AN ASSESSMENT OF THE ANTIPYRETIC AND ANALGESIC EFFECT OF SELECTED INDIGENOUS PLANTS IN RATS

By

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THESIS

Submitted in partial fulfilment of the requirement for the degree

Master of Veterinary Science

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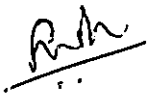
Mannuthy - Thrissur

1992

DECLARATION

I hereby declare that the thesis entitled **AN ASSESSMENT OF THE ANTIPYRETIC AND ANALGESIC EFFECT OF SELECTED INDIGENOUS PLANTS IN RATS** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship fellowship or other similar title, of any other University or Society.



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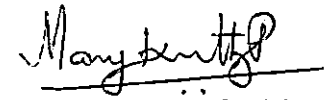

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ACKNOWLEDGEMENT

I wish to express my heart-felt gratitude to Dr. Marykutty, P., Professor, Department of Pharmacology and Toxicology, under whose inspiring guidance this research work was carried out.

I am gratefully indebted to Dr. M.K. Rajagopalan, Professor and Head, Department of Pharmacology and Toxicology, member of Advisory Committee for the valuable help and whole-hearted co-operation in carrying out the study.

I am gratefully acknowledge the help rendered by the members of the Advisory Committee, Dr. Zacharias Cherian, Professor, Department of Pharmacology and Toxicology and Dr. C.B. Manomohan, Associate Professor, Centre of Excellence in Pathology for their perpectual interest throughout the course of this study, and creative suggestions at every stage of the research.

I am deeply indebted to Dr. Jacob V. Cheeran, Professor, Department of Pharmacology and Toxicology for the valuable help, suggestions and guidance.

My sincere thanks are due to Dr. A.M. Chandrasekharan Nair, Dr. N. Gopakumar, Dr. K. Venugopalan, Sri. V.R.Raghunandan, Associate Professors and Dr. Usha, P.T.A., Assistant Professor, Department of Pharmacology and Toxicology for the valuable help rendered during the study.

I am thankful to Dr. P.A. Ommer, Professor and Head, Dr. K.R. Harshan, Associate Professor, Department of Anatomy for their valuble help and suggestions.

The generous help and co-operation of Dr. A. Rajan, Director and Dr. N. Divakaran Nair, Assistant Professor, Centre of Excellence in Pathology are greatly acknowledged.

I extend my sincere gratitude to Sri. K.C. George, Professor, Smt. K.P. Santha Bai and Sri. Prasad, Department of Statistics for their whole-hearted co-operation.

My sincere thanks are due to Dr. C.S. James, Professor, Department of Nutrition, for his timely help and co-operation.

I am grateful to Dr. G. Nirmalan, Dean in-charge, College of Veterinary and Animal Sciences, for the facilities provided for the study.

My heartfelt thanks are due to Dr. Mini, K.P.. Dr. Mini Bharathan, Dr. Viju George, Dr. Fabiana Lobo, Dr. Vinod Kumar, Dr. Krupesh Sharma, Dr. Raj Menon, Dr. Prasad, P.B., Dr. Sunil, B. and Dr. Sunil, M. for their timely help, constant coaxing and cajoling.

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Introduction

INTRODUCTION

Fever, in broad sense means a rise of body temperature above the normal range and is manifested when there is an upset in the thermoregulatory mechanism of the body. Regulation of body temperature requires a delicate balance between the production and loss of heat. Hypothalamus plays a key role by regulating the set point at which the body temperature is maintained.

In fever, the desired core body temperature or set point is elevated. The initiation of a febrile state results from bacterial or viral infections, inflammatory reactions, alteration of immune status or neoplastic conditions. These situations cause the release of mediators which are collectively termed as exogenous pyrogens. They attach to membrane receptors and stimulate both circulating and fixed mononuclear phagocytes to produce a low molecular weight protein called interlukin I (endogenous pyrogen; IL-I). The IL-I which is released, circulates in blood and is ultimately responsible for elevated thermoregulatory set point within the hypothalamus. In the hypothalamus IL-I stimulates the synthesis of prostaglandin E_2 (PGE_2). The prostaglandin acts on the hypothalamus to elicit the fever reaction (Milton and Wendlandt, 1971).

When prostaglandin formation is blocked by drugs, the fever is either abrogated or atleast reduced. This may be the explanation for the manner in which aspirin reduces the degree of fever because aspirin impedes the formation of Prostaglandin. Drugs such as aspirin that reduce fever are called antipyretics.

Etiological factors associated with fever vary, treatment for the removal of these factors, can be done only after proper diagnosis. Therefore symptomatic treatment for the control of fever is of importance. Symptoms of fever exhibited in various conditions as reported by Davis (1979) are as follows.

Systemic and local infections - 40 per cent; Neoplasm - 20 per cent; Connective tissue disease - 15 per cent; Undiagnosed diseases - 10 per cent and Miscellaneous diseases - 15 per cent.

Symptomatic control of fever requires the use of antipyretic drugs. Aspirin like nonsteroidal anti inflammatory drugs inhibits the synthesis of prostaglandin from arachidonic acid. It specifically inhibits cyclooxygenase enzyme which convert arachidonic acid to PGG_2 and PGH_2.

Different groups of compounds such as salicylates, para amino phenol derivatives, pyrazoline derivates and indane derivates are commonly used for the control of pyrexia.

Another avenue for the use of aspirin and related drugs is the alleviation of pain. Pain can be defined as an unpleasant, sensory and emotional experience associated with actual or potential tissue damage (International Association for the study of pain, 1979). Pain depends on activation of discrete set of receptors and neural pathways and is usually elicited by stimuli that are potentially noxious.

The means and ways to relieve pain is of great importance to all living beings. Hence the discovery of analgesics and anesthetics can be considered as milestones in medical history. Aspirin and related drugs alleviate pain of mild to moderate severity. The effect appears to involve peripheral and central mechanisms. Prostaglandins are found to sensitise pain receptors to mechanical or chemical stimulation. Aspirin arrest the sensitisation of peripheral nociceptors to such stimulation by preventing production and release of the intermediates and or end product of arachidonic acid cascade. These are more effective in dull, throbbing pain associated with inflammation.

Aspirin has been found to be effective both as an analgesic and antipyretic. But the numerous drawbacks of long term use of aspirin has led to the search of better alternatives with new synthetic and indigenous drugs.

Global estimate indicates that eighty per cent of about five billion population cannot afford the products of the Western pharmaceutical industry and have to rely upon the use of traditional medicines, which are mainly derived from plant material. Recently the World Health Organisation has compiled data on over 20,000 species of plants for screening of their pharmacological activity. In many of the developing countries the use of plant drugs is increasing because modern life saving drugs are beyond the reach of almost three quarter of the third world population. Thus it is obvious that the use of herbal drugs remains viable alternative for the future.

From time immemmorial, a variety of drugs have been used for the purpose of analgesic and antipyretic activity. The medicinal potentialities of Ocimum sanctum or Holybasil has been revealed since ancient times. The use of root decoction of O. sanctum used as an excellent remedy for various types of fever have been reported. Its juice or decoction of leaves have been reported to be useful for the

treatment of fever and is also a good expectorant. Tinospora cordifolia, which is known as "Indian Quinine", forms a major ingredient of various Ayurvedic preparations used in the treatment of fever. The decoction of stem of T. cordifolia has been reported to be useful in febrile conditions (Kirtikar and Basu., 1959). Therefore a detailed evaluation of the antipyretic and analgesic properties of O. sanctum and T. cordifolia will be of immense scientific value.

With this aim in view an attempt has been made in this study to evaluate the antipyretic and analgesic potentialities of essential oil, benzene extract and decoction of O. sanctum and benzene extract and decoction of T. cordifolia in yeast induced pyrexia in albino rats.

Review of Literature

REVIEW OF LITERATURE

In the Ayurvedic system of medicine the juice or decoction of the leaves of Ocimum sanctum is used as diaphoretic and antipyretic. A decoction of O. sanctum, Tinosporn cordifolia and Evoluvus alsinoides was used to treat malarial fever. Ocimum canum leaves and infusion of seeds of Ocimum basilicum were used in fever (Kirtikar and Basu, 1959).

Watt (1972) reported that O. sanctum root decoction was given as a diaphoretic in malarial fever. The juice of leaves have carminative, refrigerant and febrifugal actions.

Decoction of O. sanctum root and juice of leaves were used in fever in children (Drury, 1978).

Juice of leaves of O. sanctum possessed diaphoretic, stimulating and expectorant properties. A decoction of the root was given as a diaphoretic in malarial fever. Bitter principles of the T. cordifolia showed antispasmodic, antipyretic properties and possessed one fifth of analgesic effect of sodium salicylate (The Wealth of India, 1966).

A comparative antipyretic study was made on the effect of T. cordifolia and Amritharistam in T.A.B. vaccine induced pyrexia in albino rats (Pillai et al., 1980). T. cordifolia showed antipyretic effect at the end of first hour which sustained upto the end of fourth hour. Amritharistam produced significant effect from the third hour of study.

Pendse et al. (1981) reported that water extract of T. cordifolia could produce significant analgesia at higher dose levels and at a dose of 2000 mg/kg showed antipyretic effect from the third hour.

Ocimum sanctum fresh leaf juice with honey, ginger and onion were used as an expectorant in fever in children. Decoction of leaves with the flowers of Careyan arborea and black pepper were used in fever. Infusion prepared from the stem and root of T. cordifolia was given in debilitating diseases, intermittent fever and dyspepsia. Water extract of the plant also had a febrifugal action (Nadkarni, 1988).

Essential oil of O. sanctum produced dose related inhibition of rise in temperature in albino rats. But it was devoid of local anaesthetic, analgesic and anti convulsant activities (Tandan et al., 1989).

Other plants having antipyretic and analgesic action

Singh et al. (1974) studied the antipyretic effect of Celastrus paniculata in albino rats. Seventy per cent alcoholic extract of the whole plant was given to the rats which received subcutaneous injection of 15 per cent Brewer's yeast. The antipyretic effect was compared with that of sodium salicylate given to another group of rats. It was found that C. paniculata produced antipyretic effect within two hours after the administration of the drug.

Alcoholic extract of Sarcostema brevistigma significantly reduced body temperature within four hours in female rats (Mohoolkar, 1976). A significance of 0.01 percentage was found within the dose rate of 800 mg/kg. For analgesic activity, 0.05 and 0.001 per cent significance was found at 400 mg and 800 mg/kg dose level respectively.

Anand et al. (1976) revealed that Bavachinin - A, a flavanone isolated from seeds of Psoralea coryfolia (Bachi) at a dose rate of 50-200 mg/kg in albino rats produced antipyretic, analgesic and anti-inflammatory activities. It was found that 150 mg/kg of drug was more effective than 500 mg/kg of paracetamol.

Petroleum ether, chloroform and benzene extracts of Oxalis corniculata was used for anti-inflammatory, analgesic and antipyretic activities (Gaitonde et al 1977). It was found that these three extracts at a dose of 500 mg/kg were as potent as 600 mg/kg of aspirin.

Singh et al. (1978) used ethyl alcohol extracts of Hibiscus rosasinensis leaves, defatted seeds of Withania somnifera, Tephrosia purpurea whole plant, Nigella sativa seeds and plumieride, a glycoside fraction of Nerium indicum for evaluating the anti-inflammatory, analgesic and antipyretic effects in albino rats. It was found that 100 mg dose level of H. rosea, W. somnifera and plumieride produced a significant antipyretic effect within two hours of treatment. They also observed the analgesic potency of acetyl salicylic acid, W. somnifera, plumieride and H. rosa in the decreasing order of potency with the aconite induced writhing test in mice.

A trihydroxy - dicarboxylic acid was isolated from Corchorus depressus. Triacetate of this acid showed significant antipyretic and analgesic activities. It was devoid of CNS depressant action and was well tolerated in mice upto a dose of 800 mg/kg (Vohora et al 1979).

Pharmacological screening for the antipyretic, analgesic and antimicrobial activity of ethanolic extract of the seeds of Sisymbrium irio in albino rats exhibited antipyretic activity (Upadhyay, 1980).

Gupta et al. (1980) found that β sitosterol isolated from Cyperus rotundes exhibited anti-inflammatory activity similar to hydrocortisone and oxyphenbutazone when given intra-peritoneally to rats and the antipyretic activity resembled that of acetyl salicylic acid.

Nimbidin isolated from Neem oil showed significant analgesic and antipyretic activities at a dose rate of 100 mg/kg in rats (Pillai et al., 1980).

New triterpenic acid from Corchrus depressus and whole plant ethnolic extract of Trianthema portulacastrum were found to possess analgesic and antipyretic activities (Vohora et al., 1981 and Vohora 1983).

Gangetin isolated from the root of the plant Desmodium gangeticum produced effective analgesic and anti-inflammatory activities in mice and albino rats (Pandace et al., 1983).

Gupta *et al.* (1983) found that juice of *Aloe barbedensis* and the gum of *Salamalia malabarica*, an ingredient of an ayurvedic drug possessed significant analgesic activity in rats.

Alcoholic extract of *Woodfordia fruticosa* revealed antipyretic action in albino rats at a dose of 500 mg/kg body weight (Alam *et al.*, 1986).

A glycosidal fraction isolated from *Maesa chisia* D Don var *angustifolia* possessed antipyretic activity at a dose rate of 50 mg/kg in albino rats and this effect persisted upto 240 minutes (Gomes *et al* 1987). The drug did not possess analgesic activity and on chronic study no adverse effect could be found on body weight, growth rate, food intake and behavioural patterns.

Pillai *et al.* (1988) observed significant antipyretic activity for the aqueous extract of *Pongamia pinnata*.

A study on the antipyretic and analgesic activities of *Piper betle* conducted by Vijayakumari (1989) showed that the juice of *P. betle* leaf was as effective as paracetamol.

Kanniappan et al. (1991) noticed that chiretta brought the body temperature to normal when it was given simultaneously with yeast in rats. But chiretta given orally five hours after the subcutaneous injection of yeast reduced the body temperature, but not to the normal level.

Other actions of Ocimum sanctum

Dhar et al. (1968) revealed that ethanolic extract of O. sanctum showed hypoglycaemic effects in rats and anti spasmodic activity against spasmogen induced spasms in isolated guinea pig ileum.

Vohora et al. (1969) reported that leaves of O. sanctum showed abortifacient and antifertility activities in albino rats.

