International Journal of Zoology Studies
ISSN: 2455-7269; Impact Factor: RJIF 5.14
www.zoologyjournals.com
Volume 1; Issue 1; January 2016; Page No. 30-33

Entomophagy and entomotherapy practiced among the indigenous populations of Western Ghats of Tamil Nadu, India

Philip Samuel P, Govindarajan R, Krishnamoorthy R, Victor Jerald Leo, Selvam A, Paramasivan R, Arunachalam N

Centre for Research in Medical Entomology, Indian Council of medical Research, Department of Health Research, 4, Sarojini Street, Chinnachokkikulam, Madurai, Tamil Nadu, India

Abstract
This study brings out the entomophagy and entomotherapy practiced by the indigenous communities of Western Ghats. This work is an attempt to present a list of insects used for medicinal and also for the nutritive purposes by these communities. This study will be helpful to bring out the economically important insects present in these areas. By this the insect population of damaging stages is reduced considerably and control measures against insects may not be needed. These edible insects will meet out the food scarcity to some extent and the community efforts can therefore result in improved livelihood of the local people.

Keywords: entomophagy, entomotherapy, Western Ghats

1. Introduction

Food and Agriculture Organization estimate that the world desires to raise its food production by 70% by 2050 in order to feed on a global population of nine billion [1]. The United Nations agency predicted that by 2050, the steadily-growing population would increase the demand for food, projecting the potential of insects as a food commodity. Green revolution increased the different technologies such as pesticides, herbicides and fertilizers after the introduction of high yielding varieties of crops for the drastic increase in the crop yield to abundantly increase the food production in India [2]. Indian government has taken up Operation Flood Programme to increase the production of milk and made India one of the largest producers of milk in the world. The phenomenal increase in the production of milk in the country is christened as the White Revolution [3]. There is a future proposal to launch Blue revolution to increase the commercial fish production and productivity in India [4]. With a growing world population and increasingly demanding consumers, urgently need to identify alternative protein sources, and insects have great potential in contributing to global food security. Insects provide a unique and long-lasting solution to India's future food security and new during discovery challenges. Supplying food for human occupants remains one of the primary issues [5]. Worldwide, more than 1900 species of insects are eaten mainly in tropical countries. In fact many countries have already prepared a blueprint for harnessing this vast resource of nature. With an increasing world population and their needs, it is urgently needed to identify substitute protein sources and insects offer a great promise in contributing to global food safety medicinal as well as pharmaceutical needs. Nutritionally, edible insects constitute high quality food for humans, and feed for livestock, poultry and fish. Because insects until recently were not considered as feed and also used for medicinal purpose. In modern times, however usage of insects for consumption and medicinal purpose has declined in many societies and is sometimes ridiculed as old fashioned and not accepted. It would be prudent to carefully consider the value of customary knowledge of the usage of insects before those discarding it too readily. Thus there is an urgent need to document the field of entomophagy and entomotherapy for the welfare of human kind. It has also been observed that the traditional knowledge on use of medicinal/edible insects are disappearing fast among the younger generation mainly due to the fact that the pertinent knowledge are not properly passed on to the young ones from elderly persons. Therefore systematic documentation of this knowledge using scientific tools is of urgent need.

Indigenous people employed insects in diverse aspects like edible purpose, therapeutic use, economic input and many other activities. Edible insects are a natural renewable resource of food with nutritional, economic, and ecological benefits to the rural people [6]. There are a number of advantages of using insects as protein base above the livestock commodities. Grasshoppers and other edible insects are sold in Mexico village markets where they are fried before being eaten. Also readily prepared fried grasshoppers and chocolate covered ants are also sold in cans. Columbian citizens get pleasure from eating a variety of insects such as termites, Palm grubs and ants. Ants are ground and used as a spread on breads [7]. In Philippines people's favorite food is insects like beetles, and dragonfly larvae. In African countries people use insects like ants, termites, beetle grubs, cater pillars and grasshoppers as popular food. Roasted giant water bugs are eaten as a whole and this is a favorite food in some Asian countries. Mass insect rearing facilities will produce stable, reliable and safe products to supply to the consumers. In addition to that insects are low in cholesterol and fat. Insects have the potential of becoming an important new food and medicine item both in tropical and western countries. We are possibly evolving to brace the emergence of a new food/feed chain and a new sector of insects as food and medicine. The World Health Organization estimates that as many as 80% of the world's more than six billion people rely primarily on animal and plant based

medicine. In modern societies, zootherapy constitutes an important alternative among many other known therapies practiced worldwide.

