

Use of *Capsicum* Peppers in the Batanes Islands, Philippines

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Abstract

Capsicum peppers are native to tropical and temperate regions of the Americas, and was introduced into Asia before the sixteenth century. Local nomenclatures and detailed usage of *Capsicum* in the Batanes Islands have not been reported, although they may have original information on the genus *Capsicum*, which may be helpful in discussing dispersal routes of *Capsicum*. In this study, *Capsicum* culture in the Batanes Islands was studied in detail – linguistically, botanically, and ethnically.

C. annuum and *C. frutescens* were cultivated in the Batanes Islands. Unlike *C. annuum*, *C. frutescens* is often used for seasoning foods in the daily diet, and it has become an important and indispensable condiment in this region. The density of uncultivated plants of *C. frutescens* in bush and around or even in agricultural fields was much higher than that in the continental region of Southeast Asia or Taiwan. Similarity of nomenclature suggests that *Capsicum* peppers reached Taiwan through the Batanes Islands, but the absence of reported rituals uses in the Batanes Islands suggests that there was no direct sharing of *Capsicum* culture with the continental region of Southeast Asia. Further studies are needed to survey local nomenclatures and detailed usage of *Capsicum* peppers, with a botanical research, in other regions of the Philippines, in Indonesia, and the Pacific Islands to clarify the dispersal routes of *Capsicum*, plants itself and its related cultures, in insular regions.

Key words: dispersal routes, ethnobotany, leaves as vegetable, local nomenclature, medicinal use, uncultivated plants

Introduction

The Batanes Islands, which are volcanic islands raised from the oceans from the late Miocene to the Pleistocene ages, are located about 162 km north of Luzon Island in the Philippines and about 100 km south of Taiwan. They consist of 10 small islands and 13 islets and have a total area of approximately 209 km². The indigenous peoples are the Ivatan (on Batan and Sabtang Islands) and Itbayat (on Itbayat Island) (populations 11,440, 1,465, and 3,069, respectively, according to the 2007 Philippine Census), who speak languages of the Austronesian language family. They share prehistoric cultural and linguistic commonalities with the Yami (Tao) people of Lan Yu Island (Orchid Island) of Taiwan

(KANO 1955), and it is thought that there were comings and goings between the Batanes Islands and Taiwan from very early times (KANO 1946).

Capsicum peppers (approximately 25 species) are native to tropical and temperate regions of the Americas (ESHBAUGH 1993), and four domesticated and one semidomesticated species have been identified: *C. annuum*, *C. chinense*, *C. baccatum*, and *C. pubescens* (domesticated), and *C. frutescens* (semidomesticated, with characteristics such as seed dormancy, small fruit size, deciduous fruit, and inhibition of flowering under long days; YAMAMOTO and NAWATA 2006, 2009b, YAMAMOTO *et al.* 2007, 2008). Two of these species, *C. annuum* and *C. frutescens*, are now widely cultivated throughout the world and are economically important as condiments, vegetables, and medicines.

Capsicum was introduced into Asia before the sixteenth century (ANDREWS 1993, KUMAZAWA *et al.* 1954, STURTEVANT 1885), and it is reported that green peppers growing on trees as small as shrubs with their clusters were found in the river Bato (Cotabato) by Legaspi upon the conquest of the Philippines in 1570 (ZINGG 1934). YAMAMOTO and NAWATA (2004, 2005, 2009a) have studied the distribution and dispersal routes of *C. frutescens* in Southeast and East Asia based on morphological, physiological, and biochemical traits of genotypes. They found that accessions of *C. frutescens* from the Ryukyu Islands in Japan are closely related to those from Taiwan, the Batanes Islands, and Indonesia because they have a rare isozyme pattern, the shikimate dehydrogenase phenotype B, which is not found in continental regions of Southeast Asia. They suggested that *C. frutescens* was introduced from Indonesia *via* the Philippines and Taiwan to the Ryukyu Islands.

Capsicum in the Batanes Islands has been partially studied, as mentioned above, but its local nomenclature and detailed usage of people in the Batanes Islands have not been reported. It is possible that the indigenous peoples in the Batanes Islands have original information on the genus *Capsicum*, dating from when it was introduced into these regions around the sixteenth century, because they have been living in small isolated islands surrounded by ocean, which may be helpful in discussing dispersal routes of *Capsicum* in more detail.

In this study, the local nomenclature and use of *Capsicum* in the Batanes Islands were surveyed to reveal the relationship between people and *Capsicum*, i.e., *Capsicum* culture, in the Batanes Islands.