Aqueous extract of O. sanctum was found to have a transient hypotensive effect which was not blocked by mepyramine and hexamethonium but was partially blocked by atropine and it had direct depressant action on the heart (Singh et al., 1970).

Batta et al. (1970) reported that benzene and petroleum ether extracts of O. sanctum produced antifertility action in eighty per cent and sixty per cent of rats respectively.

Histological and biochemical studies on mice fed with leaves of O. sanctum showed mild impairment of spermatogenesis with significant reduction in seminal pH (Kasinathan et al., 1972).

Vijayalakshmi et al. (1979) reported that the aqueous extract of O. sanctum showed nematocidal activity against Meloidogyne incognita.

Girisan (1979) observed a 72 per cent reduction in fertility of albino rats treated with 200 mg and 400 mg of benzene extract of O. sanctum. No toxic effects were found in treated rats or in their offsprings.

Benzene extract of O. sanctum significantly reduced the sperm count, sperm motility and weight of the testis in rats (Seth et al., 1981).

Deshmukh et al. (1982) reported that hexane extract of O. sanctum showed larvicidal action against Culex pipiens fatigans.

Kalyansundaram and Babu (1982) found that petroleum extract of O. sanctum had larvicidal action against filarial mosquitoes and that was synergistic with synthetic chemical insecticides.

According to the observation made by seethalakshmi et al. (1982) O. sanctum enhanced the physical endurance in mice, prevented stress induced gastric ulcers in the rats and protected rats and mice against carbon teterachloride induced heapto toxicity.

Crude extract of O. sanctum was found to be more efficaceous than the steroid in the treatment of patients with acute viral encephalitis (Das et al., 1983).

Mediratta et al. (1988) reported that O. sanctum modulated the immune response by acting at various levels in the immune mechanisms such as antibody production, release of mediators of hypersensitivity reactions and response to these mediators in the target tissues.

Methanol and aqueous suspensions of O. sanctum leaves stimulated humoral immune response (Godhwani & Godwani, 1988).

Apte et al. (1988) found that O. sanctum plant extract had significant hypoglycaemic effect in the animals.

Gonzalez et al. (1988) observed that the active principle of O. sanctum favoured the uptake of glucose by the cell. It had an inhibitory effect on lipolysis and adenyl cyclase in rat adipose tissue challenged with noradrenaline.

Crespo et al. (1988) found that five milligram of the dried stem of O. sanctum in two millilitre of incubation medium produced an increase in the glucose uptake and its conversion to lipids.

Ocimum sanctum leaf extract showed an effective antistress activity by improving levels of succinic dehydrogenase in the liver and brain (Dadkar and Joshi, 1988).

Sixty millilitre of seventy five per cent extract of the leaves of O. sanctum brought the blood pressure to normal in rats and dogs with induced hypertension and humans with essential hypertension (Subhulakshmy and Sarvaiya, 1991).

Other actions of *Tinospora cordifolia*

Singh *et al.* (1979) studied the effect of four Medhya Rasayana drugs viz. Brami, Sankhapuspi, yacti and gudchi (*T. cordifolia*) on the levels of brain acetyl choline, catecholamine, serotonin and histamine in normal and stressed rats and observed that these drugs act as tranquilizers and might also improve the mental function.

Sharma *et al.* (1980) found significant anti-inflammatory activty in *T. cordifolia* on carrageenin induced hind paw oedema in rats.

Khosa and Singh (1981) observed that a non-nitrogenous crystalline substance isolated from the alcohol extract of the stem of *T. cordifolia* exhibited mild antifertility activity in female albino rats.

An Ayurvedi preparation composed of *Terminala chebula*, *curuma longa*, *phyllanthus embilica*, *T. cordifolia*, *Plumbago rosea*, *Evgemia jambolana* and *Shilajit* was given to patients with diabetes, polyurea, polypepsia, polydepsia, general debility and digestive problems. Improvement was noticed in these conditions with no side effects (Saley and Nalgirkar, 1982).

Gulati and Pandey (1982) found that aqueous extract of T. cordifolia stem showed significant anti-inflammatory activity in male albino rats.

Tinospora cordifolia was found effective in preventing fibrous changes and promoting regeneration of parenchymal tissues of liver in albino rats (Rege et al., 1984).

Aqueous extract of T. cordifolia stem significantly decreased the broncho spasm induced by five per cent histamine aerosol in guinea pigs, decreased capillary permeability in mice and reduced the number of disrupted mast cells in rats (Nayampalli et al., 1986).

Aqueous extract of T. cordifolia showed mild diuretic activity, accompanied by an increase in the excretion of electrolytes in rats, whereas a variable diuretic response with no significant alteration in urinary electrolytes was found in healthy volunteers (Nayampalli et al., 1988).

Rege et al. (1989) revealed that aqueous extract of T. cordifolia given at a dose rate of 100 mg/kg for seven days improved the cellular immune function.

Karnick (1989) used a herbal drug composed of Berginia lingulath, T. cordifolia, Elipta alba, Tributis terrestis Asparagis racemosis, withania somnifera and found it effective in thirty patients with urinary calculi and the calculi were discharged through urine as calcium carbonate and calcium oxalate within thirty days.

Faizullah (1990) treated six goats orally with Liv. 52 at a dose rate of one millilitre per kilogram and another six goats with T. cordifolia decoction five millilitre per kilogram body weight in experimental carbon tetrachloride hepatopathy. Liv. 52 showed better regeneration of hepatic cells compared to T. cordifolia treated ones. However the clinical and haematobiochemical values of both groups showed improvement.

Materials and Methods

MATERIALS AND METHODS

Experiments were carried out in three different stages.

Determination of antipyretic activity of *Ocimum sanctum* and *Tinospora cordifolia* in albino rats

Fresh leaves with stem of *Ocimum sanctum* and stem of *Tinospora cordifolia* were collected from Kerala Agricultural University Campus during September to December, 1991.

Essential oil of *O. sanctum* was prepared by steam distillation of fresh leaves. On an average 100 grams of the leaves gave 0.2 ml of essential oil.

Leaves with small branches of *O. sanctum* were dried at room temperature and powdered using a pulverizer. The dried powder (100 g) was extracted using benzene (80°C) and benzene soluble fraction was recovered qualitatively. Benzene fraction obtained was about 2-2.5 per cent weight of the dried powder.

Benzene extract of the stem of *T. cordifolia* was also prepared in the same way. The residue obtained was 1.5 to 2 per cent of the weight of dried powder. The residue was kept at room temperature and evaporated to dryness.

Decoction of the whole plant of O. sanctum and stem T. cordifolia were prepared by boiling sixty grams of air dried plant material in 1450 ml of water and brought the final volume to 90 ml, and filtered to remove the coarse particles. Ninety millilitre for 60 kg body weight considered to be an effective oral dose of decoction in man. Seven times human dose was administered orally to rats (Sheela, 1989). Thus a similar dose schedule was followed in these experiments, ie., 1.05 ml/100 g body weight of rats.

Two hundred and forty adult healthy albino rats weighing between 90-120 g were selected from the Small Animal Breeding Station, College of Veterinary and Animal Sciences, Mannuthy. They were divided into twenty four groups of ten each. Each group was kept in a single cage, feed and water were provided ad lib (Farris et al., 1949). The composition of feed was as follows:

Bengal gram	25 per cent
Ground nut cake	25 per cent
Wheat	20 per cent
Wheat bran	20 per cent
Meat cum bone meal	8 per cent
Salt	0.5 per cent
Supplevite M*	1.5 per cent

* Sarabhai - Baroda

To begin with the experiment, body temperature of the rats were recorded at an interval of one hour continuously for seven hours for two days in order to familiarise the animals to laboratory handling and management. The animals were kept under observation for a period of one week.

Pyrexia was induced in all the 23 groups and one group was kept without inducing pyrexia (normal control). Fresh yeast obtained locally was prepared as 20 per cent suspension in normal saline (20 g in 100 ml) and was administered subcutaneously in a dose of one millilitre per 100 g body weight to induce pyrexia as described by Turner (1965).

Experimental design

Group No.	Treatment
I	Kept as control without administration of yeast.
II	Yeast 1 ml/100 g body weight subcutaneously + 1 ml of 5 per cent emulsion of Tween 80 in water administered orally.
III	Yeast 1 ml/100 g body weight subcutaneously + benzene extract of O. sanctum 50 mg/kg body weight orally.

IV	Yeast 1 ml/100 g body weight subcutaneously + benzene extract of O. sanctum 100 mg/kg body weight orally.
V	Yeast 1 ml/100 g body weight subcutaneously+benzene extract of O. sanctum 200 mg/kg body weight orally
VI	Yeast 1 ml/100 g body weight subcutaneously + benzene extract of O. sanctum 400 mg/kg body weight orally.
VII	Yeast 1 ml/100 g body weight subcutaneously + essential oil of O. sanctum 50 mg/kg body weight orally
VIII	Yeast 1 ml/100 g body weight subcutaneously + essential oil of O.sanctum 100 mg/kg body weight orally
IX	Yeast 1 ml/100 g body weight subcutaneously + essential oil of O. sanctum 200 mg/kg body weight orally
X	Yeast 1 ml/100 g body weight subcutaneously + essential oil of O. sanctum 400 mg/kg body weight orally
XI	Yeast 1 ml/100 g body weight subcutaneously + 1.05 ml/100 g body weight decoction of O. sanctum orally

XII	Yeast 1 ml/100 g body weight subcutaneously + 2.10 ml/100 g body weight decoction of O. sanctum orally
XIII	Yeast 1 ml/100 g body weight subcutaneously + 3.15 ml/100 g body weight decoction of O. sanctum orally
XIV	Yeast 1 ml/100 g body weight subcutaneously + benzene extract of T. cordifolia 50 mg/kg body weight orally
XV	Yeast 1 ml/100 g body weight subcutaneously + benzene extract of T. cordifolia 100 mg/kg body weight orally
XVI	Yeast 1 ml/100 g body weight subcutaneously + benzene extract of T. cordifolia 200 mg/kg body weight orally
XVII	Yeast 1 ml/100 g body weight subcutaneously + benzene extract of T. cordifolia 400 mg/kg body weight orally
XVIII	Yeast 1 ml/100 g body weight subcutaneously + 1.05 ml/100 g body weight decoction of T. cordifolia orally
XIX	Yeast 1 ml/100 g body weight subcutaneously + 2.1 ml/100 g body weight decoction of T. cordifolia orally

XX	Yeast 1 ml/100 g body weight subcutaneously + 3.15 ml/100 g body weight decoction of T. cordifolia orally
XXI	Yeast 1 ml/100 g body weight subcutaneously + 50 mg/kg body weight of aspirin orally
XXII	Yeast 1 ml/100 g body weight subcutaneously + 100 mg/kg body weight of aspirin orally
XXIII	Yeast 1 ml/100 g body weight subcutaneously + 200 mg/kg body weight of aspirin orally
XXIV	Yeast 1 ml/100 g body weight subcutaneously + 400 mg/kg body weight of aspirin orally

The powdered residue of the above mentioned extracts as well as the essential oil were made into two per cent emulsion using five per cent solution of Tween-80 in water and given orally. The suspension of aspirin was also prepared in the same way. But decoction prepared was administered in different doses as mentioned in the experimental design.

All the drugs were administered when the temperature rise was at its peak (6th hour) thereafter rectal

temperature was recorded at one hour interval for four hours. Results were analysed using analysis of variance (Snedecor & Cochran, 1967). The temperature before administration of the drug was taken as 100 and subsequent temperature were converted to the respective percentage and were presented in the tables (Kanniappan et al. 1991).

Investigation of analgesic effect of *Ocimum sanctum* and *Tinospora cordifolia*

The analgesic effect of *O. sanctum* and *T. cordifolia* was determined by thermal stimulus (Dandiya and Menon 1963).

Analgesic effect in rats was assessed by tail flick method using analgesio meter. This instrument has a Nichrome wire which would be heated to the required temperature and maintained by means of heat regulators. The current passing through the Nichrome wire is indicated on the ammeter which indirectly gives the temperature of the wire. A jacket surrounds the Nichrome wire and water is circulated through it. The upper surface of the jacket serves as a platform on which the tail of the rat can be placed. The water circulating through the jacket prevents the platform from getting heated up. This ensures that only

that portion of the tail which lies just above the hot wire is affected. The ammeter was set to four amperes so that the heat produced in the Nichrome wire was constant throughout the experiment. The rat was kept in a rat holder with only the tail portion protruding out. The tail was placed on the platform. So that the middle portion of the tail remained just above the hot wire but without touching it. The reaction time was noted when the animal responded with a sudden and characteristic flick or tail lifting.

Experimental design

Six groups consisting of six rats each were used for the study.

Group I	200 mg/kg body weight of aspirin
Group II	200 mg/kg body weight of Benzene extract of O. sanctum
Group III	400 mg/kg body weight of Benzene extract of O. sanctum
Group IV	200 mg/kg body weight of Benzene extract of T. cordifolia
Group V	400 mg/kg body weight of Benzene extract of T. cordifolia
Group VI	1 g/kg body weight of Benzene extract of T. cordifolia

The drug preparation used for analgesic study was similar to those used in the antipyretic study. Reaction time, that is the time taken for the characteristic tail lift was measured in seconds before administration of the drug in all the rats. All the rats which were not responding with in ten seconds were discarded. After the administration of the drugs, reaction time for each drug was measured at 30, 60, 90 and 120 minutes. Results were analysed using student's "t" test (Snedecor & Cochran, 1967).

Long Term effect (Chronic study) of esssential oil of Ocimum sanctum and benzene extract of Tinospora cordifolia in albino rats

Experimental design

The drugs were administered once daily for a period of 60 days to asses the haematological and histopathological changes of liver in rats.

Group I	Control rats(five per cent emulsion of Tween-80 in water administered orally).
Group II	100 mg/kg dose of essential oil of O. sanctum administered orally.
Group III	100 mg/kg dose of Benzene extract of T. cordifolia administered orally.

