Ethnomedicinal uses of honey of stingless bee by *Nepali* community of Darjeeling foothills of West Bengal, India

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Therapeutic use of animal products is an age old and widespread cross-cultural practice. However, there is a general lack of interest about ethnopharmaceutical practices among the busy modern people. Surveys were carried out during 2010 to 2015 for identifying the use of honey of stingless bee, *Lepidotrigona arcifera* (Cockerell) in the ethnomedicine of *Nepali* community. Open ended structured questionnaires were used to acquire knowledge about the use of honey for medicinal purposes from medicine men and old resource persons. As much as 18 different ailments have been found to be cured traditionally by the use of *Lepidotrigona* honey either alone or in combination with other ingredients. Some of the plant parts, cow urine, milk, etc. were also found to be used to prepare concoction with the honey. Diseases treated with the honey singly or in combination with other natural products ranged from simple cold and cough to dreaded disease like cancer. However, clinical trials are further required to confirm the potentiality of honey to treat these diseases. Utilizing the traditional knowledge of use of stingless bee honey will help in harnessing the knowledge of natural resources of medicine all the same domesticating and conserving sub-Himalayan stingless bee diversity.

**Keywords:** Ethnomedicine, Stingless bee, *Lepidotrigona arcifera*, Honey, *Nepali* community

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According to the World Health Organization, between 75 % - 80 % of the world’s population uses traditional folk medicines1. Millions of people depend partially or completely on natural products harvested from natural areas for medicinal purposes2 — indicating the importance of animals and medicinal plants as fundamental elements of traditional medical practices.

Use of animal products in ethnomedicine is a very old tradition which had been practiced by many tribes from different topographical and cultural background. With advancement in medical sciences, traditional knowledge has almost lost its importance among modern busy people. Traditionally, in most cases, people consider plants and their products for medicinal purposes, however, like plants, animals and their products also possess medicinal properties3,4. In West Bengal, much work has been done to document traditional uses of medicinal plants and plant products5,6, but there is a definite lack of ethnozoological works. In zootherapy, honey has been one of the major components of ethnomedicine.

Banerjee et al.10 described honey to have multiple properties and is been in use therapeutically since time immemorial. It's antibacterial, anti-inflammatory and wound healing properties are promising11. Honey in general used extensively in the therapies of various kinds12. It is used for the treatment of various ailments like wounds, burns, arthritis, etc., either in the form of Apitherapy or therapy with bee products like honey, propolis, herb honey, etc13. Because of their beneficial effects, these products used as food and medicines are receiving worldwide attention. In Apiculture major focus has always been given to the honey obtained from *Apis* sp. because of their easy domestication and large scale production of honey. However, there are number of other stingless bee species which can be exploited for the same purpose. Moreover, honey obtained from such bees is more potent medicinally and has been used ethnomedicinally by various tribals and ethnic communities of the world14. There are reports suggesting the stingless honey as potential therapeutic antibiotic agents due to the presence of enzyme glucose-oxidase which has been observed to effectively control both susceptible, as well as drug-resistant pathogens.
resistant pathogenic bacteria\textsuperscript{15}. One such species is *Lepidotrigona arcifera* (Fig. 1) which is largely adorned by Nepali community of Darjeeling foothills and the Dooars of West Bengal for their high valued medicinal honey, where insect is commonly known as ‘*Putka*’ and honey is known as ‘*Putka ko maha*’\textsuperscript{16}.

*Lepidotrigona* is the largest and most widely distributed genus, which includes 130 species under ten sub-genera. All the species of stingless bees of Asia and Africa belong to the tribe *Trigonini*\textsuperscript{17}. Stingless bees usually nest in hollow trunks (Fig. 2). Apart from being an important pollinating agent of forest, these bees have also been an important source of honey or *Putka ko Maha* amongst the Nepali community. The honey produced by stingless bee is highly medicinal and has a very good market demand. It is about 20 times costlier than the honey produced by other bees\textsuperscript{18}. Several animal species commercialized for medicinal use are officially listed as rare or threatened—often precisely because of the pressure due to excessive harvesting\textsuperscript{19}. There is an urgent need to examine the ecological, cultural, social, and public health implications due to the usage of animals and animal products for medicinal purposes and the socio-cultural context associated with their consumption.

This work is an attempt to document and conserve the traditional knowledge of Nepali community about the therapeutic use of stingless bee honey for the treatment of different diseases.