Study Site and Data Collection

Fieldwork was conducted for a total of three weeks on May and June 2007 in the Batanes Islands. The work consisted of interviews and plant observations of *Capsicum* species. The study sites are shown in Fig. 1. Surveyed villages in this study included Basco, Mahatao, San Vicente, Ivana, Uyugan, Itbud, and Imnajbu in Batan, Sinakan, Savidug, Chavayan, Malakdang, Nakanmuan, and Sumnanga in Sabtang, and Santa Lucia, Santa Rosa, San Rafael, Santa Maria, Yawran, and Rael in Itbayat. I interviewed 68 local people

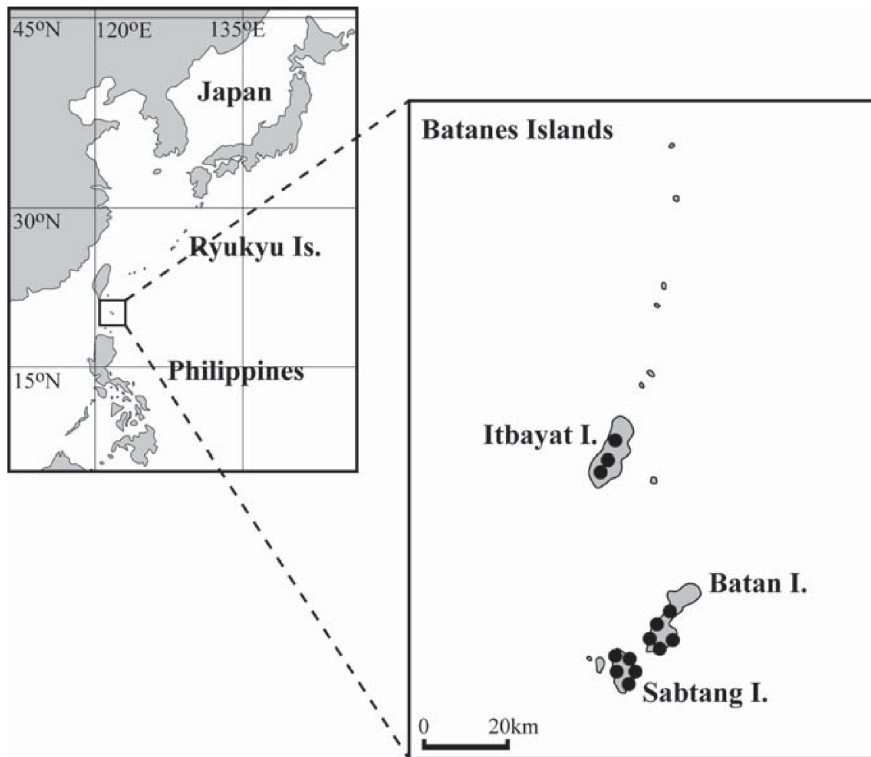


Fig. 1. Study sites (●) in the Batanes Islands.

in the Batanes Islands (42 males, 26 females; 27 from Batan Island, 23 from Sabtang Island, and 18 from Itbayat Island) regarding the local nomenclature and use of the genus *Capsicum*. The interviewees were 32 to 88 years old, with the median age of 61. Ivatan and Itbayat words were referred to HIDALGO *et al.* (1998).

Results and Discussion

Local nomenclature for *Capsicum*

Two species of *Capsicum* are used in the Batanes Islands (Fig. 2A); *C. annuum* (two pungent types: round or long fruit type) and *C. frutescens* (several types: green or greenish yellow immature fruit color, and several fruit sizes). Unlike *C. annuum*, *C. frutescens* is often used for seasoning foods in the daily diet, and it has become an important and indispensable condiment in the Batanes Islands.

People on the islands of Batan and Sabtang generally called *Capsicum* pepper 'sili', which is probably derived from 'chile' in Spanish (SANTOS 1988), and people of Itbayat Island called it 'kasiri' which seems cognate also (Table 1). The Kavalan and Paiwan



Fig. 2. Use of *Capsicum* peppers by people in the Batanes Islands. A round fruit type of *C. annuum* 'batunes' (A-1), and a green immature fruit color type (A-2) and a greenish yellow immature fruit color type (A-3) of *C. frutescens*. A weedy plant of *C. frutescens* along a roadside (B). Traces of fruits of *C. frutescens* eaten by birds (C). 'Bagung', which is fresh *Capsicum* fruits soaked in 'silam' (vinegar made from sugarcane) sold in a store in Basco ('batunes': D-1; several fruit sizes of *C. frutescens*: D-2). Homemade 'bagung' (E). 'Bagung' used for eating 'lataven' (raw fish) (F). *C. frutescens* leaves collected from weedy plants (G-1), sold in a store in Basco (G-2), and used for a soup called 'nilaneg amung' (G-3).

