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Evaluation of Analgesic and Anti-Inflammatory Activity of *Mahanimba* (*Melia Azedarach* Linn.) *Moola Ghanavati* In Albino Rats

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ABSTRACT

The drugs which are used as analgesic and anti inflammatory agents cause many side effects and toxic effects. Many medicines of plant origin have been used from many years without any side effects. In Ayurvedic ancient text named *Gada Nigraha*, it has been mentioned that *Mahanimba* (*Melia azedarach* Linn.) *Moola* can be used in the management of *Gridhrasi* (Sciatica). In *Gridhrasi* pain and inflammation of Sciatic nerve is the main cardinal symptoms. So, in this pharmacological study evaluation of analgesic and anti inflammatory activity of test drug *Mahanimba Moola* have been assessed with compare to Standard drug *Parijata Patra* (*Nyctanthes arbortristis*).

Key words: Analgesic, anti inflammatory, *Mahanimba*, *Melia azedarach* Linn., *Parijata*, *Nyctanthes arbortristis*.

INTRODUCTION

Pharmacology is the science that deals with drugs. It consists of detailed study of drugs, particularly their actions on living animals, organs or tissues. The actions may be beneficial or harmful. Review of the classical literature shows that experiments on animals is not a new phenomena in fact testing food and drug on animals before giving to man was a common practice throughout the ages. Many references especially about the toxic drugs, which were studied by observing their effect on animals, are available. With increasing knowledge about the pathophysiology of diseases, their drug therapy has now become more rational base on logical thinking supported by comprehensive and objective information. This approach reasons out why a particular drug is selected for a given patient. For this, knowledge of the mode of action of a drug, of its effects on various body systems and of the probable adverse effects on various body systems and of the probable adverse effects is important. The object of pharmacology is mainly to provide such scientific data, using which one can choose a drug treatment of proven efficacy and safety from the various options available, to suit the patient.[1]

The role of research in Ayurveda is not only to elucidate the principles of Ayurveda but also, to explain them in terms of modern parameters. In *Gada Nigraha* it has been mentioned that root of *Mahanimba* can be used in management of *Gridhrasi.*[2] Main aim of the present experimental study was to provide pharmacological basis to above mentioned matter. No references have been found on *Mahanimba Moola* (*Melia azedarach* Linn.*)* pharmacological activity in the form of *Ghana Vati*.

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OBJECTIVES

To evaluate the test drug *Mahanimba* for analgesic activity and anti inflammatory activity.

MATERIALS AND METHODS

Source of Drug

Mahanimba Moola (*Melia azedarach* Linn.) has been collected from forest area of *Vadodara* (In May, 2015). The sample was used for both experimental and clinical studies. *Parijata* (*Nyctanthes arbortristis* Linn.) leaves, which was used as reference standard in clinical study, was also used in experimental study. The plant material for this purpose was collected from surrounding areas of *Vadodara* (May, 2015). *Ghana Vati* of both the drugs was prepared in Pharmacy of Parul Institute of Ayurveda, Limda, Vadodara as per the standard procedure, with some modification. *Mahanimba* had been annotated as MG (*Mahanimba Moola Ghana Vati*), while *Parijata* had been annotated as PG (*Parijata Patra Ghana Vati*) while referring the rest of the document.

Animals

1. Wistar albino rats of either sex weighing between 120 to 200g. were used for experimental study.
2. The animals were obtained from the animal house attached to the Pharmacology Laboratory of Parul University, Vadodara.
3. Animals were exposed to natural day and night cycles with ideal laboratory condition in terms of ambient temperature (22 ± 2ºC) and humidity (50 – 60%). They were fed with Amrut brand rat pellet feed supplied by Pranav Agro Industries and water given *ad libitum*.
4. The experiments were carried out after obtaining permission from "Institutional Animal Ethical Committee."

Dose Fixation and Schedule

The dose selection was done on the basis of body surface area ratio using the table of Paget and Barnes (1969) and it was done as follows.[3]

Therapeutic human dose × Surface area ratio (Convertibility factor) for rate as required.

Conversion of the dose obtained above to dose in mg/kg/day by multiplying with suitable conversion factor based on the average weight of the animal.