By 2020, India's total food production requirement will be far from sufficient. In India, over 68.4% of the population lives in rural areas where food security has become a problem. Poor food distribution and high food prices have added to the misery. Edible insects are a natural renewable resource of food with nutritional, economic, and ecological benefits to the rural people. The high protein content with digestibility as well as some minerals, vitamins, fat and carbohydrates make the insects as a perfect food. In fact, insects are the cheapest source of protein compared to animal meal and fish. The preface of entomophagy is traditional in several states of India. In Arunachal Pradesh; the Nyishi and Galo tribes consume 81 insects [8]. In the North East region, the Ahom community consumes silkworm pupae in the nature stage, whereas other tribes (Garo, Naga, Bodo, Missing, Rabha, Kachari, etc.) prefer these insects in prepupal form or adult [9]. In Meghalaya termites are served as a source of proteins and carbohydrates [10]. In Assam, Mizoram, Manipur and Tripura, the cinnamon bug, Ochrophora (Udonga) Montana (Distant) (Heteroptera: Pentatomidae) is fried in oil and consumed [11]. In Tamil Nadu and Karnataka, winged termites are fried and eaten by Palliyan tribes [12]. In Odisha, termites are eaten alone or together with rice [13].

2. Materials and methods

Entomological investigations were undertaken in the Western Ghats area Kothagiri area of Nilgiris district, Anamalai Hills area in Pollachi block in Coimbatore district, Bodi hills area, Theni district, Kodaikanal block in Palani hills, Sathyamangalam forest at Erode district and Gudalur hills in the Nilgiri district to understand the entomophagy and entomotherapy practiced in different ethnic groups. The team visited and the surveys for entomophagy and entomotherapy practices in different indigenous people were undertaken in different seasons during 2013 to 2015. The team visited individual villages and the data set were obtained by the personal discussion from the residents of the villages. The age of these informants were above 20 years. Details about the habit of utilization of insects were also recorded from the personal discussion. A standard questionnaire was prepared for this purpose and the information gathered was carefully recorded. The informants were enquired about the insect species used as food/medicine, mode of consumption/utilization, form of preparations, life stages of insects consumed, association with other ingredients, culture related to insects, or any other uses etc. During this study, insect species were also collected from different habitats and preserved following the standard methods and recorded.

3. Results and discussion

The inclusion of insects and their use as human food (entomophagy) and medicinal purpose (entomotherapy) were examined in this study.Much area of that region is inhabited by the tribal population; some of these populations use the insects as food and medicine for the remedy for their various local malady. It is amazing and disappointing that these marvels of life process remain largely unknown in a scientifically demonstrable manner. This study was undertaken to basically unravel the nutritionally and medically unknown marvels of the wonderful world of insects which constituted nearly 70% of the world nearly 30 million extant species. Regular visits were undertaken to Kothagiri area of Nilgiris district Tamil Nadu to understand the entomophagy and medicinal use of insects by the local population helped to understand the insects used by them for medicinal and nutritive purposes.

A study on tribal people unconventional food consumption at Anamalai Hills area in Pollachi block in Coimbatore district revealed the usage of honey bees bee hive and eggs (Apis sp.) with larva collected from trees and rock hole as food. The collected nest was cut by half and crushed by hand and white milk juice was collected in a vessel. Then this extracted juice was fried in a pan and finally a white paste is formed. This is consumed by the locals to improve their physical health. In Uganda also the honey bee larva are collected as food. In Columbia bee nests are are collected as much for their bee grubs as for the honey. They are considered as delicacy [13].

The practice of eating winged termites Macrotermites spp. commonly called as '*Easal*' was observed from plain and hill villages. The adult part of termites was eaten after properly cooked with rice. This observation was noticed among the tribal population in Bodi hills area of Theni district and Sathyamangalam forest at Erode district. This is also consumed by the locals to improve their physical health. Tribal people of Kandhamal, Koraput, Sundergarh, Keonjhar and Mayurbhanj districts of Orissa eat red ant and termites. Roasting are frequently used method of cooking. They eat roasted insects as snack or with rice [14]. In parts of Africa termites are eaten raw soon after catching. The larger species of termites *Macrotermes bellicosus*, *M.falciger* and *M. subhyalinus* are much favoured as food in many parts of East Africa. In Eastern Ugenda winged termites are induced to emerge by beating the nearby ground with sticks. Drumming was observed to induce termite emergence here. The termites are eaten raw or lightly fried in their own fat. In many East African towns and villages sun-dried termites are found at the right season in the local markets. The people live in the northern shore of Lake Victoria in Uganda use termites as snacks between the main meals [13]. Termites were collected at the time of swarming whereas the red ants are collected from the plants with ants nests found.