Thirty apparently healthy albino rats weighing 90-130 g were used for the study. They were divided into three groups and housed under ideal conditions of feeding and management. The drug preparation used for chronic study was similar to those used in the antipyretic study. Before the administration of the drugs, erythrocyte count, total leucocyte count, differentital count and haemoglobin concentration were estimated as per the technique described by Schalm (1975). Blood was collected as the method discribed by Garvey et al. (1977). Each drug was given at a dose rate of 100 mg/kg body weight daily morning at 8 a.m. and continued for 60 days. The haematological parameters were determined at interval of 15 days. Results were analysed using analysis of co-variance (Snedecor & Cochran, 1967). On the 61st day all the rats were sacrificed using chloroform. Liver tissues were collected and processed by routine paraffin embedding technique. Paraffin sections of four to five micron thickness were stained with Harri's haematoxylin and Eosin (Luna, 1968).

Results

RESULTS

Results obtained are presented in the tables 1 to 21.

Benzene extract, essential oil and decoction of Ocimum sanctum and benzene extract and decoction of Tinospora cordifolia produced a significant reduction in the temperature ($P < 0.01$) during the specific time intervals after administration of the drug.

Benzene extract of O. sanctum (Table 1-4). at a dose rate of 50 mg/kg orally reduced the temperature from 38.62°C (104.26) to 38.33°C (103.34) after the first hour. and to 37.81°C (102.07) after the fourth hour. Dose rate of 100 mg/kg lowered the temperature from 39.36°C (106.52) to 38.68°C (104.68) and 37.7°C (102.02) after the first and fourth hours after its administration. A decline from 38.84°C (105.22) to 38.1°C (103.22) and 37.51°C (101.62) were observed for 200 mg/kg body weight of the aforesaid time intervals. 400 mg/kg dose rate caused a decreased from 38.84°C (103.99) to 38.34°C (102.59) and 37.79°C (100.58) after first and fourth hour.

Essential Oil of O. sanctum (Table 5-8) at a dose rate of 50 mg/kg orally reduced the temperature from 39.31°C (105.72) to 38.77°C (104.27) after the first hour. The

temperature was further reduced to 38.17°C (103.16) after the fourth hour of its administration. A dose rate of 100 mg/kg caused a reduction of 39.18°C (105.32) to 38.66°C (103.92) and 38.22°C (103.15) after the first and fourth hour. A decline of 39.37°C(106.11) to 38.78°C (104.52) and 37.96°C (102.31) were observed for 200 mg/kg dose rate for the specific time intervals. 400 mg/kg dose rate caused a decrease of 39.21°C (106.05) to 38.55°C (104.20) and 37.91°C (102.54) after first and fourth hour of its administration.

Decoction of O. sanctum (Table 9-11) at a single dose orally reduced the temperature from 38.77°C (104.44) to 38.65°C (104.14) after the first hour. The temperature was further reduced to 37.92°C (102.12) after the fourth hour. When the dose rate was doubled a reduction from 38.93°C (104.79) to 38.04°C (102.39) was observed after the first hour and to 37.49°C (100.91) after the fourth hour. Triple the dose of decoction of O. sanctum produced a reduction from 39.74°C (106.82) to 39.11°C (105.13) after the first hour and to 38.02°C (102.20) after the fourth hour.

Benzene extract of Tinospora cordifolia (Table 12-15) at a dose rate of 50 mg/kg orally reduced the temperature from 39.22°C (105.68) to 38.87°C (104.74) after the first hour where as to 38.23°C (103.01) after the fourth hour.

A dose rate of 100 mg/kg lowered the temperature from 39.22°C (105.79) to 38.53°C (103.93) and 37.91°C (102.26) after the first and fourth hour of its administration. A decline from 39.24°C (105.85) to 38.57°C (104.04) and 37.78°C (101.91) were observed for 200 mg/kg body weight for the above mentioned time intervals. 400 mg/kg dose rate caused a decrease from 39.01°C (105.03) to 38.89°C (104.71) after the first hour and to 37.77°C (101.69) after the fourth hour.

Decoction of Tinospora cordifolia (Table 16-18) at a single dose orally reduced the temperature from 40.19°C (107.17) to 39.25°C (104.66) after the first hour. The temperature was further reduced to 38.51°C (102.69) after the fourth hour. When the dose rate was doubled a reduction from 39.72°C (106.20) to 38.8°C (103.74) was observed after the first hour and to 38.14°C (101.97) after the fourth hour. Triple the dose of decoction produced a reduction from 39.16°C(105.26) to 38.52°C(103.54) after the first hour and to 38.15°C (102.55) after the fourth hour.

Antipyretic effect of all the drugs based on dose rate used were presented in the Figure 1 to 7.

Ocimum sanctum administered at different dose rates of 200 mg/kg and 400 mg/kg produced no significant analgesic effect in albino rats (Table 19). T. cordifolia administered at dose rates of 200 mg/kg and 400 mg/kg also produced no significant analgesic effect. T. cordifolia administered at a higher dose rate of one gram per kilogram also failed to produce any significant analgesic effect (Table 20). Aspirin produced significant analgesic effect in albino rats within 30 minutes after the oral administration at a dose rate of 200 mg/kg.

The dose rate of O. sanctum and T. cordifolia employed in this study for analgesic activity failed to produce statistically significant positive results.

Haematological parameter of essential oil of Ocimum sanctum were given in the table 21. A steady increase ($P<0.01$) of erythrocyte count ($10^6/mm^3$) was observed after 45 days of treatment with the drug. At the end of chronic study a significant increase ($P < 0.01$) in the erythrocyte count could be found out. Leucocyte count ($10^3/mm^3$) showed no significant variation during the period of study. Haemoglobin value (g/dl) showed higher value from 30 days onwords ($P < 0.01$) after its daily administration of the drug. Neutrophil percentage showed a significant increase

($P < 0.01$), lymphocyte percentage showed a decrease and no change was observed for eosinophil after 15 days of treatment with the drug. After 60 days of drug administration an increase in the neutrophil percentage ($P < 0.01$) and decrease in the lymphocyte percentage noticed.

Haematological parameter of benzene extract of Tinospora cordifolia were given in the table 21. A steady increase ($P < 0.01$) of erythrocyte count ($10^6/mm^3$) was observed after 45 days of treatment with the drug. At the end of chronic study a significant increase ($P < 0.01$) in the erythrocyte count could be found out. Leucocyte count ($10^3/mm^3$) showed a significant variation ($P < 0.05$) at the end of study. Haemoglobin value (g/dl) showed higher value from 30 days onwards ($P < 0.01$) after its daily administration of the drug. Neutrophil percentage showed a significant increase ($P < 0.01$), lymphocyte percentage showed a decrease and no change was observed for eosinophil after 15 days of treatment with the drug. After 30 days, Neutrophil percentage showed a variation ($P < 0.05$) with a decrease in the lymphocyte persentage. After 45 days, an increase of neutrophil percentage ($P < 0.01$) and decrease in lymphocyte percentage noticed. After 60 days of drug administration an increase in the neutrophil percentage ($P < 0.01$) and decrease in the lymphocyte percentage noticed.

Histopathological examination of hepatic tissue of control group of animals (Fed with Tween-80) revealed the following lesions. Out of ten albino rats eight revealed mild to moderate fatty change. The lesions were distributed focally in six and diffusely in two animals. Along with fatty change, moderate to severe congestion of central veins was also observed in seven specimens (Fig. 8). Hyperplasia of bile duct was encountered in three rats (Fig. 9). Thrombus formation, diffuse and focal degeneration were noticed in three different specimens.

Essential oil of Ocimum sanctum treated group revealed the following lesions. In four albino rats out of ten, mild to moderate fatty changes were evident (Fig. 10). Central venous congestion was also found in four specimens. Hyperplasia of bile duct was observed in three. Diffuse necrosis, dilatation of central vein and congestion of sinusoids were characteristics in two specimens (Fig. 11). Para central necrosis was found in one case.

Benzene extract of Tinospora cordifolia treated group revealed the following lesions. Mild fatty change was observed in six rats out of 10 focal in five and diffuse in one (Fig. 12). In seven albino rats mild to moderate congestion of central vein was recorded (Fig. 13). Dilatation of central vein was evident in two specimens and diffuse necrosis in one.

Table 1. Benzene extrtact of Ocimum sanctum (50 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	38.62±0.06 (104.26)	38.33±0.08 (103.34)	38.27±0.07 (103.32)	37.99±0.11 (102.56)	37.81±0.11 (102.07)
Aspirin	39.49±0.13 (106.58)	38.65±0.15 (104.31)	38.36±0.15 (103.53)	38.02±0.14 (102.61)	37.77±0.16 (101.94)
Yeast	37.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.233	0.289	0.377	0.371	0.349

Summary of ANOVA Table (Mean square)

Source	df					
Treat-ment	3	6.481**	6.723**	4.562**	4.041**	6.005**
Error	36	0.0656	0.101	0.173	0.167	0.148

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 2. Benzene extrtact of Ocimum sanctum (100 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	39.36±16.0 (106.52)	38.68±0.26 (104.68)	38.13±0.36 (103.19)	37.70±0.23 (102.02)	37.70±0.14 (102.02)
Aspirin	39.41±0.12 (106.22)	38.63±0.05 (104.12)	38.36±0.11 (103.39)	37.94±0.12 (102.26)	38.11±0.16 (102.72)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.331	0.451	0.618	0.462	0.386

Summary of ANOVA Table (Mean square)

Source	df					
Treat-ment	3	6.731**	6.721**	4.567**	4.373**	6.369**
Error	36	0.133	0.246	0.464	0.259	0.181

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 3. Benzene extrtact of Ocimum sanctum (200 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	38.84±0.14 (105.22)	38.10±0.13 (103.22)	37.84±0.24 (102.51)	37.71±0.15 (102.16)	37.51±0.17 (101.62)
Aspirin	39.35±0.12 (106.26)	38.78±0.12 (104.72)	37.94±0.15 (102.45)	37.35±0.24 (100.86)	37.15±0.26 (100.65)
Yeast	39.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.331	0.345	0.506	0.449	0.508

Summary of ANOVA Table (Mean square)

Source	df					
Treat-ment	3	5.7981**	7.307**	4.628**	5.325**	6.468**
Error	36	0.1334	0.144	0.311	0.245	0.314

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 4. Benzene extrtact of Ocimum sanctum (400 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	38.84±0.11 (103.93)	38.34±0.12 (102.59)	38.09±0.06 (101.92)	37.96±0.09 (101.57)	37.79±0.10 (100.58)
Aspirin	39.26±0.12 (105.87)	38.19±0.08 (102.99)	37.73±0.10 (101.75)	37.29±0.17 (100.56)	36.96±0.18 (100.00)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.331	0.451	0.618	0.462	0.386

Summary of ANOVA Table (Mean square)

Source	df					
Treatment	3	5.043**	3.545**	4.699**	5.108**	9.102**
Error	36	0.128	0.115	0.100	0.127	0.169

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 5. Essential oil of Ocimum sanctum (50 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	39.31±0.086 (105.72)	38.77±0.12 (104.27)	38.87±0.11 (104.54)	38.37±0.09 (103.20)	38.17±0.14 (103.16)
Aspirin	39.48±0.13 (106.58)	38.65±0.15 (104.31)	38.36±0.15 (103.53)	38.02±0.14 (102.61)	37.75±0.16 (1.94)
Yeast	39.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.2496	0.3204	0.397	0.359	0.3829

Summary of ANOVA Table (Mean square)

Source	df				
Treat-ment	3	6.838**	6.838**	5.66**	4.236**	6.486**
Error	36	7.5629	0.124	0.192	0.156	0.1779

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 6. Essential oil of Ocimum sanctum (100 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	39.18±0.05 (105.32)	38.66±0.06 (103.92)	38.61±0.08 (103.79)	38.66±0.05 (103.92)	38.22±0.16 (103.15)
Aspirin	39.41±0.12 (106.22)	38.63±0.05 (104.12)	38.36±0.11 (103.39)	37.94±0.12 (102.26)	38.11±0.16 (102.72)
Yeast	39.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.2297	0.2600	0.3731	0.2865	0.3586

Summary of ANOVA Table (Mean square)

Source	df					
Treat-ment	3	6.33**	6.701**	4.966**	5.1927**	6.763**
Error	36	0.640	0.082	0.154	0.0996	0.1560

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 7. Essential oil of Ocimum sanctum (200 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	39.37±0.16 (106.11)	38.78±0.14 (104.52)	38.66±0.11 (104.20)	38.88±0.12 (103.30)	37.96±0.16 (102.31)
Aspirin	39.35±0.12 (106.26)	38.78±0.12 (104.72)	37.94±0.15 (102.45)	37.35±0.24 (100.86)	37.15±0.26 (100.65)
Yeast	39.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.31±0.18	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.3405	0.360	0.400	0.5796	0.4960

Summary of ANOVA Table (Mean square)

Source	df					
Treat-ment	3	6.5885**	6.9921**	5.397**	3.7083**	7.020**
Error	36	0.1407	0.157	0.194	0.4076	0.2985

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 8. Essential oil of Ocimum sanctum (400 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	39.21±0.13 (106.05)	38.55±0.16 (104.20)	38.12±0.19 (103.11)	38.87±0.71 (102.43)	37.91±0.04 (102.54)
Aspirin	39.26±0.12 (105.87)	38.19±0.08 (102.99)	37.73±0.10 (101.75)	37.29±0.17 (100.56)	36.96±0.11 (100.00)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.269	0.345	0.376	0.465	0.359

Summary of ANOVA Table (Mean square)

Source	df					
Treatment	3	5.957**	6.759**	4.816**	4.752**	7.562**
Error	36	0.0879	0.1449	0.1723	0.263	0.1566

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 9. Single dose of decoction of Ocimum sanctum at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	38.77±0.073 (104.44)	38.65±0.10 (104.14)	38.09±0.09 (102.58)	37.86±0.07 (101.96)	37.92±0.09 (102.12)
Aspirin 100 mg/kg	39.41±0.12 (106.22)	38.63±0.05 (104.12)	38.36±0.11 (103.39)	37.94±0.12 (102.26)	38.11±0.16 (102.72)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.237	0.2634	0.3644	0.330	0.348

Summary of ANOVA Table (Mean square)

Source	df					
Treatment	3	6.0286**	6.697917**	4.582**	4.154**	6.411**
Error	36	0.0685	0.084	0.161	0.132	0.1475

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 10. Double dose of decoction of *Ocimum sanctum* at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	38.93±0.07 (104.79)	38.04±0.08 (102.39)	38.10±0.07 (102.55)	37.68±0.06 (101.42)	37.49±0.06 (100.91)
Aspirin 200 mg/kg	39.41±0.12 (106.26)	38.63±0.05 (104.72)	38.36±0.11 (102.45)	37.94±0.12 (100.86)	38.11±0.16 (100.65)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.225	0.2704	0.3545	0.327	0.329

