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MEIMAN: Database exploring Medicinal and Edible insects of Manipur

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Abstract:
We have developed MEIMAN, a unique database on medicinal and edible insects of Manipur which comprises 51 insects species collected through extensive survey and questionnaire for two years. MEIMAN provides integrated access to insect species thorough sophisticated web interface which has following capabilities a) Graphical interface of seasonality, b) Method of preparation, c) Form of use - edible and medicinal, d) habitat, e) medicinal uses, f) commercial importance and g) economic status. This database will be useful for scientific validations and updating of traditional wisdom in bioprospecting aspects. It will be useful in analyzing the insect biodiversity for the development of virgin resources and their industrialization. Further, the features will be suited for detailed investigation on potential medicinal and edible insects that make MEIMAN a powerful tool for sustainable management.

Availability: www.ibsd.gov.in/meiman

Background:
Manipur enjoys a very rich and fascinating diversity of insect fauna being a part of Indo-Burma Biodiversity hotspot region. Traditionally, indigenous people employed insects in diverse aspects like edible purpose, therapeutic use, economic input and many other activities. The state has 30 different ethnic communities consisting of 1 major group, the Meitei and 29 tribes with distinct identity, culture and food habit. Literature survey revealed that no detail studies have been made so far from Manipur regarding the utilization of insect bioresources. It is intended to develop strategies for conservation and preservation of traditional life as well as cultural practices of resources utilization by the people. The studies will be able to provide a scientific basis for sustainable resource management and basic information for further research in various fields. However in India, proper documentation of traditional knowledge on the utilization of insect resources is less expertise. Advance enterprises in these fields and their values do not get due recognition, as compare to insect resources utilization in different corners of the world **[1-3].** In view of the above importance, the present investigation records and collects all the available information of the age old culture and knowledge of the several ethnic people regarding the utilization of insect resources particularly edible **[4-7]** and medicinal insects **[8-9].**

Database to retrieve the comprehensive information on insects for edible and medicinal potential will be extremely useful to modern research, and could enable new insights and discoveries concerning evolutionary relationship of gene and gene products anticipated in entomotherapeutic uses. No attempt has been made so far for Systematic documentation of medicinal and edible insects of Manipur, thus we have designed a sophisticated web based database to provide comprehensive information on insects used for medicinal and edible purpose.

We have developed a unique, publicly available database called MEIMAN-Medicinal and Edible Insects of Manipur (www.ibsd.gov.in/meiman) that provides access to the

taxonomy, seasonality, their method of preparation, and form of uses, ethnic user communities, market value, economic status and links. MEIMAN is first resource that provides comprehensive retrieval of information related to edible and medicinal insects found in Manipur. MEIMANs' sophisticated web based graphical user interface allows efficient retrieval of data. The reliable data provide content and links to add an advantage in exploring information of insect resources which will make MEIMAN a comprehensive and sophisticated tool.

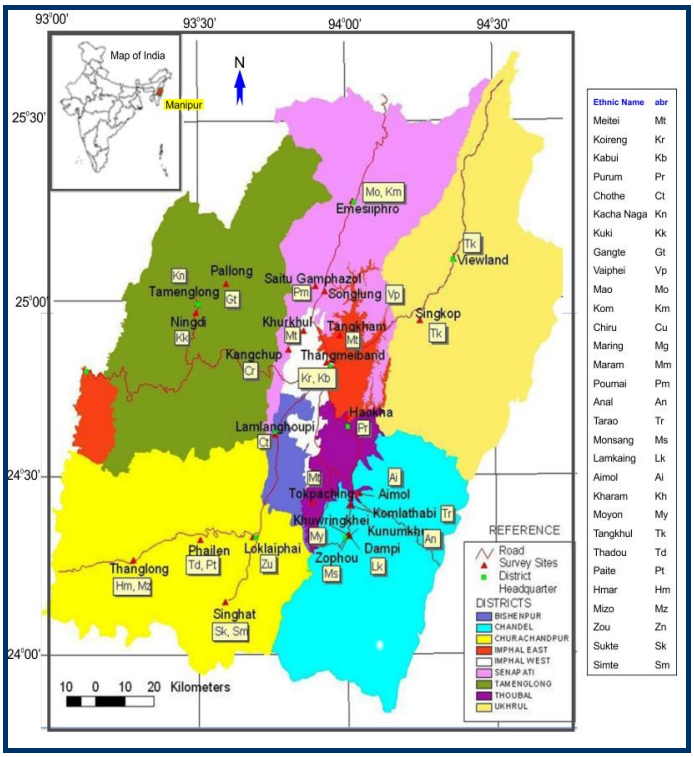

Figure 1: Mapping of Manipur showing the survey sites

Methodology:

Surveys for entomophagy and entomotherapy practices in different ethnic groups were conducted in 25 villages **(Figure 1)** during 2008 to 2011. Data were obtained by performing personal interview from 1005 persons comprising village heads, traditional knowledge holders, educated youths and homemakers. The age of these informants were above 20 years. Village heads and traditional knowledge holders (TK holders) are aware about the age-old practices of insect resources. Homemakers were included because they are responsible for collection, selling and preparation. Educated youths were taken to record their views about the habit of utilization of insects. Data were collected through a questionnaire attached with coloured photographs of the different insect species for easy identification. 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 the course of study, insect species were also collected from different habitats and preserved following the standard methods and identified up to family level by following the standard taxonomic keys **[10-12]**. The identification and authentication of the insect species were done at USDA, ZSI, IARI, etc.

