



## Research Article

www.ijrap.net



### ANTI-PYRETIC ACTIVITY OF AQUEOUS AND ETHANOLIC EXTRACT OF *CASSIA ALATA* LINN LEAF

Timothy SY<sup>1\*</sup>, Wazis CH<sup>1</sup>, Zakama SG<sup>2</sup>, Dawurung JS<sup>3</sup>, Albert T<sup>2</sup>

<sup>1</sup>Department of Pharmacology and Toxicology, Faculty of Pharmacy, University of Maiduguri, Maiduguri, Nigeria

<sup>2</sup>Department of Pharmaceutics and Pharmaceutical microbiology, Faculty of Pharmacy, University of Maiduguri, Maiduguri, Nigeria

<sup>3</sup>Department of Microbiology, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria

Received on: 02/08/12 Revised on: 30/10/12 Accepted on: 10/11/12

#### \*Corresponding author

E-mail: satiye2002@gmail.com

DOI: 10.7897/2277-4343.03625

Published by Moksha Publishing House. Website www.mokshaph.com

All rights reserved.

#### ABSTRACT

Pyrexia is one of the most common symptomatic presentations of disease. A lot of research is going on worldwide towards finding antipyretic agents from natural sources. The aim of this study was to screen the antipyretic effect of aqueous and ethanol leaf extract of *Cassia alata*.

The leaves of *Cassia alata* was collected, dried, ground and extracted using water and 95% ethanol at which the extracts was used for the antipyretic screening. Brewer's yeast was used to induce pyrexia at which the rectal temperature of the rats was taken after the oral administration of the varying doses of the extracts.

The reduction in temperature by the extracts was dose dependent with ethanol having higher percentage reduction compared with the water extract. At 400 mg/kg of ethanol extract, the reduction in pyrexia after 30 and 60 minutes was 137% and 167% respectively which was significantly higher than the paracetamol (75% and 122%) used as a positive control ( $p < 0.05$ ).

It is evident from the results of this finding that the crude aqueous and ethanol leaf extracts of *Cassia alata* contains bioactive constituents that may be responsible for the antipyretic activity observed, thus justifying its uses in traditional medicine.

**Keywords:** Antipyretic, Aqueous, Ethanol, *Cassia alata*

#### INTRODUCTION

*Cassia* is a native plant in Southeast Asia, Africa, Northern Australia and Latin America<sup>1</sup> that are grown as ornamental plants<sup>2</sup> with diverse medicinal uses. It is commonly known as "Rai dore" in Hausa, "Asuwon oyinbo" in Yoruba, "Omirima" in Igbo and "Whu shilshili" in Kilba<sup>3</sup>. Pyrexia (fever) arises as a secondary impact of infection, malignancy or other diseased states<sup>4</sup> and high fever could enhance faster disease progression by increasing tissue catabolism, dehydration and existing complaints<sup>5</sup>. Antipyretic drugs reduce elevated body temperature and are known to act centrally on the temperature regulation center in the brain or peripherally through vasodilatation or heat dissipation possibly by inhibiting the synthesis of prostaglandin<sup>6</sup>. Several reports have shown that *Cassia alata* contain antimicrobial substances<sup>7-11</sup> that may be responsible for its reported activity in bacterial and fungal infections. *Cassia alata*, *Cassia fistula*, and *Cassia tora* are recommended for primary health care in Thailand to treat ringworm and skin diseases<sup>12</sup>. Even though several studies evaluated the antibacterial, antifungal, antimutagenic, analgesic, antiinflammatory and hypoglycaemic activities of the leaf extracts of *Cassia alata*<sup>7-9, 13</sup>, the antipyretic activity of the plant is yet to be evaluated despite the growing use of this plant especially in our environment. Therefore, this study seeks to evaluate the *In vivo* antipyretic activity of water and ethanol leaf extracts of *Cassia alata*.

#### MATERIALS AND METHODS

##### Source of Plant Material, Collection and Authentication

The leaf of *Cassia alata* Linn were collected in the month of September, 2011 from Hong, Hong local government area of Adamawa state, Nigeria and was identified by a taxonomist of the Department of forestry and Wild life, University of Maiduguri at which the voucher specimen number was assigned (28659) and deposited in the Department.

##### Preparation of the Leaf Extracts

The leaves were air dried at room temperature and grounded into powder using wooden pestle and mortar. The powdered plant material was stored in an air tight container prior to extraction. The solvents used in the extraction are distilled water and ethanol.

