The Research Project on Edible Wild Plants of Bhutan and Their Associated Traditional Knowledge

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Abstract : The Researchers from the Graduate School of Agriculture, Shinshu University in Japan and the Council for Renewable Natural Resources Research in Bhutan initiated a joint research project titled, "Wild Edible Plants of Bhutan" in 2005 with financial support from the Ajinomoto Foundation for Dietary Culture. In 2006 and 2007, the project was extended with a financial support from the Toyota Foundation. The objective of the project is to make the species of edible wild plants resources clear and evaluate their associated traditional knowledge in Bhutan. Three surveys during April 2005, April 2006 and July 2007 at different villages, markets and forests were carried out. A total of 62 edible wild plants belonging to 33 families of *Magnoliophyta* were determined, out of which 46 species has been identified. A total of 22 edible plants species of *Pteridophyta* were recorded, out of which 7 species has been identified. Many of these plants are believed to affect human health. For example, the leaves of *Nasturium offiicinale* and *Hemerocallis* sp. are believed to improve general condition of the blood, leaves of Mentha species and inflorescence of *Girardiana palmate* are believed to reduce blood pressure and leaves of *Urtica dioia* are believed to cure tuberculosis. Some wild plants were commonly used as edible in the surveyed area ; *Plectocomia himalayana, Elatostema* sp., *Thlaspi arvense, Cymbiduim* sp., *Justicia adhatoda, Asparagus racemose, Phytolocca acinosa, Houttuynia cordata, Mentha* sp., and *Colocasia* sp. As one of the outcome of the project a book titled "Edible Wild Plants of Bhutan and Their Associated Traditional Knowledge" was published in 2008 which will be used as a reference for the research and development on natural resources of Bhutan in the future.

Key words : edible wild plants, evaluation, functionality, human health, species, traditional knowledge

Introduction

Owing to its high nutritional value, culinary use of wild edible plants is increasing worldwide. It has become a popular delicacy in European and Asian cuisines. In Bhutan, wide range of indigenous wild vegetable plants are collected and consumed. These contribute greatly to the nutritional well-being of rural people by providing the essential nutrients required for body growth and development and for prevention of diseases associated with nutritional deficiencies. Traditionally, rural farmers have made conscious efforts to preserve these plants around their homesteads, in crop fields and communal lands.

Over the past decade, government's drive towards high yielding varieties has started to erode traditional utilization of indigenous vegetables. The availability of wild edible plants is declining because of cultivation of introduced crops, habitat change, and rapid dietary changes among the population. This is further exacerbated by a lack of major research and extension efforts to improve their husbandry and promote indigenous species. There is also growing ignorance among young people about the existence of these nutritionally rich food plants. Such decline in the use of indigenous vegetables by rural people could attribute to increased incidence of nutritional deficiency disorders and diseases in among the rural populace.

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It is clear that the wild plants play important roles in Bhutanese diet. However, there is some concern that the importation and subsequent introduction of vegetables may replace indigenous edible plant species. It is feared that a reduction in the consumption of indigenous wild plants would result in a decrease in sustainable forest usage, and consequently, disruption of the coexistence of people with the forest and the loss of traditional knowledge in near future.

Based on this premise, the Graduate School of Agriculture, Shinshu University and the Council for Renewable Natural Resources Research of Bhutan (CoRRB) initiated a joint research project titled, "Wild Edible Plants of Bhutan" in 2005 with financial support from the Ajinomoto Foundation for Dietary Culture. In 2006 and 2007, the project was extended with a financial support from the Toyota Foundation. The objective of the project is to make the species of edible wild plants resources clear and evaluate their traditional knowledge and beliefs associated with their use and their effects on human health in Bhutan.

As one of the outcome of the project a book titled "Edible Wild plants of Bhutan and Their Associated Traditional Knowledge" was published in 2008. The book will be used as a reference for research in the future and thus contributes to the sustainable development and conservation of natural resources in Bhutan.