The local name of another red ant is '*MUSURU*' and technical name is weaver ant / Red ant. These insects make nest in tree leaves mostly in mango (*Oecophylla smaragdina*) trees. The nest with adult, larvae and egg were collected from tree leaves and then heated by iron sheet or pan. Then the dust would be removed by filtering. After that the filtered substance placed in grinding stone was crushed by stone. The grinded substance collected in a cloth (mostly white cloth) and the juice is extracted. The extracted juice is mixed with spices and water to prepare soup (Rasam). This is consumed mainly by the lactating mothers to increase the flow of milk and also to cure the cough and cold. A study at Kodaikanal block in Palani hills area unraveled the consumption ants. Similarly in Orissa the ant with the eggs were collected from trees and fried with salt, chilly, spices and mustard oil and taken as food [15]. In Mexicao, an ant (*Atta cephalotes*) is consumed in rainy season which has 42% protein. Ants are ground up and used as a spread on breads by Columbian citizens. Ants larvae/or pupae are usually eaten raw in Columbia. In Zaire insects are used for treatment of various diseases successfully. Trembling red ant is used for the treatment of the Muyeen (bronchitis). The saliva of the ants helps patient recover his normal respiration. (Srivastava *et al* 2009).

The other insect called as '*kosu theni'* (Hymanopters sp.) was use as medicine for cough and sneezing cold. The nest of adult with egg was collected and crushed by grinding stone and juice was extracted. The extracted juice was added with spices and prepared as soup. This is taken by the local people for medicinal purpose. In the Gudalur hills in the Nilgiri district a study was carried out to explore the information of medicinal and edible insect resources. The Honey bees nest with larva and the practice of eating termites is common in plain village and hill villages. Consumption of these insects is common because people tend to use insects which are readily available, plentiful, and easy to capture, store, and prepare for eating (Table 1). Edible insects are rich in protein, fat, carbohydrates, minerals, and other activated elements that promote human health [16].

Entomophagy is a promising approach to meet human nutritional needs in space. This study reviewed the entomophagy and the entomotherapy practiced by the tribes in the aforementioned areas of Western Ghats. This can be encouraged in the places where acute food shortage is faced as a substitute. It was observed that some of the insects like Honey bees (Egg/Larvae), Termite (Termite Soil) and red ants are being used for various medicinal and nutritive purposes by these people. Edible insects are a natural renewable resource of food with nutritional, economic, and ecological benefits to the rural people. The high protein content with digestibility as well as some minerals, vitamins, fats and carbohydrates make the insects a perfect food which is the cheapest source of protein compared to animal meat and fish.

Considering the current status of food security and future requirement of food, entomophagy can be recommended, particularly during natural disasters and at the starting of the crop season. If facilities are available, insects and their products can be exported through cooperative societies. When insects are collected or picked up from crop fields, the population of damaging stages is reduced considerably; control measures against insects may not be needed. Community efforts can therefore result in improved livelihood of the local people. The collection of edible insects is a good source of income for women who are gathered by hand and they require little capital. Insects are widely offered in the local village markets while some of the preferred species reach the urban markets and restaurants.

This study brings out the list of insects consumed for nutritive and medicinal purposes by the ethnic communities of Western Ghats region. This work is also an attempt to present a list of insects used for medicinal and also for the nutritive purposes from these communities. This will be helpful to bring out the economically important insects present in this area and the taxonomically validate of the same. In future this will pave a way for the development of a database with all the edible and medicinal insects of this region for the sustainable management of these economically important insect resources. Collecting and farming insects could provide a diversified employment strategy and multiple income-earning chances in developing countries. Cultural practices developed for these edible insects will meet out the food scarcity to some extent.

Table 1: Entomophagy and the entomotherapy practiced by the tribes of Western Ghats

Insects used	Purpose	Available season	Source of collection	life stage consumed	Consumption pattern	Preparation pattern	Beneficiary Target group	Usage
Macrotermites spp., (Easal)	Food	Rainy	Soil	Adult	Cooked	Fried and mixed with Aaval-Fried raw rice mixture	All	To improve physical health
Oecophylla smaragdina, (Musuru Red ant)	Medicinal food	All time	Trees	Adult, egg & larvae	Cooked	Prepare Soup (Rasam) & Thuvaiyal	Adult especially feeding mother	To increase milk secretion for feeding mothers and help to cure cough & cold
Apis spp., (Honey bee larvae / egg)	Food	April - June	Trees & Rocks	Larvae	Raw/ Cooked	Fried and white colloidal substance	All	To improve physical health
Hymanoptera sp. (Kosu theni)	Medicinal food	All time	Trees	Adult, egg & larvae	Cooked	Prepare Soup (Rasam) & Thuvaiyal	Adult	Help to cure cough and sneezing cold

