



International Journal of Pharmacy and Natural Medicines

CODEN (USA): IJPNRC | ISSN: 2321-6743
Journal Home Page: www.pharmaresearchlibrary.com/ijpnm



Review Article on Antipyretic Activity of Various Plants

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ABSTRACT

Plants are well known for their various uses since ancient times. Especially in medical, pharmaceutical, and food industries they play a major role. Various plants are used to reduce the fever. Fever is also known as pyrexia which is elevated body temperature. Pyrexia may occur due to infection, inflammation and any disease state. Here we are reviewing various plants such as Kalmegha, Drumstick, Bahuphali, Sita ashoka, Indian sarsaparilla, Bitter gourd, Noni, Neem, Fever nut, Custard apple which shows the Antipyretic activity. All these plants contain secondary metabolites such as alkaloids, glycosides, flavonoids, tannins, steroids, saponins, carbohydrates, amino acids, terpenoids and protein brewer's yeast induced pyrexia s. The antipyretic activity of all these drugs was determined by using e-coli induced pyrexia and brewer's yeast induced pyrexia method. Herbal drugs are now in great demand in the developing world for primary health care not because they are inexpensive but also for better cultural acceptability, better compatibility with the human body and showing less side effects compared with synthetic drugs like paracetamol, ibuprofen, aspirin etc., Majority of synthetic antipyretic drugs shows side effects such as gastric ulcer, hepatic necrosis and renal damage.

Keywords: Kalmegha, Drumstick, Bahuphali, Sitaashoka, Indian sarsaparilla, Bitter gourd, Noni, Neem, Fever nut, Custard apple, Anti-inflammatory

ARTICLE INFO

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ARTICLE HISTORY: Received 18 March 2021, Accepted 12 September 2021, Available Online 18 December 2021

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Citation: Chandana I Shivashimpi, *et al*. Review Article on Antipyretic Activity of Various Plants. *Int. J. Pharm. Natural Med.*, 2021, 9(1): 20-25.

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1. Introduction

Herb is generic term for plant or plant parts like leaves, roots barks, flowers, fruits or seeds which are used as medicinal values. Herbal medicine also known as herbalism, or botanical medicine, or phytomedicine. It is the study of pharmacognosy in which the plants-based

formulations are used to alleviate the diseases. The scope of herbal medicine commonly includes fungal and bee products, as well as minerals, shells and some animal parts. An herb is a plant or plant part used for its scent, flavor, or therapeutic properties. They are one type of dietary supplements and they are sold as tablets, capsules, powders,

teas, extracts, and fresh or dried plants. Herbal medicine is the use of plants to treat diseases and enhance general health and wellbeing.

India has centuries old and rich heritage of medicinal and aromatic plant due to diversity in environment for curing human illness. The most common illness is fever which is pharmacological known as pyrexia characterized by elevation of temperature above the normal range of 36.5⁰c to 37.5⁰. Fever is associated with symptoms of sickness behavior which consists of lethargy, depression, anorexia, sleepiness and inability to concentrate. This increase in set point triggers increased muscle tone and shivering. However, antipyretic medication can be effective at lowering the temperature which may include the affected persons comfort. Medicinal plants are the only easily accessible health care alternative for most of our population and traditional medicines remained a part of our integral health system.

Herbal care or traditional system of medicines are used throughout the world and from century's herbs have been the original source for most of the drugs. Medicinal plant contains so many chemical compounds which are the major source therapeutic agents to cure human disease. Recent discovery and advancement in medicinal and aromatic plants have lead enhancement of healthcare of mankind. Various medicinal plants like Drumstick, Bahuphali, Sita ashoka, Indian sarasaparilla, Bitter gourd, Noni, Neem, Fever nut, Custard apple traditionally used for treating fever. The extract prepared from the leaves, plants, fruits, roots, seeds etc., reported to have antipyretic activity in rats. The medicinal plant with folklore uses having antipyretics or any other pharmacological activity should be subjected to clinical investigation, proper regulatory mechanism is recommended to ensure safety and efficacy of herbal products.