Objectives

- Study edible wild plants and record their associated traditional knowledge
- Make clear the species found, its habitat and their indigenous knowledge
- Conduct research and development
- Production of a picture book of edible wild plants

Materials and Methods

1. Survey Method

Four surveys during April 2005, April 2006, July 2007 and Oct. 2008 at different places were carried out by the group of Japanese researchers from Shinshu University, Japan in collaboration with the Bhutanese researchers of the Renewable Natural Resources (RNR) Research Centres of Bhutan.

1.1 Market Survey

- List and characterise edible wild vegetable plants on sale in the vegetable markets
- Interview sales persons on the indigenous knowledge such as local names, sources, uses and functional values
- Collect samples for identification

1.2 Farm Survey

- Interview farmers on indigenous knowledge such as local names, sources, uses and functional values
- Make field observations
- Collect samples for identification

2. Survey Sites

Shinshu University and RNR Research Centre conducted the surveys of edible wild plants from 2005 to 2008 in the following sites in Bhutan.

Out of 20 Dzongkhags[1], 13 Dzongkhags has been already surveyed (solid circles in Fig.1). However the survey was carried out only in limited geogs[2], village and fields (Table 1).

3. Species Identification

3.1 Scientific name

The specimens collected from survey sites were identified using previously published references. As for unidentifiable specimens, identification was made by specialists of certain taxa at the National Biodiversity Centre, Ministry of Agriculture, Bhutan (NBC) and by using photographs in Japan.

3.2 Family

As for 'Scientific name' above. *Liliaceae* were divided into the *Alliaceae, Asparagaceae, Ruscaceae (Convallariaceae)* and *Liliaceae,* according to the methodology used in the 'Flora of Bhutan'.

4. Purported health benefit

The purported beneficial effects associated with plant consumption were collected by interviewing salesmen/women in each market, farmers, and villagers in the study area.

5. Visit of Bhutanese Researchers to Shinshu University, Nagano, Japan.

[1] Dzongkhag(s) means province
[2] geog(s) means city/town/village.

Table 1. Survey date and areas in Bhutan, 2005 to 2008.

Year	Date	Areas
2005	8–13 April	Vegetable Market of Thimphu, Punakha & Tsirang. Farmer village in Toke, Haa.
2006	7–16 April	Trongsa, Bumthang, Mongar, Trashigang & Zhemgang. 3 Bazaars, 4 farmer villages, 1 garden, 2 forest, 1 community forest, 2 research field.
2007	5–9 July	Haa, Thimphu, Punakha & Wangdue. 3 vegetable markets, 3 villages, 4 fields
2008	16–30 October	Gasa, Chukha & Dagana. 3 vegetable markets, 5 villages, 3 fields, 2 forest

