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ETHNO-THERAPEUTIC PRACTICES BY TRIBES OF BHAMRAGAD ADMINISTRATIVE BLOCK, GADCHIROLI DISTRICT, MAHARASHTRA, CENTRAL INDIA

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Abstract
To assess the ethno-therapeutic practices used by the tribal of Bhamragad administrative block of Gadchiroli district of Central India field investigation was carried out in 14 villages. A sample population of 31 individuals (n=10 female, n=21 male) was included in the study. A specially designed, developed, and field-tested questionnaire was used to elicit the information from the respondents. The findings of the study highlight the tribal from the study area used insects as a source of medicine for human beings and animals. The Asian weaver ant (Oecophylla smaragdina, Formicidae) was identified as an insect that is available throughout the year for the treatment of various diseases. The adult-stage ants and the whole body are used in the medicine. The preferred means for the use of these ants is in the order of drying > crushing > powder > smoke. The diseases for which these ants are used include cold, fever, malaria, diabetes, and cold and fever due to Coronavirus. It has been reported that the disease symptoms subside in 3-4 days and no side effects or death due to these insect medicines are ever reported. These insects' medicines are also prescribed to children. The use of insects as medicine by various tribes from the study area is in the order of Madia (42%) > Gond (32%) > Gowari (25%) > Pardhan (1%). The respondents reported self-treatment by using these insects and did not visit doctors or hospitals. To treat the fever in the hens (Gallus gallus domesticus) these dried ants were mixed with water and the same was given. Further investigations are required to identify the biomolecules from these ants to be used for pharmaceutical purposes in emerging diseases viz. Coronavirus.

Key Words: *Asian weaver ant, Ethno-therapeutic, Bhamragad, Gadchiroli, Insect medicine, Oecophylla smaragdina*

Introduction

In various medical systems across the world, insects and the materials taken from them have been utilised as medicinal resources since ancient times. Often viewed as repulsive and unclean creatures, several insect species have been utilised in magico-religious rites, as well as in live, cooked, ground, infusions, plasters, salves, and ointments, as well as in both preventative and curative medications (Costa-Neto, 2000). Entomotherapy is the use of insects and products generated from them for medicinal purposes. The usage of

insect-based medications should be considered from a cultural perspective since medical systems are structured as cultural systems (Costa-Neto, 2000).

According to reports, at least 1000 insect species are utilised medicinally globally; however, because there is a paucity of information in this area, the true number may be much greater (Meyer-Rochow, 2017). China alone is known to contain over 300 species of medicinal insects spread throughout 70 genera, 63 families, and 14 orders (Cherniack, 2010). Numerous other countries have also reported using hundreds of insects to cure ailments in both people and domestic animals, to mention a few South America (Costa-Neto, 2005; Costa-Neto *et al*., 2006), Africa (Kutalek and Prinz, 2004; Jideani and Netshiheni, 2017), Tibet (Czaja, 2019), Japan (Umemura, 1943), Korea (Pemberton, 1999; Okamoto and Muramatsu, 1922; Meyer-Rochow, 2013), India (Ayekpam *et al*., 2014; Senthilkumar *et al*., 2008; Sharma, 2018; Shrivastava and Prakash, 2015; Srivastava *et al*., 2009), Spain (Percino-Daniel *et al*., 2013; Vallejo and Gonzalez, 2013), and Turkey (Zengin and Karaca, 2017).

As far as India is concerned, except for a few rural tribes of northeast India, the full potential of insects as food and/or raw material for medicines is still far from being appreciated (Chakravarti *et al*., 2013, Chakravarti *et al*., 2014). This is the identified knowledge gap in the subject domain. To fill this knowledge gap with new knowledge this study was proposed to be carried out with an objective to identify insects used as a source of medicine and to identify methods for insects used as a medicine. The knowledge generated through this study can be utilised in the preparation of new drugs for existing and emerging diseases.

The nutritional value of red ant as reported by Srivastava *et al*. (2009) is 13.9g protein, 3.5g fat, 2.9g carbohydrate, 47.8g calcium, and 5.7g iron. Ghosh *et al*. (2017) reported the use of hundreds of insects and other invertebrate species in traditional medicinal techniques. According to Costa-Neto (2005), in the Bahia state, in north-eastern Brazil, at least 42 insects have reportedly been used in traditional medicine. Most traditional cures are given in the form of teas that are brewed from powder made by grinding an insect or animal's whole body that has been toasted or scraped. More than 40 folk species from various groups in the state of Bahia have already been identified. According to Mozhui *et al.* (2021) in Nagaland, insects are used therapeutically in addition to being consumed as food by the different ethnic groups. A total of 50 species of medicinal insects belonging to 28 families and 11 orders are effective in treating at least 50 human diseases, with coughs, gastritis, rheumatoid arthritis, gastrointestinal aches, and wound healing. Bhowate and Pawan Kumar (2020) reported tribes include mashed-up live ants of *Oecophylla smaragdina* as food in their diet to treat 16 diseases, including pneumonia, fever, gastritis, piles, wound healing, weakness, liver disorder, dog bite, hydrophobia, snakebite, and various diseases in children. Bairagi (2019) reported insects are a natural resource with the potential to be used as medicines to treat and prevent serious illnesses like viral infections, HIV, cancer, and others.

