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COMPARATIVE ANTITUSSIVE ACTIVITY OF *KANTAKARI AVALEHA* & ITS GRANULES IN *SWISS ALBINO* MICE – IN VIVO STUDY

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ABSTRACT

Kantakari Avaleha (KA) is used for respiratory system-related diseases in Ayurveda. *Kantakari Kwatha* (Decoction of *Solanum xanthocarpum*) and other 15 herbal ingredients are included in this formulation. KA was converted into *Kantakari Avaleha* granules (KAG) to increase its palatability. Most of the ingredients included in this formula are shown in Anti - asthmatic effects which have been pharmacologically proven. But there are no published Pharmacological details regarding the antitussive activity of *Kantakari Avaleha* as one medicine. Furthermore, KAG is a modified dosage form, it needs a comparative study of both dosage forms. **Aim and Objectives:** To evaluate the antitussive activity of (KA) and its Granules (KAG) in *Swiss albino* mice. **Method:** KA and KAG were prepared in the laboratory of Bhaishajya Kalpana and Swiss albino mice of either sex were obtained from the Animal house attached to the Pharmacology laboratory of ITRA, GAU, Jamnagar, after taking the approval of Institutional Animal Ethical Comity (IAEC/25/2019/04). Experimental Models were antitussive activity against SO_2-induced cough reflexes. The dose selection was done based on the body surface area ratio using the table of Paget and Barnes (1969). **Results:** Both the groups of KA and KAG treated produced a statistically significant ($P<0.05$) decrease in cough reflex in comparison to the control group. There was no significant difference in

efficacy between the two test drugs treated groups. **Conclusion:** Both the medicine KA and KAG have an anti-tussive effect and hence *Kantakari Avaleha* granules can be substituted for *Kantakari Avaleha*.

Keywords: Antitussive effect, Bronchial asthma, *Kantakari Avaleha*, *Kantakari Avaleha Granule*, *Swiss* albino mice

INTRODUCTION

Kantakari Avaleha (KA) is one of the advantageous medicines used for *Shwasa* (Asthma), *Kasa* (Cough), *and Hikka* (Hic-cup) like respiratory system-related diseases in Ayurveda [1]. The main portion of this formula is the decoction (*Kwatha*) of the whole plant of *Kantakari (Solanum xanthocarpum)*. And also13 herbals with Ghrita and sesame oil are included as constituents. KA was converted into *Kantakari Avaleha* granules (KAG) with the same compound merely modified in the process of preparation. The granular dosage form increases its palatability as well as it is more feasible for modern society than the *Avaleha* dosage form[2]. Bronchial asthma is one of the lung ailments having the main symptoms of shortness of breath, wheezing, and cough[3]. It occurs due to inflammation and constricted airways which carry air into the lungs[4]. Cough (*tussis)* is the rapid expulsion of air from the lungs. It may be a voluntary or reflexive action that clears the throat and breathing passage from foreign particles, microorganisms, irritants, gasses, fluids, and mucus. Cough can be suppressed in different ways like steam inhalation and using demulcents for Hydration of the respiratory tract. Besides, central cough suppressants are also used to manage the unrestrained cough. As *Kantakari Avaleha* has a long history as an anti-asthmatic formulation, an antitussive effect should be part of its action. Though most of the ingredients included in this formula are individually proven in their Anti-asthmatic activity pharmacologically[5,6,7,8] there are no published Pharmacological details regarding the antitussive activity of *Kantakari Avaleha* as one medicine. Furthermore, KAG is a modified dosage form, it needs a comparative study of both dosage forms. In view of the above facts, the present study has endeavored to evaluate the comparative antitussive activity of both dosage forms of KA and KAG in sulfur dioxide-induced cough reflex in mice.

MATERIALS AND METHODS

Drugs and Chemicals

Drug Detail:

The composition of *Kantakari Avaleha* is presented in **Table 1**. Both the *Kantakari Avaleha* and *Kantakari Avaleha* granules were prepared with the same ingredients. All the raw materials procured were authenticated with the pharmacognostic laboratory and drugs were prepared in the *Bhaisajya Kalpana* laboratory of the institute. The KA was prepared according to the Sharangadhara Samhitha and KAG was prepared by a modified method that was derived from a series of trial preparations. In this course, *Ghee* and *Tila Taila* composition was reduced by 25% of the basic standard formula to maintain the appropriate consistency. All chemicals used in the study and for the biochemical assay were of analytical grade.