Summary of ANOVA Table (Mean square)

Source	df					
Treatment	3	6.048**	7.140**	4.57**	4.406**	6.652**
Error	36	0.0618	0.0887	0.1525	0.129	0.1317

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 11. Tripple dose of decoction of *Ocimum sanctum* at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
O. sanctum	39.74±0.11 (106.82)	39.11±0.11 (105.13)	38.79±0.15 (104.27)	38.15±0.10 (102.60)	38.02±0.10 (102.20)
Aspirin 400 mg/kg	39.41±0.12 (105.87)	38.63±0.05 (102.99)	38.36±0.11 (101.75)	37.94±0.12 (100.56)	38.11±0.16 (100.00)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.265	0.289	0.4025	0.3425	0.344

Summary of ANOVA Table (Mean square)

Source	df					
Treatment	3	8.106771**	7.591146**	5.4127**	4.1028**	6.486**
Error	36	0.0852	0.1015	0.1966	0.142	0.143

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 12. Benzene extrtact of Tinospora cordifolia (50 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
T. cordifolia	39.22±0.14 (105.68)	38.87±0.15 (104.74)	38.75±0.13 (104.41)	38.37±0.14 (103.39)	38.23±0.11 (103.01)
Aspirin	39.49±0.13 (106.58)	38.65±0.09 (104.31)	38.36±0.15 (103.53)	38.02±0.14 (102.61)	37.77±0.16 (1.94)
Yeast	39.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.302	0.343	0.407	0.469	0.360

Summary of ANOVA Table (Mean square)

Source	df				
Treat-ment	3	6.682**	7.0**	5.29**	3.585**	6.635**
Error	36	0.110	0.1429	0.2014	0.2671	0.157

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 13. Benzene extrtact of Tinospora cordifolia (100 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
T. cordifolia	39.22±0.15 (105.79)	38.53±0.13 (103.93)	38.43±0.14 (103.66)	38.06±0.11 (102.67)	37.91±0.075 (102.26)
Aspirin	39.41±0.12 (106.22)	38.63±0.05 (104.12)	38.36±0.11 (103.39)	37.94±0.122 (102.26)	38.11±0.16 (102.72)
Yeast	39.34±0.04	39.41±0.07	38.94±0.15	38.93±0.15	38.60±0.110
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.2997	0.308	0.395	0.382	0.342

Summary of ANOVA Table (Mean square)

Source	df					
Treatment	3	6.404**	6.6354**	4.677**	3.798**	6.368**
Error	36	0.109	0.115	0.189	0.177	0.142

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 14. Benzene extrtact of Tinospora cordifolia (200 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
T. cordifolia	39.24±0.09 (105.85)	38.57±0.14 (104.04)	38.83±0.08 (104.74)	38.19±0.10 (103.02)	37.78±0.13 (101.91)
Aspirin	39.35±0.16 (106.26)	38.78±0.12 (104.72)	37.94±0.15 (102.45)	37.35±0.24 (100.86)	37.15±0.26 (100.65)
Yeast	39.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.289	0.3569	0.386	0.618	0.4816

Summary of ANOVA Table (Mean square)

Source	df				
Treat-ment	3	6.265**	6.854**	5.973**	2.977**	6.679**
Error	36	0.1017	0.154	0.180	0.4645	0.2814

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 15. Benzene extrtact of Tinospora cordifolia (400 mg/kg) at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
T. cordifolia	39.01±0.07 (105.03)	38.89±0.07 (104.71)	38.30±0.10 (103.12)	37.90±0.16 (102.04)	37.77±0.11 (101.69)
Aspirin	39.26±0.12 (105.87)	38.19±0.08 (102.99)	37.73±0.10 (101.75)	37.29±0.17 (100.56)	36.96±0.18 (100.00)
Yeast	39.34±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.01	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.235	0.278	0.358	0.429	0.385

Summary of ANOVA Table (Mean square)

Source	df					
Treat-ment	3	5.625**	7.398**	5.082**	5.606**	7.273**
Error	36	0.0674	0.094	0.156	0.222	0.180

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 16. Single dose of decoction of Tinospora cordifolia at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
T. cordifolia	40.19±0.11 (107.17)	39.25±0.11 (104.66)	39.10±0.06 (104.26)	38.73±0.05 (103.28)	38.51±0.08 (102.69)
Aspirin 100 mg/kg	39.41±0.12 (106.22)	38.63±0.05 (104.12)	38.36±0.11 (103.39)	37.94±0.12 (102.26)	38.11±0.16 (102.72)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.2669	0.281	0.352	0.321	0.3367

Summary of ANOVA Table (Mean square)

Source	df					
Treat-ment	3	10.6692**	8.075**	6.557**	5.22**	7.57**
Error	36	0.0864	0.095	0.1509	0.125	0.137

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 17. Double dose of decoction of *Tinospora cordifolia* at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
T. cordifolia	39.72±0.053 (106.20)	38.80±0.22 (103.74)	38.55±0.24 (103.07)	38.51±0.24 (102.96)	38.14±0.22 (101.97)
Aspirin 200 mg/kg	39.41±0.12 (106.26)	38.63±0.05 (104.72)	38.36±0.11 (102.45)	37.94±0.12 (100.86)	38.11±0.16 (100.65)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.22	0.381	0.491	0.473	0.435

Summary of ANOVA Table (Mean square)

Source	df	4.30	5.30	6.30	7.30	8.30
Treatment	3	8.014**	6.873**	4.85**	4.591**	6.645**
Error	36	0.062	0.176	0.29	0.271	0.229

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 18. Tripple dose of decoction of Tinospora cordifolia at different time intervals (Mean value of temperature in degree centigrade).

Treatment	Time intervals in hours				
	0	1	2	3	4
T. cordifolia	39.16±0.07 (105.26)	38.52±0.13 (103.54)	39.57±0.07 (103.68)	38.25±0.16 (103.11)	38.15±0.18 (102.55)
Aspirin 400 mg/kg	39.41±0.12 (105.87)	38.63±0.05 (102.99)	38.36±0.11 (101.75)	37.94±0.12 (100.56)	38.11±0.16 (100.00)
Yeast	39.41±0.04	39.41±0.07	38.94±0.11	38.88±0.15	38.60±0.11
Normal	37.73±0.10	37.43±0.15	37.31±0.18	37.33±0.10	36.72±0.11
CD	0.236	0.307	0.352	0.391	0.413

Summary of ANOVA Table (Mean square)

Source	df					
Treatment	3	6.296**	6.63**	4.88**	4.30**	6.65**
Error	36	0.067	0.115	0.150	0.185	0.207

** Significant at 1 per cent level
Figures in parenthesis indicate percentage of temperature

Table 19. Results of Student "t" test for comparison between Asprin and Benzene Extract of Ocimum sanctum (BEOS).

Time (min)	Mean		't' value	Mean		't' value
	Aspirin 200 mg/kg	BEOS 200 mg/kg		Aspirin 200 mg/kg	BEOS 400 mg/kg	
30	13.20	6.20	5.939**	13.2	7.8	3.987**
60	11.83	6.67	4.8414**	11.83	7.67	3.694**
90	11.33	6.67	4.774**	11.33	8.33	2.458**
120	12.50	6.33	9.428**	12.50	6.67	6.411**

** Significant at 1 per cent level.

Table 20. Results of Student "t" test for comparison between Asprin and Benzene Extract of Tinospora cordifolia (BETC)

Time (min)	Mean		't' value	Mean		't' value	Mean		't' value
	Aspirin 200 mg/kg	BETC 200 mg/kg		Aspirin 200 mg/kg	BETC 400 mg/kg		Aspirin 200 mg/kg	BETC 1 g/kg	
30	13.20	6.5	4.4173**	13.20	5.3	6.3146**	13.20	9.0	2.8791**
60	11.83	7.67	3.6941**	11.83	6.5	4.2018**	11.83	8.0	3.0680**
90	11.33	6.50	4.9300**	11.33	6.5	4.7676**	11.30	7.5	2.8712**
120	12.50	5.50	9.2990**	12.50	5.33	10.1920**	12.50	7.0	7.2012**

** Significant at 1 per cent level.

Table 21. Haematological parameters (Adjusted mean - days after drug administration)

	Pre administration	15	30	45	60
RBC ($10^6/mm^3$)					
Control	716.0±20.90	638.95	664.87	688.50	670.14
O. sanctum	558.5±32.64	601.73	769.86	837.05	812.72
T.cortifolia	622.0±41.25	590.40	726.59	813.93	907.99
C.D.		74.14	78.94*	101.03**	86.53**
WBC ($10^3/mm^3$)					
Control	5670±385	4755.88	5267.26	5516.34	4930.88
O. sanctum	4020±475.4	5306.49	4807.43	5765.83	4872.06
T.cortifolia	4630±488	5120.48	4811.95	5452.56	6417.41-
C.D.		580.64	1376.11	1188.81	1260.30*

(Contd....)

(Table 21 Contd.....)

	0	15	30	45	60
Haemoglobin (g %)					
Control	9.30±0.13	9.33	9.41	9.25	9.59
O. sanctum	9.21±0.29	9.23	10.13	11.82	11.23
T.cortifolia	8.80±0.28	9.13	10.60	11.63	11.59
C.D.		0.517	0.535**	0.615**	0.842**
Neutrophils					
Control	20.2±2.6	9.83	11.83	13.90	12.49
O. sanctum	18.9±2.39	19.17	12.81	17.13	37.40
T.cortifolia	14.1±1.06	18.26	9.36	21.69	24.90
C.D.		5.06**	5.14	6.32*	9.56**

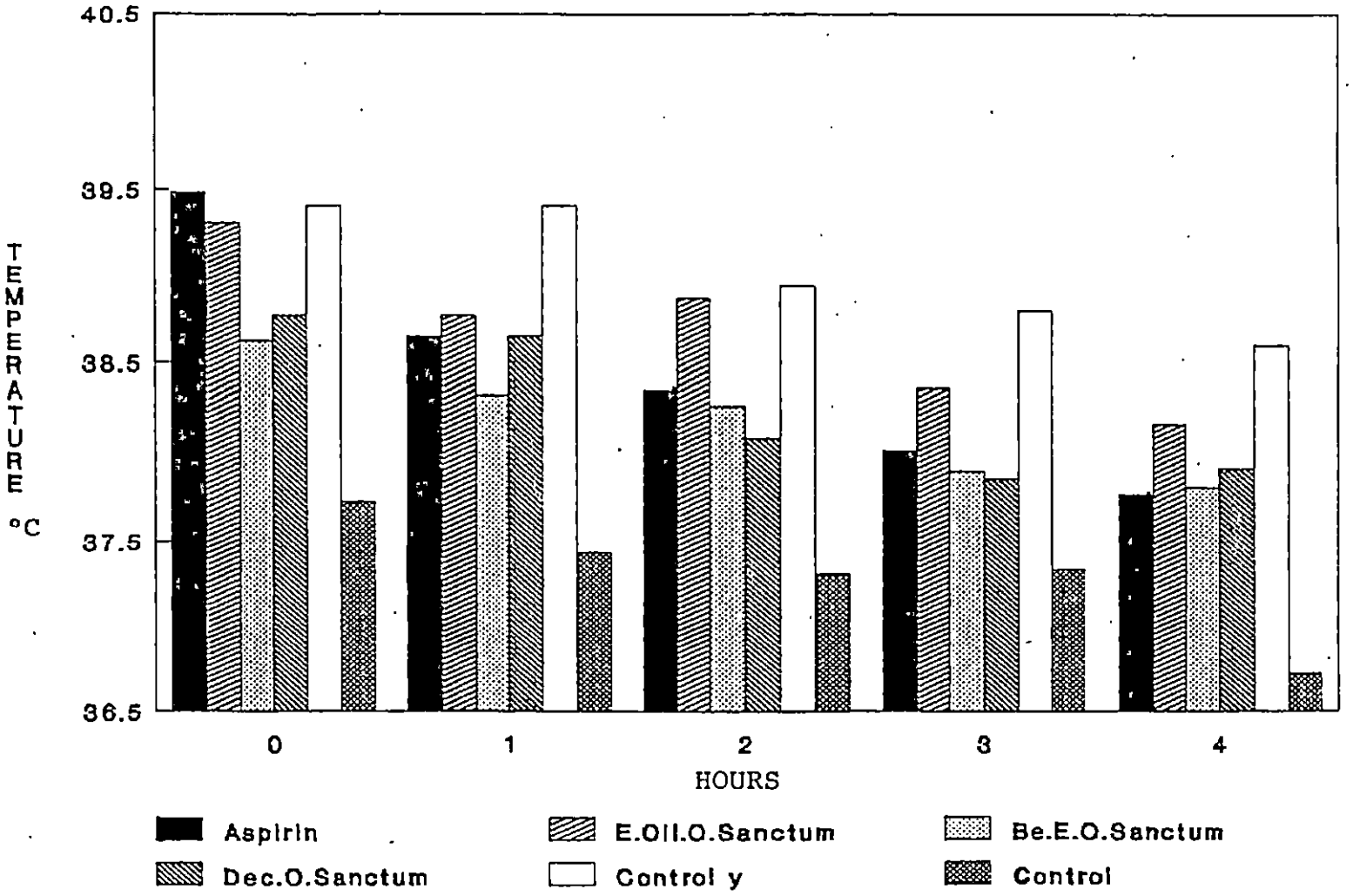
(Contd.....)

(Table 21 Contd.....)

