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An Experimental Study on the Analgesic Activity of Leaves of *Guchakaranja (Quassia indica Gaertn)*

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Abstract*—Ayurvedic health care system mainly based on plant and plant based products. Plants have been the primary basis for drug discoveries and developing new drugs. The drug Guchakaranja is mentioned as one of the Karanja variety by Raja Nighantu and Nighantu Ratnakara. The mentioning of this drug is not found in any of the other classical Ayurvedic text books. It is popularly known as Karinjotta in Kerala. The drug Karinjotta had been mentioned in Van Reed's Hortus Malabaricus along with its medicinal uses. Its leaves are used in cold, fever & erysipelas. The oil prepared from fruit cures cholera & diseases of joints. The drug had been used extensively in folklore practice for many diseases like skin diseases, inflammatory disorders, fever, cough,joint disorders etc. In traditional practice the leaves of Karinjotta is used in the preparation of 'Vethuvellam' (a medicated water used for puerperal women) and also leaves are used in the preparation of Ilakizhi (a traditional preparation in Kerala prepared with leaves of drugs having pain-relieving property). All these signifies the usage of drug in relieving pain. The drug Guchakaranja is botanically correlated as Quassia indica Gaertn (Samadera indica Gaertn) belonging to the family Simaroubaceae commonly known as Niepa bark tree. The studies of this drug were not available using an Ayurvedic formulation. So an experimental study is essential for validating the properties mentioned in Nighantus Hortus Malabaricus and the traditional uses. Hence the analgesic activity of the Guchakaranja was evaluated using Hotplate method. For that 30 male Wistar albino rats were used, they were divided into 5 groups of 6 rats each. On analysis the result obtained was stastically significant with* $P < 0.01$*, which showed the drug have significant analgesic activity.*

***Keywords*—** *Guchakaranja,Quassia indica Gaertn, Analgesic activity, Hot plate method*.

I. INTRODUCTION

Ayurvedic health care system mainly based on plant and plant based products. Plants have been the primary basis for drug discoveries and developing new drugs. Along with the conservation and cultivations of medicinal plants it is also mandatory to explore the large number of *Anukta dravya* which are still waiting to move towards main stream clinical practice of *Ayurveda a*s well as to enrich the Ayurvedic Pharmacopeia of India.

Some *dravyas* which are mentioned in *Ayurvedic Nighantus* are still unknown and there are not using the main stream clinical practices. Also folklore system of medicine is a rich source of knowledge which gives excellent unfailing remedies for a number of clinical conditions. So we have to explore the identity and utility of the drugs mentioned in *Nighantus* by searching its folklore and traditional uses.

The present drug *Guchakaranja* is botanically correlated as *Quassia indica* Gaertn (*Samadera indica* Gaertn) belonging to the family Simaroubaceae commonly known as Niepa bark tree. The *Ayurvedic* reference of the drug can be seen in *Raja Nighantu*[1] and *Nighantu Ratnakara*[2], in these *Nighantus* the drug is indicated for *vata rogas ,visha, kandu, kushta, vicharchika and twak doshas*. The reference from *Hortus Malabaricus*[3] text covering the medicinal drugs available & practiced in Kerala in the 17th century, revealed its usage in inflammatory conditions, fever, skin diseases and rheumatic complaints. . In traditional practice the leaves of *Karinjotta* is used in the preparation of *'Vethuvellam'* (*a* medicated water used for puerperal women) and also leaves are used in the preparation of *Ilakizhi* (a traditional preparation in Kerala prepared with leaves of drugs having pain-relieving property). All these signifies the usage of drug in relieving pain.

Till now classical *Ayurvedic* preparations of the drug has not been the subject of any *Ayurvedic* research. Even though it is commonly used for so many diseases by the local people, a scientific study to prove the clinical use of the drug in *Ayurveda* has not been undertaken so far. So this study using the *choornam* (powder) of the leaves of *Karinjotta* plant was planned to give validation for its use in *Vata* diseases with pain.

II. MATERIALS AND METHODS

Materials Used

Male Wistar albino rats weighing 150 to 200 g, suspension of powder of *Quassia indica* Gaertn, distilled water, rat cages, feeding cannula, gloves, Eddy's Hot plate, weighing balance, stop watch, feeding bottle, syringes

Collection of the Plant material

The fresh leaves of *Guchakaranja* (*Quassia indica* Gaertn) was collected from the Puthiyakavu locality of Tripunithura. The sample was identified as genuine by the Pharmacognostic studies, conducted in the department of *Dravyaguna Vijnanam*, Government Ayurveda College, Tripunithura, Kerala. The leaves were washed with water thoroughly to remove physical impurities like soil, mud etc. and then chopped and dried well in sun. It was then powdered and kept in airtight containers. Finally it was made to fine powder of 120 mesh size.