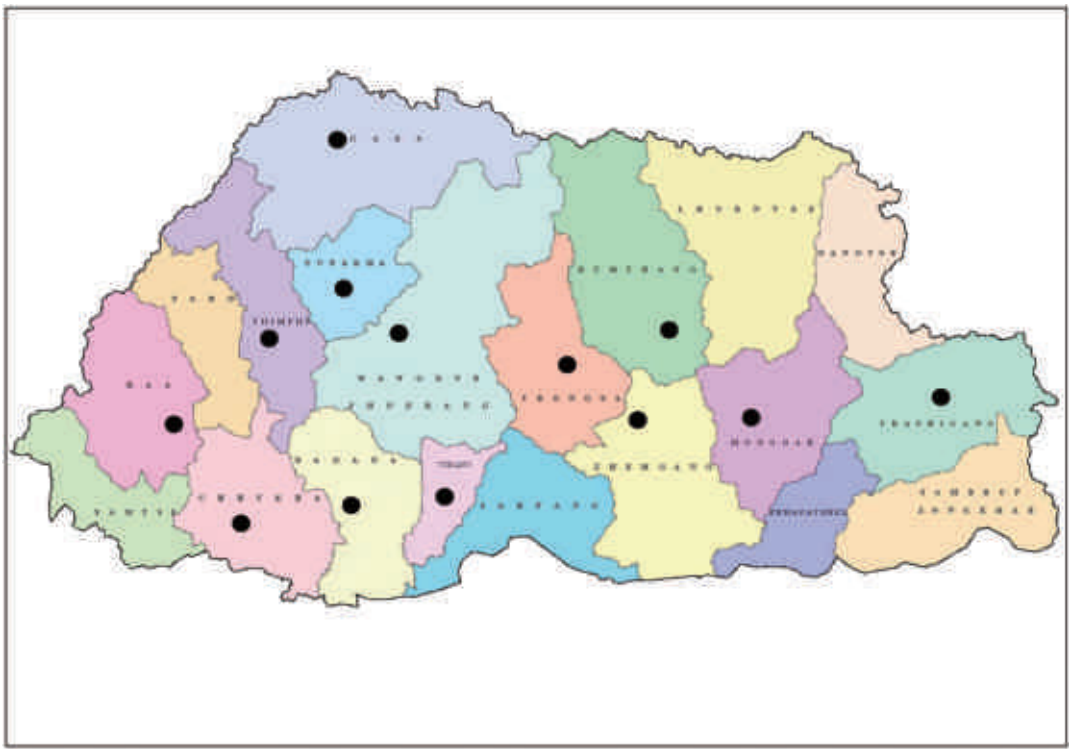

Fig.1. Map of surveyed Dzongkhags/Districts (solid circle) in Bhutan from April, 2005 to Oct. 2008

During April, 2006 the project also funded the visit of two Bhutanese researchers, Ms. Laxmi Thapa and Ms. Dawa Delma from CoRRB to Shinshu University for two weeks. The activity during the visit included introduction to the university and its facilities, local market survey in Ina town to study wild edible plants of Japan and visit to food industry and Agriculture Research Stations. The visit also included presentation by Bhutanese about the findings of the wild edible plants of Bhutan to the university students.

Result

2005

A total of 98 edible plant species were recorded including 30 wild species and 68 cultivated plants. *Pogostemon amaranthoides, Phytolocca acinosa* and *Elatostema lineolatum* leaves are used as vegetables and very often sold in the market. Some wild species are believed to affect human health functionally. Leaves of *Nasturium offiicinale* and *Hemerocallis* sp. are believed to improve general condition of the blood. Leaves of *Mentha* sp. and inflorescence of *Girardiana palmate* are believed to reduce blood pressure. Leaf of *Urtica dioia* is believed to cure tuberculosis. Some consumers prefer the bitter taste of food from various parts of the plants such as the flower of *Justica adhatoda,* the stem of *Asparagus racemose,* the flower of *Cymbidium* sp. and the young shoot of *Plectocomia himalayana.* It is believed that the bitter taste of food have the good effect on human health. The soup of young shoot of *Plectocomia himalayana* is good for healing the nausea and the inflorescence derived from some orchid is good for treating headache and dizziness.

The young stems of fern as vegetable were

observed frequently in the market. At least eight kinds of ferns were observed in the market. The two main types of fern locally known in Bhutan are “Pankey” and “Nakey”. Many farmers like the bitter taste of the fern which is locally called as “Kem”. The ferns are believed to act as brain stimulant.

2006

A total of 47 edible plants species those belong to 25 families of Magnoliophyta were determined. A total of 12 edible wild plants species of Pteridophyta were determined. Common edible wild vegetables in 2005 and 2006, with their Botanical and Dzongkha names, were : *Justicia adhatoda* (Bashakha), *Plectocomia himalayana* (Patsha), *Asparagus racemose* (Ngakhagchu), *Phytolocca acinosa* (Tashigangkha), *Houttuynia cordata* (Gaytsho), *Chenopodium* sp. (Henshu), *Mentha* sp. (Usila), *Cymbiduim* sp. (Olachoto), *Pogostemon amaranthoides* (Namna), *Elatostema lineolatum* (Damroo), *Oenanthe* sp. (Zemtsi), *Colocasia* sp. (Dow), *Thlaspi arvense* (Gekha), *Urtica dioia* and *Girardianan palmate* (Zocha).

2007

A total 26 edible wild plant species those belong to 19 families of Magnoliophyta and 10 edible wild plant species of Pteridophyta were determined.