		0	15	30	45	60
Differential Count						
CONTROL	L	78.9±2.61	87.7±1.68	87.2±1.72	86.3±1.48	87.1±1.40
	N	20.2±2.60	11.8+1.63	12.5±1.69	13.5±1.94	13.7±2.01
	E	0.9±0.23	0.5±0.22	0.3±0.15	0.2±0.13	0.1±0.10
OCIMUM SANCTUM	L	79.1±2.36	78.9±3.06	85.2±2.67	82.3±3.01	61.6±4.57
	N	18.9±2.39	18.8±1.63	13.2±2.69	16.9±2.70	38.1±5.80
	E	1.0±0.25	1.0±0.33	1.6±0.49	0.8±0.30	0.3±0.15
TINOSPORA CORDIFOLIA	L	85.5±1.06	82.4±2.06	90.3±1.92	77.6±2.47	76.0±2.40
	N	14.1±1.06	16.3±2.00	8.7±1.73	22.1±2.4	23.7±2.40
	E	1.4±0.33	1.3±0.39	1.0±0.29	0.3±0.15	0.3±0.21

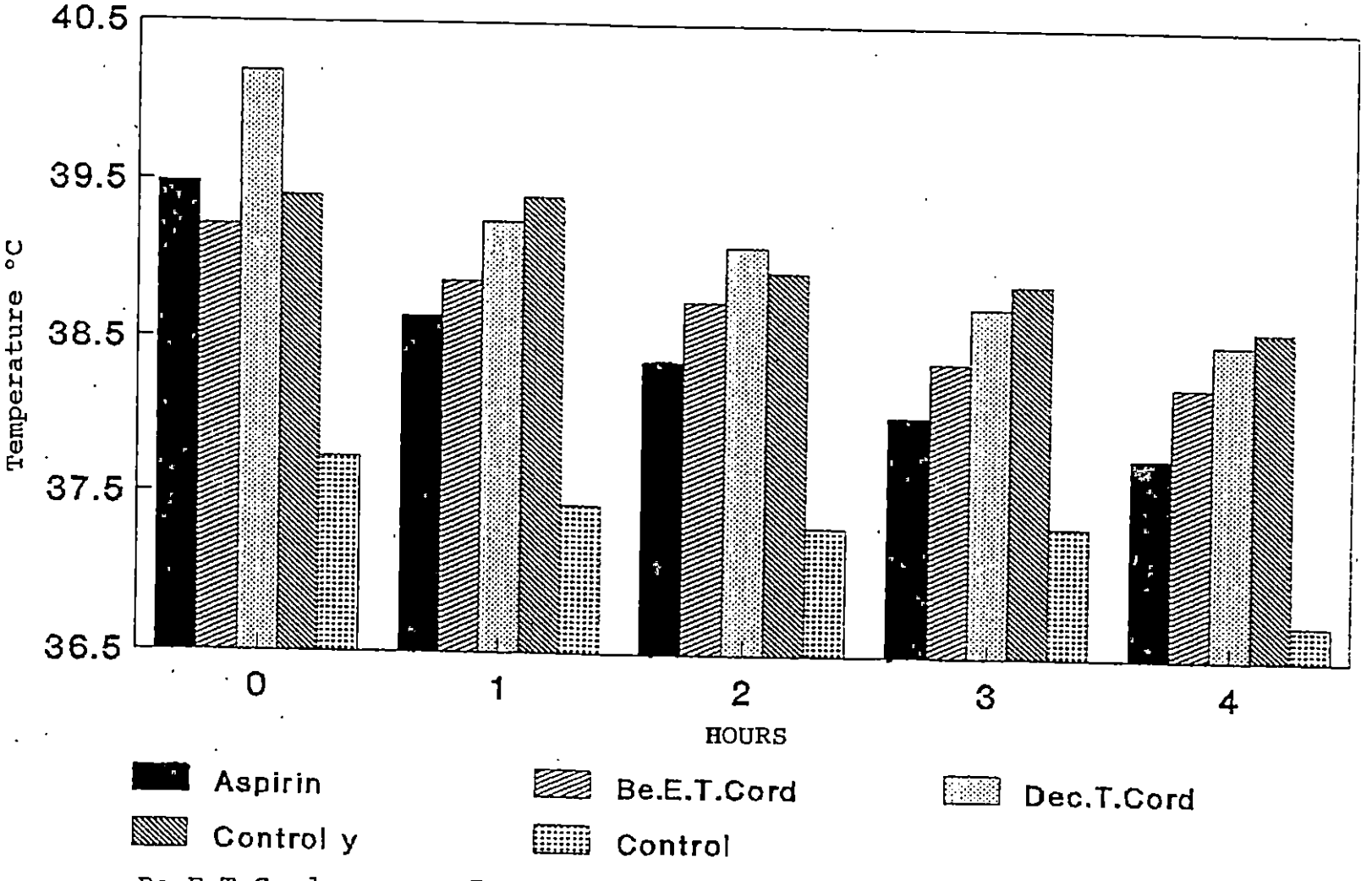
L - Lymphocyte N - Neutrophil E -Eosnophil

FIG.1. COMPARATIVE ANTIPYRETIC EFFECT OF OCIMUM SANCTUM AT DIFFERENT TIME INTERVALS - 50mg/kg



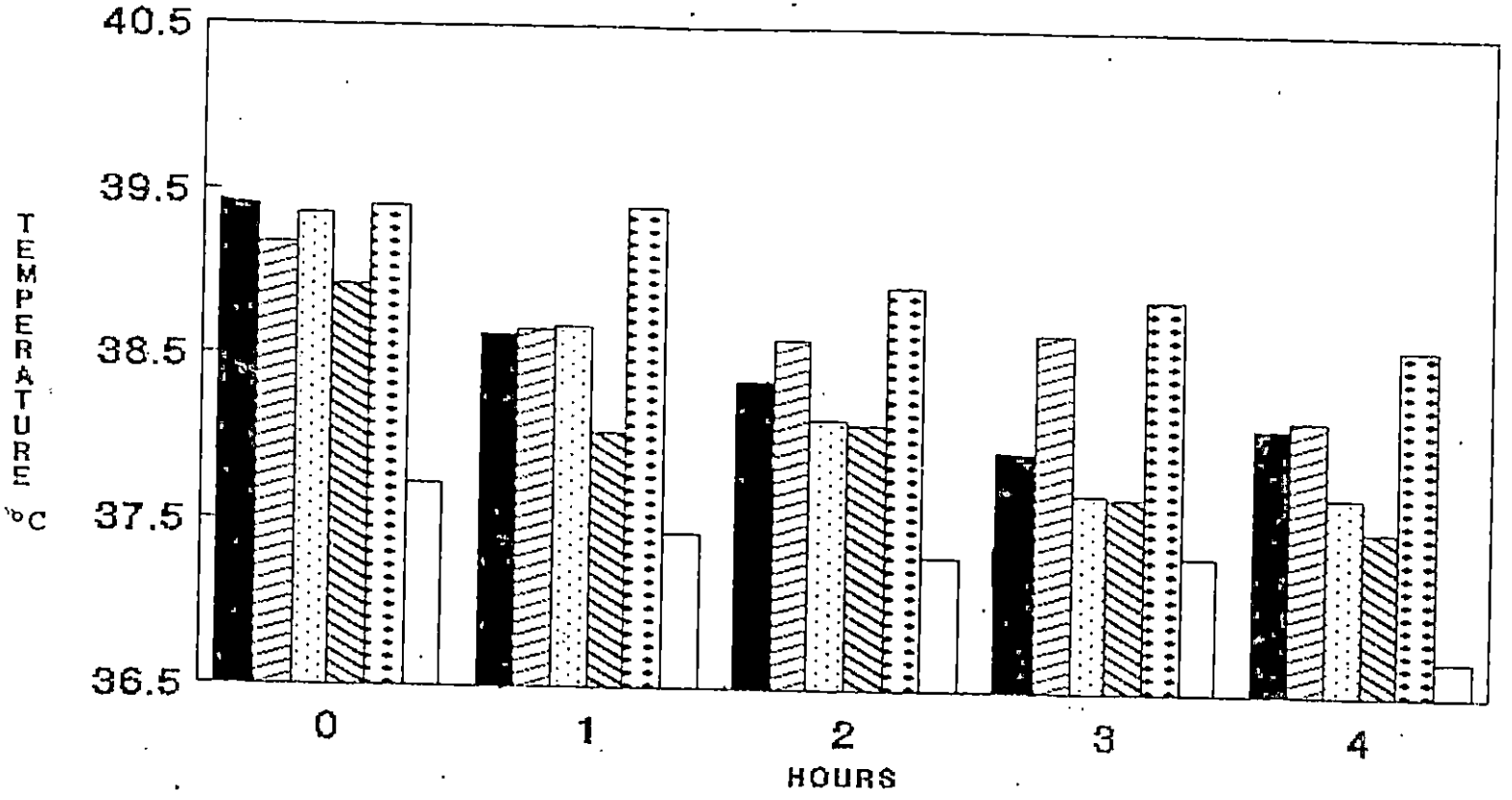
E.Oil.O.Sanctum - Essential oil of O. sanctum.
Be.E.O.Sanctum - Benzene extract of O. sanctum
Dec.O.Sanctum - Decoction of O. sanctum.
Control y - Control yeast

FIG.2. COMPARATIVE ANTIPYRETIC EFFECT OF TINOSPORA CORDIFOLIA 50 mg/kg AT DIFFERENT TIME INTERVALS



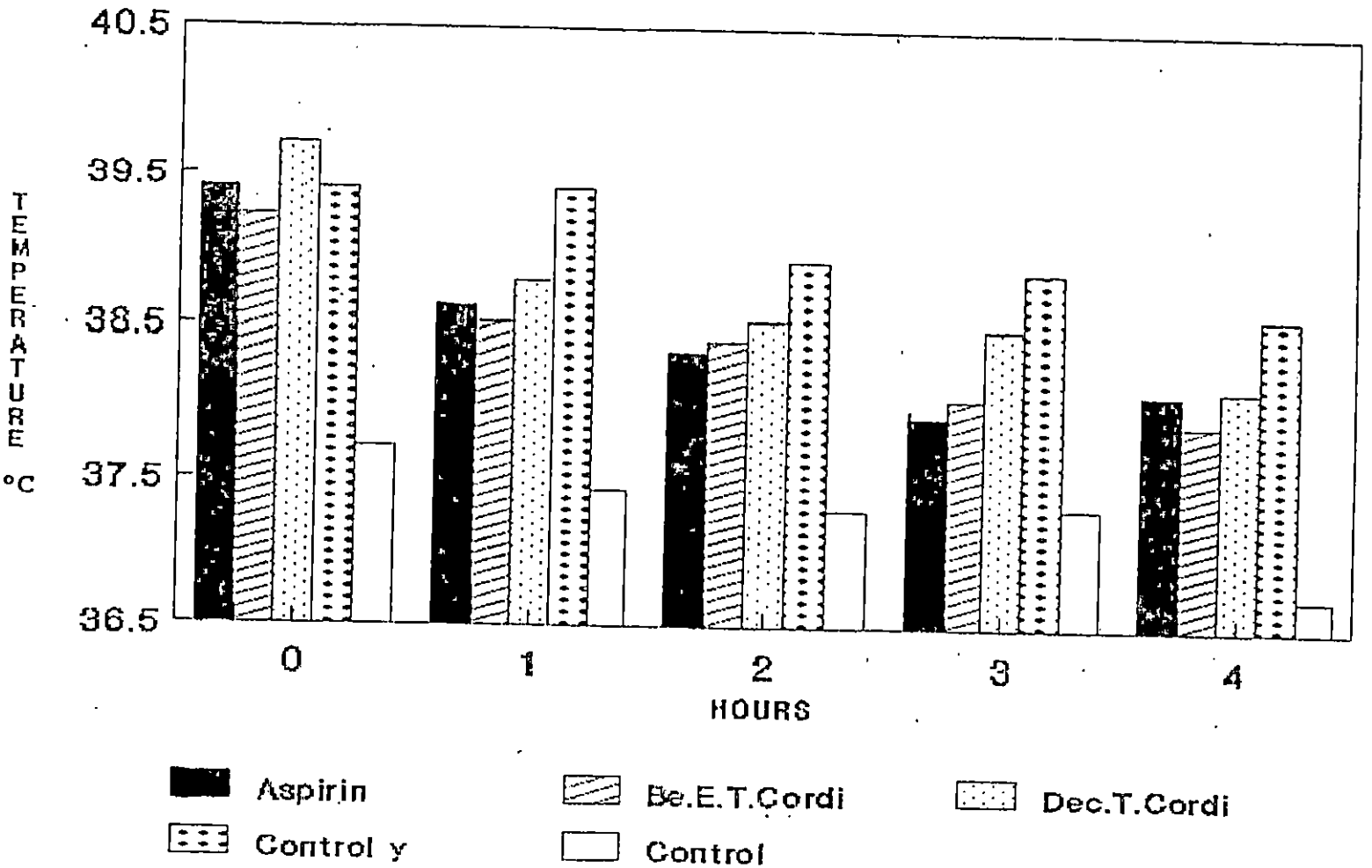
Be.E.T.Cord - Benzene extract of T. cordifolia
Dec.T.Cord - Decoction of T. cordifolia
Control y - Control yeast