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Fig. 1. *Quassia indica* Gaertn.


Fig. 2. Leaves of *Quassia indica* Gaertn.

Preparation of Suspension

The suspension of the drug powder is prepared by mixing 12g powder in 100 ml distilled water (considering 12 g as the human dose). It was shaken uniformly so that 1 ml of the solution contains 0.12 g of test drug. This is administered according to the bodyweight of the animals by oral route with the help of feeding cannula.

Animals

Male albino rats of Wistar strain (150-200 g), maintained under standard conditions (27 ± 2°C; relative humidity 60 ± 5 %, light dark cycle of 12 hrs) and fed with standard pellet diet and purified water were used for present study.

Ethical Clearance

As per the order no.B4/2071/2017/GAVC from the Institution Animal Ethical Committee, animals were purchased from the proposed source, College of Veterinary and Animal Sciences, Mannuthy, Trissur, Kerala (Reg. No. 328/01). For the study 30 male Wistar Albino rats were procured.

Drugs & Dose

Three groups of test drug, standard drug Aspirin & control group with Normal saline.

There is no available classical reference regarding the dose of *Quassia indica Gaertn*. Considered 12 g human adult dose of *choorna*, the effective dose of the test drug for rats was calculated using the formula given by M.N.Ghosh in Fundamentals of experimental pharmacology. The doses of the drugs were calculated by extrapolating the therapeutic dose to rat dose on the basis of body surface area ratio (conversion factor 0.018 for rats)

Animal dose = Human dose × 0.018 for 200 gm of animal.

= 12 g × 0.018 = 0.216 g/200 gm of animal are comparable with the therapeutic effects in man.

Test Drug Dose

The drug is given in the following doses (1/2) X, X and 2X where 'X' represents the calculated effective dose of the test drug (0.216 g/200 g b. wt).

Grouping of Animals

The animals were divided to 5groups of 6rats each. Group A (Control) received normal saline 10ml/kg. Group B (standard) received standard drug Aspirin 100mg/kg. Test groups received calculated effective dose, half the calculated dose and double the calculated dose of the test drug

The grouping and dose of the drugs in the animals are tabulated below:

TABLE I. Grouping of animals.

Groups	**Drug dose**
Group A- Control	Normal saline (2 ml/200g b. wt)
Group B- Standard	Aspirin (20 mg/200g b. wt)
Group C- Test Group 1	(1/2)X (0.108g/200g b. wt)
Group D- Test Group 2	X (0.216g/200g b. wt)
Group E- Test Group 3	2X (0.432g/200g b. wt)

All the administration was a single dose through oral route.

Design of Animal Experiment

The study was conducted in 30 male Wistar albino rats of about 150-200 g. Animals which had normal response time within 6seconds were selected for the study.10 seconds was taken as maximum analgesia and the animals were removed from the hot plate to avoid injury to the paws.

Procedure

The grouped animals were kept in separate cages and marked for their easier observation. The selected animals were placed on the Eddy's hotplate. Basal reaction time was noted by observing hind paw licking or jump response when the animals are placed on the hot plate using a stopwatch. The animals were individually placed on the hot plate maintained at 55°C .Then the respective doses were administered to all the groups. After the administration of drugs, the reaction time was noted at 15, 30, 60 and 120 minutes.


Fig. 3. Eddy's Hot plate.

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Statistical Analysis and interpretation of data of Analgesic activity

The data were subjected to statistical analysis using repeated ANOVA test to draw a comparison between control and treatment groups; and Aspirin and treatment groups. A level for $p<0.05$ was considered to be statistically significant.

III. RESULTS

On analysis it is observed that, in control reaction time is reducing after treatment. In standard, reaction time improving after treatment, reached its peak after 60 minutes and reduced below Basal level after 120 minutes. In TG1, reaction time improving after treatment, just like standard, but it is increased sharply after 120 minutes. In TG2 and TG3, reaction time improving after treatment more than the other groups, reached its peak after 60 minutes and reduced slightly after 120 minutes.

TABLE II. Difference in reaction time with time in different groups.

