

ETHNOBOTANY.—*Polynesian names of sweet potatoes.* O. F. COOK, Bureau of Plant Industry, and ROBERT CARTER COOK.

The same word, *cumara* or *kumara*, serves as a name for the sweet potato (*Ipomoea batatas*) among the Quichua or Inca people of Peru and in the Polynesian islands. The fact was recognized over half a century ago when Seemann recorded the use of the word in Ecuador. In the Urubamba valley of southern Peru, on the eastern slope of the Andes below Cuzco, there are two native names for different classes of sweet potatoes, *apichu* for the sweet varieties and *cumara* for those that are merely starchy.<sup>1</sup>

That an important crop plant should have the same name among the Polynesians as in the interior of Peru might be taken as proof of a recent introduction, just as the Polynesian name *poaka* was taken at first to demonstrate that pigs were brought by Europeans. Later it was pointed out that the Polynesian pigs could not have come from Europe because they belonged to an Asiatic or Malayan species. The name *poaka*, in spite of its obvious likeness to the Spanish *puerco* or the English *porker*, is accepted by the best authorities as a genuine Polynesian word.

To insist that *kumara* can not be a Polynesian word because it appears in the Quichua language of Peru would be like saying that *puaka* could not be Polynesian because the Greeks and Romans had *porcus*. If *kumara*, *poaka*, or other words for particular animals or plants reappear in different languages, the fact needs to be recognized and taken into account in tracing the origins of the domesticated species and their relation to the extension of agriculture in prehistoric times.

Thus far the word *kumara* seems not to have been challenged as a foreign element by any student of the Polynesian language. Certainly it does not appear un-Polynesian, in view of the frequent occurrence of the sounds and syllables of which it is composed. Among such words as *kakara* (odor), *kapura* (fire), *karoro* (sea-gull), *korora* (mussel), *mamara* (charcoal), *marara* (fly-

<sup>1</sup> COOK, O. F. *Quichua names of the sweet potato.* Journ. Wash. Acad. Sci. 6: 86. 1916.

ing-fish), *tauama* (outrigger canoe), and *tamara* (palm leaves), *kumara* seems fairly at home. It is also very widely distributed, with only slight modifications, conforming with the changes of consonant sounds in some of the dialects. The following variations of the word are brought together by Tregear: *kumaa* (Marquesas), *kumala* (Tonga), *uala* (Hawaii), *umala* (Samoa), *umara* (Tahiti), *uwala* (Hawaii), with *kumara* recorded for New Zealand, Rarotonga, Easter Island, Mangareva, and Paumotu. *Hooarra* was recorded as the Hawaiian name of the sweet potato in 1778, by Captain Cook's expedition.

Possible cognates or derivatives of *kumara* are numerous in the Maori language, including *kumanu*, to tend carefully; *kumore*, cape or headland; *kumete*, dish, bowl, or trough; *kume*, to pull out; *kumu*, to draw back. *Whakakumu* is the name of one of the New Zealand varieties of sweet potato, and *kumu* also means fist, or portions of food squeezed out with the hand. The growing sweet potato crop was called *maara* in New Zealand, reminding of *malla*, the Quichua word for a young plant. *Kamala* is a word for thatch in Hawaii, where *kumara* vines were often used for this purpose. *Kalau* is another Hawaiian word which means either a thatch of leaves or vines of sweet potatoes, or to work inefficiently, the sweet potato materials being but poorly adapted to the purpose. *Kalina* is defined by Andrews as "old potato vines that have done bearing," or "a garden of potatoes where the old refuse potatoes only remain." *Kalina* and *ilina*, the latter meaning burial-place in Hawaii, are suggestive of the Quichua word *illuni*, meaning to dig for roots. Other Quichua words are *cullquini*, meaning "to dig with a stick," and *culluna*, a silo or subterranean storehouse.

In New Zealand the words *kapuka* and *kepura* are both said to mean "a handful of potatoes." Two native New Zealand plants, *Pomaderris elliptica* and *Quintonia serrata*, are called *kumarahou*, but the relation to *kumara* is not indicated. *Hau* is a general name for *Paritium tiliaceum*, a shrub widely cultivated among the Polynesians for the sake of its fibrous bark.

In Hawaii, where the name of the sweet potato is softened into *uala*, the same word is applied to the large muscles of the upper

arm, by an analogy easily understood. In Easter Island, where the full form of the word *kumara* is used, there is a word, *komari*, also applied to parts of the human body. *Komala* means pleasant in Hawaii.