Database Content

MEIMAN database contains an extensive compilation on medicinal edible insects, which can be visualized and analyzed by graphical web-interface. The database comprised of 51 insect species of which 48 are utilized as edible and 20 species in medicinal purposes**.** Further, biochemical and molecular data on gene and gene products will be updated after experimental validation of result.

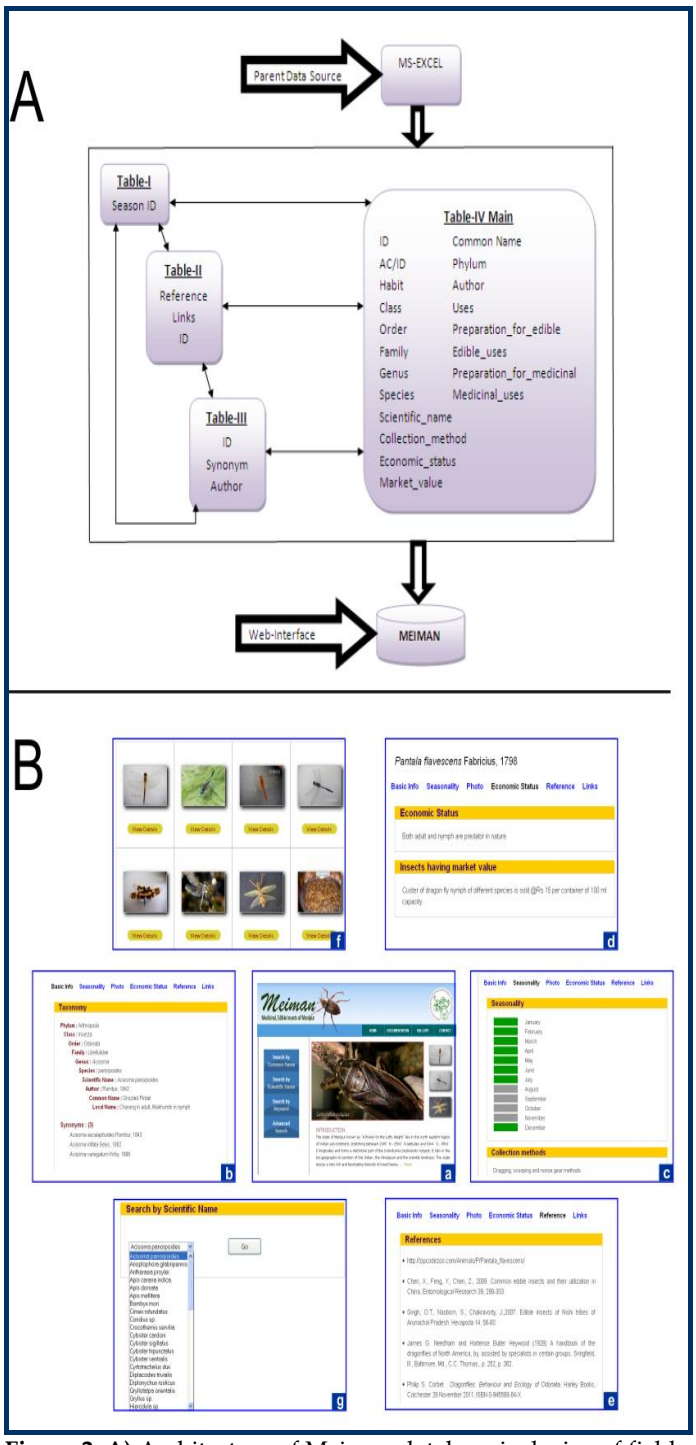

Figure 2: A) Architecture of Meiman database inclusive of fields and sub-field that used for retrieval of information**; B)** Outline of Meiman database representing **a)** Home; **b)** Basic information; **c)** Seasonality; **d)** Economic statute; **e)**References; **f)** Gallery and **g)** Search

Design and Implementation

The MEIMAN database was developed by extracting seamlessly integrating data from extensive questionnaire compiled in MS Excel. This data compiled in MySQL 5.1.41 (www.mysql.com) relational database along with cross references to taxonomy, seasonality, method and form of uses, snaps, references and links. **(Figure 2)** gives architecture and outline of MEIMAN database. The MySQL database was normalized and indexed to ensure efficient and accurate data retrieval through the query option available in MEIMAN web interface. At present search by common name, scientific name, keyword and advance options are available to the users. We will perform regular updates to the MEIMAN database to ensure that its' contents are up to date with periodic update in experimental and biochemical study.

The MEIMAN web interface developed in Apache 2.0 Handler CGI 1.1 (www.apache.org) runs on the Windows 2003 web server and utilizes the MySQL (XAMPP-win32-1.7.7) module to query and retrieve data from back end MySQL database (www.mysql.com). The graphical display of seasonality was implemented with JAVA Script 1.6 programming (http://www.javascriptsource.com).

Future Development:

With the above previews, our objective is to develop MEIMAN database as a comprehensive warehouse for all edible and medicinal insects of the region which will regard as a basis platform for sustainable management of insect bioresources. Since, biologically active compounds derived from plants, animals and microbes have good binding affinities towards target of lethal diseases, bioactive compounds from insect could provide insight for novel ligands. Drugs from such untapped resources are welcome by drug development fraternity due to limitations of synthetic chemistry and adverse reactions. In the future, we have a plan to enhance the capabilities in MEIMAN by including biochemical, molecular data and evolutionary relationship in gene and gene products amongst all the insects utilized by ethnic communities of this region.

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