**Aqueous extract:** Two hundred grams of the powdered leaf were subjected to series of maceration in distilled water (200 g/1.5 L) and the extract decanted at an interval of 24 hours. The filtrate was then evaporated to dryness in an oven (ewerka oven) at 40°C giving a dark green solid with a yield of 12.5 g (6.25%).

**Ethanol extract:** Two hundred grams of the powdered leaf was subjected to maceration in ethanol (200 g/1.5 L). The extract was then concentrated to dryness under pressure giving a dark green solid with a yield of 16.4 g (8.2%).

##### Experimental Animals

Adult albino rats, weighing between 120 g and 200 g were purchased from the animal house unit of the Faculty of Pharmacy, University of Maiduguri, Borno State, Nigeria. The Animals were maintained in standard wire

mesh cages in the animal section, Pharmacology and Toxicology Laboratory, Department of Pharmacology and Toxicology, Faculty of pharmacy, University of Maiduguri, Borno state, Nigeria. The animals were kept in wire mesh cages, at suitable (room) temperature; sawdust was provided to prevent excess moisture; the environment was naturally illuminated and ample time was given for the animals to acclimatize with the laboratory conditions. They were provided with a steady supply of drinking water and standard livestock feed (vital feed) from Brand cereals and oil mills ltd, Bukuru, Jos, Plateau state, Nigeria.

**Induction of Pyrexia**

Pyrexia was induced in the rats by administration of 100 mg/ml of Baker’s yeast at a dose level of 100 mg/kg body weight. The rectal temperatures of the rats were measured by inserting the digital thermometer 3-4 cm into the rectum of the rats after 8 hours.

**Assay of antipyretic activity of the extracts**

Antipyretic activity was carried out in 50 albino rats (Grouped into 8 each consisting of 5 rats) weighing 120 to 200 g according to the method described by Timothy et al<sup>14</sup>. Groups 1 and 2 served as negative (distilled water) and positive (paracetamol) controls respectively. Paracetamol was administered intraperitoneally at a dose level of 100 mg/kg. The remaining groups were administered the aqueous and ethanol extracts viz a viz; Aqueous (Group 3, 4, 5) and ethanol (Group 3, 4, 5) respectively. Group 3, 4 and 5 received parenteral doses at 400 mg/kg, 200 mg/kg and 100 mg/kg body weight respectively. The rectal temperatures were measured at 8 hrs, 30 minutes, 60 minutes and 120 minute intervals after their different doses of the reference drug and extracts.

**Statistical Analysis**

Student t-test was used in the analysis to determine the level of significance of the various temperature changes between different doses of extracts and paracetamol. P-value less than 0.05 were considered significant.

**Table 1: Effect of aqueous leaf extract of *Cassia alata* Linn on yeast-induced pyrexia in rat**

Treatment	Dose	Rectal temperature (°C)		Rectal temperature after the extract (°C)		
		Initial (A)	8 <sup>th</sup> hour(B)	30 <sup>th</sup> min (C <sub>1</sub> )	60 <sup>th</sup> min (C <sub>2</sub> )	120 <sup>th</sup> min (C <sub>3</sub> )
Control	-	36.82±1.66	39.30±0.37	38.94±0.35 (14.52%)	38.68±0.50 (25.00%)	37.88±0.33 (57.26%)
Paracetamol	100 mg/kg	36.70±1.40	38.98±0.77	37.26±0.81 (75.44%)	36.20±0.61 (121.93%)	35.78±0.84 (140.35%)
<i>C. alata</i> aqueous extract	400 mg/kg	36.74±0.97	39.12±0.40	38.34±0.54* (32.77%)	37.26±0.50* (78.15%)	35.94±0.65 (133.61%)
<i>C. alata</i> aqueous extract	200 mg/kg	36.56±1.52	39.00±0.32	37.84±0.94 (47.54%)	36.74±0.43 (92.62%)	36.16±0.77 (116.39%)
<i>C. alata</i> aqueous extract	100 mg/kg	36.44±1.05	38.80±0.58	38.20±0.79 (25.42%)	37.14±0.84 (70.34%)	36.46±1.07 (99.15%)

All values are express as mean ± SD (n = 5); Percentage reduction in rectal temperature is given by = B-Cn/B-A X 100; where n = 1, 2, 3; A = Initial rectal temperature (°C); B = Rectal temperature 10<sup>th</sup> hour after yeast administration; C = Rectal temperature after extract administration

