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EDIBLE INSECTS USED AS FOOD BY TANGSA AND WANCHO TRIBES OF CHANGLANG DISTRICT, ARUNACHAL PRADESH

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ABSTRACT

In India, entomophagy practices are common among the people who consume insects as ethnic food. In Changlang district of Arunachal Pradesh, the consumption of insects as food is a common practice, with insects consumed as additional food source. The present study revealed that eleven insect species belonging to six orders are accepted as food by the two tribes (Tangsa and Wancho) of the Changlang district, Arunachal Pradesh. *Apis indica, Oecophylla smaragdina* (Hymenoptera) and *Macrotermes* sp. (Isoptera) are the three common edible insects. From the nutritional point of view, these edible insects are rich in protein content. Such insects form a regular part of the diet, whenever available. But the people of the district are not much familiar with their nutrition and market value. This study analyses these so as to inform them, the consumers, about their sustainable use as food and their nutritional importance.

Key words: Arunachal Pradesh, Changlang, Tangsa, Wancho, edible insect, entomophagy, *Apis indica, Oecophylla smaragdina*, *Macrotermes* sp., market value, nutrition, protein

People of Tangsa are considered as a Naga tribe of Changlang district and their lifestyle shows they are good cultivators, whereas Wancho tribes are indigenous people and are traditionally governed by a council of elderly chieftains. Both the tribes have chosen entomophagy as a sustainable source of food as it has been used since ancient times, a knowledge which has been passed down from generation to generation through word of mouth. According to Chakravorty et al. (2013) the insects in Arunachal Pradesh are not consumed for their nutritional supplement value but are appreciated for their taste when seasonally available. The present study assesses the protein content of such edible insects available in Changlang district of northeast India. Study on macronutrients composition of insects from different habitats reveal that these are rich in protein, carbohydrate and lipid (Das, 2018). According to Atanu (2017) in India different insects are consumed by ethnic tribes. People of Phek, Dimapur and Kohima District of Nagaland eat grasshoppers, crickets, red ants and larvae of mulberry silk worms. A total of 41 insect species belonging to 8 orders under 24 families and 36 genera are consumed as food in Manipur as reported by Shantibala et al. (2012). In Meghalaya, termites are consumed as a good source of proteins and carbohydrates. In Arunachal Pradesh, the Nyshi and Galo tribes consume at least 81 species of local insects, belonging to 26 families and 5 orders as shown by Chakravorty et al. (2011). Moreover, modern people are more reluctant to hold their traditional way of life, as a result consumption of insects is declining at a sharp rate. It was found that some tribes of Arunachal Pradesh still take pride in including insects as their food source. The present study provides information on edible insects and their nutritional value as protein and used as food by Tangsa and Wancho tribes of Changlang district, Arunachal Pradesh.

MATERIALS AND METHODS

Changlang district is the second largest district in Arunachal Pradesh, India and it is bounded by Lohit district on the south and Tirap district on the north (27.7422ºN, 96.6424ºE). This district is home land of fascinating and interesting tribes such as Tangsa, Singpho, Tutsa, Nocte, Wancho, Lisu, Deori, Chakma and Hajong. These tribals are mainly dependent on agriculture, forest, river and their resources for their livelihood. The insects are naturally collected from fresh water bodies (e.g., ponds and streams), paddy fields, vegetable gardens, soils and farmland, shrubs and trees, grassland and dwellings. Samples of specimens previously determined as edible by the local tribes were collected using aerial net, aquatic net, sweep net, beating sheet and forceps. These specimens were identified with key characters using photographs. A household survey was done with questionnaire having simple questions like type of edible insects, their local names, stage eaten and mode of intake. The local people were also

addressed with questionnaires as to know how the edible insects are harvested, the way they are cleaned, cooked or dried and about the body parts that are / discarded. The ages of the target group interviewed ranges between 30-70 years and included both men and women. Eleven commonly consumed insects were selected for biochemical studies viz., *Apis indica, Samia cynthia ricini, Gryllotalpa* sp., *Okanagana viridis, Oecophylla smaragdina, Brachytrupes* sp., *Heiroglyphus banian, Polistiso* sp., *Lethocerus* sp., *Macrotermes* sp. and *Phyllophagus* sp. (protein estimation). Egg, larvae, pupa and adult of each of the seasonally available edible insects were collected biochemical analysis. After collection these were brought to the laboratory, stored at -20°C, for further biochemical analysis. Total protein content was estimated by Lowry et al. (1951).