In Assamese festivals like Bohag Bihu, red ants are a popular food item, particularly among the Mishing tribe and the Ahom community (Chowdhury *et al.,* 2015). According to Chakravorti *et al.,*

(2011) in the easternmost state of India, Arunachal Pradesh, approximately 20 common human complaints and the food and mouth disease of cattle were the targets of zoo-therapies. Of the 36 vertebrate species used in the treatment of ailments and diseases, mammals constituted 50% of the total. Chakravorti *et al.* (2011) found the collection of useful insect species has gotten harder over time.

The red ants' formic acid may have a property to treat diseases such as diabetes, scabies, malaria, corona (cold and fever), and the common cold and fever. The fire ant (*Solenopsis invicta*) is the source of a main alkaloid that claims to have anti-antigen action. This toxin has the power to block several kinesis processes involved in the angiogenesis process. The weak vision was treated with ant eggs mixed with an equal amount of wheat flour to make dough. Most of the native healers used ants (Bairagi, 2019).

Ants are one of the most familiar members of the Hymenoptera order. This is a social family with an impressive life span, the record being 29 years (Seabrooks and Hu, 2017). Insects are the most economically advantageous source of protein when compared to fish and meat from animals. Traditional medicine has also employed insects to cure various human and animal illnesses, including the common cold.

Study Area

Maharashtra is a state in the western peninsular region of India and Bhamragad is an administrative block and a district sub-division in the Gadchiroli district. The administrative block is spread between 18.43°N to 21.50°N latitude and 79.45°E to 80.53°E longitude with a total area of 64,336 hectares at an average elevation of 231 meters above mean sea level (Figure 1). The Gadchiroli district is called the lungs of Maharashtra as it has 35% of its land is covered by thick teak (*Tectona grandis*) forest. The local inhabitants mostly depend on forests for their survival. The Bhamragad administrative block is locally called *zadipatti*—an area of forest and trees. The administrative block has 72% of the land area covered by southern tropical dry deciduous forest. The administrative block was located in the dense forest with most of the population belonging to Madia, Gond, Gowari, and Pradhan tribes and maintaining their traditional lifestyle. As per the Census of India 2011, the population of the administrative block was 36,325 with a literacy rate of 55%. The total area of the administrative block is 1420 square kilometres with a population density of 26 persons per kilometre. The tribal population dominates (81%) of the total population of the administrative block (Census of India 2011, 2011). The main occupation of the aboriginal tribes from the study area is tendu (*Diospyros melanoxylon*) leaf collection and bamboo (*Bambusa vulgaris*) cutting.