**Table 2: Effect of ethanol leaf extract of *Cassia alata* Linn on yeast-induced pyrexia in rat**

Treatment	Dose	Rectal temperature (°C)		Rectal temperature after the extract (°C)		
		Initial (A)	8 <sup>th</sup> hour(B)	30 <sup>th</sup> min (C <sub>1</sub> )	60 <sup>th</sup> min (C <sub>2</sub> )	120 <sup>th</sup> min (C <sub>3</sub> )
Control	-	36.82±1.66	39.30±0.37	38.94±0.35 (14.52%)	38.68±0.50 (25.00%)	37.88±0.33 (57.26%)
Paracetamol	100 mg/kg	36.70±1.40	38.98±0.77	37.26±0.81 (75.44%)	36.90±0.61 (121.93%)	35.78±0.84 (140.35%)
<i>C. alata</i> ethanol extract	400 mg/kg	36.58±1.11	38.82±0.63	35.76±0.96* (136.61%)	35.08±0.84* (167.00%)	34.74±1.19 (182.14%)
<i>C. alata</i> ethanol extract	200 mg/kg	36.20±1.40	38.66±0.81	36.70±0.89 (79.68%)	36.02±0.66 (107.32%)	35.98±0.63 (108.94%)
<i>C. alata</i> ethanol extract	100 mg/kg	35.96±1.09	38.72±0.54	37.80±0.57 (33.33%)	36.70±0.57 (73.19%)	35.98±0.91 (99.28%)

All values are express as mean ± SD (n = 5); Percentage reduction in rectal temperature is given by = B-Cn/B-A X 100; where n = 1, 2, 3; A = Initial rectal temperature (°C); B = Rectal temperature 10<sup>th</sup> hour after yeast administration; C = Rectal temperature after extract administration

**RESULT**

**Effect of aqueous leaf extract of *Cassia alata* on yeast induced pyrexia in rats**

The results of this study showed the antipyretic effects of the aqueous leaf extracts of *Cassia alata* on yeast induced pyrexia over 30, 60 and 120 minutes. The reference drug showed a higher percentage reduction in temperature as compared to all the drug concentrations used. Notably, the percentage reduction in temperature showed a progressive increase with time (Table 1).

**Effect of ethanol leaf extract of *Cassia alata* on yeast induced pyrexia in rats**

The results of this study showed the antipyretic effects of the ethanol leaf extracts of *Cassia alata* on yeast induced

pyrexia over 30, 60 and 120 minutes. Generally, the reference drug showed a higher percentage reduction in temperature but in the highest dose the ethanol extract (400mg/kg) the percentage reduction in temperature was significantly higher. (Table 2)

**DISCUSSION**

The antipyretic effect of aqueous and ethanolic leaf extracts was dose dependent being that the percentage reduction at the highest dose level was visibly higher than that at the lowest dose level. The reduction in yeast induced pyrexia was also found to be increasingly progressive with time which could be dependent on agonist receptor or macromolecule contact time. The

antipyretic effect of the extracts may be in agreement with the report of Flower and Vane<sup>6</sup> in which the extracts could be acting centrally on the temperature regulation center in the brain or peripherally through inhibiting the synthesis of prostaglandin. The effects produced by the extracts at varying doses tested showed a higher antipyretic effect than the negative control (distilled water) ( $p < 0.05$ ). On the other hand paracetamol was found to reduce pyrexia at the dose administered better than the tested doses of the aqueous extract with statistical significant difference at 400 mg/kg 30 and 60 minutes post yeast administration ( $p < 0.05$ ). This agrees with the findings of Flower and vane<sup>6</sup> where the standard showed superiority in reducing the yeast induced pyrexia in laboratory animals. The antipyretic effects produced by the ethanol extracts showed significant higher reduction in pyrexia than paracetamol at 400 mg/kg when the rectal temperatures was measured 30 and 60 minutes post yeast administration ( $p < 0.05$ ). The differences in the activity of the extracts with respect to the paracetamol may be due to the higher quantities of bioactive constituents like flavonoids, anthraquinones and terpenoids in the ethanol extract as earlier reported by Sule *et al*<sup>10</sup> and Timothy and his colleagues<sup>3</sup>. The antipyretic activity of ethanol leaf extract at almost all the dose levels tested in this study was found to be significantly higher than the aqueous leaf extract ( $p < 0.05$ ) indicating that ethanolic leaf extract is more active and potent than the water extract in relieving fever. Therefore, ethanolic extract of *Cassia alata* could be useful in reducing pyrexia (fever) arises as a secondary impact of infection, malignancy, or other diseased states as reported by Chattopadhyay *et al*<sup>4</sup>.