2. Antipyretic Activity

KALMEGHA

Naveen alayasam et al. proved that Antipyretic activity of *Andrographis paniculata* which consist of leaves belonging to the family *Acanthaceae*. Kalmegha is mainly used for liver problems, as it protects the liver against damage caused by free radicals due to its antioxidant and anti-inflammatory activity. It also helps to boost the immunity and is used to manage the symptoms of common cold, sinusitis and allergies due to its antimicrobial and immunomodulatory properties. It might be good for diabetic as it is effective in lowering blood sugar levels by increasing insulin secretion. It also helps in managing blood pressure by widening the blood vessels and increasing blood flow. It also helps to manage arthritis in Ayurveda. Kalmegha is reputed homeopathic drug which contains bitter principles and rographolide, a bicyclic diterpenoid lactone and kalmeghin [2.5%], -sitosteryl fatty acid esters.

Aqueous leaf extract of *A. paniculata* was used to check the antipyretic activity using lab breed New Zealand strains of rabbit of either sex of body weight 1000 to 1500gms was

used. Animals were divided into 5 groups which contain 6 animals in each group and all the animals were administered with misoprostol subcutaneously which increases body temperature at doses of 100mcg/kg.

- Group 1 named as Control and administered with normal saline (2ml/kg).
- Group 2 was given with standard drug Aspirin (28mg/kg).
- Group 3,4 and 5 were given with *A. paniculata* in various doses of 200,400 and 800mg/kg respectively.
- Study was carried out for about 4 hours where; rectal temperature was noted for every 30 minutes interval and effect was compared with standard drug.
- *Andrographis paniculata* showed significant reduction in rectal temperature at doses of 400 and 800mg/kg body weight. Hence Antipyretic activity was proved comparing against standard drug of aspirin.

DRUMSTICK

Divya Agarwal et al. reported the antipyretic activity of ethanolic leaf extract of *Moringa olifera* (EMO). Moringa leaves are in incredible source of essential vitamins such as vitamin B complex, C,K and -carotene. Leaves also include minerals like Calcium, Zinc, Manganese, Magnesium and dietary fibers. Drumstick is used to strengthen the bone, augments the immune system, promotes the gut health, regulates hypertension, improves liver and kidney health, regulates diabetes, promotes good vision, cures edema and also fights against infection. The potent anti-inflammatory properties of drumstick are beneficial in treating conditions like arthritis and also heal minor bone fractures. Along with anti-inflammatory, antibacterial property assist in lessening the symptoms of asthma, cough, wheezing and other respiratory problems. Antioxidant property improves circulation of blood and nutrient to the heart, and clears the toxins from the kidney. Moringa contains active components such as vitamins, Polyphenols like flavonoids, phenolic compounds, Quercetin, and chlorogenic acid, and some alkaloids, Glucosinolates and Isothiocyanates, Tannins, and Saponins.

Using brewer's yeast induced pyrexia in rats. The rats were divided into 6 groups containing equal number of 10 animals each. One group was fed with Normal saline (2ml/kg) and named as control. Another group was administered with paracetamol (100mg/kg) orally which was considered as standard. Remaining 4 groups were given with ethanolic extract of *M. oleifera* at doses of 50,100,200 and 400mg/kg body weight respectively. EMO at dose of 100mg/kg, onset of action was found at 2 hours. And of 200 and 400mg/kg onset of action was found at 30 minutes and activity was lasted upto 12 hour for all doses.+ EMO showed significant reduction in body temperature at doses of 100,200 and 400mg/kg body weight. Hence antipyretic activity was proved comparing with standard drug of paracetamol.

BAHUPHALI

Saeed ahmad et al. proved the antipyretic activity of Hydroalcoholic extract of plant *Corchorus depressus*. Linn belonging to the family *Tiliaceae*. Bahuphali is effective in the treatment of Gonorrhoea, Hepatitis, Heart stroke, Urinary tract infection, and Impotence. It gives cooling and emollient actions. It has tonic property, so it is given with the milk and sugar. It helps in removing tumors and pains and cures the piles. Bahuphali has potential antacid property and it contains carbohydrates, proteins, cellulose, and triterpenes; -Amyrins; cordepressin acid; cordepressin. Using e-coli induced pyrexia in rabbits. Rabbits of either sex of local strain of body weight 1000 to 1200gms were taken and divided into 5 groups of 5 each.