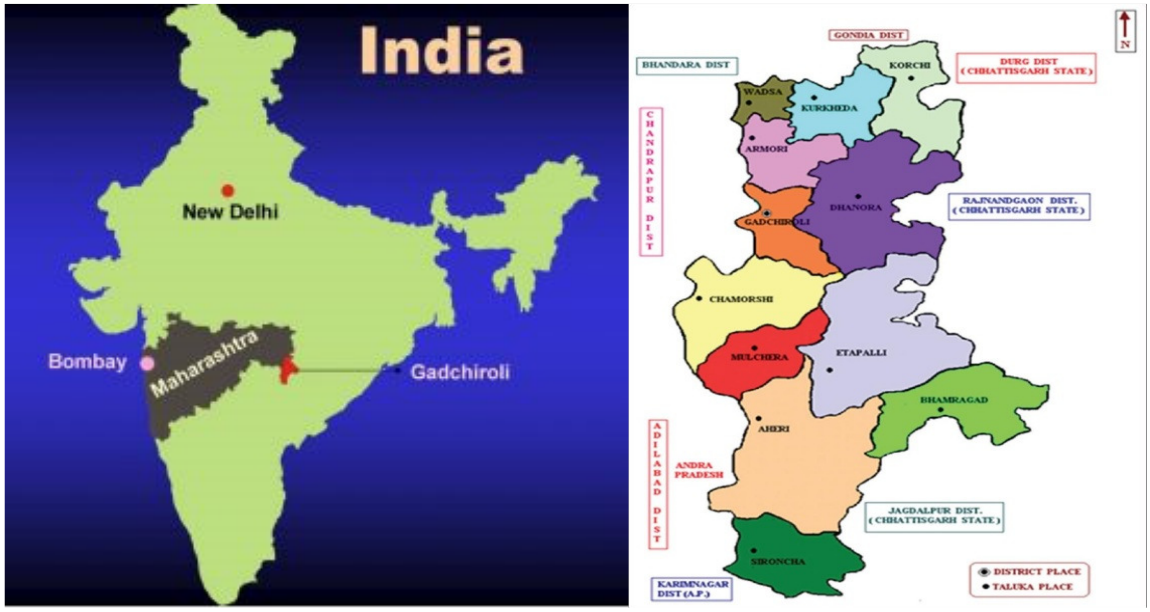

Fig. 1: Study area

The Gadchiroli district's climate varies periodically. The summers (March to June) are scorching with a maximum temperature of 42.1°C. The average humidity was 62%. The asymmetrically distributed rainfall during the southwest monsoon from June to September with the normal annual rainfall varies from 1300 mm to 1750 mm/year. The eastern part of the district receives more rainfall than the western part. The winter season from December to February is bitterly frigid with the mean minimum temperature of 14.6°C.

Material and Methods

The methodology adopted for this study is comprised of the construction of a tool (interview schedule), pilot study, identification of sample population, field survey, data collection, and data analysis. The study was carried out in 14 villages of Bhamragad administrative block. To elicit the information about the insects used as medicine a specially designed and field-tested questionnaire was developed. This questionnaire was modified from the inputs received by the pilot study. The questionnaire comprises various sections ranging from respondents' profiles to insects used in medicine, veterinary medicine, and specific motives for the same. The questionnaire comprises questions with options prepared based on the Likert scale. The questionnaire was introduced to the respondents in their native language at their home or field and answers were marked by a Research Assistant thus to minimise the errors. The respondents were identified based on the snowball technique. The primary data collected was analysed with the help of Microsoft Excel®. The secondary data was collected from the Census of India Gadchiroli District Handbook (Census of India 2011, 2011). A total of 31 respondents were identified from the sampling locations from the study area comprising 21 (67.74%) males and 10 (32.25%) females with age group from 19 to 60 years. The ~48% (n=15) respondents had education less than the 10th standard and the main source of livelihood is in the order of subsistence farming, informal,

commercial farming, casual labour, other, and formal employment. The inclusion criterion for the respondents for this study was those inhabitants from the study area who are using insects as a source of medicine for human and animal treatment. The insects used for therapeutic purposes were collected from the respondents as specimens and they were preserved using accepted practices and identified with the help of published keys.

Results and Discussion

The elderly, both male and female, from the study area, were found to have an excellent understanding of folkloric remedies, particularly those derived from insects. The medicinal insects to cure human diseases from the study area are presented in Table 1. From the table, the Asian weaver ant (*Oecophylla smaragdina*) (Figure 1) (whole-body) which is available around the year on trees is used for the treatment of cold and fever by inhaling the fumes daily three times. Furthermore, these dried ants are smelled on alternate days for a week two to three times a day for the treatment of malaria. During the Coronavirus pandemic, to treat the common cold and fever these ants were crushed and smelled. In addition, to control diabetes these dried ants are crushed and powder or paste is used.

Fig. 1: Asian weaver ant

Table 1: Insects as a medicine used for human beings

Common name	Vernacular name (Marathi)	Scientific name	Family name	Habitat	Seasonal available	Stage eaten	Part eaten	Mode of intake	Diseases	Preparation for medicine
Asian weaver ant	Damodhe	*Oecophylla smaragdina*	Formicidae	Trees	Round the year	Adult	Whole body	P/S	Cold, fever	Fumes of ants are inhaled daily thrice.
Asian weaver ant	Damodhe	*Oecophylla smaragdina*	Formicidae	Trees	Round the year	Adult	Whole body	P	Malaria	For a week, two to three times of dried ants are smelled on alternate days.
Asian weaver ant	Damodhe	*Oecophylla smaragdina*	Formicidae	Trees	Round the year	Adult	Whole body	S	Corona (Cold, fever)	Raw ants are crushed and then smell it.
Asian weaver ant	Damodhe	*Oecophylla smaragdina*	Formicidae	Trees	Round the year	Adult	Whole body	P/P	Diabetes	For a week, two to three times of dried ants are crushed and the powder or paste is used.

(**Note** - D: Dry, P: Powder, P: Paste, S: Smoke, R: Roasted, B: Boiling, F: Fry)

The medicinal insect species (Asian weaver ant in this case) are mostly collected from wild trees 35.48%, forest 25.80%, household environment 22.58%, and paddy fields 16.12%. These ants typically build their nest on mango trees by using their large leaves. These nests are removed by using a long bamboo stick attached to a sickle. The ant nest after removal is immediately put into the bucket full of water and ripped within the water. The nest forming the leaves is taken out of the bucket, and the eggs, larvae, and adults are then separated and used. The tribal and rural peoples from the study area are using powder and smoke methods for the treatment of human beings. These ants are usually used as a medicine by crushing 29.03%, drying 32.25%, powder 22.58%, and smoke 16.12%.