Table 1. Local names for *Capsicum* on the islands of Batan, Sabtang, and Itbayat.

Location	General name for <i>Capsicum</i>	<i>C. annuum</i>	<i>C. frutescens</i>
Batan	<i>sili</i>	<i>batunes</i> (: button)* <i>sili**</i>	<i>sili nu ipes</i> (<i>ipes</i> : cockroach) <i>sili nu iloko</i> (<i>nu iloko</i> : of Ilokano) <i>sili nu hapon</i> (<i>hapon</i> : Japan) <i>sili nay saranga</i> (<i>from saranga</i> area) <i>lutug</i> (: upside down) <i>vulaw</i> (: wild)
Sabatang	<i>sili</i>	<i>batunes</i> * <i>sili**</i> <i>sili a manaru</i> (<i>manaru</i> : long)** <i>sili nu tagalog</i> (<i>tagalog</i> : Tagalog)**	<i>lutug</i> <i>nay hapon</i> <i>sili nu ipes</i> <i>sili nu pyek</i> (<i>pyek</i> : a bird name)
Itbayat	<i>kasiri</i>	<i>maxexed</i> (: round)* <i>malemeleh</i> (: round)* <i>kasiri nu mavakes</i> (<i>mavakes</i> : woman or girl)* <i>batunes</i> *	<i>marrayem</i> (: needle) <i>talugen</i> (: the shape between an oval and a trigonal pyramid)

*the round fruit type of *C. annuum*

**the long fruit type of *C. annuum*

people, who are indigenous peoples speaking languages of the Austronesian language family in Taiwan, called it '*sili*', '*sini*', or '*sidi*' (YAMAMOTO 2009), which is probably derived from the word used in the Batanes Islands. TSUCHIDA (1977) reported that the Pazeh in Taiwan called chili pepper '*saxiri?*', perhaps from *s-ax-iri?* < *siri?* (Tsuchida personal communication). These findings suggest that some *Capsicum* peppers (local names and/or plants themselves) were introduced from the Batanes Islands to Taiwan.

Many people on the islands of Batan and Sabtang called the round fruit type (1-2 cm in diameter) of *C. annuum* '*batunes*' (: button) (18 of 27 and 16 of 23 interviewees in Batan and Sabtang, respectively). People on Itbayat Island called the round type '*maxexed*' (: round), '*malemeleh*' (: round), '*kasiri nu mavakes*' (*mavakes*: woman or girl), and '*batunes*'. People in the Batanes Islands thought that smaller *C. frutescens* fruits were hotter and good for men, and that milder fruits of the round fruit type of *C. annuum* were best for women and girls. Long or big fruit types of *C. annuum* were rarely cultivated in the Batanes Islands, and some people on the islands of Batan and Sabtang called these types just '*sili*' (or general name for *Capsicum*), '*sili a manaru*' (*manaru*: long), or '*sili nu tagalog*' (: Tagalog). A 47 years old man in Ivana, Batan, said, "Small fruit types of *sili* (ex. '*sili nu ipes*' or '*lutug*', see below) were here for a long time, but long or big fruit types of *sili* may be introduced from Manila." It seems that long or big fruit types of *C. annuum* were recently introduced to the Batanes Islands.

The people of Batan Island called *C. frutescens* '*sili nu ipes*' (*ipes*: cockroach) throughout the island (18 of 27 interviewees), '*sili nu iloko*' (*nu iloko*: of Ilokano) in Basco, '*sili nu hapon*' (*hapon*: Japan) in Basco and Mahatao, '*sili nu saranga*, *sili nay saranga*'

(: from the Saranga area; people thought that *C. frutescens* grown in Saranga was much hotter than that in other regions because of the soil) in Itbud and Uyugan, ‘*vulaw* (: wild)’ in Basco, and ‘*lutug*’ (: upside down) in the southern area (San Vicente, Ivana, and Imnajbu) (Fig. 3). The people throughout Sabtang Island called *C. frutescens* ‘*lutug*’ (19 of 23 interviewees), and some people called it ‘*nay hapon*’ and ‘*sili nu pyek*’ (*pyek*: a bird name, see below). There are unscheduled boats between Sabtang Island and Ivana, south of Batan Island. Therefore, it is thought that the local name ‘*lutug*’ was also used in the southern area of Batan Island, under the influence of the Sabtang people (Fig. 3). On Itbayat Island, people distinguished *Capsicum* peppers by their fruit shapes, calling *C. frutescens* ‘*marrayem*’ (: like a needle), which was a very common local name in this island (15 of 18 interviewees), and ‘*talugen*’ (: the shape between an oval and a trigonal pyramid) (Table 1).

