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STUDY REVIEW

The Joys and Pains of Sampling and Analysis of Traditional Food of Indigenous Peoples

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"Traditional food of Indigenous Peoples' is defined as food that comes from the local environment and is culturally accepted. Usually, this food is part of the subsistence base of a specific cultural group, and may be wild animals, plants and/or insects, earth elements, or subsistence agricultural crops and animals. Since this food is often unfamiliar to the researcher, identification and sampling requires close collaboration with Indigenous People, and working with them in harvest, perhaps in local preservation techniques, and preparation for consumption. The many pleasures and benefits of this research include encountering unique food species, learning about "new" cultural food practices, uncovering new knowledge about nutrient composition, and potentially identifying excellent nutrient sources. Difficulties include the frustrations of making scientific collections in the human field setting (often in developing areas), getting replicate samples when food resources may be scarce, securing sufficient sample size, making judgements on simplifying preparation techniques, and ensuring adequate storage, transportation and shipping to avoid spoilage. Examples of these principles are represented from traditional food research with the Hopi Nation, Nuxalk Nation, James Bay Cree of Quebec, and the Canadian Inuit.

Key Words: Indigenous People; traditional food system; food sampling.

INTRODUCTION

Traditional food systems of Indigenous Peoples contain a wealth of information on unique food species that can be used for human nutrition. While there is great diversity in the cultural ecosystems used by Indigenous Peoples through history, and tremendous variety in the plant and animal species used as food, current trends are to replace the use of many of these foods with industrially derived products circulated through market networks. Anthropologists, ethnographers, ethnobotanists and nutritionists have documented traditional food resources and the patterns of harvest, preservation, and preparation for consumption of many of the world's cultures (for example, see McIlwraith, 1948; Whiting, 1939; Turner, 1995; Robson and Elias, 1978). However, the attention given to date to the chemical composition of traditional food of Indigenous Peoples has been, at best, fragmentary.

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with published ethnographies and other reports from the region to identify existing information about locally harvested species for food and medicine.

A reasonable strategy is to recognize that compromises must often be made, and that persistence pays off, to get the maximum information possible, even if the ideal is not reached. Some information is better than no information, especially after expensive field excursions. Storage of samples and shipment of samples from the field must be planned in advance to maximize retention of nutrients or other properties. To ensure proper handling, it is usually the case that sampling and shipping containers must accompany the researcher to and from the field setting.

SIX EXPERIENCES TO ILLUSTRATE THESE PRINCIPLES

The following six examples, all from North America, demonstrate several of the problems and issues that are encountered during the sampling and analysis of traditional foods of Indigenous Peoples.

Hopi Piki Bread

Piki bread is a prepared food with only four ingredients that demonstrates the complexities of traditional food system composition research with recipes. This is a unique traditional maize food from the Hopi Nation of Arizona in the Southwest of the United States. The major ingredient, maize, is usually Hopi blue corn, but it may also be made with indigenous varieties of pink, white, or yellow corn, depending on the occasion. The second important ingredient is a plant ash that is usually prepared by burning the green leaves and stems of *Atriplex canescens*, also called four-wing salt bush. Other plants, such as the spent vines of beans or juniper, may also be burned to form an ash for piki. Baking soda has also been used. The third ingredient is water, which is added to form a thin batter. Cooking fat, such as lard, vegetable fat, or oil, is used to moisten the flat-stone cooking surface. Formerly, the fat used for this purpose was from sheep spine or squash seeds. The ash raises the pH of the batter, thus emphasizing the anthocyanin pigment in the blue corn, which is the desired colour for blue corn piki. The batter is quickly cooked on a hot stone surface, and the resulting thin bread is quickly rolled into the finished product (Calloway *et al.*, 1974).

To understand fully the nutrient composition of piki, the minimal data requirements are those shown in Table 2. One common preparation should be identified for research. With variations that may occur among Hopi communities, it is best to identify one frequently consumed recipe for study. The most frequently used maize, blue maize, ground fine for piki, should be sampled from both stone- and machine-grinding processes (it is known that the grinding method slightly alters the mineral content). The most popular ash should be sampled from five preparations, and the water mineral content known. Finally, the composition of the fat used in cooking the bread should be identified; today this is a market fat such as corn oil.

Therefore, for the laboratory sample numbers for these minimal sampling and data requirements, approximately 20 samples are needed in addition to published data for minerals contained in water and nutrients in cooking fat. If the research were to fully understand the complexities of piki, additional sampling would include variations in maize varieties used, other ash preparations, other mineral-contributing grinding implements and cooking surfaces, and the other potential fats. Thus, a thorough study of this one food item in the Hopi traditional food system would result in upwards of 200 samples, a prohibitive number of analyses for most food composition laboratories.

TABLE 2

Hopi piki · data requirements

Ingredients: Blue corn, plant ash, water, cooking fat	Variations: 8–10 other preparations
1. Identify one common preparation. Focus on one community (of 8) 5 samples of finished piki — from 5 homes, with recipes	red, white, yellow or multicolor corn other ash — juniper, bean pod, baking soda other grinders, cooking surfaces Other fats — seeds, sheep spine, lard
2. Blue corn meal, fine ground 5 stone-ground, 5 homes 5 machine-ground, 5 homes	
3. Chamisa ash (*Atriplex canescens*) 5 samples, 5 homes	
4. Water mineral data	
5. Market fat composition	

TABLE 3

Minerals in Hopi blue corn, ash, and piki bread

n	Ca	Fe	Zn
	Mean (range): mg/kg		
4-Blue corn meal	80 (50–120)	39 (31–35)	31 (26–37)
1-Chamisa ash	125×10^3	3840	169
1-Bean pod ash	132×10^3	5720	287
2-Piki bread	1600 (1400–1800)	90 (84–97)	47 (36–46)

Source: Calloway *et al.* (1974).

The existing data on the composition of piki were reported by Calloway *et al.* (1974) following mineral analyses with inductively coupled plasma atomic emission spectroscopy (ICPAES). Selected data on components of piki from this report are shown in Table 3. Even with the limited number of samples, it is clear that the calcium, iron, and zinc contents of the finished bread contributed by the plant ash are exceptional, and demonstrate this outstanding source of minerals in the Hopi food system, as well as the uniquely high mineral contents for a maize bread product.

Red Huckleberries (Vaccinium parvifolium)

Several First Nations from the West Coast of British Columbia use the red huckleberry as an important part of their traditional food system. For the Nuxalk of the Bella Coola valley, *Vaccinium parvifolium* is a favorite summer fruit among the 29 different species and varieties of wild berries harvested in the valley (Kuhnlein, 1989). With help from community residents, we were able to pick five samples of approximately 300 g each from different regions in the valley, with each sample representing the fruit of several dozen plants. Excerpts from the published data are shown in Table 4, which demonstrates that this sampling strategy was effective. However, due to costs in vitamin analyses, composite samples were prepared. The data show that red huckleberries are not an outstanding source of any one nutrient, but are typical of other berry foods.

Published values on each of the wild berry species were reported. It is ironic that when dietary evaluations were done with the Nuxalk, the frequent consumption of