Dried sweet potatoes are called *kao* in New Zealand and *ao* in Hawaii, where the same is applied to dried *taro* or to *Alocasia*. *Koiri*, in New Zealand, means "to plant potatoes," and a variety of sweet potatoes is called *koiwi*. Other meanings of *kao* are rib, core, shoot, or terminal bud of a plant. The Hawaiians called the sea-bread or hardtack of the English ships *ao* when they first saw it. *Kao* suggests *kaya*, the Quichua name for dried *ocas* (*Oxalis*). *Kauno*, in Quichua, means withered or dried in the sun; *kauñu*, dried cane or corn stalks; potatoes after freezing, *chuño* or *chuñu*; potatoes left behind in the field, *koyo*. *Kauñu* and *chuñu* are obviously related, like the German *kauen* and the English *chew*.

According to Martius the sweet potato is called *coundi* by two tribes of Indians in Brazil, while in Florida *kunti* is the native name of the edible cycad *Zamia*. In the Lucumayo valley of southern Peru the rootstocks of *Xanthosoma*, an aroid closely similar to the *taro* of the Polynesians, are dried "to make *chuños*." In the vicinity of Ollantaytambo, Peru, a native medicinal plant with thickened roots, somewhat resembling the dried *ocas*, is called *kayakaya*.

The Hawaiians had two words, *haaweawe* and *pahulu* for second-growth sweet potatoes, or those that spring up from roots left behind at the harvest, just as the Quichuas have *koyo*, *acacha*, *cachu*, and *ihua* (*eewa*) for potatoes left in the ground or growing in the old fields. In New Zealand gleanings of root crops are called *wairan*, but the word *kaunga* is applied to sweet potatoes that will not grow when planted. Another meaning of *kaunga* is "smelling unpleasantly," which would be a natural connection if the word related to stored potatoes that had begun to decay.

In some of the Polynesian islands *kao* is not defined as relating to dried sweet potatoes, but is used in the sense of "grabbling," taking a few of the roots from the hill without disturbing the plant. In explaining the connection Tregear states that the im-

mature roots are used to make *kao*, presumably because they dry better while the flesh is still starchy, before much sugar is formed.

Related perhaps, to *kao* and *kaunga*, are *kauahi*, *kauati*, *kauhure*, *kaunaki*, and *kaunoti*, which are Maori names relating to the sticks that are used for making fire by friction, the wood for this purpose being kept, of course, very dry. *Kauati*, in the Paumotu islands, means to make fire; *auwaki* are fire-sticks in Hawaii, and *kahu* is fire or to burn. In New Zealand again, *kauhuri* means "to dig; to turn over the soil." *Huri*, in some of the islands, means to dig, but in others seed, suckers, or offshoots used for planting. The Quichua name for a green corn-stalk or sugar-cane is *huiró*.

That *kao* and *kahu* may be related words is further suggested by the fact that one of the Hawaiian varieties is called *kahe* and one of the New Zealand varieties *pokerekahu*. The Maori name of the yam is *uwhikaho*. Although in the Maori language *kahu* is not reckoned as a name of fire, it is the name of the hawk, the god of fire, reckoned as a child of the fire-goddess Mahuika. Moreover, *Kahukura* was the name of the rainbow-god of the Maoris, and also the name of the man who, according to one tradition, brought the *kumara* to New Zealand, together with the taro, the bottle-gourd, and the yam. The traditions indicate that the dried sweet potatoes had great importance in former times among the Maoris, perhaps as affording their only supplies of food that could be kept over from one season to another.

In addition to the drying of sweet potatoes to make *kao*, the leaves of the plant were eaten, as they are by the Quichuas in South America. The Hawaiian word *palula* is defined as the leaf of the sweet potato, and as a dish made by roasting sweet potato leaves on hot stones. The word resembles *pahulu*, defined as "potatoes of a second growth," and *ponalo*, "the dying or drying up of potato tops."

The status of sweet potato varieties among the Polynesians affords the most definite evidence of long-standing possession and familiarity. While almost nothing in the way of detailed

information regarding the Polynesian varieties seems to have been placed on record, the facts that have been noted incidentally by writers on ethnology and language are sufficient to show that numerous varieties of sweet potatoes are recognized and distinguished by native names, in the same way that large numbers of potato and other root crop varieties are named among the Quichuas in Peru, although very few of these names have been recorded in the published vocabularies of the Quichua language.

Although domesticated plants afford significant data for the study of the contacts and relations of primitive peoples, plant names have seldom received much attention from philologists and ethnologists. From New Zealand, however, about 40 native names of varieties of sweet potato have been published, from different districts, the largest list, containing 25 names, supposed to represent nearly as many different sorts.<sup>2</sup>

A similar diversity of varieties might be found in other islands, but from most of the groups no varietal names have been recorded, while in others a few names have been noted incidentally, such as Manana, "the name of a kind of sweet potato," in Hawaii. In the same group "very small potatoes with red veins"

<sup>2</sup> Three lists of native varieties of sweet potato have appeared in the *Journal of the Polynesian Society* (2: 102, 3: 144, and 3: 237). Arranged in alphabetical order to facilitate comparison, the names are as follows:

List 1. (Locality not given.) Kaihaka, Kaipō, Kanawa, Kaoto, Korehe, Kotepo, Maomao, Taurapunga, Toroamahoe, Tukau, Waina, Waniwani, Whakakumu. The variety called Waina is noted as having been introduced early in the nineteenth century.