Table 01: Formulation Composition of *Kantakari Avaleha*

Sl. No	Materials	Ingredients	Botanical Name	Parts used	Qty. in Classic	In metric
1		*Kantakari*	*Solanum xanthocarpum* Schrad. & Wendl.	Whole plant	*Tula*	4800 g
2		Water	-	-	*Drona*	12288 ml
3	*Churna Dravya* 12 ingredients	*Guduchi*	*Tinospora cordifola* Miers	Stem	1 *Pala*	48 g
4		*Chavya*	*Piper chaba* Trel. & Yunck.	Stem	1 *Pala*	48 g
5		*Chitraka*	*Plumbago zeylanica* Linn.	Root	1 *Pala*	48 g
6		*Musta*	*Cyperus rotundus* Linn.	Rhizome	1 *Pala*	48 g
7		*Karkatahringi*	*Pistacia integerrima* J.L. Stewart ex Brandis	Gall	1 *Pala*	48 g
8		*Sunthi*	*Zingiber officinale* Roscoe.	Rhizome	1 *Pala*	48 g
9		*Maricha*	*Piper nigrum* Linn.	Fruit	1 *Pala*	48 g
10		*Pippali*	*Piper longum* Linn.	Fruit	1 *Pala*	48 g
11		*Dhanvayasaka*	*Alhagica melorum* Fisch	WholeCan plant	1 *Pala*	48 g
12		*Bharangi*	*Clerodendrum serratum Indicum* Moon	Root	1 *Pala*	48 g
13		*Rasna*	*Alpinia galangal* Willd.	Rhizome	1 *Pala*	48 g
14		*Shati*	*Hedychium spicatum* Ham ex smith	Rhizome	1 *Pala*	48 g
15	*Madhurdravya*	*Sita*	Sugar Candy	-	20 *Pala*	960 g
16		*Madhu*	Bee honey	-	8 *Pala*	384 g
17	*Tila Varga*	*Ghrita*	*Ghee*	-	8 *Pala*	348 g
18		*Taila Tila*	Sesame oil	-	8 *Pala*	384 g
19	*Prakshe Pa Dravya*	*Tugaksiri (Vamshalochana)*	*Bambusa arundinacea* (Retz.)	-	4 *Pala*	192 g
20		*Pippali*	*Piper longum*Linn.	Fruit	4 *Pala*	192 g

Animals:

Swiss albino mice of either sex were used in experimental studies. Animals were obtained from the Animal house attached to the Pharmacology laboratory of ITRA. Animals were exposed to day and night cycles with ideal laboratory conditions in terms of ambient temperature (25 ºC ± 2ºC) and humidity (50 - 60%). They were fed with *Amrut* brand rat pellet feed supplied by Pranav Agro Industries and drinking water was given *ad libitum*. Experiments were carried out in

conformity with the Institutional Animal Ethics Committee (IAEC) after obtaining its permission (IAEC/25/2019/04).

Dose fixation and schedule:

The dose selection was done based on body surface area ratio using the table of Paget and Barnes (1969)[9] as follows:

= Therapeutic human dose × Body surface area ratio (convertibility factor) for rat/mouse as required for experiments.

Human therapeutic dose of *Kantakari Avaleha* and its Granules*:* 12 g/day

Dose for Mice:

= Human dose × 0.0026 for mouse weighing 20g

i.e., 12 g × 0.0026 = 0.0312 g/20g body weight mouse/day

= 1.56 g/ kg body weight mice/day

Route of drug administration:

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

Statistical analysis: The obtained data has been presented as Mean ± SEM, the difference between the groups was statistically determined by Student's unpaired t-test and Annova Dunnett multiple t-tests. The value $P< 0.05$ is considered statistically significant.

Requirements:

Weighing scale, cotton wool, syringe, needle, oral catheters, water manometer, desiccator, funnel, stethoscope and filter paper, flask, burette.

Chemicals used: Anhydrous sodium sulfite and concentrated sulphuric acid were used for the antitussive activity. All the chemicals or reagents used in the experimental study were procured from standard and reputed firms and are of analytical grade.

Antitussive effect:

In this study, the capability of the drug to relieve cough reflex was considered. Cough was induced by using Sulphur-dioxide gas in mice[10]. For this experiment, selected *Swiss albino* mice of either sex weighing between 25 ± 5 g were divided into three groups as follows.

Group I Control group received distilled water as a vehicle (10 ml/kg, po)

Group II Test drug, *Kantakari Avaleha* (1.56 g/kg, po)

Group III Test drug, *Kantakari Avaleha* Granules (1.56 g/kg, po)

In brief, the assembly of a 500 ml three-necked flask containing aqueous saturated sodium hydrogen sulfite ($NaHSO_3$; Nice Chemicals Pvt. Ltd.) solution is taken. Into this bottle, concentrated sulphuric acid (H_2SO_4; Merck, India) is introduced drop by drop through a burette; the reaction involved is as follows:

$2NaHSO_3 + H_2SO_4 = 2SO_2 + Na_2SO_4 + H_2O$

SO_2 is filled previously in the column of the water manometer by opening the three-way cork such that the SO_2 can enter the water manometer but without any exit way until the pressure generated reads 75 mm of water as recorded by the water manometer.

