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NUTRITIONAL VALUE OF SELECTED INDIGENOUS VEGETABLES OF CORDILLERA

ABSTRACT

Survey on indigenous vegetables was undertaken through a partici-patory approach with the local folks who were asked about traditional food plants that are found growing in their areas in Benguet including Baguio City and in Mountain Province. Forty-nine indigenous vegetables (IVs) were documented belonging to 31 genera and distributed to 23 plant fami-lies.

Selected widely eaten indigenous vegetables such as: ***Amaranthus blitum, Bidens pilosa,, Cardamine hirsuta Cestrum nocturnum,, Crasso-cephalum crepidioides, Passiflora edulis, Pteridium aquilinum, Rorippa indica, Solanum nigrum, and Sonchus arvensis*** *were subjected to chemi-cal analyses to determine the proximate and vitamin contents which will give idea to the consumers of what nutrients they really get when they eat these crops. The analyses revealed that the chemical contents of IVs were comparable and some are even higher when compared to the cultivated crop* ***Brassica chinensis*** *that was used as a control plant.*

INTRODUCTION

The development, health, and scientific communities do not usually understand the food resources that indigenous people know and use. Chemical analysis for nutrients and other phytochemical contents of these foods may be unknown for many species. There is a need to assess local traditional food system resources and their nutritional contents in order to recognize and promote these indigenous food for alleviating micronutrient

malnutrition or what is known as 'hidden hunger'. Investigations recently carried out by the Food and Agriculture Organization collaborators in five case studies of indigenous people in rural areas of Asia, found that, of 716 species of traditional food reported by the five community areas, 93 still required original identification, and for approximately 147 species, there was not even the most basic nutrient data on file (Kuhnlein, 2001). This is the same case of the indigenous food crops particularly those eaten as vegetables in the Cordillera region where there is limited information on the chemical analysis and proper scientific identification of these plants. A documentation of the nutritional contents of these food plants is well worth pursuing.

Indigenous vegetable refers to species or variety genuinely native to a region, or to a crop introduced into a region where it has evolved (or has been naturalized) over a period of time. They are native species often growing wild as weeds, resistant to pest and diseases, better adapted to their ecology, and which could be a storehouse of desirable traits necessary for the improvement of vegetable species (AVRDC, 1990; Yang, 2006).

Indigenous vegetables remain the cheapest sources of important protein, vitamins, minerals and antioxidants. Recommendations to increase the intake of vegetables and fruits are supported by a wealth of epidemiologi-cal data, most of which are related to cancer incidence. Undoubtedly, the increase in vegetable consumption should be one of the primary approaches to combating nutritional disorders (Chadha and Olouch, 2007).

The Cordillera Region harbors a vast array of these species, and due to their diversity in forms and textures, vegetables can supplement the dietary nutrients in a way that cannot be achieved from any other major en-ergy-providing foods. Especially during these difficult times there is a need to tap our nature's free gifts for alternative additional sources that would ease the demand for medicine, shelter, fuel, and most especially for food that is needed by our ballooning population (Lirio et al., 2006).

METHODOLOGY

Travels were made to the different municipalities of Benguet and Mountain Provinces, and including Baguio City (Fig. 1) to conduct infor-

mal surveys on the diversity and importance of indigenous vegetables. The survey involved visits and personal interviews with the old folks, farmers, etc in their fields/gardens with the assistance of some staffs of the municipal agriculture office. They were asked about plant species that they eat and also other uses besides as food. Botanical characterization and descriptions of the IVs surveyed were studied, and which helped in the correct identifica-tions of the species.