**Methodology**

Field surveys were undertaken during 2010–2015 to explore, collect, identify and preserve the traditional knowledge of honey of *Lepidotrigona arcifera* used by Nepali community in Darjeeling foothills and the Dooars. Survey area comprised of the places like Teesta valley Tea Estate, Mahanadi Tea Estate, Chamurchi, Buxa Forest Village, etc., covering major portion of Darjeeling foothills and the Dooars (Fig. 3). Before the commencement of the survey work, due permissions (Prior Informed Consent or PIC) were taken from the village-heads with proper persuasion. During survey ethnic knowledge were documented in the form of notes as well as audio/vedio-recordings. Still photographs were also taken. Information was gathered from the community through structured questionnaire\textsuperscript{6,20-22}. Medicine men (*Baidha*) and local resource persons were interviewed to collect data on medicinal uses of honey and additional natural resources, their usable parts to treat various ailments, vernacular names, mode of administration and disease cured. Information were repeatedly cross-checked during the interviews. Collected animal specimens were identified with the help of standard systematic references\textsuperscript{23}. Species level identification of bee was done with the help of Dr Claus Rasmussen of Department of Bioscience, Aarhus University, Denmark added with his and others published references\textsuperscript{23}. The plant specimens were collected and processed according to the standard methods\textsuperscript{23}. The plants were identified at the Taxonomy and Environmental Biology Laboratory, Department of Botany, University of North Bengal, with the use of local floras\textsuperscript{25-28} further verified and deposited at NBU Herbarium.
Results

During the investigation a total of 18 formulations were found to be used against different diseases by the Nepalese community of Darjeeling foothills and the Dooars. All the formulations have been presented in Table 1, comprising scientific name, Nepali vernacular name, method of preparation and dosage regime. A total of 8 plant species belonging to 8 genera and 6 families were recorded which are used as ingredients in these formulations. Apart from plant parts, alum, cow milk and cow urine were also found to be used in some formulations/remedies. These remedies have been practically well accepted by a majority of the Nepali population in the study area for generations.

About 18 formulations were recorded which are used by the Nepali traditional healers for the treatment of 21 types of diseases (Table 1). The study shows that the drugs prepared and administered by Nepali traditional healers are of very high quality. Although the efficacy of the medicine is yet to be proven medically, however, patients with minor complaints like cough, asthma, burnt, cut, allergy, etc., seem very much satisfied with the treatment.

Discussion

Nepali traditional healers have developed varieties of medicinal formulations (Table 1) to use against commonly occurring diseases, using locally available Lepidotrigona honey. Though, the physiological changes this honey brings to cure the diseases still need thorough understanding, yet wide acceptance of honey as medicine among Nepali community advocates its cultural importance to them. The medicines prepared out of honey seem to be very helpful as the people have been entrusting and maintaining the traditional use of honey in their culture for centuries. Unless the requirement arises for better medical care, villagers do not visit a hospital, which is usually located far away from their settlements. During survey it was also observed that due to its high medicinal and cultural value, there is a significant variation in pricing of the honey from place to place. Normally it ranges from ₹ 3000 to as much as ₹ 9000 or more for a litre (L) of honey (Table 2). This may be because the availability of the honey is very scarce as majority of it is collected from the forests. Since, it is sold as “find and sell” product there is no commercial regularity system which can regulate the price because of which people charges varied hefty amount from place to place.

The honey collectors in this region mostly follow the “Seek-find-destroy” method for honey collection from the wild, hence if this exploitation goes unchecked for long then it can lead the species to get endangered or even worst getting extinct. The existence of these honey bees is not only important in view of their medicinally important honey but their role in forest tree pollination is also considered as one of the important factor. It is now very important to verify these medicines scientifically to find out if any lead is available for the development of new drugs for their application over wider areas. Traditional knowledge obtained from Nepali community about the use of stingless bee honey will help in harnessing
### Table 1 — Uses of *Lepidotrigona* honey in different formulations by the Nepali community