People in the Batanes Islands added some words related to other countries or ethnic groups to local names for *Capsicum*, such as ‘*sili nu hapon* (*nay hapon*)’, ‘*sili nu iloko*’, and ‘*sili nu tagalog*’. A 55 years old man in Chavayan, Sabtang, said, “I think Japanese brought some *C. frutescens* varieties here during World War II, so we have *sili nu hapon*.” The Ilokano people, who inhabit the northwestern tip of Luzon in the Philippines, are thought by the Ivatan and Itbayat people to prefer hot peppers. The local name ‘*sili nu iloko*’ may be derived from the following ideas: 1) ‘*sili nu iloko*’ is so hot that the Ilokano people are



Fig. 3. Schematic diagram of uneven distributed local names for *C. frutescens* on islands of Batan and Sabtang. ●: village names.

keen to eat it, or 2) the Ilokano people brought *Capsicum* peppers to the Batanes Islands.

In Japan, people call *Capsicum to-garashi* (*to*: Tang Dynasty, i.e., China, *karashi* [*garashi*]: a type of mustard) named after introduction from China, and also sometimes *nanban-kosho* (*nanban*: European, *kosho*: *Piper nigrum*) named after introduction by European trade. However, *to* and *nanban* sometimes mean that something is just from “abroad.” Similarly, ‘*hapon*’, ‘*iloko*’, and ‘*tagalog*’ mean introduction not only literally from these regions but also just from “outside.”

Weedy forms of *C. frutescens* and bird behavior toward fruits

Weedy plants of *C. frutescens* are often found at forest edges or along roadsides in villages in Southeast and East Asia. Among the 68 interviewees, 64 had seen weedy forms of *Capsicum*, and 23 people answered that weedy plants were only small fruit types of *Capsicum*, or *C. frutescens* (Table 2). People in the Batanes Islands thought that it was not necessary to cultivate *C. frutescens* because it grows as a weed and is dispersed by several birds, although they believed that they had to cultivate *C. annum* ‘*batunes*’. These statements are confirmed by many weedy plants of *C. frutescens* that were found around fields and in bush in the Batanes Islands (Fig. 2B).

Among the 68 interviewees, 61 people knew or had seen that birds, such as ‘*ibwaw*’ (: *Macropygia tenuirostris phaea*), ‘*pyek*’ (: *Microscelis amaurotis harterti*), ‘*vadug*’, ‘*manuk*’ (: common domestic fowl), and ‘*datiw*’ (: *Zosterops simplex batanis*) etc. (scientific names of birds were referred to KANO (1946), Table 3), ate fruits of pungent *Capsicum*, and 34 people answered that they ate only fruits of *C. frutescens*. Some people (10 of 68 interviewees) said on their own initiative that birds ate fruits and that the seeds germinate from their droppings. Traces of fruits of *C. frutescens* eaten by birds were often found during the field survey (Fig. 2C).

Use of *Capsicum* in the Batanes Islands

Fresh or dried fruits

Those who preferred spicy flavors bit into fresh fruits of *Capsicum*, squashed and dipped it in salt when they ate ‘*uvi*’ (*Dioscorea alata*) or other main crops, or roasted it for

Table 2. Perception of weedy forms of *Capsicum* and bird behavior toward fruits.

	Batan	Sabtang	Itbayat	Total	
	yes / total	yes / total	yes / total	yes / total	%
Do you know weedy forms of <i>Capsicum</i> ?	26 / 27	20 / 23	18 / 18	64 / 68	94.1
referring to only small fruit types	16 / 26	5 / 20	2 / 18	23 / 64	35.9
Do you know birds eat its fruits?	25 / 27	18 / 23	18 / 18	61 / 68	89.7
referring to only small fruit types	21 / 25	6 / 18	7 / 18	34 / 61	55.7
Birds ate fruits and the seeds germinate from their droppings (answered on their own initiative)	2 / 27	4 / 23	4 / 18	10 / 68	14.7

Table 3. Local names for birds that eat fruits of *Capsicum* in the Batanes Islands.