- *Mahanimba Moola Ghana Vati* (MG) : Human dose: 4 g/day
- *Parijat Patra Ghana Vati* (PG : Human dose: 4 g/day
- Dose for Rats : Human dose - 4g × 0.018 x 5.
- i.e. 360 mg/kg/day ≈ 400 mg/kg/day

The Stock suspension of each samples of *Mahanimba Moola Ghana Vati* and *Parijata Ghana Vati* was prepared fresh just prior to administration to animals using water and the concentration was adjusted to provide volume of 0.5 ml/100g BW for rat used for all the experimental purposes.

Route of Drug Administration

The test drug and vehicle to control were administered according to the body weight of the animals by oral route with the help of gastric catheter of suitable size sleeved to a syringe nozzle.

Animal Grouping

The selected animals were grouped into 3 groups of either sex and each Group comprises six animals.

- **Group W :** Water control
- **Group MG :** *Melia azedarach Linn.* Root *Ghana Vati* (MG) - 400 mg/kg/day for rat.
- **Group PG :** *Nyctanthes arbortristis* Linn. Leaves *Ghana Vati* (PG) - 400 mg/kg/day for rat.

Instruments used

Weighing Scale, Mono pan balance, Cotton, Syringe, Needle, Catheters, Plethysmometer, Hot plate, stop watch.

Chemicals : Carrageenan

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Statistical Analysis

Students "t" test for unpaired data has been used for analyzing the data generated during the study. A 'p' value less than 0.05 is considered as statistically significant, the value of $p<0.01$ or $p<0.001$ is considered statistically highly significant. Level of significance was noted interpreted accordingly.

Experimental models[4]

a. Analgesic Study : Jumping or Paw licking after placing on Hot plate.

b. Anti inflammatory Study : Carrageenan Induced Paw Oedema

(A) Analgesic Study

Principle

Method of Eddy's Hot plate was adopted to screen the analgesic activity of *Melia azedarach* Linn. root *Ghana Vati* and *Nyctanthes arbortristis* Linn. leaves *Ghana Vati* after its administration in rats.

Rats of either sex having weight between 120 to 200g. were used. As per the body weight of individual rats, drug was administered. After that they had been kept on Hot plate. This hot plate had been set on specific temperature. The rats were kept one by one on hot plate and as they jump from the hot plate, time had been noted for the same by stop watch. The time when animals were kept and when they jump from Hot plate had been noted.

Drug administration : 28 consecutive days

Procedure

Rats of either sex in the weight range of 120 to 200g. were allotted to different groups as per standard protocol. They were administered with vehicle and test drugs as described above by oral route.

After that they had been kept on Hot plate. This hot plate had been set on specific temperature between 40°C to 45°C. The rats were kept one by one on hot plate and as they jump from the hot plate, time had been noted for the same by stop watch. The time when animals were kept and when they jump from Hot plate had been noted. This observations have been noted on the 15th day and 28th day after administeration of drug.

(B) Anti Inflammatory Study

Principle

Method of Winter *et al.* (1962) was adopted to screen the anti inflammatory activity of *Melia azedarach* Linn. root *Ghana Vati* and *Nyctanthes arbortristis* Linn. Leaves *Ghana Vati* against Carrageenan induced paw oedema in rats.[5]

Rat of either sex weighing 120 to 200g. were used. Rats were provided with food and tap water up to the start of experiment. Initially left hind paw volumes to the tibio-tarsal articulation were recorded by using a Plethysmograph. The Plethysmograph employed, consists of 10ml. glass vessel (25 mm × 65 mm) fixed to 2ml. glass syringe through pressure tubing. About 5ml. mercury was filled in the syringe and the mercury level was adjusted to zero mark of the micropipette. The space between the zero mark and the fixed mark of the glass vessel was filled with water and few drops of teepol. The initial level of fluid was adjusted and set at zero. The paw was immersed in water in the glass vessel was adjusted to the prefixed mark by releasing the pressure of the connected syringe. The level where water and mercury interface in the micropipette was recorded as paw volume.

Drug administration : 28 consecutive days

Procedure

One hour after drug administration, oedema was produced by injecting 0.1 ml. freshly prepared 1% Carrageenan in sterile saline solution to the sub plantar aponeurosis of the left hind limb. The rats were administered with the tap water in the dose of 2 ml/100g body weight to ensure uniform hydration. This is supposed to minimize the variation in oedema formation. The paw volume is recorded at the interval of 15th day and 28th day.

Results were expressed as difference in paw volume at 15th and 28th day in comparison to the initial values.