FIG.3. COMPARATIVE ANTIPYRETIC EFFECT OF OCIMUM SANCTUM 100 mg/kg AT DIFFERENT TIME INTERVAL



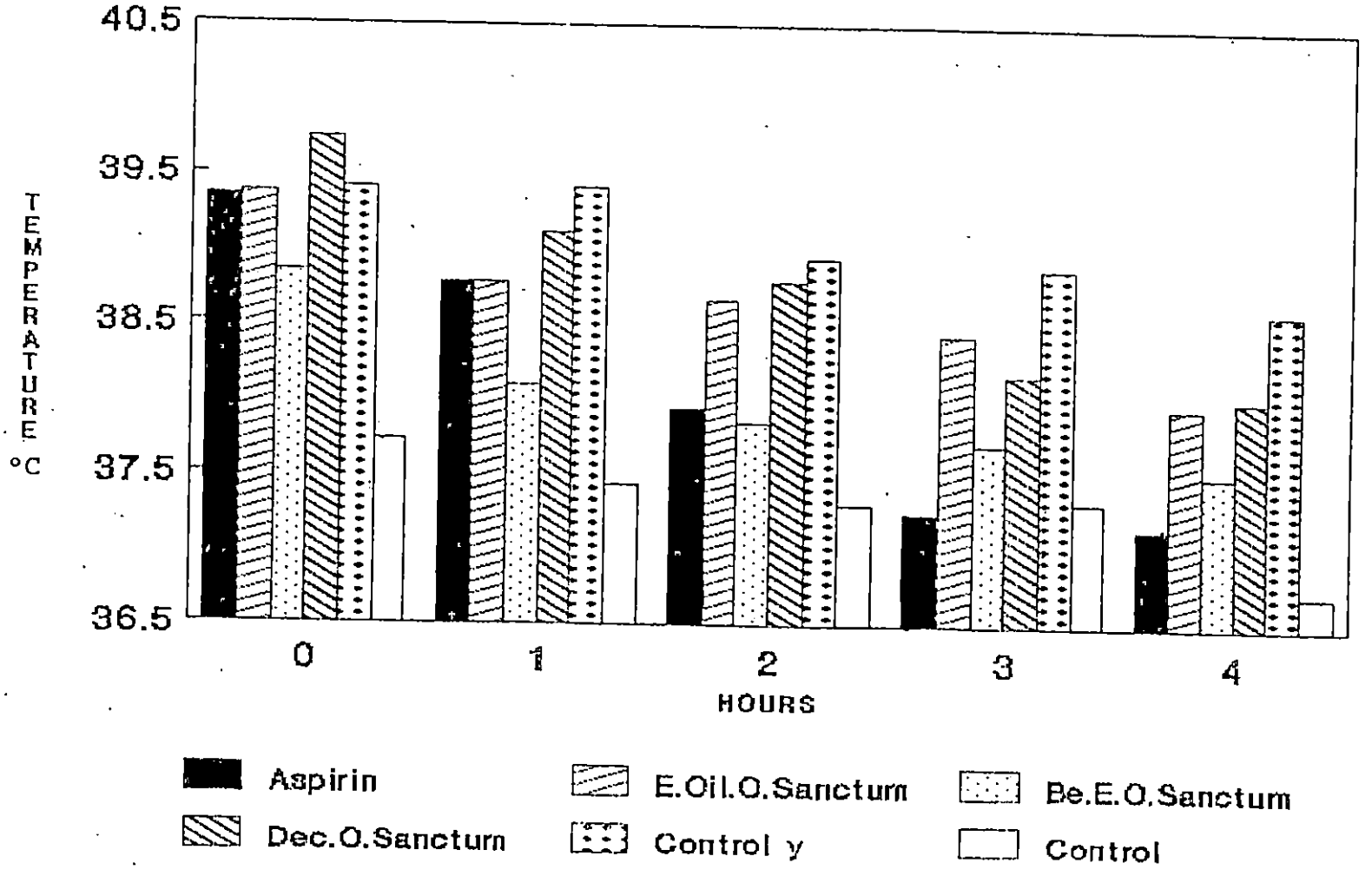
E. oil - Essential oil
Be.E.O.Sanctum - Benzene extract of O. sanctum
Dec.O.Sanctum - Decoction of O. sanctum
Control y - Control yeast

FIG.4. COMPARATIVE ANTIPYRETIC EFFECT OF TINOSPORA CORDIFOLIA 100 mg/kg AT DIFFERENT TIME INTERVAL



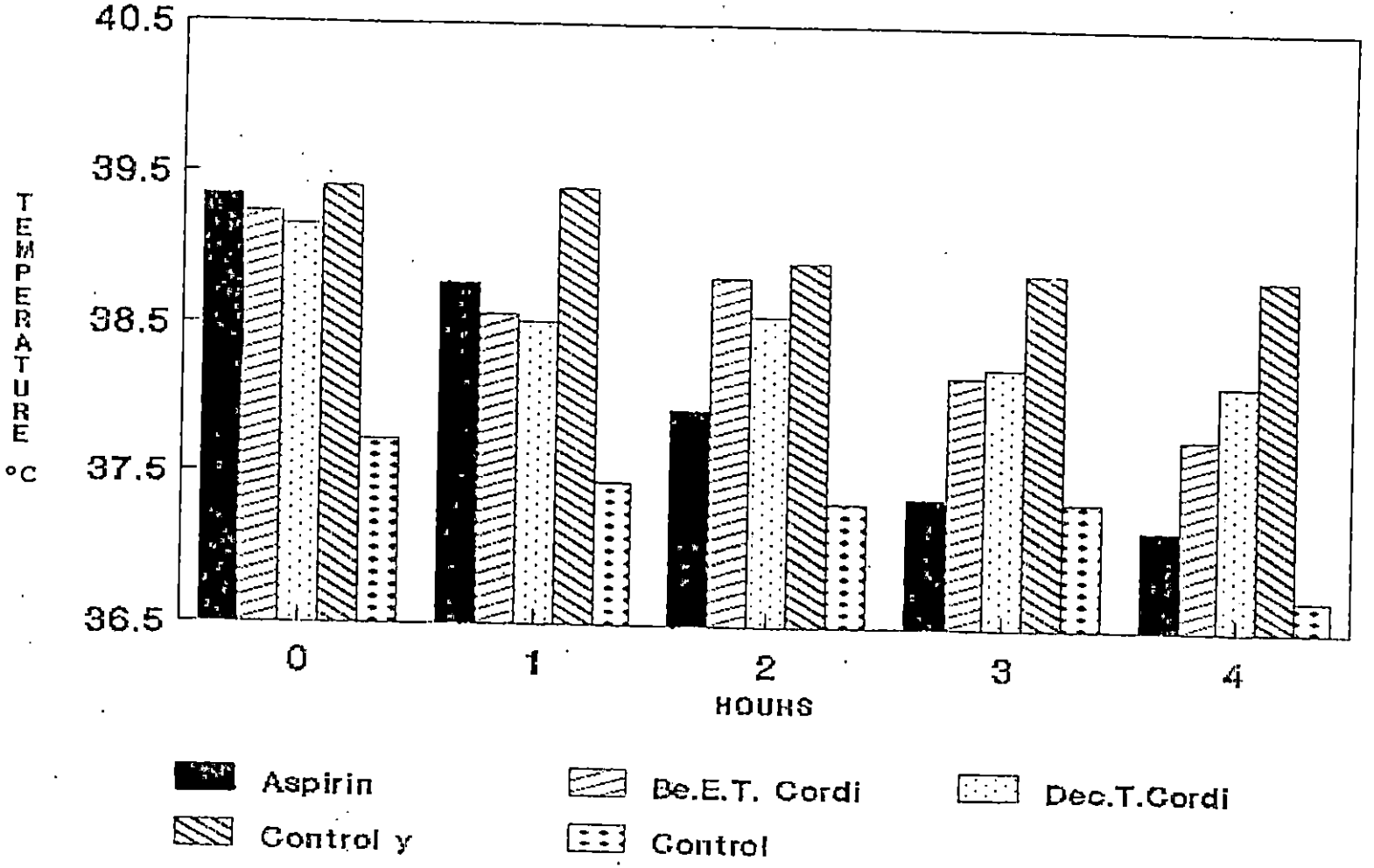
Be.E.T.Cordi - Benzene extract of T. cordifolia
Dec.T.Cordi - Decoction of T. cordifolia
Control y - Control yeast

FIG.5. COMPARATIVE ANTIPYRETIC EFFECT OF OCIMUM SANCTUM 200 mg/kg AT DIFFERENT TIME INTERVAL



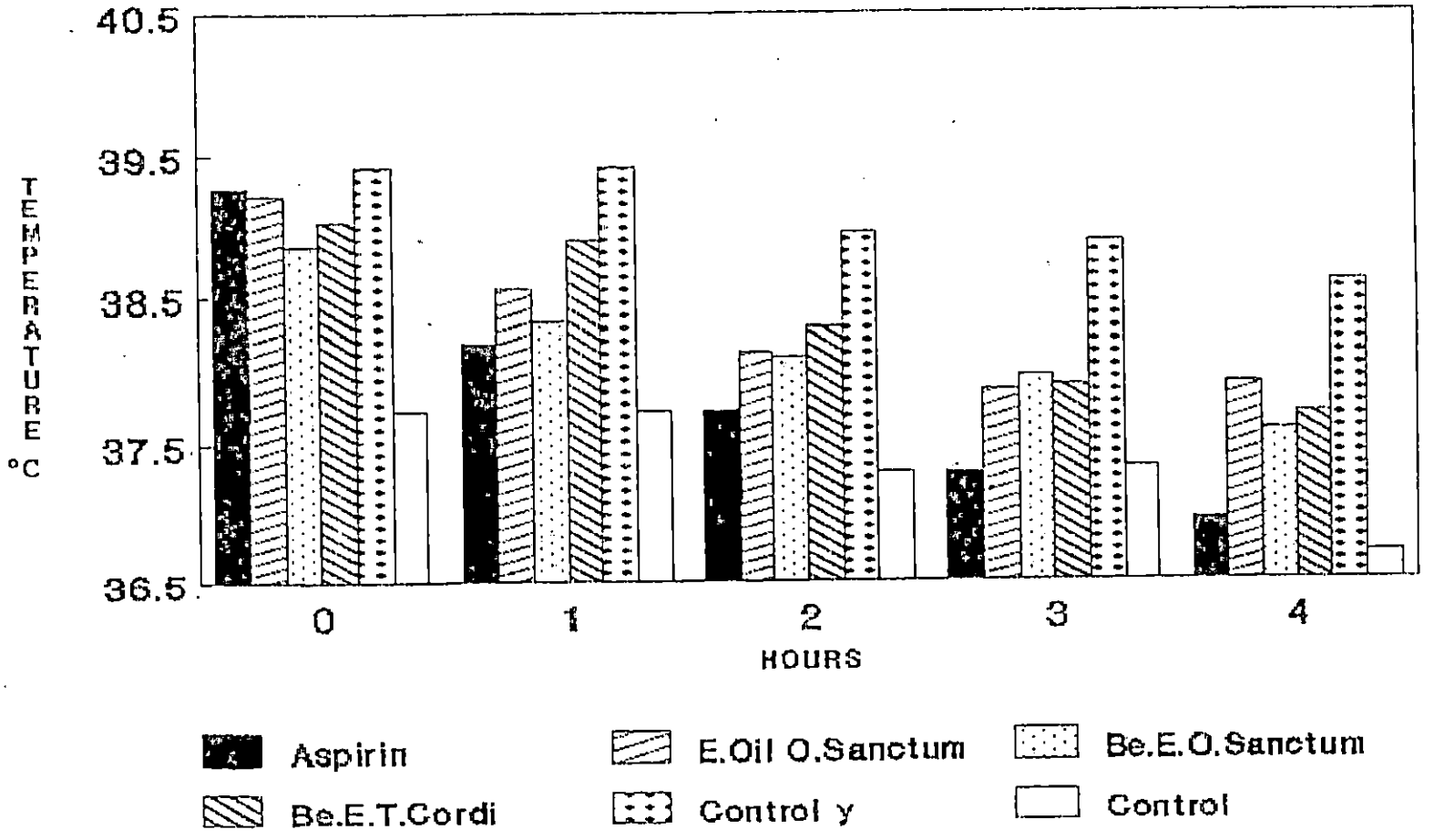
E.Oil.O.Sanctum - Essential oil of O. sanctum
Be.E.O.Sanctum - Benzene extract of O. sanctum
Dec.O.Sanctum - Decoction of O. sanctum
Control y - Control yeast

FIG.6. COMPARATIVE ANTIPYRETIC EFFECT OF TINOSPORA CORDIFOLIA 200 mg/kg AT DIFFERENT TIME INTERVALS



Be.E.T.Cordi - Benzene extract of T. cordifolia
Dec.T.Cordi - Decoction of T. cordifolia
Control Y - Control yeast

FIG. 7. COMPARATIVE ANTIPYRETIC EFFECT OF OCIMUM SANCTUM AND TINOSPORA CORDIFOLIA 400 mg/kg AT DIFFERENT TIME INTERVALS



E.Oil O. Sanctum - Essential oil of O. sanctum
Be.E.O.sanctum - Benzene extract of O. sanctum.
Be.E.T.Cordi - Benzene extract of T. cordifolia
Control y - Control yeast

Fig. 8.
Rat liver - Central venous congestion, fatty change. H & E x 250

Fig. 9.
Rat liver - Bile duct hyperplasia, fatty change. H & E x 250

Fig. 8.

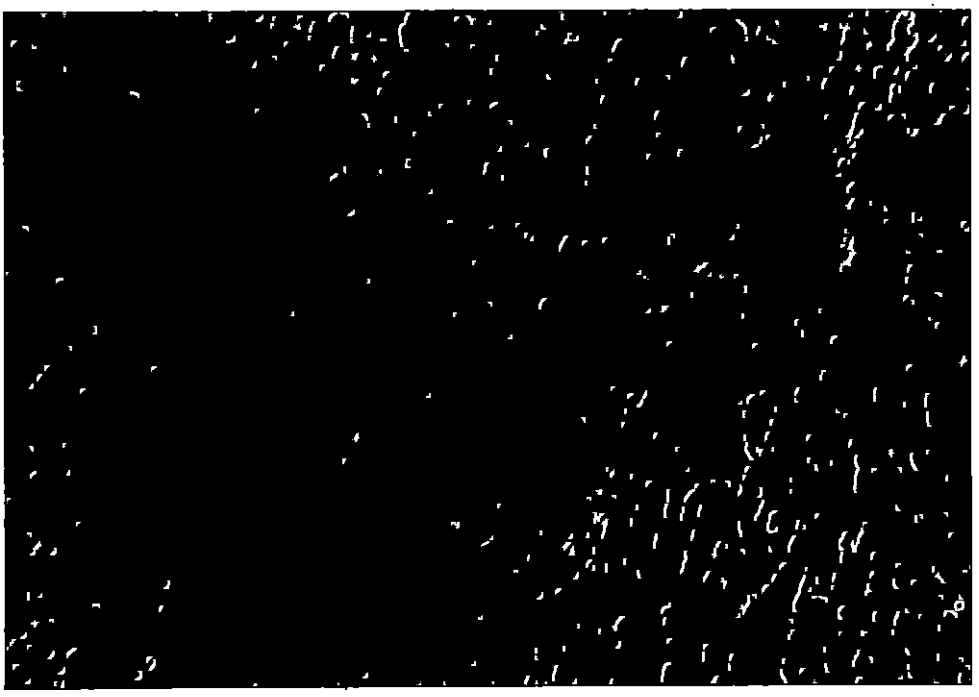


Fig. 9.