Island	Local name	People answered
Batan	<i>ibwaw</i> (: <i>Macropygia tenuirostris phaea</i>)*	18
	<i>pyek</i> (: <i>Microscelis amaurotis harterti</i>)*	15
	<i>vuyit</i> (: <i>Sphenocercus formosae formosae</i>)*	5
	<i>vahud</i> (: similar to a dove but smaller in size, dark green in color)**	2
	<i>manuk</i> (: common domestic fowl)	2
	<i>datiw</i> (: <i>Zosterops simplex batanis</i>)*	2
	<i>vadug</i> (: same features as eagle but smaller in size, dark brown in color)**	2
	<i>punay</i> (: same as dove in size but it has greenish feather)**	1
Sabtang	<i>pyek</i>	12
	<i>vadug</i>	12
	<i>manuk</i>	5
	<i>alan</i> (: <i>Gallinula chloropus</i> subsp.)*	2
	<i>datiw</i>	2
Itbayat	<i>ivwaw</i> (same as <i>ibwaw</i>)	16
	<i>manuk</i>	5
	<i>pyek</i>	5
	<i>voyit</i>	2
	<i>alatiw</i> (same as <i>datiw</i>)	1
	<i>itoxo</i> (owl)	1
	<i>vahud</i>	1
	<i>paloma</i> (no information)	1

* referred to KANO (1946)

** referred to HIDALGO *et al.* (1998)

side dishes. In the field, they sometimes collected fresh *C. frutescens* fruits growing wild, wrapped them in the leaves of banana or other plants, cooked them on a fire, and ate the roasted *C. frutescens* fruits as an appetizer. They used fresh fruits of *Capsicum* when they cooked the pork-blood stew called 'dinuguan'. They appeared to use dried fruits only rarely, unlike people in the continental region of Southeast Asia. People in Cambodia said that they used dried fruits especially in the dry season because they could not collect fresh fruits (YAMAMOTO and MATSUMOTO 2008). There is a minor north-east monsoonal effect in the Batanes Islands, but the rains are more or less evenly distributed throughout the year (MADULID and AGOO 2006), which enable people to collect fresh fruits of *Capsicum* peppers all the year, which accounts for their preferring fresh fruits to dried ones for daily diet.

Processed or preserved fruits

Almost all (65 of 68) interviewees more often used fruits of *Capsicum* peppers as 'bagung' (original meaning: small fish salted and preserved in bottles), which is fresh fruits (of *C. frutescens* in most cases) soaked in 'silam' (vinegar made from sugarcane), occasionally with salt, ginger, 'kalamansi' (*Citrus microcarpa*) juice, garlic, onion, and soy sauce. The 'bagung' is sold in certain small stores (Fig. 2D), but they usually produce it at home

according to their own taste (Fig. 2E). They put, for example, homemade ‘*bagung*’ (both juice and fruits), ‘*kalamansi*’ juice, and a sliced shallot into soy sauce and use it as a dipping sauce for ‘*lataven*’ (raw fish) or the raw meat of a cow or goat (Fig. 2F). In contrast to the Batanes islands, it is known that the people in Taiwan and the Ryukyu Islands, lying to the north of the Batanes Islands, usually soak fruits of *C. frutescens* in liquor (YAMAMOTO 2009).

Fruits of *Capsicum* peppers soaked in vinegar are seen in restaurants throughout Southeast and East Asia. Some people in Cambodia soaked fruits for home use in liquid left over from boiling rice or palm juice, both of which became sour if kept at room temperature, or in boiled water with ants for a sour taste (YAMAMOTO and MATSUMOTO 2008). It is unknown whether people in Southeast and East Asia developed this “sour” and “spicy” substance for some unknown cultural reason or accepted it by the introduction from European people. Anyway, the “sour” taste seemed to be one of the most important elements with “spicy” flavor of *Capsicum* peppers in Southeast and East Asia.

Use of leaves and roots of Capsicum

Among the 68 interviewees, 61 people had eaten or knew how to eat leaves of *Capsicum* (*C. frutescens* leaves in almost all cases) as a vegetable, but no one ate its roots as a spice or vegetable in this survey. They put leaves into ‘*nilaneg amung*’ (fish soup) (Fig. 2G), ‘*tinola*’ (chicken soup), ‘*sinigang*’ (sour soup), ‘*nigisa*’ (sautéed viand), or ‘*lawuya* (*nilawuya*)’ (boiled meat and bones). A 69 years old man in Sta. Rosa, Itbayat, said, “A smell of fish will disappear if I put leaves of *sili* into a fish soup.” However, the leaves of *C. frutescens* are eaten only in moderation, with some informants advising, “You will have a stomachache if you eat too many leaves of *sili*” (a 65 years old man in Sinakan, Sabtang) and “Eating too many leaves of *sili* cause diarrhea because they are rich in vitamins. A doctor taught me so” (a 67 years old man in Chavayan, Sabtang).