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Observation and Results

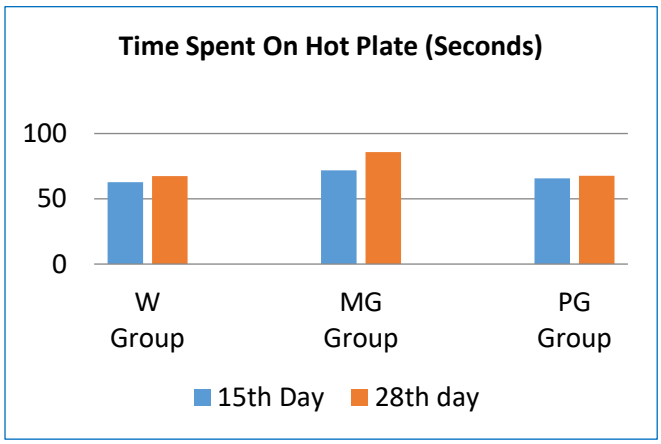
1. Evaluation of Analgesic Activity

Table 1: Effect on pain perception using Eddy's hot plate method.

	Time Spent on Hot Plate(s)	
Group	**15th Day**	**28th day**
W Group	62.83±0.87	67.33±0.76
MG Group	71.83±0.94	85.83±0.40
PG Group	65.66±1.28	67.66±0.76

Each point is represented as Mean ± S.E.M, n=6. *p<0.05, **p<0.01, ***p<0.001 is compared with Control Group W, #p<0.05, ###p<0.001 is compared with Test Group MG and Standard Group PG.

Graph 1: Comparision for Analgesic activity between 3 Groups.



W = Water (Control Group) , MG = *Mahanimba Moola Ghanavati* (Test Group), PG = *Parijata Patra Ghanavati* (Standard Group)

Results

Duration of time spent on Hot Plate is significantly increased in case of Test Group Rats (Group MG)(p<0.001)as compared to Control Group Rats (Group W) and also Test Drug Group Rats (Group MG) shows increasing in the duration of time on hot plate compared to the Standard drug Group Rats(Group PG) and Control group Rats (Group W).

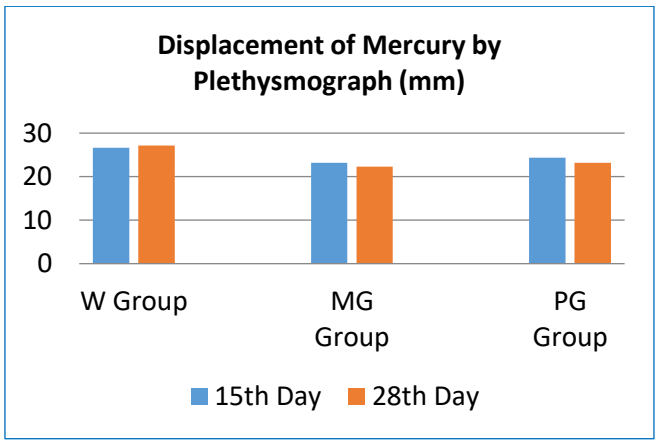
2. Evaluation of Anti Iflammatory Activity

Table 2: Effect on Inflamation By Carraginnan Induced Pow Edema Method.

	Displacement of Mercury (mm)	
Group	**15th Day**	**28th Day**
W Group	26.66±0.66	27.16±0.79
MG Group	23.16±0.70	22.33±0.91
PG Group	24.33±0.76	23.16±0.87

Each point is represented as Mean ± S.E.M, n=6. *p<0.05, **p<0.01, ***p<0.001 is compared with Control Group W, #p<0.05, ###p<0.001 is compared with Test Group MG and Standard Group PG.

Graph 2: Comparision for Anti Iflammatory Activity between 3 Groups.



W = Water (Control Group) , MG = *Mahanimba Moola Ghanavati* (Test Group), PG = *Parijata Patra Ghanavati* (Standard Group)

Results

Displacement of Mercury in Plethysmograph is significantly decreased in case of Test Group Rats (Group MG) (p<0.001) as compared to Control Group Rats (Group W) and also Test Drug Group Rats (Group MG) shows decreasing in the Mercury Displacement level compared to the Standard drug Group Rats (Group PG) and Control Group Rats (Group W).

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CONCLUSION

Evaluation of test drugs for anti-inflammatory activity and analgesic activity indicate significant effect in both the parameters. Test Drug *Mahanimba* is more significant than Standard Drug *Parijata*.

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