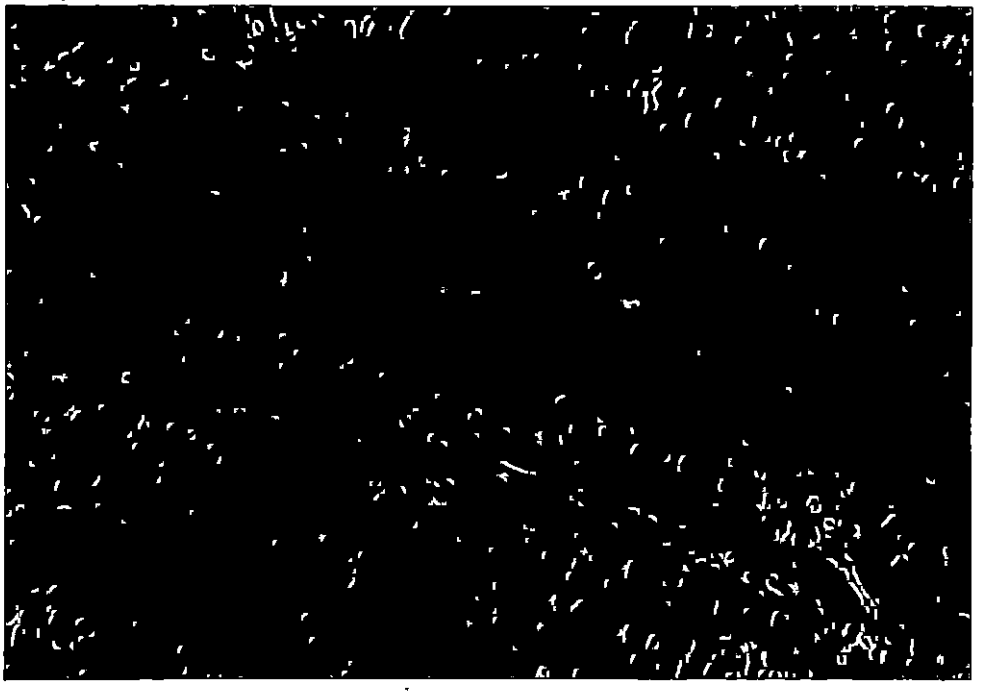


Fig. 10.
Rat liver - congestion, fatty change, diffused necrosis. H & E x 250

Fig. 11.
Rat liver - Fatty change, venous congestion.
H & E x 250

Fig. 10

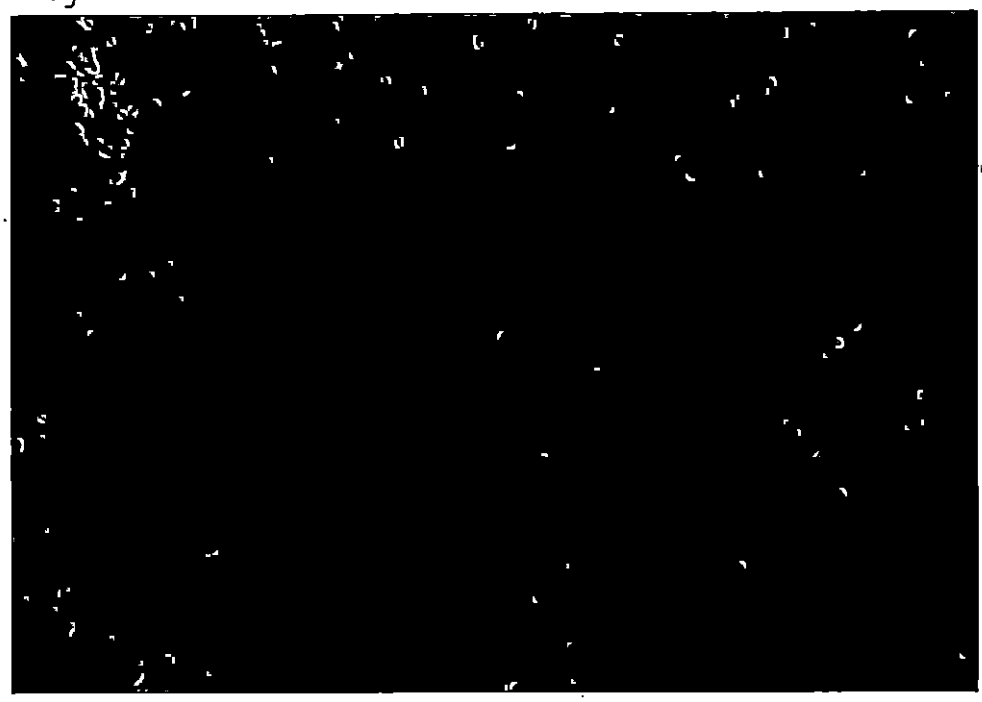


Fig. 11

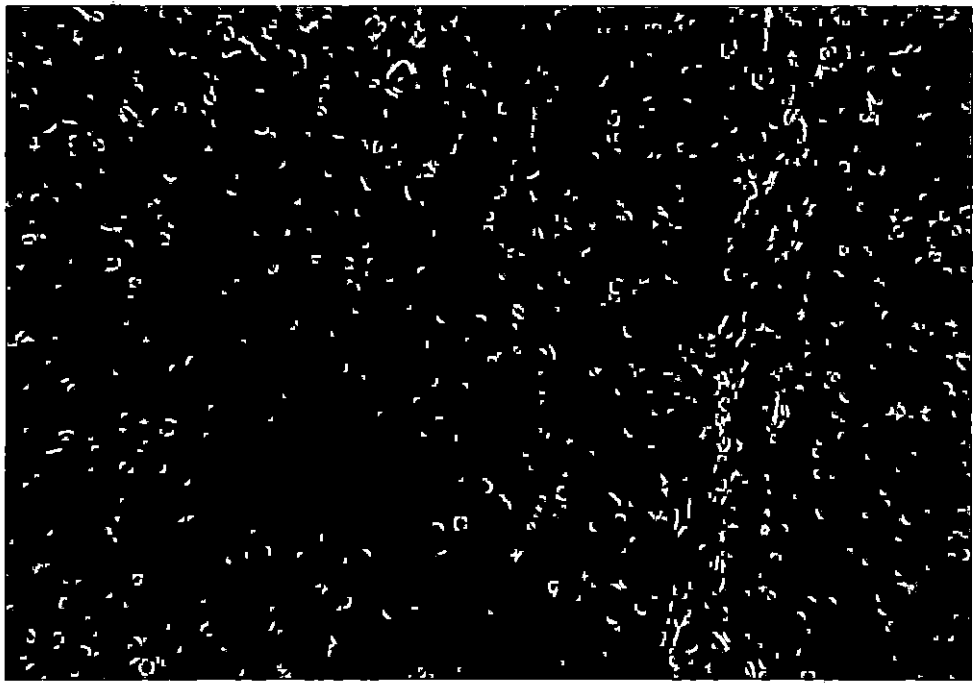


Fig. 12.
Rat liver - Mild fatty change
H & E x 250

Fig. 13.
Rat liver - Sinusoidal congestion, fatty change. H & E x 250

Fig. 12.

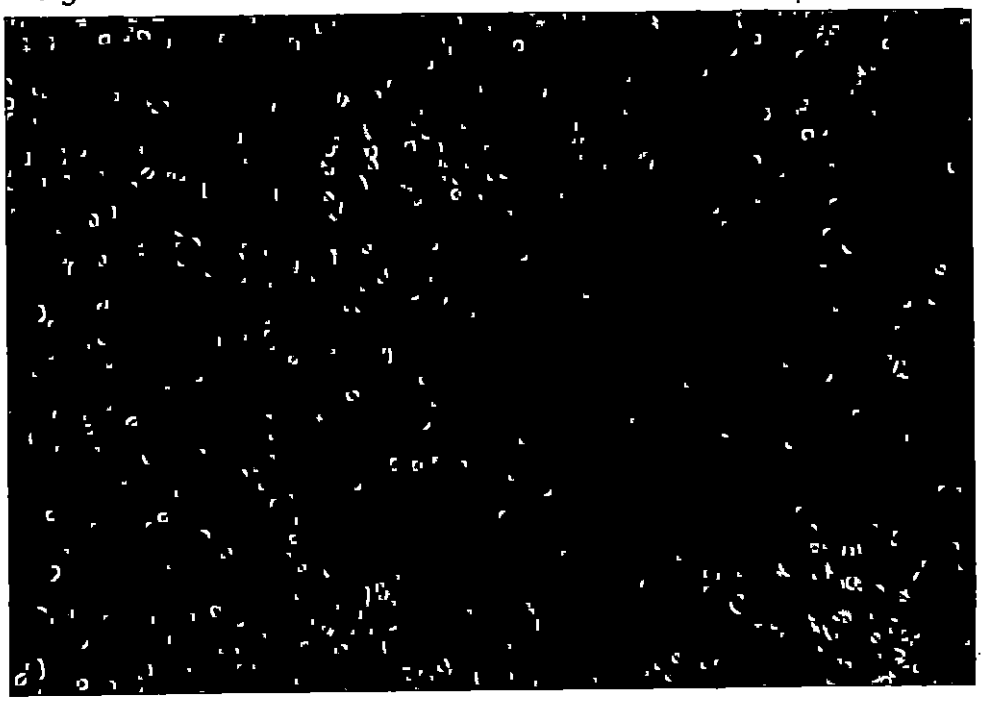
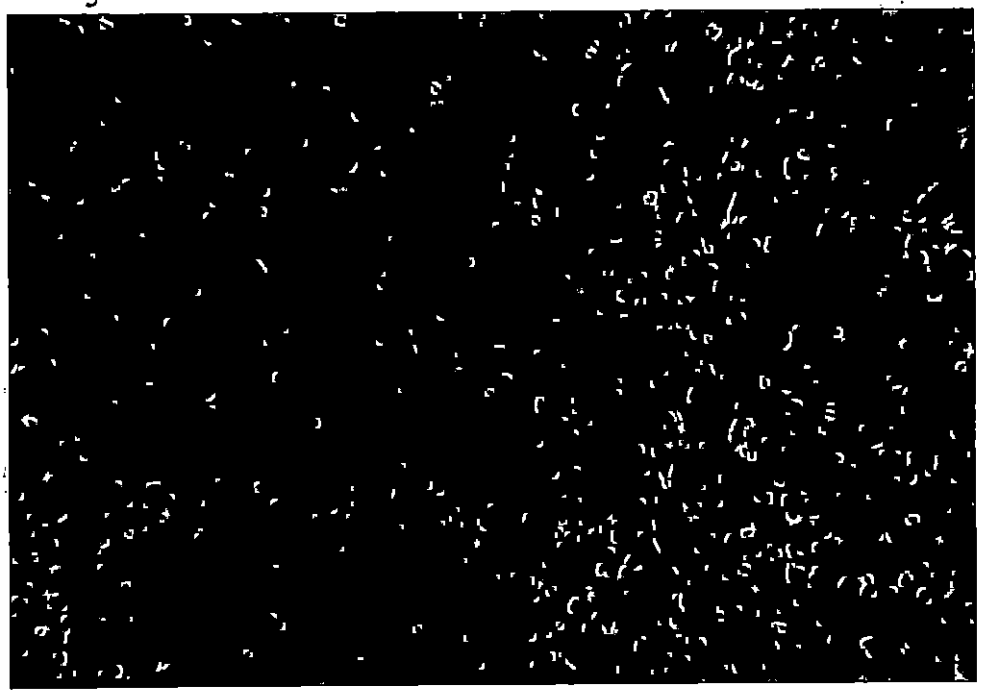


Fig. 13.



Discussion

DISCUSSION

Benzene extract of Ocimum sanctum produced a dose dependant antipyretic effect after four hours of administration. The dose rate of 50 mg/kg showed a better reduction in the rise in temperature than 100 mg/kg at the end of first hour. But a dose rate of 400 mg/kg showed a better decline in the rise in temperature when compared with the other dose rates during the time intervals. Rats received 400 mg/kg dose rate of benzene extract of O. sanctum produced better effect than aspirin as dose rate of 200 mg/kg body weight after one hour and four hours of administration.

Essential oil of O. sanctum showed a better reduction in temperature for the dose rate of 100 mg/kg when compared with the other dose rates after one hour. But at the end of four hours the dose of 200 mg/kg produced better decline in the temperature than the dose rate of 400 mg/kg. Similar studies carried out by Tandan et al. (1989) obtained a dose dependant reduction in the rise in temperature. They showed that the temperature was reduced from 39.16°C (105.83) to 38.51°C (104.08) and 38.15 (103.10) in the first and fourth hour after the administration of the drug at the dose rate of 300 mg/kg. But in the present study a dose rate of 200 mg/kg showed a better reduction in the temperature than the

dose rate of 300 mg/kg. Essential oil of O. sanctum at 200 mg/kg dose rate was more effective than 100 mg/kg dose rate of aspirin.

A single dose of decoction of O. sanctum reduced the temperature from 38.77°C (104.44) to 38.65°C (104.14) and 37.92°C (102.12) after the first and fourth hr respectively. When the dose rate was doubled it produced a more effective reduction in the rise in temperature when compared with the effect produced by triple the dose of decoction of O. sanctum. Double the dose rate of decoction was as effective as 200 mg/kg dose rate of aspirin. An antipyretic agent, Chiretta also produced a similar type of reduction in temperature at a dose rate of 2 ml/100 g body weight at the end of five hours after administration. (Kanniappan, 1991).

Benzene extract of Tinospora cordifolia at the rate of 100 mg/kg produced a better decline in the temperature at the end of the first hour, after its administration (38.53, 103.93). The dose rate of 400 mg/kg showed a reduction in the temperature from 39.01 (105.03) to 38.89 (104.71) after the first hour and the temperature was reduced to 37.77 (101.69) after the fourth hour of its administration. A dose dependant reduction in temperature was observed after

the fourth hour of the administration of the drug, Benzene extract of T. cordifolia at the dose rate of 400 mg/kg produced a better reduction in temperature than Aspirin at the dose rate of 100 mg/kg after the fourth hour.

According to Pendse et al. (1981) water extract of T. cordifolia at the rate of 200 mg/kg reduced the temperature significantly after the third and fourth hour of its administration. The weak antipyretic activity observed with large dose of water extract of T. cordifolia was due to its diuretic action (Pendse et al., 1981). In the present study benzene extract of T. cordifolia was found to be a better antipyretic agent than the water extract of T. cordifolia and this was due to its central activity.

Triple the dose of decoction of T. cordifolia reduced the temperature from 39.16 (105.26) to 38.52 (103.54) after the first hour of its administration. When compared to other dose rates double the dose of the decoction was found to be more efficient in reducing the temperature, at the end of the four hours. Double the dose of the decoction brought down the temperature from 39.72°C (106.20) to 38.14°C (101.97). Double the dose of decoction of T. cordifolia was more effective than 100 mg/kg dose rate of aspirin.