C. frutescens leaves were sometimes sold in stores (Fig. 2G), but they were usually gathered from plants growing in fields or growing wild around fields and in bush (Fig. 2G). They collected leaves or whole young plants of *C. frutescens* before fruiting, which seemed to have adverse effects on fruit production, but the stable production of both fruits and leaves was supported by the high density of uncultivated plants around or even in agricultural fields, which seems to be due to high temperature and humid condition through the year, birds, few paved roads, and isolated small islands.

Medicinal uses of Capsicum

Some of the people I investigated placed squashed fresh *C. frutescens* fruits on wounds or arthralgic areas as an ointment: “I squashed fresh fruits of *kasiri* and put it on my wounded part” (a 54 years old man in Raele, Itbayat) and “I squashed fresh fruits of *kasiri*, mixed it with coconut oil, and painted it on my painful joint” (a 56 years old woman in San. Rafael, Itbayat). I was able to test efficacy of this practice; when I cut the tip of my finger in the field survey, I put juice of *C. frutescens* on it; thereafter, it stimulated body flow, which had the effect of cleaning dirt from the finger and the cut did not suppurate. These

traditional practices are confirmed by scientific studies which have demonstrated that certain extracts and essential oils of *Capsicum* inhibit the growth of some bacteria (ABDOU *et al.* 1972, GALLI *et al.* 1985). Moreover, capsaicin, a pungent ingredient of hot peppers, can produce long-lasting suppression of sensory neuron activity, and this compound is used to relieve pain caused by arthritis and pruritus (CRAFT and PORRECA 1992). People in Southeast and East Asia also use *Capsicum* peppers as traditional medicines for many kinds of diseases, such as digestion, stomachache, diarrhea, vomiting, headache, arthralgia, bruises, snakebite, dog bite, wood wounds, itching or insect bites, and malaria (NAJ 1992, YAMAMOTO 2009, 2010, YAMAMOTO and MATSUMOTO 2008).

Fruits of *Capsicum* were also used to treat sickness or eye disease of a common domestic fowl. Among 68 interviewees, 24 people fed fresh fruits or 'bagung' (both fruits and liquid) to sick domestic fowls as nourishment, in a manner similar to the practice of the indigenous peoples of Taiwan or Japanese. Some people also put squashed fresh fruits on the eyes of domestic fowls with eye diseases (a 54 years old man in Raelé and a 46 years old man in Yawran, Itbayat). A few people used *Capsicum* peppers to kill 'kayaw' (: mite found in domestic fowls): "I put *sili* fruits onto a fire and fumigated domestic fowls over the resulting smoke if the domestic fowls had *kayaw* in their feathers" (a 63 years old woman in Nakanmuan, Sabtang) and "If *kayaw* is in a nest of domestic fowls, chicks will die. So, I put branches of *sili* with fruits and leaves in the nest to make *kayaw* go away" (a 64 years old man in Malakdang, Sabtang).

Other uses of Capsicum

Fruits of *Capsicum* were used as an insecticide. "I spray the mixture of squashed *sili* and water on plants as an insecticide" (a 55 years old man in Chavayan, Sabtang, and a 71 years old woman in Sta. Lucia, Itbayat). A 64 years old man in Malakdang, Sabtang, said, "If you put *sili* fruits onto a fire under the house, insects in the house will die by the resulting smoke." Another reported, "My mother put juice of squashed *sili* on her nipples to wean my brother when he was one year old" (a 62 years old man in Uyugan, Batan). The same treatment was also collected from some indigenous Taiwanese peoples, and it is known that mustard was used in the same way in Japan. A 71 years old woman in Sta. Lucia, Itbayat, said, "If somebody's wife has an affair with another man, he will put squashed *kasiri* fruits on her genital area as punishment." This story is very similar to a story from the Maya in Central America, who rubbed fresh *Capsicum* fruits on the genital areas of unfaithful wives (NAJ 1992).

These usages seem derived from the "hotness" or "inflammatory action" of *Capsicum* fruits. It has been reported widely that *Capsicum* peppers are, or were, used as poison and punishment. For example, Ainu in Japan, Bunun in Taiwan, and some Pygmy in Africa use, or used, *Capsicum* for arrow poison, and Tsou in Taiwan used *Capsicum* as fish poison (YAMAMOTO 2009). The Codex Mendocino, which is an Aztec codex created about twenty years after the Spanish conquest of Mexico, pictures a boy being held in the asphyxiating smoke from burning *Capsicum* peppers as punishment and a Popolocán Indian group near Oaxaca still punishes disobedient children in this matter (ANDREWS 1995).