4. Conclusions

Entomophagy and the entomotherapy are practiced by the tribes of Western Ghats. It was observed that some of the insects like Honey bees (Egg/Larvae), Termite (Termite Soil) and red ants are being used for various medicinal and nutritive purposes by these people. Edible insects are a natural renewable resource of food with nutritional, economic, and ecological benefits to the rural people. This study brings out in detail the consumption of nutritive and medicinal insects by the ethnic communities of Western Ghats region. This will be helpful to bring out the economically important insects present in this area. When insects are collected or picked up from crop fields, the population of damaging stages is reduced considerably; control measures against insects may not be required. Community efforts can therefore result in improved livelihood of the local people. In future, insects and their products can be exported through cooperative societies. Considering the current status of food security and future requirement of food, entomophagy and entomotherapy can be recommended. This work is also an attempt to present a list of insects used for medicinal and also for the nutritive purposes from these communities.

5. Acknowledgment

Authors thank the Secretary, Department of Health Research (DHR), Ministry of Health & Family Welfare and the Director General, ICMR for financial support and Dr. B. K. Tyagi for Providing the facilities and for their encouragement, guidance and useful suggestions for the Study. Sincere thanks are due to all the supporting staff of CRME, Madurai.

6. References

1. www.fao.org/fileadmin/.../How_to_Feed_the_World_in_2050. pdf 12-13 October, 2009.
2. Raising Agricultural Productivity and Making Farming Remunerative for Farmers. An Occasional Paper NITI Aayog, Government of India. 2015, 16.
3. Kurien Varghese. India's Milk Revolution: Investing in Rural Producer Organizations. In Narayan,Deepa; Glinskaya, Elena. Ending poverty in South Asia: Ideas that work 2007. Washington D C USA. (The World Bank, 52 ISBN o-8213-6876-1, 2012.
4. Sharma A P, Mohanty B P, Hiralal Chaudhuri. Current Science, 2015; 108(2):1921-2014.
5. Yokota H, Ishikawa Y, Yamashita M, Oshima T. Space Agriculture Task Force Space agriculture on Mars using hyperthermophilic aerobic bacteria. Habitation. 2006; 10:191.
6. Gahukar R T. Entomophagy can support rural livelihood in India Current Science. 2012; 103(1):10.
7. Srivastava SK, Naresh Babu, Hema Pandey. Traditional insect bioprospecting –As human food and medicine. Indian Journal of Traditional Knowledge. 2009; 8(4):485-494
8. Chakravorty J, Ghosh S, Meyer-Rochow VB. Vertebrates used for medicinal purposes by member of the Nyishi and Galo tribes in Arunachal Pradesh North East India. Journal of Ethnobioology/ Ethnomedicine. 2011; 7:1-14.
9. Sarmah MC. Current Science. 2011; 100:3-279.
10. Paul D, Sudipta Dey. Nutrient content of sexual and worker forms of the subterranean termite *Reticulitermes* sp. Indian Journal of Traditional Knowledge. 2011; 3:505-507.
11. Azad Thakur NS, Firake DM. Current Science. 2012; 102:845-846.
12. Rajan BKC. Tiny wild fauna and human food. My Forest. 1987; 23:177-180.
13. Srivastava SK, Naresh Babu, Hema Pandey. Traditional insect bioprospecting – As human food and medicine. Indian Journal of Traditional Knowledge. 2009; 8(4):485-494.
14. Reddy G, Geetha Rani, Gupta HS, Kavia ZD, Ray DP. (Mission Unit, Division of Agricultural Extension, Indian Council of Agricultural Research, New Delhi, Published by Director, DIPA, ICAR, Krishi Anusandhan Bhavan, Pusa, New Delhi), 2003, 542.
15. Pradhan Matu. *Inventory of indigenous Technical Knowledge in Agriculture*, Document *2*, edited by Das P, Das SK, Mishra A, Arya HPS, Bujarbaruah KM, Singh RP, Verma LR, Subba Reddy G, Geetha Rani, Gupta HS, Kavia ZD & Ray DP, (Mission Unit, Division of Agricultural Extension Published by Director, DIPA, ICAR, Krishi Anusandhan Bhavan, Pusa, New Delhi), 2003, 625.
16. Shantibala T, Lokeshwari RK, Debaraj H. Nutritional and antinutritional composition of the five species of aquatic edible insects consumed in Manipur, India. Journal of Insect Science. 2014; 14:14. Available online: http://www.insectscience.org/14.14.