Pillai et al. (1980) observed reduction in temperature from 38.5 (108.5) to 38.1 (102.47), 37.96 (102.09), 37.70 (101.39) and 37.50 (100.86) at hourly intervals for four hours after the administration of the drug. But Amritaristam, an antipyretic preparation of T. cordifolia reduced the temperature from 38.80 (102.91) to 38.7 (102.65) 38.5 (102.12), 38.47 (102.04) and 38.29 (101.56) at hourly intervals for four hours after its administration. According to Pillai et al. (1980) decoction of T. cordifolia at a dose rate of five gram per hundred gram body weight was more effective than Amritaristam (1 ml/100 g).

The mechanism of inhibition of Prostaglandin synthesis by aspirin like drugs has been studied in detail by Crastan (1970). The theory that has been now put forward is that the antienzyme property of aspirin and similar drugs bring out their action. Other studies have revealed that paracetamol (4-acetamidophenol) has no anti- infllammatory action but has only analgesic and antipyretic actions. A possible explanation for this discrepancy is that the synthetase system from different regions of the body show different sensitivities to the same drug. Flower et al. (1972) investigated the effect of paracetamol and other drugs on a prostaglandin synthetase system derived from brainand this study revealed sensitivity of different

antipyretic drugs. Feldberg et al. (1972) found that a prostaglandin like substance appeared in CSF when fever was produced by the intravenous administration of pyrogen. Paracetamol reduced the concentration of Prostaglandin to normal level in the CSF. Thus it is clear that paracetamol acts as an antipyretic centrally. The mechanism of the antipyretic activity of O. sanctum and T. cordifolia has not yet been explored. Based on the work done by Singh et al. (1975), Pendse et al. (1981) reported that water extract of T. cordifolia brought down the temperature due to its diuretic action. But the exact central role of these two herbal drugs has not yet been found out.

When compared with Aspirin at the dose rate of 200 mg/kg, benzene extract of O. sanctum at the dose level of 200 mg/kg and 400 mg/kg showed no significant analgestic action in albino rats for a period of two hours after its administration. Tandan et al. (1989) observed that the essential oil of O. sanctum was devoid of analgesic activity upto a dose rate of 300 mg/kg when treated with Eddy's Hot Plate method in mice. The present study also revealed a similar result which indicate a lack of activity similar to morphine type of analgesics. When compared with Aspirin the dose rate of 200 mg/kg, benzene extract of T. cordifolia upto a dose rate of one gram per kilogram showed no

significant analgesic activity, for a period of two hours after administration. The water extract of T. cordifolia at 1000 mg/kg dose rate produced a mild analgesic effect whereas 500 mg/kg dose rate failed to produce analgesic action for a period of one hour after its administration (Pendse et al., 1981).

According to Pendse et al. (1981) water extract of T. cordifolia at the dose rate of 500 mg/kg and morphine at the dose rate of 1.5 mg/kg administered concomittantly produced a statistically significant analgesic effect. Inhibition of the nor adrenaline uptake by the water extract of T. cordifolia which produces the increased level of nor-adrenaline caused the enhancement of morphine analgesia.

A significant increase in the total erythrocyte count and haemoglobin concentration has been noticed , towards the later half of the experimental study. This feature was comparable in Group II and Group III. Increase in the total leucocyte count was noticed in Group III only. Increase in the differential count noticed in both the Groups. At present, no litrature revealthese effects of the essential oil of O. sanctum and benzene exract of T. cordifolia. Therefore the present observations stress on the need for

the further studies to evaluate their effect on haematopoiesis.

Tween-80 has been known to cause capillary wall damage and congestion leading to degenerative changes in liver (Nityanand and Kapoor, 1979). Moderate to severe congestion of central vein, hyperplasia of bile duct epithelium, moderate fatty change and other degenarative changes encountered in the experimental rats fed with tween-80 for 60 days in this study were comparable with the observations recorded by these investigators, although the chemical was used for alonger period at a higher concentration by them. Thus, the standardization of appropriate dose level of tween-80 to cause minimum hepatic damage requires further studies.

In the experimental rats fed with essential oil of O. sanctum in tween-80, hepatic lesions of mild to moderate fatty change, central venous congestion, hyperplasia of bileduct epithelium, diffuse necrosis, dilatation of central vein, congestion of sinusoids and paracentral necrosis were observed, but the intensity was considerably less when compared with those encountered in the control group which was fed only tween-80. Hepatotropic activity of benzene extract of O. sanctum has been reported by Girisan (1979), at a dose rate of 200 mg/kg body weight for a period of two

months. Similar regenerative hyperplastic reaction of hepatic cells was not evident in this study. This may be due to the lower dose level (100 mg/kg) of O. sanctum. But the reduction in the intensity of degenerative changes indicates the beneficial effects of essential oil of O. sanctum in bringing down toxicity of Tween-80.

Lesions observed in Group III (experimental rats fed with benzene extract of T. cordifolia) are in general, comparable with those of Group II. Benzene extract of T. cordifolia has been shown to induce regenerative changes in the hepatic tissue treated with toxic result with carbon tetrachloride in goats. Observation with the rats in this study also suggested a protective effect since the lesions were milder than those caused by Tween-80 in hepatic tissue.

It could be found that neither essential oil of O. sanctum nor benzene extract of T. cordifolia produced hepatic tissue damage in any of the experimental animals.

Summary

SUMMARY

Experiments were conducted in three parts.

The study was undertaken to assess the antipyretic effect of Ocimum sanctum and Tinospora cordifolia. Benzene extract, essential oil and decoction of O. sanctum and decoction and benzene extract of T. cordifolia were used for the study in albino rats. Twenty four groups of ten albino rats each were used for the study. Pyrexia was induced by injecting 20 per cent yeast suspension subcutaneously. Maximum rise in temperature was obtained six hours after the administration of yeast. At the peak level of temperature rise each drug was given orally using stomach tube. Temperature was recorded at hourly intervals for a period of four hours.

Antipyretic effect of each drug was assessed by recording the temperature before administration of the drug in each group as 100 and converting subsequent temperatures to the respective percentage.

Benzene extract of O. sanctum produced a dose dependant reduction in the body temperature, four hours after administration in the following pattern. Fifty milligram per kilogram dose reduced the temperature from

38.62°C (104.26) to 37.81°C (102.07), 100 mg/kg from 39.36°C (106.52) to 37.7°C (102.02), 200 mg/kg from 38.84°C (105.22) to 37.51°C (101.62) and 400 mg/kg from 38.83°C (103.99) to 37.79°C (100.58). Effective dose rate for benzene extract of O. sanctum was 400 mg/kg and it was more effective than 200 mg/kg dose rate of aspirin.

Administration of essential oil of O. sanctum resulted in the following effects on the body temperature. Fifty milligram per kilogram produced a reduction from 39.31°C (105.72) to 38.17°C (103.16), 100 mg/kg from 39.18°C (105.32) to 38.22°C (103.15), 200mg/kg from 39.37°C (106.11) to 37.96°C (102.31) and 400 mg/kg from 39.21°C (106.05) to 37.91°C (102.54) four hours after its administration. Effective dose rate for essential oil of O. sanctum was 200 mg/kg and was more effective than 100 mg/kg dose rate of aspirin.

Decoction of O. sanctum produced the antipyretic effects as follows. Single dose rate caused a reduction from 38.77°C (104.44) to 37.92°C (102.12), double the dose rate from 38.93°C (104.79) to 37.49°C (100.91) and triple the dose rate from 39.74°C (106.82) to 38.02°C (102.20) after four hours of its administration. Double the dose rate of

decoction of O. sanctum was the effective dose and it was as effective as 200 mg/kg dose rate of aspirin.

Benzene extract of T. cordifolia produced dose dependant reduction in the body temperature four hours after its administration. Fifty milligram per kilogram dose level showed a reduction from 39.22°C (105.68) to 38.23°C (103.01), 100 mg/kg from 39.22°C (105.79) to 37.91°C (102.26), 200 mg/kg from 39.24°C (105.85) to 37.78°C (101.91) and 400/kg 39.01°C (105.03) to 37.77°C (101.64) after four hours of its administration. Effective dose rate for benzene extract of T. cordifolia was 400 mg/kg and it was more effective than 100 mg/kg dose rate of aspirin.

Decoction of T. cordifolia produced the antipyretic effect as follows. Single dose rate caused a reduction from 40.19°C (107.17) to 38.51°C (102.69), from 39.72°C (106.20) to 38.14°C (101.97) and tripple dose rate from 39.16°C (105.26) to 38.15°C (102.55) after four hours of its administration. Double the dose rate of decoction of T. cordifolia was the effective dose and it was as effective as 100 mg/kg dose rate of aspirin.

In the second part of the experiment analgesic effect of benzene extract of O. sanctum and T. cordifolia were evaluated.

Analgesic effect in rats was assessed by tail flick method using analgesiometer. After the administration of the drugs reaction time for each drug was measured at 30, 60, 90 and 120 minutes. Six groups consisting of six rats each were used for the study.

Two hundred and four hundred milligram per kilogram dose level of benzene extract of O. sanctum produced no significant analgesic effect. The effect was compared with aspirin (200 mg/kg) in albino rats for a period of two hours.

The dose of 200, 400 and one gram per kilogram body weight benzene extract of T. cordifolia showed no significant analgesic effect in rats. The effects were compared with aspirin (200 mg/kg) in albino rats for a period of two hours.

In the third part of the experiment long term effect of essential oil of O. sanctum and benzene extract of T. cordifolia were studied. Thirty albino rats divided into three groups were used for the study. Control rats were fed with five per cent emulsion of Tween-80 in water. Each drug was given at a dose of 100 mg/kg body weight once in a day (8 a.m.) for 60 days. Haematological parameters were

determined at an interval of 15 days. On 61st day all the rats were sacrificed and conducted histopathological studies of liver.

Haematological parameters revealed as follows. Benzene extract of O. sanctum and T. Cordifolia produced a significant increase in the erythrocyte count from 45 days onwards. At the end of the study, Benzene extract of T. cordifolia treated group revealed a significant increase in the leucocyte count. Both the group showed a significant increase in the haemoglobin value from 30 days onwards. After the administration of the drug both the groups showed a significant increase in the neutrophil count and decrease in the lymphocyte count at 15th and 60th day of observation.

Histopathology of hepatic tissue of control group treated with Tween-80 revealed mild to moderate fatty change in eight out of ten albino rats. Along with fatty change moderate to severe congestion of Central Vein was observed in seven specimens. Three specimens encountered with hyperplasia of bile duct. Thrombus formation, diffuse and focal degeneration were noticed in three different specimens.

Ocimum sanctum (essential oil) treated group showed mild to moderate fatty change in four albino rats. Central venous congestion was found in four specimens. Hyperplasia of bile duct was observed in three specimens. Diffuse necrosis, dilatation and congestion of sinusoids were observed in two specimens.

Mild fatty change in six rats out of ten was observed in T. cordifolia treated group. In seven specimens mild to moderate congestion of central vein was recorded. Dilatation of central vein was evident in two specimens and diffuse necrosis in one. From the result it could be found that fatty changes, hyperplasia of the bile duct, diffused necrosis and congestion were observed in both control and treated groups. The deleterious effects on liver may be due to the chronic effect of Tween-80 used as the emulsifying agent in the preparation of the plant extracts.

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* Originals not seen

AN ASSESSMENT OF THE ANTIPYRETIC AND ANALGESIC EFFECT OF SELECTED INDIGENOUS PLANTS IN RATS

By

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ABSTRACT OF A THESIS

Submitted in partial fulfilment of the requirement for the degree

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ABSTRACT

The experiments were conducted in three different parts. In the first part of the experiment the antipyretic activity of Ocimum sanctum and Tinospora cordifolia was determined. Twenty four groups of ten albino rats each were used for the study. Pyrexia was induced by injecting 20 per cent yeast suspension subcutaneously. Benzene extract of O. sanctum was given at 50, 100, 200 and 400 mg/kg dose levels in four different groups. A dose depandent reduction in temperature was obtained after four hours of its administration. Four hundred mg/kg dose level produced an effective lowering in the temperature than other doses used and showed the reduction in the temperature from 38.84°C (103.99°F) to 37.59°C (100.58°F). Dose rates used for essential oil of O. sanctum were same as benzene extract. Two hundred mg/kg dose level revealed a more effective reduction in the temperature than four hundred mg/kg. A reduction of temperature was observed from 39.37°C (106.11) to 37.96°C (102.31) after four hours of its administration.

Single, double and tripple the doses of decoction of O. sanctum were used for antipyretic study. Compared to other doses, double the dose of decoction produced a maximum reduction in the temperature. It produced a reduction from 38.93°C (104.79) to 37.49°C (100.91).

Dose rate used for benzene extract of T. cordifolia were 50, 100, 200 and 400 mg/kg body weight. A dose depandant reduction in the temperature could be observed after four hours of its administration. Four hundred mg/kg dose level revealed as an effective dose caused a reduction from 39.01°C (105.03) to 37.77°C (101.69) after four hours of its administration. Single, double and tripple the dose of decoction of T. cordifolia were used for assessing antipyretic activity. Double the dose of decoction was found to be more effective. And it reduced the temperature from 39.72°C (106.20) to 38.14°C (101.97) after four hours of its administration.

In the second part of the experiment analgesic effect of benzene extract of O. sanctum and T. cordifolia were evaluated. All the dose rates of both the drugs used were compared with aspirin for a period of two hours showed no significant analgesic effect.

In the third part of the experiment long term effect of essential oil of O. sanctum and benzene extract of T. cordifolia were studied. Haematological parameters were determined at an interval of 15 days. Benzene extract of O. sanctum and T. Cordifolia produced a significant charge in the erythrocyte count from 45 days onwords. At the end

of the study Benzene extract of T. cordifolia treated group revealed a significant change in the leucocyte count. Both the groups showed a significant change in the haemoglobin value from 30 days onwards. Fifteen days after the administration of the drug, both the groups showed a significant increase in the neutrophil count and decrease in the lymphocyte count. At the end of study same effect was noticed. On 61st day histopathological studies of liver were conducted.

Lesions observed in the both treated groups were in general, comparable with those of control group. It was found that neither essential oil of O. sanctum nor benzene extract of T. cordifolia caused lesions in hepatic tissue in any of the experimental animals.