Group	Basal	After Treatment				F - value	P value
		15 Minutes	30 Minutes	60 Minutes	120 Minutes		
Control	4.83 ± 0.60	3.00 ± 0.63	3.00 ± 0.37	2.83 ± 0.54	2.67 ± 0.33	3.329*	0.030
Standard	4.50 ± 0.62	6.00 ± 1.32	6.50 ± 1.06	6.83 ± 1.30	4.00 ± 1.29	1.193^{NS}	0.344
TG1	4.67 ± 0.67	5.50 ± 1.15	6.50 ± 1.50	7.17 ± 1.05	9.50 ± 0.34	6.788***	0.001
TG2	5.83 ± 0.48	7.00 ± 0.37	9.00 ± 0.45	10.0 ± 0.00	9.00 ± 1.00	9.774***	0.000
TG3	4.83 ± 0.70	7.67 ± 0.67	8.17 ± 0.79	10.0 ± 0.00	9.17 ± 0.83	9.376***	0.000

Values are in mean ± standard error of mean.
*** ➔ The difference is significant at 0.001 level.
* ➔ The difference is significant at 0.05level.
NS➔ The difference is not significant

Here all the p-value calculated were less than the significance level 0.001, except standard; the difference in reaction time within time is significant in all groups except standard. That is, the reaction time is changing significantly with time in every group except standard.

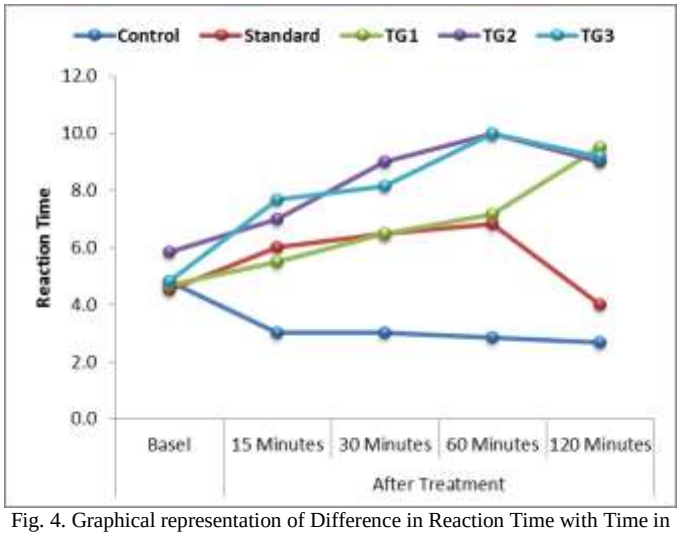

Fig. 4. Graphical representation of Difference in Reaction Time with Time in Different Groups.

For difference in reaction time between the groups, ANOVA with Duncan's multiple range test was used. The reaction time is significantly higher in TG2 (10.0 ± 0.00) and TG3 (10.0 ± 0.00) compared to other groups after the 60 minutes of drug administration .The reaction time is significantly lower in control (2.67 ± 0.33) and standard (4.00 ± 1.29) compared to TG1 (9.50 ± 0.34), TG2 (9.00 ± 1.00) and TG3 (9.17 ± 0.83) after the 120 minutes of drug administration.

IV. DISCUSSION

The analgesic activity of drug *Guchakaranja* was assessed with Hot plate method. The test groups were statistically more significant than standard group; the p value of standard drug group 0.344 where as the p value of the test drug group TG1 was 0.001 and other two test groups TG2 & TG3 were 0.000 (i.e. $p < 0.001$). So on doing statistical analysis the drug *Guchakaranja* showed significant analgesic activity than the Standard drug Aspirin.

The significant analgesic effect could be attributed to the presence of flavonoids which inhibit the synthesis or release the receptor responses in prostaglandin mediated effects [4].Some flavonoids, tannins and alkaloids possess hypoglycaemic activity and this may be reason for inactivity of muscles. As hot plate test is used for the evaluation of central analgesic activity, the drug is assumed to posses the same. Phytochemistry of leaf revealed presence of fiber in it, this may be also a reason for its anti-inflammatory and analgesic effects.[5]

Musculoskeletal pain can be cold type and heat type. Heat type musculoskeletal pain characterized by redness, pain and inflammation of muscles and joints. So the drug *Guchakaranja* may be useful in pacifying heat type musculoskeletal pain

The *ushna veerya* and *snigdha guna* of the drug acts as *vata samana*, which helps in alleviating pain; thus it can acts as analgesic.

V. CONCLUSION

So from the above animal experimental study it can be concluded that the leaves of *Guchakaranja* showed statistically significant result in all the three test drug group with $p<0.001$ when compared with control and standard group. So it can be summarized that *choorna* of the leaves of

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Guchakaranja (*Quassia indica* Gaertn) possess significant analgesic activitiy.

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