Notes on Economic Plants

Balsam-pear (*Momordica charantia*, Cucurbitaceae).—*Momordica*, a chiefly African genus of ca. 40 species, occurs exclusively in the Old World except for *M. balsamina* L. and the often noxious weed *M. charantia* L. Wild and cultivated populations of *M. charantia* are pantropical in distribution. The balsam-pear or bitter-melon, as the species is commonly called, is grown as an ornamental and vegetable crop. Although its native country is uncertain, the regions of eastern India and southern China have been suggested as possible centers of domestication (*1, 2*). Wild *M. charantia* var. *abbreviata* Ser., a native of Asia, may be the progenitor to the domesticate (*1*). Several cultivated types are grown in southern Asia (*2, 3*), but their taxonomy is ill defined. The domesticate is thought to have been introduced to the New World with the slave trade from Africa to Brazil (*4*). Bird dispersal of the scarlet arillate seeds of wild or domesticated forms may account for the spread of the species within continents (*5*).

In over 30 floras from tropical and subtropical regions, we found that species descriptions of *M. charantia* typically describe wild balsam-pear and escaped forms of the domesticate without distinguishing between the two. Therefore, fruit and seed characters described below for the wild form are based on plants of well-established populations we observed in Florida and from similar specimens we examined from Central and South America. Descriptions of the domesticate come from plants grown from germplasm obtained from U.S. commercial sources and Chinese markets and from horticultural publications (e.g., *2, 6*).

Momordica charantia is a monoecious herbaceous vine with bright green, lobed leaves and numerous, small, fragrant, yellow flowers. Mature fruits of the wild balsam-pear are 2–7 cm in length and 1.4–2 cm in width. They are ovoid to oblong, pointed at both ends, and covered with small warts, and have 8–10 irregular longitudinal ridges marked by prominent triangular tubercles. The green soft pericarp turns orange and eventually red with age. At maturity, the three valves of the dehiscent fruit curl back to expose 5–20 seeds, each surrounded by a scarlet, sticky, pulpy aril. Seeds are 5–9 mm long and 2.5–6 mm wide and are slightly three-toothed at the apex and base; the sculptured faces are rugulose and pale brown with irregular black areas and corrugated black margins. Aside from fruit characters, the domesticate retains a remarkable resemblance to wild forms. Mature fruits of the domesticate may be 10–35 cm long and 4–8 cm in width; they are verrucose, ridged, and, in some cultivars, pointed only at the blossom tip (*2*). The green fruits turn orange at maturity; dehiscence is irregular. Like the wild form, the seeds are covered by a scarlet sweet-tasting aril. Seeds are similar in shape to wild balsam-pear, but range from 10 to 16 mm long and from 7 to 10 mm wide and are typically pale brown.

The immature fruit of the cultivated form, which is pickled, stuffed, stir-fried, and prepared in many other ways (*7, 8*), is true to its name bitter-melon (Fig. 1). The treatment of the fruit before cooking by blanching or soaking in salt water reduces the bitter taste to give a flavor comparable to dandelion leaves (*9*). The fruit, young shoots, and flowers are used for flavorings, the leaves as greens, and the pulpy arils as a sweet (*6, 7, 10*). Cucurbitacins, which cause bitterness in other cucurbits, are absent in *M. charantia*; instead, the bitter substance is an alkaloid, momordicine (*11*). Nutritionally, the fruit is a good source of iron, phosphorus,

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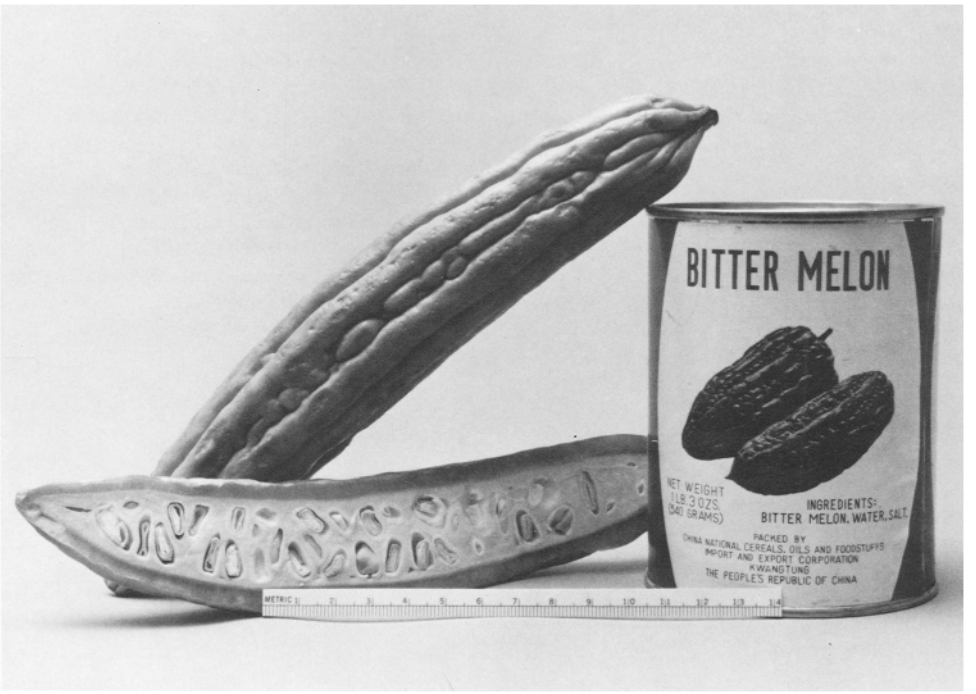