Some wild plants commonly used as edible were : *Plectocomia himalayana* (Patsha), *Elatostema lineolatum* (Damroo), *Thlaspi arvense* (Gekha), *Chenopodium* sp. (Henshu), *Mentha* sp. (Usila), *Cymbiduim* sp. (Olachoto) , *Pogostemon amaranthoides* (Namna), *Phytolocca acinosa* (Tashigangkha).

Pteridophyta sp.

Elatostema sp.

Cymbidium sp.

Dioscorea sp. A farmer shows the edible tuber.

Fig.2 Some edible wild plants commonly used in Bhutan

From the 2005-2007 investigation, a total of 62 edible wild species those belong to families of Magnoliophyta were determined, out of which 46 species has been identified. A total of 22 species of Pteridophyta has been recorded, out of which 7 species have been identified. For the survey in 2008, results are now in process of compilation.

Conclusion

From the survey, it is clear that a wide range of edible wild plants can be found in Bhutan. These edible wild plants are collected by farmers for self -consumption and sale. These play a very important role to the farmers of Bhutan traditionally and economically. Considering the importance of the wild plants in Bhutan for the Bhutanese farmers, the need for a strategic approach to studying edible wild plants cannot be overemphasized. The long-term approach among others, should focus on the nation wide further documentation, species led research and development.

Farmers have abundant traditional knowledge of the effects of edible wild plants on human health. However, most of them believed by the people have never been scientifically evaluated. Therefore, there is a need to verify their belief in the traditional knowledge scientifically and to evaluate food value of these plants. Further research for the analysis of functional components of the edible wild plants of Bhutan is necessary.

To address needs and continue our further research program, the researchers from the Shinshu University have come up with a new project proposal phase titled "Analysis of functional components of Edible wild plants of Bhutan for Human Health", starting April 2008 to 2010. This project will include five main activities :

1. Investigation of wild edible plants in Bhutan
2. Determination of food value of the vegetables
3. Genetic analysis of wild edible plants
4. Visit of Bhutanese researchers to Japan
5. Revision of the picture book "Edible Wild Plants of Bhutan"

Researchers in the Project

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ブータンにおける食用野生植物の利用と伝統的知識に関する研究プロジェクト

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要　約

信州大学大学院農学研究科とブータン王国農業省 the Council for RNR (Renewable Natural Resources) Research は2005年から「ブータンにおける食用野生植物」に関する共同研究を開始した。2005年は味の素食文化財団，2006，2007年はトヨタ財団の援助をいただいた。本研究の目的はブータンにおける食用野生植物の種を同定し，それに関わる伝統的知識を評価することである。３ヵ年にわたりブータン各地の村落，市場，森林を調査した。被子植物 *Magnoliophyta* に属する62種の内46種を同定した。シダ植物22種の内７種を同定した。聞取り調査の結果，それらの多くは人の健康に効果があると信じられていた。例えば，*Nasturium offiicinale* と *Hemerocallis* sp.の葉は血液の一般的状態を改善する，*Mentha* sp.の葉および *Girardiana palmate* の花序は血圧を下げる，*Urtica dioia* の葉は結核を治すと信じられていた。調査をした各地域に共通的に見られた植物は，*Plectocomia himalayana, Elatostema* sp., *Thlaspi arvense, Cymbiduim* sp., *Justicia adhatoda, Asparagus racemose, Phytolocca acinosa, Houttuynia cordata, Mentha* sp., *Colocasia* sp.などである。これらの調査結果は「Edible Wild Plants of Bhutan and Their Associated Traditional Knowledge」として2008年に刊行された。今後，ブータンの自然資源の研究における参考図書として利用されるであろう。しかし，これらの食用野生植物の持つ人に及ぼす健康効果は，これまで全く科学的に検証されていない。したがって，これらの植物の機能性成分の分析が必要である。この観点から，2008年から新たな共同研究プロジェクトとして「Analysis of functional components of Edible wild plants of Bhutan for Human Health」が３年計画でスタートした。新プロジェクトの目的は機能性成分の分析，評価とその遺伝様式の解明である。

キーワード：機能性，健康，種，食用野生植物，伝統的知識，評価