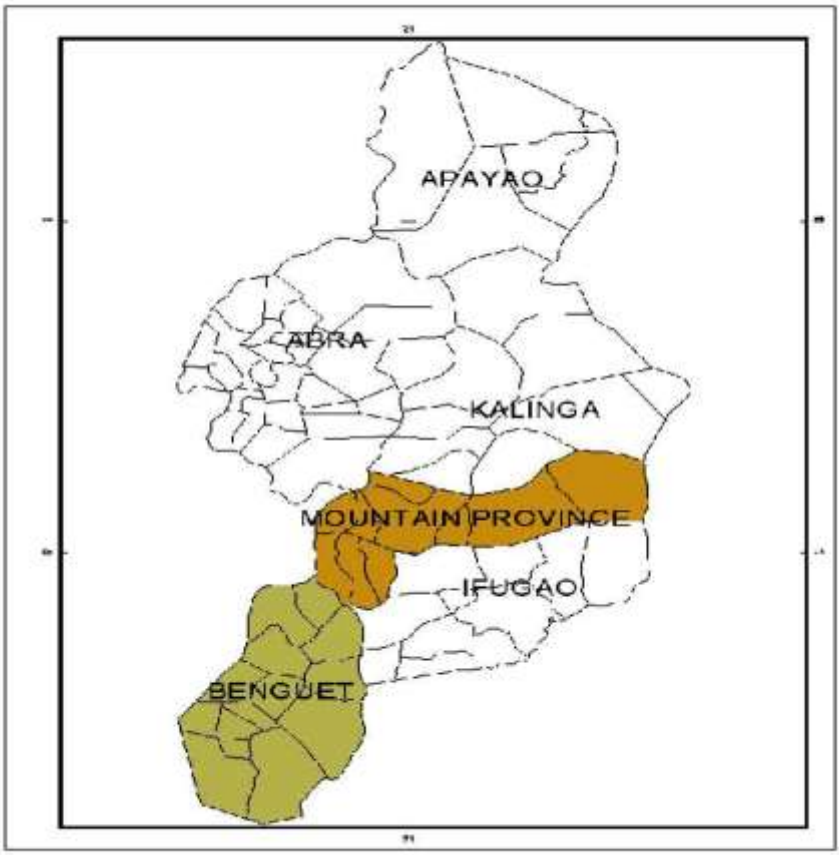

Fig. 1. *Map of Cordillera Administrative Region*

The study areas include Mountain Province, the "weaving paradise of Cordillera" lies at the very end of Cordillera Range. There are no flatlands except small niches found along riverbanks. The province experiences a dry

season from November to April and a rainy season the rest of the year. The climate is temperate and frost occasionally occurs during the months of De-cember and January. The province has 144 barangays distributed in the 10 municipalities namely: Barlig, Bauko, Besao, Bontoc, Natonin, Paracelis, Sabangan, Sadanga, Sagada, and Tadian (MPDO, 2007).

Benguet Province is located in the roof of Northern Luzon, and straddles the soaring mountain ranges. It has a temperate climate ranging from a low 8oC from December to February and rising only to as high as 26oC during the summer months of April and May. The fresh resinous air of Pine clad mountains and cool weather throughout the year make Benguet an ideal vacation place. Benguet has thirteen municipalities namely: Atok, Bakun, Bokod, Buguias, Itogon, Kabayan, Kibungan, La Trinidad, Kapangan, Mankayan, Sablan, Tuba and Tublay (Benguet Profile, 2005).

Plant materials. Fresh shoots and tops of selected IVs were collected in specified places, cleaned thoroughly of any adhering soil and debris, and then brought to the laboratory for the chemical determinations of proximate and vitamin contents. Voucher specimens of the plants are kept as herbarium materials in the Department of Biology, Benguet State University, La Trinidad, Benguet.

Chemical analysis. The proximate analysis consists of the determination of moisture or volatile matter, ash, crude fat, crude protein, crude fiber and carbohydrates. Crude fiber is determined through Weende Method. For crude fat, Soxhlet method was used while the crude protein determination used Kjeldahl method. Carbohydrate is analyzed by spectroscopic determination of the furfural, by the action of sulfuric acid. Solvent extraction and High Performance Liquid Chromatography (HPLC) or the Spectrophotometer was used to determine vitamins A and C (Food Analyses, 1991).

RESULTS AND DISCUSSIONS

The nutritional analyses revealed that some indigenous vegetables have notably higher nutrient contents as compared to *Brassica chinensis* that served as control. Most IV analyzed have higher total ash contents as compared with *Brassica chinensis* (Table 1). The higher total ash implies the higher mineral content of the plants. Solanum nigrum has the highest

value for crude protein (33.12%) so with *Amaranthus blitum, Rorripa indica,* and *Bidens pilosa*. Proteins are essential components of every living cell and are utilized in the formation and regeneration of tissues.

Table 1. Proximate Analysis of IVs

INDIGENOUS VEGETABLES	MOISTURE CONTENT (%)	TOTAL ASH (%)	CRUDE PROTEIN (%)	CRUDE FAT (%)	CRUDE FIBER (%)	TOTAL CHO (%)
Amaranthus blitum	6.00	2.82	26.10	23.01	7.31	34.76
Bidens pilosa	10.64	11.00	23.12	2.92	7.40	44.92
Cestrum nocturnum	5.37	4.65	0.38	8.61	11.02	69.97
Passiflora edulis	5.74	1.73	0.38	8.59	10.71	72.85
Rorippa indica	9.45	11.71	26.01	3.84	8.10	40.89
Solanum nigrum	9.64	10.05	33.12	0.73	4.94	41.52
Sonchus arvensis	10.43	15.94	19.04	4.08	11.40	39.11
Brassica chinensis	9.30	9.00	2.00	0.50	2.20	32.00

- *Mean of 3 trials*

The crude fat value of *Amaranthus blitum,* 23.01% was notably the highest value as compared with the rest of the other IVs including that of cultivated *Brassica chinensis*. Dietary fats and oils are excellent sources of energy and they contribute to the palatability of the diet.