Fig. 1. *Momordica charantia.* Fresh fruits and a can of fruits. (Photograph by Joe Ruh.)

and ascorbic acid, while young shoots and leaves are relatively rich in calcium, carotene, riboflavin, and ascorbic acid (*3, 7, 12*).

Although little known as a vegetable in the United States (it can be purchased, fresh or canned, in some ethnic markets in larger cities), balsam-pear is consumed in some areas of the New World tropics and is occasionally grown as an ornamental. The plant is an attractive trellis or arbor cover, is relatively pest resistant, and grows rapidly. In Florida, wild populations and our cultivated plants flowered for over 4 mo in late summer through the fall. Wild plants often flower and fruit throughout the year when temperatures remain high (*7*).

The numerous medicinal uses of nearly all parts of the plant (*7, 11*) indicate a long association with people, especially in Asia. A substance with the clinical properties of insulin has been isolated from the species (*13*). Juice from several plant parts is used externally to treat skin ailments and diseases and is ingested to cure various internal disorders (*3, 7, 11, 14, 15*). Most plant parts act as a purgative when ingested and are reported to be somewhat toxic; the death of a child was blamed on an overdose of juice from the leaves (*14*).

Future studies are planned to examine the distribution and taxonomy of *M. charantia.* Investigation of the amount of divergence, isolation, and introgression among the often sympatric wild, naturalized, recently escaped, and domesticated populations may shed light on the apparent overall lack of morphological differentiation within this widespread species.

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The Kerguelen-cabbage, *Pringlea antiscorbutica* (Brassicaceae).—The Kerguelen Archipelago is in the subantarctic Indian Ocean midway between South Africa and Australia and 1,000 mi north of Antarctica. Its best-known plant is the Kerguelen-cabbage, *Pringlea antiscorbutica* Brown ex Hooker (Brassicaceae) (Fig. 1), which grows also on Heard, Crozet, Marion, and Prince Edward islands (*13, 15*). In the heyday (1800–1870) of the penguin/seal/whale hunting around Kerguelen, the cabbage was said to have been "invaluable" (*12*) as a fresh vegetable—an antiscorbutic—to crews of the many ships there. Not all who have eaten it, however, consider it to be a *tasty* vegetable.

The plant's leafy rosettes, up to 18 in wide (Fig. 2), so resemble those of the cultivated cabbage that Hooker (*8*) commented, "if growing in a garden with their namesakes in England they would not excite any particular attention." The rosettes may be at ground level, or each may be borne atop a stalk to 1 m tall (*22*). From the base of the rosettes arise the inflorescences (*22*), which may persist several years; Moseley (*16*) noted 28 on one plant, some of them 8 yr old. The lower part of the stalks may lie along the ground for up to 6 ft (*11*). Sometimes 5–6 in thick (*11*), these "rhizomata" are "full of spongy and fibrous substance intermixed, of a half woody texture, and with the flavour of horse-radish" (*8*).

Rabbits, brought to Kerguelen about 1874 (*4*), have eliminated *Pringlea* from many areas. Fortunately, these edacious animals are not on all the archipelago's islands. On those where rabbits are absent, "large areas are densely clothed with this native cabbage," but on Kerguelen the cabbage is found mostly "as isolated plants in areas inaccessible to rabbits" (*10*). (See [*1*] and [*20*] for photos of *Pringlea*-dominated sites.) The cabbage grows especially well in guano enriched soils and can tolerate salt spray.

The first mention of the cabbage is in the account of Captain Cook's 1776–1780 voyage (*5*): "Another plant, which grew to near the height of two feet, was pretty plentifully scattered about the boggy declivities: it had the appearance of a small cabbage . . . It had the watery acrid taste of the antiscorbutic plants . . . When eaten raw, it was not unlike the New-Zealand scurvy-grass; but when boiled, it acquired a rank flavour."