- E. coli suspension (0.01ml/kg) was injected in marginal ear vein to induce pyrexia in rabbits.
- Group 1 was given with only vehicle i.e. E. coli suspension (negative control)
- Group 2 was served as positive control and given with paracetamol at dose 150mg/kg
- And Group 3,4 and 5 were given with hydroalcoholic extract of *C. depressus* at various doses of 25,50 and 100mg/kg orally in E. coli suspension induced pyrexia respectively.
- Rectal temperature of rabbit was measured over a period of 5 hours at interval of 60 minutes.
- Hydroalcoholic extract of *C. depressus* has showed significant reduction in body temperature and indicated antipyretic activity and when compared to standard drug paracetamol, *Corchorus depressus* was found better.

SITA ASHOKA

Varaprasad.N et al. proved that Antipyretic activity of the methanolic extract of leaves of *Saraca asoca [Roxb].de wild* was used. It has been used to manage gynaecological complications and infections besides treating haemorrhage dysentery, uterine pain, bacterial infections, skin problems, tumours, worm infestation, cardiac and circulatory problems. Almost all the parts of the plant of sita ashoka are considered pharmacologically important. It contains major chemical constituents such as alkaloids, glycosides, steroids, flavonoids, terpenoids, polyketides and phenolic compounds.

Using brewer's yeast induced hyper pyrexia method in wistar albino rats of either sex weighing 150-180gms were used. Animals of either sex were divided into five groups containing 6 in each group for this experiment, before the yeast injection the basal rectal temperature of each rat was measured by digital tele thermometer at an interval of 1hr after that the rats were subjected to Sub-cutaneous injection of 10ml/kg of 15% w/v yeast which is suspended in 5% w/v of CMC solution after the completion of 18hrs of yeast injection, the vehicle (propylene glycol 5ml/kg), Standard (Paracetamol 150mg/kg), Test drug (Methanolic extract of *Saraca asoca* 100,300, and 500mg/kg of body weight) were administered to the control, standard and test groups respectively.

Rectal temperature was recorded by digital tele thermometer at 0,1,2 & 3hrs after the drug administration. It was confirmed that methanolic extract of leaves of *Saraca asoca (Roxb).de wild* showed significant reduction in the rectal temperature at all doses of 100,300 & 500mg/kg body weight, and hence the antipyretic activity was proved comparing against the standard drug.

INDIAN SARASAPARILLA

Lakshman.K et al. reported that the antipyretic activity of the methanolic extract of roots of *Hemidesmus indicus* which belonging to the family *Asclepiadaceae*. It is used traditionally to treat a wide variety of illnesses including rheumatism, leprosy, urinary tract infection. The anti-oxidant, anticancer, anti-inflammatory, antipyretic, analgesic, antimicrobial, antidiabetic, hepatoprotective, cardioprotective, neuroprotective and immunomodulatory properties of *Hemidesmus indicus* have been investigated in numerous in vivo and in vitro studies. The roots of *Hemidesmus indicus* contains major chemical constituents such as hexatriacontane, lupeol, -amyrin, -amyrin and sitosterol. The leaves contain tannins, flavonoids, rutin and coumarin and leucoderma lignoids.

Using brewer's yeast induced pyrexia method in albino rats (wistar strain) of either sex weighing 180-200g were used. The rats of either sex were given 20ml/kg (20%) suspension of brewer's yeast which is injected subcutaneously. The initial rectal temperature was recorded. After 18 hrs the animals that showed an increase of 0.3-0.5°C in rectal temperature were selected.

