rats. These plants have been described to possess these properties

TABLE 2

Effect of drugs against aconitine induced writhing in albino mice.

Compound	PD <sub>50</sub> in mg./kg. (p.o) $\pm$ S. E.
Normal saline (control)	—*
Acetyl salicylic acid	18.8 $\pm$ 2.4
<i>Hibiscus rosa-sinensis</i>	125.0 $\pm$ 9.6
<i>Withania somnifera</i>	62.5 $\pm$ 6.2
<i>Tephrosia purpurea</i>	252.0 $\pm$ 15.8
<i>Nigella sativa</i>	*
<i>Plumieride</i>	102.0 $\pm$ 8.2

\* No protection with normal saline (0.5 ml) and *Nigella sativa* (dose upto 500 mg/kg p. o.)

TABLE 3

Effect of various drugs against carrageenin induced oedema in albino rats.

Compound	Dose mg/kg i. p.	n	Mean volume of oedema in ml $\pm$ S. E.	Percent anti-inflammatory effect	'p' Value
Normal saline (control)	0.5 ml	10	0.99 $\pm$ 0.02	—	—
Hydrocortisone	10	10	0.48 $\pm$ 0.06	51.5	$< 0.001$
<i>Hibiscus rosa-sinensis</i>	100	10	0.40 $\pm$ 0.03	59.6	$< 0.001$
<i>Withania somnifera</i>	100	10	0.36 $\pm$ 0.04	63.6	$< 0.001$
<i>Tephrosia purpurea</i>	100	10	0.68 $\pm$ 0.08	31	$< 0.05$
<i>Nigella sativa</i>	100	10	0.76 $\pm$ 0.09	23	$< 0.05$
<i>Plumieride</i>	100	10	0.56 $\pm$ 0.04	43	$< 0.001$

TABLE 4

$LD_{50}$  (i. p.) of various drugs in albino mice.

Name of the extract	mg/kg Mean $\pm$ S. E.
1. <i>Hibiscus rosa-sinensis</i>	1533 $\pm$ 25
2. <i>Withania somnifera</i>	1250 $\pm$ 31
3. <i>Tephrosia purpurea</i>	1138 $\pm$ 41
4. <i>Nigella sativa</i>	561 $\pm$ 21
5. <i>Plumieride</i>	4206 $\pm$ 68

in our ancient literature so the present work was an exploration of the same properties by various experimental techniques used in pharmacology. Among these plant materials tested, *Withania somnifera*, *Hibiscus rosa-sinensis* and *Plumieride*, the glycosides from *Nerium indicum*, were found to possess potent antipyretic, analgesic and anti-inflammatory activities. In the other two plant extracts (*Nigella sativa* and *Tephrosia purpurea*) these activities were less significant. The acute  $LD_{50}$  of the pharmacologically active drugs was also quite large and the glycoside of *Nerium indicum* was least toxic.

The presence of these properties in *Withania somnifera* and *Hibiscus rosa-sinensis* indicate the isolation of active constituent(s) in the extracts. Since the extracts have low toxicity and high safety margin, there may be assessed for their usefulness in Ayurvedic medicine for the treatment of rheumatism, and pain.

### Summary

In the present study 70% alcoholic extracts from *Hibiscus rosa-sinensis* (leaves), *Withania somnifera* (defatted seeds), *Tephrosia purpurea* (whole plant), *Nigella sativa* (seeds) and the pure glycoside (*Plumieride*) obtained from the roots of *Nerium indicum* were studied for their antipyretic, analgesic anti-inflammatory activities.

Among these drugs, the extracts from *Hibiscus rosa-sinensis* and *Withania somnifera* and pure glycoside from *Nerium indicum* showed the presence of potent antipyretic, analgesic and anti-inflammatory activities in albino rats and mice. Since, the extracts have low toxicity and high safety margin, they may be assessed for their usefulness in Ayurvedic system of Medicine in cases of fever, pain and rheumatism.

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हिन्दी सारांश

**कुछ स्वदेशी चिकित्सोपयोगी वनस्पतियों के ज्वरहर, शोथहर तथा वेदनाहर गुणों का द्रव्यगुण-वैज्ञानिक अध्ययन**

एन० सिंह, आर० नाथ, ए० के० अग्रवाल तथा आर० पी० कोहली

कुछ वनस्पतियों का प्रयोग ज्वरहर, शोथहर तथा वेदनाहरण के लिए आयुर्वेदिक चिकित्सा पद्धति में होता है। वर्तमान अध्ययन गुड़हल, अश्वगन्धा, सरपुंरवा तथा कर्लीजी के सुराविलेय तत्वों का और कनेर के शुद्ध ग्लाइकोसाइड का उपरोक्त गुणों का द्रव्यगुण वैज्ञानिक अध्ययन है।

गुड़हल एवं अश्वगन्धा (सुराविलेय तत्व) तथा कनेर (शुद्ध ग्लाइकोसाइड) में वेदनाहरण, ज्वरहर तथा शोथहर गुण अत्यधिक मात्रा में पाये गये। इन औषधियों में विषाक्तता भी कम पायी गयी। चिकित्सा में इनका ज्वर, वेदना तथा शोथ में प्रयोग के लिए आगे अध्ययन की आवश्यकता है।