List 2. East Cape district: Anutipoki, Huiupoko, Kawakawa, Kerikaraka, Kokorangi, Koreherehe, Makakauere (Makakauri or Matakauri), Makutu, Matawaiwai, Mōii, Monehu, Ngakaukuri, Paea, Papahaoa, Para-karaka (same as Makutu), Paretaua, Patea, Pokere-kahu, Puatahoe (said to produce flowers), Punuiarata, Tanehurangi, Taratamata, Taurapunga, Toroamahoe, Waiha (or Waniwani) (same as Huiupoko), Wini. All of these varieties are said to have been cultivated in New Zealand before the arrival of Europeans.

List 3. West Coast of the North Island: Anurangi, Aorangi, Arikaka, Kahutoto, Kopuanganga, Kotipu, Monenehu, Pehu, Pokere-kahu, Rangiora, Taputini, Toroamahoe.

Other New Zealand varieties mentioned by Tregear are Kōiwi, Ruamataki, and Torowhenua, the last name said to be used also in the Marquesas group, where Maori is also the name of a sweet potato variety.

and "water-soaked potatoes" are called *kokokooha*, *koko* being the name of the fibers of the leaf-bases of the coconut palm, or a net of braided strings to hold a calabash. One of the Hawaiian varieties is called Apo, while *apoapo* means a hill of sweet potatoes, reappearing in New Zealand as *apuapu*. Other Hawaiian names for varieties of sweet potatoes mentioned in Andrews' *Dictionary* are Kahe, Kipawale, and Koloaha. The variety called Kihi is said to be "the ancient potato of Hawaii."

Some writers have thought that the sweet potato must be a recent acquisition among the Polynesians, because of the many myths and traditions relating to its introduction. But such evidence appears to have a different signification when we consider how much the Polynesians were given to family pride and genealogies. To say that one's forefathers came in the canoe that brought the *kumara* certainly did not mean that the family was recent, but was the Maori way of claiming a Mayflower ancestry. White has given us a detailed account showing how acutely the subject was debated by the Maoris, and the intensity of feeling is reflected in the care taken by that author to report the controversy in such a way as to avoid the appearance of taking sides and thus offending some of his native neighbors.

If weight is to be given to traditions of the introduction of sweet potatoes, account must also be taken of the myths and cosmographies that represent the sweet potato as one of the primeval possessions of the human race, the first plant to be recognized among the heavenly gifts. Thus the Maori pantheon began with Void (Kore) and Darkness (Po) as the parents of Heaven (Rangi) and Earth (Papa). In the third generation of deities came Tane, god of trees, forests, and birds; Tangotango, god of day and night; and Wai-nui, the goddess of water. Tane figures as the grandfather of sweet potatoes and the bottle-gourd, the former by his oldest child, the latter by his youngest. The passage treating of the sweet potato is as follows:

Tane took to wife Hine-rau-a-moa and begat Rongo-ma-Tane, who was the parent, origin, or personification of the *kumara* (sweet potatoe) and of cultivation and the arts of peace; and Hine-te-iwaiwa, the guardian of motherhood; and Tangaroa, the Polynesian Neptune, who

stands in the same relation to the ocean and the fish thereof as does Tane to forests and birds.<sup>3</sup>

In this, as in many other myths and traditions of the Maoris, the sweet potato has precedence over all other crops and plants, and it may be significant that the bottle-gourd, another plant that the Polynesians shared with the natives of South America, is in this case the second in order of consideration, before the taro or other plants cultivated by the Maoris.

Tregear has made a careful study of the ancient religious myths of the Polynesians and finds many that are closely parallel to those of the Mediterranean countries. He compares the god Maui of New Zealand with the Egyptian Osiris, and his wife Hina or Pani with Isis, Ceres, Diana, and other goddesses of agriculture and fecundity among the Asiatic and Mediterranean peoples. Maui is associated with the sun and Hina with the moon. *Kura-a-Maui* is recorded as a poetic name of the sweet potato among the New Zealanders, *kura* meaning red or royal, or a wreath of red flowers, as worn by the ancient heroes, according to the traditions. There was also a sacred or priestly name of the sweet potato, *kurawhiti*. Maui was invoked in planting *kumaras*, but the formal incantation was addressed to

<sup>3</sup> BEST, E. *Notes on Maori mythology*. Journal of the Polynesian Society, 8: 95.