RESULTS AND DISCUSSION

Inventory knowledge about the edible insects, their mode of consumption, stages and local name by the Tangsa and Wancho tribes are presented in Table 1. The study concludes that these tribes of Changlang district prefer insects as edible by their availability and appearance. The Tangsa tribe is a community of several tens of thousands of individuals, mainly depended on forest, agriculture and the river for their livelihood and collecting varied plants, animals and insects from forest and river for food. From the selected insects these consume nine species- *Apis indica, Oecophylla smaragdina, Okanagana viridis, Polistiso* sp., *Lethocerus* sp., *Heiroglyphus banian, Gryllotalpa* sp., *Samia cynthia ricini* and *Macrotermes* sp. Mode of consumption of these insects varies according to their life stages- egg, larvae and pupa of order Hymenoptera are eaten after steam boiling by placing the wrapped insect in bamboo leaves beside a fire. Insects of other orders Isoptera, Coleoptera, Orthoptera, Hemiptera and Lepidoptera are preferred roasted and fried with oil after discarding the non-edible parts. Insects belonging to order Hymenoptera and Lepidoptera such as *A. indica* and *S. cynthia ricini* are available throughout the year, are easily reared, domesticated and commonly sold in the market. Termites (*Macrotermes* sp.) are delicious edible insect species with a high fat content. The collection is mainly done during their swarming period as in this period plenty of winged adults emerge out from the soil. Red ants (*Oecophylla smaragdina*) were collected in nest formed directly from the trees, wasps (*Polistis* sp.) also collected in nest formed when available, bugs (*Lethocerus* sp.) were collected while fishing, grasshopper (*Heiroglyphus banian*) and mole cricket (*Gryllotalpa* sp.) were collected from forest field. While, cicada (*Okanagana viridis*) was collected by attracting them using a white sheet and making sounds with the help of bamboo sticks.

The Wancho tribe is indigenous to Arunachal , and they depend on agriculture, hunting and fishing for their livelihood. Large animal, fishes, insect and different plants species are collected as food by them. They preferred six species of edible insects viz., *A. indica, O. smaragdina, H. banian, Brachytrupes* sp., *Phyllophaga* sp., and *Macrotermes* sp. Like the Tangsa tribe, Wancho tribe also prefer the same mode of insect collection and consumption i.e., boiling, roasting and fried the insect with ingredient etc. It was noted now that the insects *Phyllophaga* sp. and *Brachytrupes* sp. were collected

Table 1. Edible insects used by Tangsa and Wancho tribes of Arunachal Pradesh

Scientific name	Order	Common name	Local name (Tangsa)	Local name (Wancho)	Stage eaten	Mode of consumption
Apis indica	Hymenoptera	Honey bee	Yakay	Nakat	Egg, Larvae, Pupa, Adult	Boiled/ Fried with oil
Oecophylla smaragdina	Hymenoptera	Weaver ant	Saisho/ Hahoi	Thajao	Egg, Larvae, Pupa, Adult	Boiled/ Fried with oil
Polistiso sp.	Hymenoptera	Paper wasp	Nyasaa	----	Eggs, Larva, Pupa, Adult	Boiled/ Fried with oil
Macrotermes sp.	Isoptera	Termite	Khunkhi	Ualong	Winged adult	Fried with oil
Okanagana viridis	Hemiptera	Green cicada	Machera	----	Adult	Roasted/ Fried with oil
Lethocerus sp.	Hemiptera	Giant water bug	Kupthak	----	Adult	Roasted/ Fried with oil
Hieroglyphus banian	Orthoptera	Grasshopper	Kupchek	Okuk	Adult	Roasted/ Fried with oil
Gryllotalpa sp.	Orthoptera	Mole cricket	Kuborr	----	Adult	Roasted/ Fried with oil
Brachytrupes sp.	Orthoptera	Cricket	----	Okul	Adult	Roasted/ Fried with oil
Samia cynthia ricini	Lepidoptera	Eri silkworm	Raijung	----	Larvae, pupa	Roasted/ Fried with oil
Phyllophaga sp.	Coleoptera	Beetle	----	Notphong	White grub or adult	Boiled/ Roasted/ Fried with oil

from soil, decaying wood and directly from the field. Also, these two insects are only consumed as fried/ roasted with oil.