In terms of crude fiber, all representative vegetable crops had higher contents compared with the control B. chinensis, with the highest values noted in *Sonchus arvensis, Cestrum nocturnum, and Passiflora edulis.* Vegetables contain fiber that adds bulk to the food, thereby minimizing the feeling of satiety and enhancing movement of food through the alimentary canal. The crude fiber content is an index of the amount of indigestible mat-ter, or roughage in a food or a feed. Fiber has no nutritive value but it gives bulk to the food and stimulates peristaltic action. Crude fiber also aids in digestion and traps cholesterol. Likewise, all the IVs have higher total car-bohydrates though the values are just comparable with that of *B. chinensis.* Carbohydrates are important sources of energy necessary for man's metabo-lism.

Results of vitamin analyses revealed vitamins A and C contents comparable with that of the cultivated B.chinensis (Table 2). Vitamins are

organic nutrients that are necessary in small amounts for normal metabolism and good health. Vitamins are not sources of energy as are carbohydrates, fats, and proteins, instead, they serve as chemical partners for the enzymes involved in the body's metabolism, cell production, tissue repair and other vital processes.

Table 2. Vitamin Analysis of IVs

INDIGENOUS VEGETABLES	PLANT FAMILY	VITAMIN C (mg/100g)	VITAMIN A (mg/100g)
Amaranthus blitum	*Amaranthaceae*	44.47	152.98
Bidens pilosa	*Asteraceae*	247.50	5,629.75
Cardamine hirsute	*Brassicaceae*	30.15	250.81
Cestrum nocturnum	*Solanaceae*	39.25	474.20
Crassocephalum crepidioides	*Asteraceae*	66.25	400.62
Passiflora edulis	*Passifloraceae*	17.05	168.30
Pteridium aquilinum	*Dennstaedtiaceae*	49.53	384.33
Solanum nigrum	*Solanaceae*	70.22	389.70
Sonchus arvensis	*Asteraceae*	22.42	411.68
Brassica chinensis	*Brassicaceae*	33.12	411.68

Remarkably though, *Bidens pilosa* has the highest value of vitamin C (347.5 mg/100) and A (5,629.75 µg /100g). Vitamin C acts as antioxi-dants and they are essential for the production of collagen, the basic pro-tein in bones, cartilage, tendons, ligaments and may help boost the immune

system. It was interestingly noted that the rural folks' other reason for eating B. pilosa is because the plant has preventive property for goiter, and is also used in 'tapey'(rice wine) making.

Vitamin A plays an important role in vision, bone growth, cell division. It also helps regulate the immune system which prevents or fight off infections by promoting the healthy linings of the eyes, respiratory, uri-nary and intestinal tracts. When that lining breaks down, it becomes easier

for bacteria to enter the body and cause infections. Vitamin C (Ascorbic Acid) is a powerful water-soluble antioxidant that is vital for the growth and maintenance of all body tissues. Though easily absorbed by the intestines, vitamin C cannot be stored in the body and is excreted in the urine within two hours of ingestion. It regulates blood pressure, contributes to reduced cholesterol levels and aids in the removal of cholesterol deposits from arte-rial wall.

Integration of food rich in micronutrients into the diet is the only way to improve micronutrient status in the human body (Ali and Tsou, 1997). Vegetables are the most affordable and sustainable dietary sources of vitamins, trace elements and other bioactive compounds.

CONCLUSIONS AND RECOMMENDATIONS

Indigenous vegetables are now recognized due to their nutrition-al contribution to human health in terms of vitamins and minerals and in preventing 'hidden hunger'. These are nutritious, acceptable and readily available since they are found in gardens, backyards, and rice fields. These edible "weeds" can be utilized as vegetable alternatives for direct human consumption. Knowing the micronutrient and vitamin contents of tradition-al food species would be an essential and positive step towards the goal of building health awareness and promotion activities that could incorporate these plants as surrogate to the original ingredients of our favorite dishes.

The Cordillera Region is rich in natural resources and its people's unique customary practices are valuable heritage that needs to be properly documented before they are gone. Traditional knowledge of indigenous peoples about the diversity of food resources must be preserved, and that this knowledge should be combined with basic scientific data. This would widen the food base needed by the growing population, hence may help in alleviating poverty.

Other ethnobotanical utilization of these indigenous food crops are reported and documented in the book "Indigenous Semi Temperate Vegetables of Cordillera" (Lirio, L., et al, 2006)

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