- Group 1 named as control and administered with 0.3ml normal saline.
- Group 2 was given with standard drug Paracetamol (100mg/kg orally).
- Group 3,4 and 5 were given with *Hemidesmus indicus* in various doses of 100,200 and 400mg/kg orally.
- The rectal temperature was determined by thermal probe Ellab thermistor thermometer at an interval of 1,2,3 & 4hr, after the test extract the standard drug is administered to compare the antipyretic activity.

Hemidesmus indicus showed significant reduction in rectal temperature at doses of 100,200 & 400mg/kg body weight, and hence the antipyretic activity was proved comparing against the standard drug.

BITTER GOURD

Roshan patel et al. proved that the antipyretic activity of the ethanolic extract of plant of *Momordica charantia* Linn belonging to the family *Cucurbitaceae*. It has been reported that bitter gourd has carminative, Anthelmintic, Anticancer, Anti-diabetic, Anti-oxidant, Anti-microbial and Anti-viral properties. It is also used in the treatment of Cholera, Bronchitis, anaemia, blood disease, ulcer, diarrhea, dysentery, disease of liver and spleen, cancer, diabetic etc., The whole plant of *Momordica charantia* contains major

chemical constituents such as alkaloids, tannins, glycosides, steroids, proteins and carbohydrates.

Using yeast induced pyrexia method in wistar rats weighing 200-220g were used. The rats of either sex were divided into four groups each containing of six rats. The test was performed in rats by injecting 10ml/kg subcutaneously of the 15% aqueous solution of brewer's yeast to induce pyrexia. The rectal temperature of each animal was taken before and after 24 hrs of yeast injection using a digital clinical thermometer. After the 24 hrs of yeast injection, the animals that did not show minimum increase of 0.7°C in the temperature were discarded. The selected animals were divided into four groups and treated as follows,

- Group 1 named as control- vehicle (3ml/kg), 1% suspension of tween 80
- Group 2 was given with standard drug paracetamol (20mg/kg)
- Group 3 & 4 were given with test drug in various doses of 250 & 500mg/kg body weight.
- The rectal temperature of each animal was again recorded at an interval of 0.5,1,1.5 & 2hours
- It was confirmed that the ethanolic extract of plant of *Momordica charatia* Linn. showed significant reduction in yeast induced fever and hence the test extract (500mg/kg) showed the effect to the same degree as standard drug (Paracetamol).

NONI

Sharma R K *et al* proved the antipyretic activity of fruit of *Morinda Citrifolia* which is belongs to the family Rubiaceae. *Morinda Citrifolia* whose Polynesian name is noni. It improve efficacy of medicines and supports immune system, circulatory system, digestive system and metabolic system. The major components have been identified in the noni plant such as potassium, vitamin C, Anthraquinone, -sitosterol, Carotene, Vitamin A, flavone glycosides, linoleic acid, and rutin. Using yeast induced pyrexia in rats aqueous and alcoholic activity using adult albino rats of either sex of body weight 120 to 150g. The animals were grouped in six groups of rats consisting of six rats in each group.

All the animals were administered the aqueous and alcoholic extracts of noni orally graded doses of 250,500,1000mg/kg body weight. Group1: aqueous extracts of noni 250mg/kg body weight orally, Group2: aqueous extracts of noni 500mg/kg body weight orally, Group3: aqueous extracts of noni 1000mg/kg body weight orally, Group4: alcoholic extracts of noni 250mg/kg body weight orally, Group5: alcoholic extracts of noni 500mg/kg body weight orally, Group6 alcoholic extracts of noni 1000mg/kg body weight orally. Activity was carried out 4 hours where rectal temperature was noted for every one-hour interval. The aqueous extracts of noni at dose 1000mg/kg show the significant decrease in pyretic temperature when compared with both extracts, alcoholic extracts show the maximum antipyretic activity.