Then the three-way cork is rotated in such a way that the volume of SO_2 collected in the water manometer escapes into the desiccators and not into the flask containing sodium hydrogen sulfite solution. These procedures are operated in a drift. After one hour of drug administration, the mouse to be tested is placed in desiccators and covered with the lid. A certain amount of SO_2 is introduced to the desiccators. The mice, after exposure to SO_2 for one minute in the desiccators, were taken out of the desiccator and confined in an upturned filter funnel. The free end of the funnel is attached to a stethoscope, with help of which the cough reflex of the mice was heard and the number of cough episodes in five minutes was calculated. To avoid observer bias, cough episodes were independently counted by two observers using digital counters and stopwatches.

RESULTS & OBSERVATIONS: Data pertaining to the effect of *Kantakari Avaleha* and its granules on SO_2-induced cough reflex in Swiss albino mice has been presented in **Table: 2**.

Abbreviations

Normal control (n=6) - NC

Kantakari Avaleha (n=6) - KA

Kantakari Avaleha Granules (n=6) - KAG

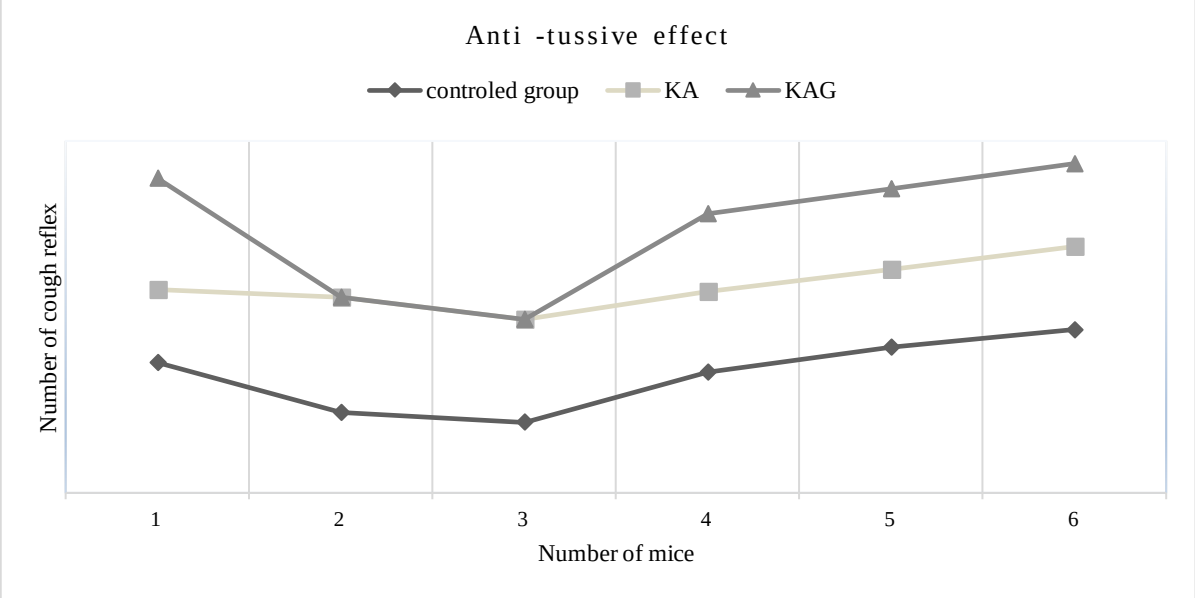
Table 02: Effect on SO_2-induced cough reflex in *Swiss albino* mice

Treatment	Dosage (g/kg)	No. of cough episodes	% Change
NC	Q. S	47.5± 5.935	-----
KA	1.56	35.33± 2.716*	25.62↓
KAG	1.56	35.00±3.028*	26.32↓

Data: Mean ± SEM: ↓- Decrease *P<0.05

*P<0.05, when compared with the control group (Annova followed by Dunnett's multiple 't-test) *Kantakari Avaleha* treated group showed a 25.62% reduction in the number of cough episodes during a five minutes observation period. *Kantakari Avaleha* granule also exhibited a 26.32 percent reduction during the observation period. However, there are no considerable changes found in the control group. Both the groups of KA and KAG treated were provided statistically significant (P<0.05) decrease in cough reflex in comparison to the control group. The KAG treated group produced very slightly (0.7) better results compared to the KA-treated group percentage-wise. The effects on SO_2-induced cough reflex in the normal control group did not exhibit any significant change. According to [**figure 1]**, it is clear that the *Kantakari Avaleha* granule shows a higher anti–tussive effect compared to the *Kantakari Avaleha* in Swiss albino mice.

Figure 01: Comparative anti-tussive effect of KA and KAG.



CONCLUSION

It can be concluded that both Drugs of *Kantakari Avaleha* and *Kantakari Avaleha* granules have similarly significant antitussive effects in Swiss albino mice and there is no significant difference between *Kantakari Avaleha* and its modified dosage form *Kantakari Avaleha* granules reference to Anti – tussive activity.

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