ABSTRACT

Gokshura is one of the ingredients of Dashamoola (Group of ten root drugs) mentioned in Ayurveda. In routine Ayurvedic practice, in the name of Gokshura, two plants viz., Laghu Gokshura [Tribulus terrestris Linn.] and Brihat Gokshura [Pedalium murex Linn.] are used. Texts of Ayurveda mentioned Dashamoola and Gokshura for the treatment of Kasa. As it is used in the treatment of Kasa, in the present study a comparative anti-tussive activity of whole plant (Panchanga) of Laghu and Brihat Gokshura was evaluated against sulphur dioxide induced cough in mice. Both the varieties of Gokshura were collected from their natural habitat, authenticated and processed to fine powder form. The mice were used as experimental animals and were randomly divided into three groups of 6 animals each. The test drugs were administered orally at a dose of 780 mg/kg. Recodex, which contains codeine phosphate (2 mg/ml) and chlorpheniramine maleate (0.8 mg/ml), was used as standard anti-tussive drug for comparison. The Panchanga of Laghu Gokshura and Brihat Gokshura have shown moderate anti-tussive activity, among them Brihat Gokshura was found to be better. Hence in non-availability of root samples of these plants and also to prevent destructive harvesting, whole plants can be used in the treatment of Kasa. Further detailed studies are required to prove this claim.

KEYWORDS: Panchanga, Laghu Gokshura, Tribulus terrestris, Brihat Gokshura, Pedalium murex, Anti-tussive, Cough.
INTRODUCTION

Cough is a protective reflex mechanism that removes foreign material and secretions from the bronchi and bronchioles. It can be inappropriately stimulated by inflammation in the respiratory tract or by neoplasia. In these cases, anti-tussive (or cough suppressant) drugs are sometimes used, for example in the dry painful cough associated with bronchial carcinoma or with inflammation of the pleura (Rang et al., 2003a). It should be understood that these drugs merely suppress the symptom without influencing the underlying conditions. In cough associated with bronchiectasis (suppurating bronchial inflammation) or chronic bronchitis, anti-tussive drugs can cause harmful sputum thickening and retention (Rang et al., 2003a). Hydration of respiratory tract by steam inhalation, demulcents are effective in reducing symptoms in majority of cases but, for uncontrolled cough, opioid central cough suppressants are used. But it has got the greatest disadvantages due to a range of unwanted effects it produces like sedation, constipation, depression of the respiratory center, nausea, vomiting, itching (due to histamine release), tolerance and dependence, euphoria etc. Their administration can lead to increased sputum viscosity, decreased expectoration and hypotension (Rang et al., 2003b). Therefore, there is a need to have effective anti-tussives which can successfully alleviate chronic cough without side effects.

Laghu Gokshura is mainly used in well known compound formulation sold in market under the name of “Dashamoola” (Group of ten root drugs) In one of the Indian medicinal text, “Bhavaprakash nighantu”, Acharya Bhavmishra has mentioned Kasaghna property for Laghu Gokshura (Bhavmishra, Bhavprakash Nighantu, 2006). However, due to inadequate availability of Laghu Gokshura [Tribulus terrestris Linn.] many a times Brihat Gokshura [Pedalium murex Linn.] is used as its substitute in Dashamoola (Kokte et al., 2006). Further in market samples along with root, whole plants (Panchanga) are also admixed for commercial purpose. So, substitution of a particular plant as well as part used is the need of the hour, not only to overcome the scarcity of the medicinal plants but also to preserve it. With this intention, the whole plant of both varieties of Gokshura was used for the study, to learn whether they are having Kasaghna property or not. As Dashmoola is known for its Kasaghna action, this study focuses on comparing the anti-tussive activity of whole plant of both the varieties of Gokshura in an experimental model. Further to the best of our knowledge this is the first attempt in this direction.

Photo Slides 1 & 2: Displaying the Habit of 2 varieties of Gokshura

1. Laghu Gokshura [Tribulus terrestris Linn.]
2. Brihat Gokshura [Pedalium murex Linn.]
MATERIALS AND METHODS

Animals

Swiss albino mice of either sex weighing 28 ± 4 g were used for the study. The animals were obtained from the animal house attached to the pharmacology laboratory, IPGT & RA, Gujarat Ayurved University, Jamnagar. Animals were exposed to natural day and night cycles with ideal laboratory conditions in terms of ambient temperature (22 ± 2°C) and relative humidity (50–60%). They were fed with Amrut brand rat pellet feed supplied by Pranav Agro Industries, Baroda and tap water given ad libitum. The experiment was carried out in accordance with the directions of the Institutional Animal Ethics Committee (IAEC) after obtaining its permission (Approval number; IAEC/09/11/25).

Test drugs

The whole plant of Laghu Gokshura [Tribulus terrestris Linn.] and Brihat Gokshura [Pedalium murex Linn.] were collected from adjacent areas of Sassoi botanical garden, near Jamnagar, Gujarat and were subjected to pharmacognostical studies in order to authenticate. They were authenticated by pharmacognosist of the institute. The plants were washed with water, cut into pieces and dried under shade. The dried whole plants were pulverized to powder and were sieved with mesh no. 120. They were coded as LGP (Laghu Gokshura whole plant) and BGP (Brihat Gokshura whole plant) respectively and used for experimental screening.