NEEM

Divya Agarwal *et al* proved the antipyretic activity of neem (*Azadiracta indica*) leaf extracts belonging to the family Meliaceae. It used in traditional medicine for the treatment of variety of ailments, very few reports are available regarding the antinociceptive, anti-inflammatory, and antipyretic effects of *Azadiracta indica* leaf extract. Major chemical mediators like Prostaglandins, Serotonin, Histamine, Bradykinin, etc. involve medication of pain inflammation and fever. Using Brewer's yeast induced pyrexia in rats. Neem leaf extracts was used to check the antipyretic activity using albino rats of either sex of body weight 100 to 200g. The animals were grouped in six group of rats consisting of six rats in each group. drugs were administered intraperitoneally Group1 control distilled water 0.5ml/rat, Group2 standard paracetamol 100mg/kg intraperitoneally, Group 3,4,5,6 (Neem leaf extracts 62.5,125,250,500mg/kg body weight intraperitoneally respectively). Activity was carried out 12 hr where rectal temperature were noted for 15min, 30min, 1hr, 2hr, 3hr, 4hr,5hr,6hr,and 12hr after the drug treatment. Neem leaf extracts at doses 125mg/kg, 250mg/kg, and 500mg/kg show the significant decrease the temperature when compared with standard drug paracetamol and neem leaf extracts. The neem leaf extracts exhibit significant antipyretic activity.

FEVER NUT

Shruti Shukla *et al* proved the antipyretic activity of the ethanolic extract of *caesalpina bonducella* belonging to the family Leguminosae. The seed is claimed to be styptic, laxative and anthelmintic, and fixes irritations, valuables in malaria, colic, hydrocele, skin illnesses and leprosy etc. Whole plant of *caesalpina bonducella* contains major chemical constituents for example, Hydrocarbons, Fatty Acids, Steroidal Saponin, Amino acids, Phytosterol, Isoflavones, and Phenolic. Ethanolic extract of *C. bonducella* whole seeds in experimental albino rats using brewers' yeast induced pyrexia in rats. Ethanolic extracts of *C. bonducella* whole seeds were used to check the antipyretic activity using albino rats either sex 100 to 125g the animal was grouped in five group of rats consisting of five rats each group. All group animals were administered by orally graded dose 100,200,400mg/kg body weight the control group was administered with normal saline (0.3m) WSECB(100,200,400mg/kg) was given to consecutive group and paracetamol at dose of 100mg/kg was referred as a standard drug ,the activity carried out 4hr where rectal temperature were noted for every one hours interval the ethanolic extracts seed sat dose 400mg/kg show the significant decrease temperature whole seed ethanolic extracts of *C.bonducella* (WSECB) and paracetamol are reduce yeast elevated significantly when compared with control group.

CUSTARD APPLE

Suneel kumar. A *et al* proved the antipyretic activity of methanolic extracts of *Annona* plant leaves (*Annona squamous*, *Annona reticulata*, *Annona muricata*). Custard apple reduces the oxidative stress, due to presence of antioxidants such as vitamin C, Flavonoids, and phenolic compounds. It is good for bones due to presence of vitamin

K, has protection against osteoporosis, helps in wound healing, the magnesium present in the custard apple helps in maintain nerve function and normal heartbeat, good for hypertension, prevent constipation, decreases cholesterol, detoxify the body, good for skin health because it protects from UV- induced erythema. hepatoprotective, and fight against cancer.it has potent antioxidant, antihypertensive and anticancer property.it contains major components as glucose, fructose, vitamins, minerals, thiamine, dietary fibres, saponins, alkaloids, terpenoids, and annotemoyin-2. Using brewer's yeast induced pyrexia in wistar rats. The rats were divided into eight groups of six each (180 -200g). Pyrexia was induced by intraperitoneal injection, 20% suspension of brewer's yeast in normal saline at dose of 10 ml/kg body weight. After 18 hrs of yeast injection rats were showed a rise in rectal temperature were taken for study.

Animals in group were treated as follows :

- Group 1: 0.5%w/v carboxymethylcellulose sodium solution (10ml/kg body weight p.o) (control).
- Group 2: ASME (100mg/kg body weight, p.o) suspended in 0.5%w/v carboxymethylcellulose sodium solution.
- Group 3: ASME (200mg/kg body weight, p.o) 0.5%w/v carboxymethylcellulose sodium solution.