No information on any ritual usage of *Capsicum* peppers by the people of the Batanes Islands was found in this survey. In Southeast and East Asia, *Capsicum* peppers are used in popular beliefs, in agricultural rituals, and in taboos (YAMAMOTO 2009, 2010, YAMAMOTO and MATSUMOTO 2008). *Capsicum* peppers are also used as materials to produce rice malt or in rituals to produce rice malt or fermented rice in the continental region of Southeast Asia and Indonesia (YAMAMOTO and MATSUMOTO 2008, YOSHIDA 1993), but it is unknown whether and how these techniques originated in one place and were dispersed to other regions, or whether they originated in many places or cultures. So far, there is no report on usage of *Capsicum* as materials to produce rice malt or in rituals to produce rice malt in the Batanes Islands and the indigenous peoples Taiwan.

Capsicum peppers also feature in jokes and humorous anecdotes. “A migratory bird called *kuyab* (: gray face buzzard) comes to this island in October. People want to capture the birds for eating, and they go hunting in the night time and damage the crops in the fields. To avoid the damage of crops, a field owner put *sili* into a *kuyab*’s anus in his field, thereafter, any *kuyab* does not come to the field because the bird tells other birds about this trouble” (a 35 years old man in Nakanmuan, Sabtang); “When I put five fruits of *sili* into a chicken’s anus for cockfighting, he was very excited and was running about like mad. The next day, he died” (a 55 years old man in Sinakan, Sabtang); “My uncle was told in his childhood by someone to paint squashed *kasiri* on his face if he wanted to make his face white. He believed it, and then...” (a 56 years old woman in San. Rafael, Itbayat); “My friend had a skin problem, and I played a trick on him. I told him to paint juice of *sili* on his diseased part for treatment, and he did it...” (a 46 years old man in Yawran, Itbayat); “My students squashed *sili* fruits and put it on the top of a ballpoint pen. When the next kid used it, a problem happened” (a 47 years old man in Ivana, Batan); and “When I was a teenager, I put squashed *sili* fruits into my friend’s crotch during a nap after lunch. He woke up and went to toilet, thereafter, he was running back in anger” (a 76 man in Ivana, Batan).

Conclusion

In the Batanes Islands, there were many local names for *C. frutescens*, of uneven distribution, but the usage of *Capsicum* peppers, as condiment, vegetable (leaves), medicine for human and also animals, insecticide, and punishment, was not very different among the islands. Moreover, the density of uncultivated plants of *C. frutescens* in bush and around or even in agricultural fields was much higher than that in the continental region of Southeast Asia or Taiwan. These findings indicate that *Capsicum* is deeply incorporated into their nature and culture equally in the Batanes Islands, even though it did not originate there and only about 400 years have passed since its introduction.

Similarity of nomenclature suggests that *Capsicum* peppers reached Taiwan through the Batanes Islands, but the absence of reported ritual uses in the Batanes Islands suggests that there was no direct sharing of *Capsicum* culture with the continental region of Southeast Asia.

Further studies are needed to survey local nomenclatures and detailed usage of *Capsicum* peppers, with a botanical research, in other regions of the Philippines, in Indonesia, and the Pacific Islands to clarify the dispersal routes of *Capsicum*, plants itself and its related cultures, in insular regions.

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References

- ABDOU, I. A., ABOU-ZEID, A. A., EL-SHERBEENY, M. R. and ABOU-EL-GHEAT, Z. H. 1972. Antimicrobial activities of *Allium sativum*, *Allium cepa*, *Raphanus sativus*, *Capsicum frutescens*, *Eruca sativa*, *Allium kurrat* on bacteria. *Qualitas Plantarum et Materiae Vegetabiles*, 22: 29-35.
- ANDREWS, J. 1993. Diffusion of mesoamerican food complex to southeastern Europe. *Geographical Review*, 83: 194-204.
- ANDREWS, J. 1995. Peppers - the domesticated Capsicums. New edition, 274 pp., University of Texas Press, Austin, Texas.
- CRAFT, R. M. and PORRECA, F. 1992. Treatment parameters of desensitization to capsaicin. *Life Sciences*, 51: 1767-1775.
- ESHBAUGH, W. H. 1993. Peppers: history and exploitation of a serendipitous new crop discovery. In: *New crops*. (Ed. JANICK, J. and SIMON, J. E.), 132-139, Wiley, New York, NY.
- GALLI, A., FRANZETTI, L. and BRIGUGLIO, D. 1985. Antimicrobial properties in vitro of essential oils and extract of spices used for food. *Industrie Alimentari*, 24: 463-466.
- HIDALGO, C. A. and the dictionary committee. 1998. *Ivatan-Filipino-English dictionary*. 538 pp., Academics Foundation, Pasig City, Metro Manila, Philippines.
- KANO, T. 1946. *Studies in the ethnology and prehistory of Southeast Asia I*. 457 pp., Yasima Shobou, Tokyo, Japan (in Japanese).