Protein is the main building block of life and constitutes many important components in body. From the biochemical analysis the protein content in egg and larvae of weaver ant, paper wasp and honeybee (Hymenoptera) is found to be 6.15± 0.041, 6.43± 0.038 and 8.31± 0.062, white grub of beetle (coleopteran) 6.65± 0.048, larvae of eri silk worm (Lepidoptera) 7.15± 0.053, winged adult of termite (Isoptera) 7.48± 0.057, adult of cicada (Hemiptera) 5.52± 0.034, adult of mole cricket (Orthoptera) 7.2± 0.055, adult grasshopper (Orthoptera) 6.26± 0.071, adult of giant water bug (Hemiptera) 8.19± 0.053 and adult of cricket (Orthoptera) 5.4± 0.031. Of these *A. indica* shows highest protein content and *Brachytrupes* sp. with lowest protein content. The protein content varies in different species which may be due to the different metamorphic stages of the insect, their habitat and diet. The stages eaten as food are mainly egg, larvae and adult of different insect. In order Hymenoptera all the stages egg, larvae, pupas, adult were consumed as food by the two tribes with same mode of consumption i.e., boiled/ fried with oil. Whereas, in case of order Lepidoptera is larvae and pupa, white grub of Coleoptera and adult as edible in both order Orthoptera and Isoptera. Hence, all the collected samples for biochemical test were edible stages. From the analysis it was found that edible insects are rich in protein content and all the selected insects' shows quite similar values; Hymenoptera (8.31mg/ ml) contain high protein followed by Hemiptera (8.19 mg/ ml), Isoptera (7.48 mg/ ml), Orthoptera (7.2 mg/ ml), Lepidoptera (7.15 mg/ ml), and Coleoptera (6.65 mg/ ml). Xiaoming et al. (2009) also reported that edible insect is rich in protein than carbohydrate. While examine 100 insects it was shown that the raw protein content is generally 20-70% at all the edible stages. Also, Ramons- Elorduy et al. (2002) revealed that the protein content range from 75 to 91%.

Similarly, the present study also revealed that protein content is high. Chakravorty et al. (2013) assessed that two common species of Orthoptera has high protein content followed by fat and carbohydrate. Das et al. (2016) showed that the protein content of 13 insects is much higher than other macronutrients. Ghosh et al. (2017) observed that protein content of five commercial edible insects in South Korea is high as compared to fat. Edible insects are a natural renewable resource that provides food to many ethnic groups in Changlang district of Arunachal Pradesh.

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REFERENCES

Atanu S. 2017. Edible Insect: Future Prospects for Dietary Regimen. International Journal of Current Microbiology and Applied Sciences 6(8): 1302-1314.

Chakravorty J, Ghosh S, Meyer-Rochow V B. 2011. Chemical composition of *Aspongopus nepalensis* Westwood 1837 (Hemiptera: Pentatomidae), a common insect food by tribal people in Arunachal Pradesh. Indian Journal of Vitam Nutrition Research 81: 1-14.

Chakravorty J, Ghosh S, Meyer-Rochow V B. 2011. Practices of entomophagy and entomotheraphy by members of the Nyishi and Galo tribes, two ethnic groups of the state of Arunachal Pradesh (North-East India). Journal of Ethnobiology Ethnomedicine 7: 5.

Chakravorty J, Ghosh S, Meyer-Rochow V B. 2013. Comparative survey of entomophagy and Entomotherapeutic Practices in Six Tribes of Eastern Arunachal Pradesh, India. Journal of Ethnobiology and Ethnomedicine 9: 50.

Das A N, Ahmed R, Singson L. 2016. Edible insects of Nagaland and its Nutritional Benefits. Periodic Research 5: 31-33.

Das J K. 2019. Macronutrient content of some edible insects with references to the Baksa district of Assam, India. International Journal of Science and Research 8: 1423-1427

Ghosh S, Lee S M, Jung C, Meyer-Rochow V B. 2017. Nutritional composition of five commercial edible insects in South Korea. Journal of Asia-Pacific Entomology 20: 686-694.

Lowry O H, Rosebrough N J, Farr A L, Randall R J. 1951. Protein measurement with the folin phenol reagent. Journal of Biological Chemistry 193: 265-275.

Ramos-Elorduy J, Pino J M. 2002. Edible insects of Chiapas, Mexico. Ecology of Food Nutrition 41(4): 271-299.

Shantibala T, Lokeshwari R K, Sharma H D. 2012. Entomophagy practices among the ethnic communities of Manipur, North East India. International Journal of Intelligent Information Technologies 5: 13-20.

Xiaoming C, Ying F, Zhiyong C. 2009. Common edible insects' ad their utilization in China. Entmological Research 39(5): 65.

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