- Group 4: ARME (100mg/kg body weight, p.o) suspended in 0.5%w/v carboxymethylcellulose sodium solution.
- Group 5: ARME (200mg/kg body weight, p.o) 0.5%w/v carboxymethylcellulose sodium solution.
- Group 6: AMME (100mg/kg body weight, p.o) suspended in 0.5%w/v carboxymethylcellulose sodium solution.
- Group 7: AMME (200mg/kg body weight, p.o) 0.5% w/v carboxymethylcellulose sodium solution.
- Group 8: paracetamol (100mg/kg body weight, p.o) (standard group).
- The rectal temperature were measured at 1 to 4 hours treatment at interval of 60 mins.
- Methanolic extracts of Annona plant leaves decreased the yeast elevated rectal temperature of rats in 100 and 200mg/kg doses in dose dependent manner. AMME (Annona muricata methanolic extract) showed significant antipyretic activity. Hence, Antipyretic activity was proved against standard drug paracetamol.

Table 1

Sl.No	Authors name	Name of the plant	Plant part	Model	Activity proved
1	Naveen alasyam et al.	<i>Andrographis paniculata</i>	Aqueous extract of leaf	New Zealand strains of rabbit	Antipyretic
2	Divya Agarwal et al.	<i>Moringa oleifera</i>	Ethanolic leaf extract	Brewer's yeast induced pyrexia in rats	Antipyretic
3	Saeed Ahmad et al.	<i>Corchorus depressus</i>	Hydroalcoholic extract of plant	E. coli induced pyrexia in rabbits	Antipyretic
4	Varaprasad. N et al.	<i>Saraca asoca</i>	Methanolic extract of leaf	Brewer's yeast induced pyrexia in rats	Antipyretic
5	Lakshman.K et al.	<i>Hemidesmus indicus</i>	Methanolic extract of roots	Brewer's yeast induced pyrexia in rats	Antipyretic
6	Roshan patel et al.	<i>Momordica charantia</i> Linn	Ethanolic extract of plant	Yeast induced pyrexia in rats	Antipyretic
7	Sharma R K et al.	<i>Morinola Citrifolia</i>	Aqueous and alcoholic extract of fruit	Yeast induced pyrexia in rats	Antipyretic
8	Divya Agarwal et al.	<i>Azadiracta indica</i>	Neem leaf extract	Brewer's yeast induced pyrexia in rats	Antipyretic
9	Shruti Shukla et al.	<i>caesalpina bonducella</i>	Ethanolic extract of seed	Brewer's yeast induced pyrexia in rats	Antipyretic
10	Suneel Kumar A et al.	<i>Annona muricata</i>	Methanolic extract of leaves	Brewer's yeast induced pyrexia in rats	Antipyretic

3. Conclusion

All around the world large number of people and mostly depend on traditional plant derived medicines for their health care. Some of the medicinal essential plants for antipyretic property discussed here are Kalmegha, Drumstick, Bahuphali, Sita ashoka, Indian Sarasaparilla, Bitter gourd, Noni, Neem, Fever nut, Custard apple. All

these plants contain secondary metabolites such as alkaloids, glycosides, flavonoids, tannins, steroids, saponins, carbohydrates, amino acids, terpenoids and proteins. These plants serve as source of therapeutic agents. Plant derived drugs have an important place in both traditional and modern medicine. In conclusion, this study provides evidence for the Antipyretic activity which

contribute to their ethno medical use. Herbal drugs are considered less potent than synthetic drugs because the synthetic drug contains one highly concentrated active ingredient while herbal drugs contain several active ingredient. The most important criteria for a herbal drugs is to maintain safety, efficacy, purity, potency and stability and also showing less side effects compared with synthetic drugs. Majority of synthetic antipyretic drugs shows side effects such as gastric ulcer, hepatic necrosis and renal damage. As a result of this herbal drugs are more preferred than synthetic drugs.

4. Acknowledgments

Authors are thankful to Bapuji Pharmacy College, Davanagere for the enormous support.

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