- KANO, T. Outline review of the Taiwan archaeology and ethnology. The Historical Research Commission of Taiwan, Taipei, Taiwan.
- KUMAZAWA, S., OHARA, T. and NIUCHI, K. 1954. The differentiation of varieties of peppers in Japan. *Journal of the Japanese Society for Horticultural Science*, 23: 152-158 (in Japanese).
- MADULID, D. A. and AGOO, E. M. G. 2006. A pictorial guide to the noteworthy plants of Batanes Islands. 140pp., UNESCO National Commission of the Philippines, Science and Technology Committee, National Museum of the Philippines, Pasay City, Philippines.
- NAJ, A. 1992. *Peppers: a story of hot pursuits*. 245 pp., Vintage Books, New York.
- PHILIPPINES NATIONAL STATISTICS OFFICE
<http://www.census.gov.ph/data/census2007/index.html>
- SANTOS, V. C. 1988. *Vicassan's Pilipino-English dictionary*. National Book Store, Manila, Philippines.
- STURTEVANT, E. L. 1885. Kitchen garden esculents of American origin. II. Peppers. *The American Naturalist*, 19: 542-553.
- TSUCHIDA, S. 1977. Some plant names in Formosan languages. *Computational Analyses of Asian and African Languages*, 7: 79-119.
- YAMAMOTO, S. 2009. Use of *Capsicum frutescens* by the indigenous peoples of Taiwan. *Studies on Indigenous Peoples of Taiwan*, 13: 39-75 (in Japanese).
- YAMAMOTO, S. 2010. *Yakumi tare no shokubunka to togarashi - nihon*. In: *Togarashi sanku* (Ed. YAMAMOTO, N.), 235-246, Yasakashobo, Tokyo (in Japanese).
- YAMAMOTO, S. and MATSUMOTO, T. 2008. Use of *Capsicum* by Khmer and other ethnic groups in Cambodia. *Udaya, Journal of Khmer Studies*, 9: 29-61.
- YAMAMOTO, S., MISUMI, M. and NAWATA, E. 2007. Effects of various photoperiods on flowering in *Capsicum frutescens* and *C. annuum*. *Environment Control in Biology*, 45: 133-142.
- YAMAMOTO, S., MISUMI, M. and NAWATA, E. 2008. Effects of photoperiod on vegetative growth, flowering and fruiting of *Capsicum frutescens* L. and *C. annuum* L. in Japan. *Environment Control in Biology*, 46: 39-47.
- YAMAMOTO, S. and NAWATA, E. 2004. Morphological characters and numerical taxonomic study of *Capsicum frutescens* in Southeast and East Asia. *Tropics*, 14: 111-121.
- YAMAMOTO, S. and NAWATA, E. 2005. *Capsicum frutescens* L. in Southeast and East Asia, and its dispersal routes into Japan. *Economic Botany*, 59: 18-28.
- YAMAMOTO, S. and NAWATA, E. 2006. The germination characteristics of *Capsicum frutescens* L. on the Ryukyu Islands and the domestication stages of *C. frutescens* L. in Southeast Asia. *Japanese Journal of Tropical Agriculture*, 50: 142-153.
- YAMAMOTO, S. and NAWATA, E. 2009a. Use of *Capsicum frutescens* L. by the indigenous peoples of Taiwan and the Batanes Islands. *Economic Botany*, 63: 43-59.
- YAMAMOTO, S. and NAWATA, E. 2009b. Effect of root zone on flower bud formation and flowering of genus *Capsicum*. *Tropical Agriculture and Development*, 53: 55-58.
- YOSHIDA, S. 1993. *Toho Asia no sake no kigen*. 349 pp., Domesu, Tokyo (in Japanese).

ZINGG, R. M. 1934. American plants in Philippine ethnobotany. *The Philippine Journal of Science*, 54: 221-274.