Sir Joseph Hooker (*8*) recounted that "during the whole stay of the 'Erebus'

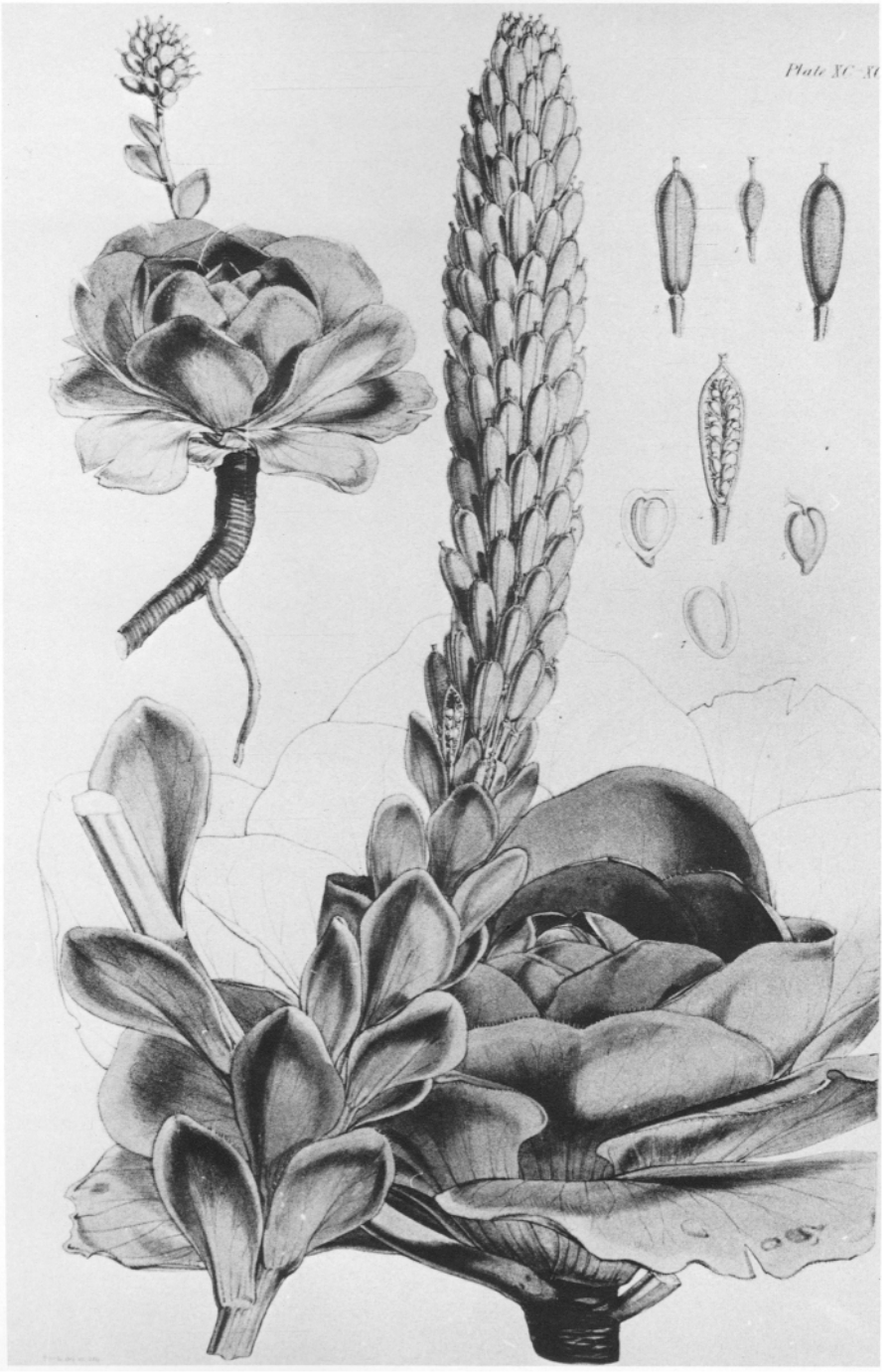

Fig. 1. The Kerguelen-cabbage. Larger plant, ×0.4. (From J. D. Hooker. 1847. *The botany of the antarctic voyage of H. M. discovery ships Erebus and Terror, in the years 1839–1843.*)

Fig. 2. The Kerguelen-cabbage. Leafy rosette, ×0.4. (Photograph by S. B. Young.)

and 'Terror' [at Kerguelen], daily use was made of this vegetable, either cooked by itself or boiled with the ship's beef, pork, or pea-soup; the essential oil gives a peculiar flavour which the majority of the officers and the crew did not dislike, and which rendered the herb even more wholesome than the common cabbage, for it never caused heart-burn, or any of the unpleasant symptoms which that plant sometimes produces." He later (*9*) wrote, "there was not a case of illness [scurvy] of any consequence [among] 120 officers and men. [The plant] well merits its Latin name of *Pringlea antiscorbutica*. . . ."