The *kumara* figures in many of the myths of this collection, including several that have to do with the sun and stars, as in the following passages:

“The sun has two wives. One wife lives in the south; her work is the cultivation of food, and her name is Aroaro-a-manu or Raumati (Warmth or Summer). The other wife is Hine-takurua (Winter); she dwells on the ocean, and her task is the taking of fish. In the winter the Sun goes to the ocean and dwells with Hine-takurua. In the month O-toru [of the Maori year] the sun returns to land to his wife Raumati, who cultivates the *kumara*. It is then summer.”

“Hoko-kumara is a name for Matariki (Pleiades). When Matariki rises in the east the *kumara* is sown.”

“When Whanui [the star Vega] is seen flashing above the eastern horizon as autumn approaches, then the cry resounds: ‘*Ko Whanui E-E! Ko Wahnui!*’ For that is the sign for taking up the *kumara* crop. If the *kumara* [sweet potato] be not dug then, the crop will be spoilt and will not keep. Such *kumara* as are left in the ground become *houhunga*, good to eat but will not keep. Potatoes are dug in the month Pou-tu-te-rangi. If left too late they will be spoilt, in which state they are termed *tauhere* or *puakiweu*.”

Pani. Large sweet potatoes of a special form were sacred to Pani and were not eaten. They were called "Pani's canoe" and the finding of them was considered a special omen from the goddess, presaging fertility. Boats were among the symbols of Isis, and one of her names was Pania.<sup>4</sup>

In New Zealand, elaborate ceremonies were performed when the *kumara* crop was planted, the seed tubers being selected with the greatest care by a priest, as was also the place in which they were planted. Over each tuber a special incantation was chanted and it was placed in the ground with the head slightly raised and pointed toward the east. One of the legends dealing with the introduction of the *kumara* tells how those who went to get them traveled toward the rising sun, and how their canoe was kept by enchantment for many days in the same place in the ocean, meaning, perhaps, that no land was sighted for many days.

Several times during the growth of the *kumara* crop religious rites were observed, and when the roots were harvested still another series of ceremonies was enacted, the first fruits of the crop being given to the gods of *kumara*.<sup>5</sup> The extent to which the religious precautions were carried is indicated by Tregear's definition of the word *whakamahunga*: "The ceremony of making sacred those who planted or dug up the *kumara*. After the first-fruits had been offered to Pani, the cultivators became common (*noa*), or no longer under restriction."

To judge from the facts noted in this brief review of the subject, the word *kumara* must still be accepted as the Polynesian name of the sweet potato, notwithstanding that the same word is applied to the same crop among the Quichuas of the eastern valleys of the Andes, below Cuzco. In view of the general distribution of the plant and its name among the Polynesians, the use of the leaves and the dried roots, and their special names, the development and naming of numerous varieties, and finally the many myths and traditions connected with the sweet potato,

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<sup>4</sup> TREGEAR, E. *Asiatic gods in the Pacific*. Journal of the Polynesian Society, 2: 145. 1893.

<sup>5</sup> WHITE. *Ancient History of the Maori*, vol. 3, preface.



it does not seem reasonable to believe that the introduction of the plant occurred within the period of exploration of the Pacific by Europeans. Nothing need be said of the reports of the early explorers who found sweet potatoes already in the islands.

If the sweet potato had come to the Polynesians in recent times from an outside source it is practically inconceivable that the same name should have been distributed and adopted in so many islands. In this respect there is a notable contrast with the many distinct names for sweet potatoes among the native tribes of the American continent. The many traditions or myths regarding the *kumara* in the Pacific may mean nothing to which any definite significance can be attached, but at least they show how deeply the *kumara* was embedded in the existence of the islanders. The sweet potato, like the coconut palm, had relatively greater importance among the Polynesians than in other parts of the world.

PHYSIOLOGY.—*The basal energy requirement of man.*<sup>1</sup> EUGENE F. DU BOIS, M.D.

It is not too much to say that the science of nutrition is founded on the study of the basal energy requirement. Therefore it seems advisable to spend our time today on this aspect of the subject as an introduction to the subsequent lectures of the series. First we shall consider the definition of the term, basal energy requirement, next the manner in which it is studied, and finally the factors by which it is influenced in health and disease.

The energy requirement of a man is represented by the number of food calories, or heat units, required to balance the calories of his heat production. The two are equal, because food oxidized in the body gives off just as much heat as food burned outside the body. The basal requirement is the minimal requirement or lowest heat production, and this condition is found only when an individual is lying down, at complete rest in the morning,

<sup>1</sup> A lecture delivered before the Washington Academy of Sciences, April 7, 1916. From the Russell Sage Institute of Pathology, in affiliation with the Second Medical Division of Bellevue Hospital, New York.