## CONCLUSION

The results of this study show that both the aqueous and ethanol leaf extracts of *Cassia alata* leaf exhibited antipyretic activity with ethanol extract having higher activity than water extract. The presence of some bioactive phytochemical constituents in the leaves may be responsible for the observed effect. However, further studies are necessary in order to isolate and characterize the active principles of *Cassia alata* leaf responsible for the antipyretic properties.

## ACKNOWLEDGEMENT

Authors are sincerely thankful to staff of Pharmacology and Toxicology, University of Maiduguri for their technical assistance and support.

## REFERENCES

1. Parsons WT, Cuthbertson EG. Noxious Weeds of Australia, Indata Press, Melbourne. 1992.
2. Gritsanaphan W, Nualkaew S. Variation of anthraquinone content in *Cassia surattensis*. Warasan Phesatchasat 2001; 28: 28-34.
3. Timothy SY, Lamu FW, Rhoda AS, Adati RG, Maspalma ID, Askira M. Acute toxicity, phytochemistry and antibacterial activity of aqueous and ethanolic leaf extracts of *Cassia alata* Linn. International Research Journal of Pharmacy 2012; 3(6): 73-76.
4. Chattopadhyay D, Amnanchalam A, Ghosh L, Rajendran K., Asit B, Mandal SK. Antipyretic activity of *Alstonia microphyta*: An ethnomedicine of Andaman Islands. Journal of Pharmaceutical Sciences 2005; 8: 558-564.
5. Spacer CB, Breder CD. The Neurological basis of fever, Journal of medicine 1994; 330: 1880-1886.
6. Flower RJ, Vane JR. Inhibition of prostaglandin synthetase in brain explaining antipyretic activity of paracetamol. Nature 1972; 230: 410-411. <http://dx.doi.org/10.1038/240410a0>
7. Caceres A, Lopez BR, Juarez X, Del Aguila J, Garcia S. Plants used in Guatemala for treatment of dermatophytic infections. Evaluation of antifungal activity of seven American plants. J. Ethnopharmacol 1993; 40: 207-213 [http://dx.doi.org/10.1016/0378-8741\(93\)90070-L](http://dx.doi.org/10.1016/0378-8741(93)90070-L)
8. Ibrahim D, Osman H. Antimicrobial activity of *Cassia alata* from Malaysia. J. Ethnopharmacol 1995; 45: 151-156 [http://dx.doi.org/10.1016/0378-8741\(94\)01200-J](http://dx.doi.org/10.1016/0378-8741(94)01200-J)
9. Somchit MN, Reezal I, Elysha N, Mutalib AR. *In vitro* antimicrobial activity of ethanol and water extracts of *Cassia alata*. J. Ethnopharmacol 2003; 84: 1-4 [http://dx.doi.org/10.1016/S0378-8741\(02\)00146-0](http://dx.doi.org/10.1016/S0378-8741(02)00146-0)
10. Sule WF, Okonkwo IO, Omo-Ogun S, Nwanze JC, Ojezele MO, Ojezele OJ. Phytochemical properties and *in vitro* antifungal activity of *Senna alata* Linn crude stem bark extract. Journal of medicinal plants research 2011; 5(2): 176-183
11. Timothy SY, Wazis CH, Bwala AY, Bashir HJ, Rhoda AS. Comparative study on the effects of aqueous and ethanol leaf extracts of *Cassia alata* Linn on some pathogenic bacteria and fungi. International Research Journal of Pharmacy 2012; 3(8): 125-127
12. Farnsworth NR, Bunyaprapatsara N. Thai Medicinal Plants. Recommended for Primary Health Care System. Medicinal Plant Information Center, Faculty of Pharmacy, Mahidol University, Thailand. 1992.
13. Villaseñor IM, Canlas AP, Pascua MP, Sabando MN, Soliven LAP. Bioactivity studies on *Cassia alata* Linn leaf extracts. Phytother Res 2002; 16(1): 93-96 <http://dx.doi.org/10.1002/ptr.768> PMID:11933153
14. Timothy SY, Mava Y, Maspalma ID, Gelu GP, Bulus YD. Evaluation of phytochemistry and antipyretic activities of aqueous and ethanolic leaf extract of *Azadirachta indica* (Neem). Indo-Glo Research Journ Pharm Sci 2011; 1(2): 57-61.

## Cite this article as:

Timothy SY, Wazis CH, Zakama SG, Dawurung JS, Albert T. Antipyretic activity of aqueous and ethanolic extract of *Cassia alata* Linn leaf. Int. J. Res. Ayur. Pharm. 2012; 3(6):811-813