<table>
<thead>
<tr>
<th>Diseases/Health conditions</th>
<th>Ingredients</th>
<th>Local/Common names</th>
<th>Remedy preparation and its administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue/Weakness</td>
<td>Cow milk, <em>Lepidotrigona</em> honey</td>
<td>Gai ko dudh, Patuka ko maha</td>
<td>Half cup of warm milk and one tablespoon of <em>Lepidotrigona</em> honey are mixed together and taken in the morning for at least 15 days.</td>
</tr>
<tr>
<td>Common Cough</td>
<td><em>Ocimum tenuiflorum</em> L., <em>Zingiber officinale</em> Roscoe, <em>Lepidotrigona</em> honey</td>
<td>Tulsi, Aduwa, Patuka ko maha</td>
<td>Juice of 10–12 leaves of <em>Ocimum tenuiflorum</em> and a few drops of rhizome extract of <em>Zingiber officinale</em> are mixed with 1 tablespoon of honey and 2 tablespoons of concoction given orally once daily till cured.</td>
</tr>
<tr>
<td>Whooping cough (Pertussis)</td>
<td>Zea mays L., <em>Lepidotrigona</em> honey</td>
<td>Makai ko khoya, Patuka ko maha</td>
<td>After removing kernels, the corn cobs burnt into ash and 1 tablespoon ash are added with 1 tablespoon honey; this mixture taken three times daily till cured.</td>
</tr>
<tr>
<td>Asthma</td>
<td><em>Justicia adhatoda</em>, <em>Lepidotrigona</em> honey</td>
<td>Asaro, Patuka ko maha</td>
<td>Sufficient leaves of <em>Justicia adhatoda</em> are placed in an earthen pot and covered the pot’s mouth by straw tightly; then pot is heated for 1 hour and placed under ground for 10–15 days for fermentation. Once taken out fermented leaves are crushed into powder. 1 tablespoon of leaf powder added with 3gm <em>Lepidotrigona</em> honey and administered every morning and evening on empty stomach till cured.</td>
</tr>
<tr>
<td>Tickle in throat</td>
<td><em>Lepidotrigona</em> honey, <em>Citrus limon</em> (L.) Osbeck, <em>Zingiber officinale</em> Roscoe, <em>Cow milk</em></td>
<td>Patuka ko maha, Nimbu, Adhava, Gai ko dudh</td>
<td>Two tablespoons of <em>Lepidotrigona</em> honey, 4 tablespoons of juice of <em>Citrus limon</em> juice and 2 tablespoons of juice of <em>Zingiber officinale</em> added with one cup of hot cow milk and taken it before going to the bed at night.</td>
</tr>
<tr>
<td>Throat irritation</td>
<td><em>Lepidotrigona</em> honey, <em>Alum</em></td>
<td>Patuka ko maha, Fitikeri</td>
<td>125 g <em>Lepidotrigona</em> honey and 25 g alum are mixed with one cup of water and gurgled with this twice daily for 2-3 days.</td>
</tr>
<tr>
<td>Breathing problems, nasal and sinus complaints</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Taken raw honey daily. During treatment chewed <em>Lepidotrigona</em> honeycomb for fifteen minutes like chewing gum and thrown away whatever remains in your mouth.</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Honey helps in recovering tuberculosis weakness. Along with tuberculosis medicine, 1 drop of honey is licked daily till the disease is cured.</td>
</tr>
<tr>
<td>Conjunctivitis</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Applied 2 drops honey around the affected eyes twice daily till cured.</td>
</tr>
<tr>
<td>Eye infection</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Washed hands and eyes with boiled clean water and then put a drop of pure filtered <em>Lepidotrigona</em> honey into eyes.</td>
</tr>
<tr>
<td>Baby/Infant Teething Problems</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Little amount of honey applied on gums of the infants twice daily while she/he is teething.</td>
</tr>
<tr>
<td>Development of Infant Immune Function</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Small amount of honey licked twice a day normally in winter. Precautions should be taken not to administered honey to an infant if he/she is having fever.</td>
</tr>
<tr>
<td>Burnt</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Sufficient amount of pure filtered honey applied on the burnt area to avoid blistering. Also administered regularly till the wound is cured.</td>
</tr>
<tr>
<td>Pain caused due to old injuries</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>1-2 drop of honey licked daily 2-3 days.</td>
</tr>
<tr>
<td>Stomach ulcer</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Two table spoons of <em>Lepidotrigona</em> honey taken orally daily with breakfast or before having breakfast.</td>
</tr>
<tr>
<td>Diarrhoea and gastroenteritis</td>
<td><em>Lepidotrigona</em> honey</td>
<td>Patuka ko maha</td>
<td>Taken 2 tablespoons of <em>Lepidotrigona</em> honey daily on empty stomach.</td>
</tr>
</tbody>
</table>
the knowledge of natural resources of medicine from Darjeeling foothills and the Dooars, however, at the same time new methods need to be devised for domesticating and conserving sub-Himalayan stingless bee diversity at an earliest.

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References