Animal groupings and dose fixation

The selected animals were divided into three groups of six animals each. First group received deionized water and served as control. The test drugs LGP and BGP were administered to second and third groups respectively. Dose of the test formulations for the animals was calculated by extrapolating the human dose (6 g/day) (Anonymous, 2007) to animals (780 mg/kg) based on the body surface area ratio by referring to the standard table of Paget and Barnes (1964). The test drugs were suspended in 0.5% w/v aqueous CMC (Carboxy methyl cellulose) solution to suitable concentration and administered orally at a volume of 0.1 ml/10 g body weight with the help of gastric catheter of suitable size sleeved on to a syringe nozzle. Recodex (Wockhardt Ltd., Mumbai, India) which contains codeine phosphate (2 mg/ml) and chlorpheniramine maleate (0.8 mg/ml) in the dose of 0.05 ml/10 g was administered to Group IV per oral as standard control drug. The test drugs and standards were administered one hour before the SO2 exposure.

Experimental design

The anti-tussive effect of the test formulations was evaluated in mice against sulphur dioxide induced cough by following the procedure of Miyagoshi et al. (1986). In brief, the assembly comprises of a 500ml three-necked flask containing aqueous saturated sodium hydrogen sulphite (Na HSO3; Nice Chemicals Pvt. Ltd.) solution. Into this bottle, concentrated Sulphuric acid (H2SO4; Merck, India) is introduced drop by drop; the reaction involved is as follows:

\[ 2\text{NaHSO}_3 + \text{H}_2\text{SO}_4 = 2\text{SO}_2 + \text{Na}_2\text{SO}_4 + \text{H}_2\text{O} \]

SO2 is filled in the column of water manometer by opening the three-way cork such that the SO2 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 SO2 collected in the water manometer escapes into the desiccator and not into the flask containing sodium hydrogen sulfite solution. These procedures are operated in a drift. The mouse to be tested is placed in 1 litre desiccator and covered with the lid. Certain amount of SO2 (5 ml which was kept constant throughout the experiment) is introduced to the desiccators by this procedure. The mice, after exposure to SO2 for one minute in the desiccators, were taken out of the desiccators and confined in an up-turned filter funnel. The free end of the funnel is attached to a stethoscope, by the help of which the cough reflex of the mice was heard.

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and the number of cough episodes in 5 minutes was enumerated. To avoid the observer bias, cough episodes were independently counted by two observers using digital counters and stopwatches.

Figure 1: displaying the Apparatus for antitussive evaluation

A. Saturated sodium hydrogen sulphite in 500 ml capacity of three-necked flask.
B. Concentrated sulfuric acid in burette.
C. Gas Reservoir.
D. Water Manometer.
E. Dessicator.

Table-1: Effect of test drugs on SO₂ induced cough episodes.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of cough episodes per 5 minutes</th>
<th>% inhibition of cough episodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>66.80 ± 4.11</td>
<td>--</td>
</tr>
<tr>
<td>LGP</td>
<td>57.20 ± 3.73</td>
<td>14.37</td>
</tr>
<tr>
<td>BGP</td>
<td>54.00 ± 4.61</td>
<td>19.16</td>
</tr>
<tr>
<td>RS</td>
<td>34.00 ± 2.92*</td>
<td>49.10</td>
</tr>
</tbody>
</table>

Data: Mean ± SEM, *P < 0.05 (Unpaired ‘t’ test) Vs control

Statistical analysis

The results are presented as Mean ± SEM. The data generated during the study were subjected to unpaired Students' t’ test as well as one way ANOVA with Dunnets’ multiple ‘t’ test as post-hoc test. The level of significance was set at P < 0.05.

RESULTS

Exposure of the mice to sulphur dioxide leads to production of cough reflexes as revealed in table – 1. Pre-treatment with LGP and BGP remarkably inhibited the sulphur dioxide induced cough episodes in comparison to control group; however the observed inhibition in both the treated groups were found to be statistically insignificant. Pre-treatment with reference standard drug significantly inhibited the sulphur dioxide induced cough episodes when compared with control group.

DISCUSSION

Coughing is a normal physiological response to an irritation of the laryngo-tracheo-bronchial system caused by mechanical or
chemical stimulation. It may be painful and fatiguing and requires suppression by antitussive drugs. In animals, coughing has been elicited by mechanical (Tedeschi et al., 1959) or chemical irritation (Turner RA, 1968) and by electrical stimulation (Cavanagh, 1976) of tracheal mucosa or by nerve stimulation (Pickering, 1979). Of all these methods, chemical or mechanical stimulation are more similar to the physiological event and are also the most preferred experimental models. Therefore the model adopted for screening of antitussive activity is Sulphur dioxide induced cough, which is a widely used model for evaluating this activity of a candidate compound. Recodex which was used as a reference standard drug contains codeine phosphate is one of the oldest and the most studied of all cough suppressants, and is a standard through which all other cough suppressants are measured. The British National Formulary lists seven opiate analogues as antitussives and the most commonly used contain codeine, pholcodeine and dextromethorphan. The opiates exert their pharmacological action via p opioid receptors. In the present study, the anti-tussive activity of Laghu Gokshura and Brihat Gokshura have been compared with that of recodex against coughing-induced by sulphur dioxide gas. Both the test drugs showed moderate antitussive effect, among which, Brihat Gokshura administered group was found to be better. However both of them failed to inhibit the cough reflex to significant extent as recodex. Both the varieties of Gokshura are having sweet taste due to presence of sugar and mucilage; these phyto-constituents may be responsible for the observed moderate antitussive effect. The mechanism by which they exert anti-tussive activity is unknown, hence further studies are needed to explore exact mechanism involved in observed anti-tussive activity.

CONCLUSION

Whole plant of Laghu Gokshura and Brihat Gokshura are having moderate anti-tussive activity and among them the activity observed in Brihat Gokshura is found to be better. So in the non-availability of root samples of these plants and also to prevent destructive harvesting whole plants can be used in the treatment of cough.

REFERENCES


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Conflict of Interest: None Declared