The therapeutic practice of using adult ants (*Oecophylla smaragdina*) among various tribes in Binagunda for the treatment of coughs, fever, malaria, corona's cold and fever, and other infections has also been reported from the Bhamragad side Kukameta, Malumpodure, Binagunda, Laheri, Hoddri, and some other villages.

In addition to insects used as medicine for human beings, they are also used for the treatment of animals. The Asian weaver ants (*Oecophylla smaragdina*) paste is internally mixed with any food material that is offered to the hens (*Gallus gallus domesticus*) for the treatment of cold and fever. Moreover, its dry powder prepared by drying it in sunlight is internally taken with water or other food material for the treatment of cold and fever (Table 2). The extract of these ants' whole body is prepared by crushing or pressing them by adding water (1:1, w/v). If ever the hens are in bad health or have any major disease or death-like situation then inhabitants use these ants as a medicine. By ingesting these ants perhaps, the immune system of the hens becomes strong, and they do not get any such disease again. To enhance the healing efficiency of these ants they are combined with other materials viz. turmeric powder, coconut oil, castor oil, salt, etc.

Table 2: Insects as a medicine used in veterinary treatment

Common name	Vernacular name (Marathi)	Scientific name	Family name	Habitat	Seasonal available	Stage used	Part used	Mode of intake	Diseases	Preparation for medicine (for Hens)
Asian weaver ant	Damodhe	*Oecophylla smaragdina*	Formicidae	Trees	Round the year	Adult	Whole body	Paste	Cold, fever	Paste of red ants are internally mixed with any food material the hens are eaten.
Asian weaver ant	Damodhe	*Oecophylla smaragdina*	Formicidae	Trees	Round the year	Adult	Whole body	Powder	Cold, fever	Dry powder of red ants is internally taken with water or other food materials.

The inhabitants from the study area preferably use those insects which are available around the year. It is reported that ~20% of insects used as medicine from the study area their availability is reduced to >70% in the last 10 years and some insects have disappeared and some are found in fewer numbers. The insects which are used as medicine are also used on children for treating various diseases. The reduction in medicinal properties of insects after drying was reported by 33% of respondents whereas 45% were not in agreement with this. The preferable method for the use of insects as medicine is crushing them and using them as dry powder. The relief from various ailments by use of insects as a medicine was reported in 3-4 days. No human casualties were ever reported by the use of insects as a source of medicine. Furthermore, no side effects from these are also reported. The respondents do not use poisonous insects as a source of medicine. The use of insects as medicine by various tribes from the study area is in the order of Madia (42%) > Gond (32%) > Gowari (25%) > Pardhan (1%). The respondents reported self-treatment by using these insects and did not visit doctors or hospitals. The tribes have a perception that the Asian weaver ant keeps them healthy and free from sickness. The availability of medicinal insects has reduced in the last decade and some insects are not available now and some are in very small numbers from the study area. This observation corroborates with Chakravorti *et al.,* (2011).

Conclusion

Folk traditional knowledge appears to still be ingrained in the tribal life of the district, based on the recording of medicinal insects from tribes within the study region. The study area's medicinal insect species provide evidence of the use of Asian weaver ants for therapeutic purposes. It also shows how in-depth analyses of specific bioactive compounds from this species, which local users have given high fidelity levels and found to be effective in treating illnesses and other disorders, may pave the way for new developments in the field of pharmacology. Insect-derived medicines have not yet achieved the level of recognition and commercial success of their plant-derived equivalents, even with the discovery of biologically active compounds extracted from insects. This certainly has something to do with the unfavourable cultural perceptions of insects, especially in the West. Nonetheless, scientists should not let the general public's negative opinion of insects stop them from exploring these relatively unexplored possibilities. Insect-derived materials have a lot of potential for the future of natural product medicine development if given the right care.

Around the world, insects are used as medicine due to the presence of several defensive bioactive molecules/chemicals developed in them in the course of evolution over millennia. The negligence received by these insect species may hinder in identification of new pharmaceutical chemicals/molecules that can be used to cure new diseases or for those the medicine is not yet developed. A sustainable use of insects is required while exploring them as a source of medicine and maintaining an ecological balance and biodiversity thus avoiding their extinction. The future priority should be given to documentation of the indigenous knowledge about these medicine insects from the area which has not been previously studied and measures to ensure its prevention of over-exploitation. A

future laboratory investigation on the claim stated by these tribes for effectively treating the diseases will open new bioprospecting in the field of natural product drug discovery. Moreover, the marketing of medicinal insects has a huge opportunity to increase inhabitants' income and pave the way for livelihood security.

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