The American Transit of Venus Expedition 1874–1875 visited Kerguelen and left a few notes on *Pringlea* (*11*): "the leaves were eaten, as cabbage, by ourselves and the ship's company . . . with relish; our fowls were fond of them, and they constituted the staple food of the live stock brought to the island. . . ."

Du Baty (*6*) described the taste of the leaves, before boiling, as "rank and bitter" and as "very much like the most powerful horse-radish." He further reported that "in the first boiling the water becomes of a dark yellow color, but in the second boiling it is fairly clear and the cabbage then becomes eatable. We made sauces with it, and chopped it up with our tinned meats for the stew-pot." A common evening meal was "Soup (from tins): Fish: Tinned meat: Rabbit or Duck: Vegetables (from tins): Kerguelen Cabbage: Coffee."

M'Intosh (*14*) was impressed "that the Disposer of all that is good should have placed [at Kerguelen] a plant so valuable to those who traverse those . . . seas, subject to one of the most fearful of all human diseases, scurvy, and that also

presented to them the moment they put their foot on shore, where, from its luxuriance and abundance, it is likely . . . to prove for ages to come an inestimable blessing to ships . . . at this far isle."

The junior author (SBY), in a 1971 visit to Kerguelen (*21*), tasted *Pringlea.* He found the raw leaves to be fuzzy (like flannel) and bitter. Cooked, the vegetable was fibrous and, because of the yellow exudate, unappetizing.

The leaves are rich in ascorbic acid, the amount similar to that in broccoli and parsley (*7*). Raw, they are indeed antiscorbutic; their vitamin C content is, of course, reduced by boiling.

The Kerguelen cabbage, an intractable wilding, has apparently not been cultivated successfully, though culture of a few plants has on occasion been attempted (e.g., *1, 2, 17, 18*). Seeds were received in the U.S. in 1914 (*19*), but whether they were planted is apparently not a matter of record.

The generic name *Pringlea* honors Sir John Pringle (1707–1787), "an eminent writer on that scourge of seamen, the scurvy" (*9*). As president of the Royal Society, Pringle brought about reforms increasing the comfort and hygiene of ordinary soldiers; for this he has been called the "father of military medicine." He also publicized the "fermentation theory" for the treatment of scurvy ("fermentation makes foods antiscorbutic"), which fitted his own published—and incorrect—ideas that the disease was generally the result of putrefaction (*3*).

We acknowledge aid from Dr. Jerry Carpenter.

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***Vigna vexillata* (Fabaceae), A pulse cum tuber crop of northeastern hill region of India.**—The northeastern hill region of India is a rich depository of many economically useful plants. Tribal communities—with their peculiar socio-economic systems, customs, and beliefs—comprise the major section of the population of the region. More than 50 tribes are recognized there. *Vigna vexillata* is a pulse cum tuber crop consumed by the native tribals. The species is also used for food by the inhabitants of Western Ghats and Goa, where it is known locally as "halunda" (*1*).

The plant, resembling cowpea, occurs "throughout the tropics" (*2*), mostly in wild habitats. Hooker reported its distribution from Simla to Kumaon and Khasia (ascending to 8,000 ft) as well as hills of West Peninsula and Ceylon (*3*). The species produces both edible seeds and tubers. *Vigna vexillata* is a prostrate, spreading, brown-pubescent, annual legume with trifoliolate leaves and axillary inflorescences. Two to four reddish-purple flowers are borne at the end of the long peduncle. At younger stages the pods can be used as a vegetable. At maturity they are about 18–20 cm long and each produces 15–20 seeds. These are reddish brown and recall cowpeas although a bit smaller. The grains are either used as *dal* or eaten after boiling or roasting (*4*). In taste they differ slightly from cowpeas.

The plant has a moderately deep, abundantly nodulose root system. The main roots develop tubers after 2–4 mo of growth. These resemble those of sweet potato and average 12–13 cm long. Fleshy and easy to peel, they are consumed either after boiling or after being roasted in fire. Tubers are eaten also raw by certain tribals of northeastern India (*5*). At later stages they become highly fibrous. Animals, especially pigs, relish the tubers. The tubers can very well be used as a substitute for tapioca in animal feeds. The plant can be propagated vegetatively by stem cuttings.

A preliminary study indicated that both the seeds and the tubers are very rich in protein content; as a tuber crop *V. vexillata* may excel even sweet potato, tapioca, or colocasia in nutritive value (*6*). The plant produces abundant root nodules at early stages and so can be utilized to enrich the fertility of newly developed lands. The species covers the ground quickly and thus is also useful as a cover crop to check soil erosion. It may also be an excellent green manure crop. These qualities make it a good cover crop cum intercrop for rubber plantations in India. As the species thrives well in marginal lands it can be an alternative crop for lands not suitable for traditional tuber crops.

Vigna vexillata is given but scant—and incidental—mention in *The Wealth of India* (*7*).

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