

Crops of the Incas in New Zealand

Bill Sykes¹

For some years I have been interested in the edible plants of the Andean Region and have grown a number of the more unusual ones found in New Zealand at home and nearby in our little community garden in Packe Street Park, St Albans, Christchurch (Fig. 1). My bible for Andean plants has been a very interesting book published in 1989 called *Lost crops of the Incas* written by several scientists of the National Research Council in Washington, DC². Many plants described in it I have never seen and probably most of these are not or are rarely grown outside South America.



Fig. 1 Packe Street Park community garden, St Albans, Christchurch. Photo: Bill Sykes.

Anyone visiting Packe Street Park cannot fail to see the influence of the Mediterranean Region with our grape vines, olives, almonds, peaches and a fig tree because such plants grow well in our dry summer climate. But another part of the world that contributes significantly, although less obviously, to the diversity of edible plants in our park is the Andes of South America.

Some of the plants mentioned below were not only known to the ancient Inca people but were amongst their staple crops. Since I have been interested in these edible plants for a long time it seemed a good idea to plant some that were available in New Zealand in Packe Street Park so that volunteer workers and visitors could try them too.

The Andes of South America (and to a lesser extent the mountains to the east) have long been known as a source of food plants, not only for the indigenous people but also for other peoples in more modern times. One needs only mention potatoes and tomatoes to make this point clear. It is surprising that tomatoes don't seem to have been used as a food crop by the Inca people but were instead taken to Mexico where the Aztec and other Indian peoples ate them. That happened well before the Spanish arrived on the scene.



Fig. 2 Botanical illustration of the andigena potato, *Solanum tuberosum* subsp. *andigena*. Drawing: Tessa Read.

Potatoes, *Solanum tuberosum* and *S. tuberosum* subspecies *andigena*

In Packe Street Park amongst the usual potato type of *Solanum tuberosum*, we grow the less common andigena potato with its small irregular dark purple tubers (Fig. 2). This potato seems to have been the first type to have been introduced to New Zealand by early Europeans and it quickly became very popular amongst Māori people. Because the tubers are often formed on

underground stems at a distance from the planted parent potato (unlike the ordinary potato) it is difficult to harvest them all properly. Thus we usually have a useful supply of emergency food for people who need something for the pot at short notice.



Fig. 3 Oca, *Oxalis tuberosa*. Photo: R. Simpson, via www.ecoport.org.

Oca, *Oxalis tuberosa*, and mashua, *Tropaeolum tuberosum*

These two tuberous vegetables, available to eat in autumn and winter, have been amongst the most important foods in the High Andes for centuries, especially oca. This latter vegetable is well known to everyone in New Zealand and needs no description because it is sold throughout this country as 'yam'. This is a very unfortunate common name because it could hardly be less like a yam as the word is applied all over the rest of the English-speaking world. True yams are of the genus *Dioscorea* and are imported from the Pacific islands to Auckland but are rarely sold as far south as Christchurch. As their genus names indicate, true yams belong to the Dioscoreaceae (a monocot family), whereas oca is a member of the Oxalidaceae (dicots), which is also known for its weedy and ornamental species of oxalis. Interestingly, up to now New Zealand has been almost the only country beyond the Andean Region where oca is generally well enough known to have had the chance

¹ Research Associate, Landcare Research, PO Box 69040, Lincoln 7640, New Zealand; sykesb@landcareresearch.co.nz

² *Lost crops of the Incas: Little-known plants of the Andes with promise for worldwide cultivation* (1989). Report of an Ad Hoc Panel of the Advisory Committee on Technology Innovation, Board on Science and Technology for International Development, National Research Council. National Academy Press, Washington, DC.

to become a commercial vegetable. Also, as many of us know, there are now several forms available with different coloured tubers (Fig. 3).



Fig. 4 Mashua, *Tropaeolum tuberosum*. **A**, growing up a holly tree in the authors' garden. Photo: Bill Sykes. **B**, botanical illustration. Drawing: Tessa Read.

Mashua, on the other hand, is a plant hardly known in New Zealand although it was also one of the most important crops of the Incas (Fig. 4A–B). This is a climbing or scrambling plant – as are most members of the genus *Tropaeolum* (Tropaeolaceae), including another Andean plant the garden nasturtium, *Tropaeolum majus*, which is a common and all too freely-seeding scrambling plant. The white tubers of mashua with their transverse grooves are so like those of oca that it is perhaps surprising that they belong in two separate families of plants although botanically these are not too distant. Furthermore they are cooked in the same way and the taste is somewhat similar. Another feature in common is that they are both short-day plants originating from low latitudes and so in New Zealand they don't form their tubers until late summer. Incidentally, potatoes introduced to Europe soon after the Spanish Conquest were also short-day plants but long-day varieties were

later developed and replaced the early ones. As a result, modern potatoes, as well as the modern andigena ones, form their tubers from early in the summer onwards. Flowering is very spasmodic in oca but more predictable in mashua and, for both, flowering doesn't happen until autumn. Also the above ground parts of both are very frost-tender and thus often the leaves and flowers get killed in the Park by the first air frost. Despite their popularity in the High Andes this cold damage must occur there as well. Certainly it would boost production if long-day varieties could be developed like the potato.



Fig. 5 Ulluco, *Ullucus tuberosus*. **A**, small plant growing in pot. Photo: Bill Sykes. **B**, botanical illustration from *Curtis's Botanical Magazine*, Vol. 77 [Ser. 3, Vol. 7], Tab. 4617 (1851) [W.H. Fitch]. Image courtesy Missouri Botanical Garden, www.botanicus.org.

Ulluco, *Ullucus tuberosus*

For several years I have grown this root crop after getting a few tubers from Plant & Food Research, Lincoln (Fig. 5A–B). The tubers are smaller than those of the oca and mashua. Ulluco is a very famous plant in its region of origin; it was also a staple food for the Incas like oca, mashua and potato. Also, like oca and mashua,

ulluco only forms its tubers in late summer and early autumn and has frost-sensitive leaves. It belongs to a quite different and uncommon family, the Basellaceae, that is mainly only known otherwise in this country by the ornamental but very weedy vine, *Anredera cordifolia*, Madeira vine or mignonette vine, that originates from Central America – despite its common name. In the tropical Pacific however, there is also to be found the climbing Asian vine *Basella alba*, Malabar spinach, that is a popular leaf vegetable.



Fig. 6 Botanical illustration of yacon, *Smallanthus sonchifolius* (as *Polymnia sonchifolia*) from Poeppig, E., *Nova genera ac species plantarum*, Vol. 3, Tab. 254 (1845). Image courtesy Missouri Botanical Garden, www.botanicus.org.

Yacon, *Smallanthus sonchifolius*

In New Zealand probably the rarest of the Andean plants to be mentioned here is yacon, *Smallanthus sonchifolius* (syn. *Polymnia sonchifolia*; Fig. 6), although it is well known in parts of the Andes. It is a relation of the sunflowers and also belongs to the Asteraceae (Compositae). Like many sunflowers yacon is a tall herbaceous plant resembling Jerusalem artichoke, *Helianthus tuberosus* (this being a species of sunflower from North America and at Packer Street Park is another community garden emergency food). Also like it, the edible parts of yacon are the underground tubers, these being rich in fructose. Yacon tubers are thus quite sweet, as well as being crunchy, and can be eaten raw or cooked. A point to remember is that the outside skin is unpalatable. Another fact in common with these other tuberous plants is that the above ground parts are very sensitive to frost

in Christchurch. I have grown yacon at home for several years but haven't yet had enough stock produced to plant it out in the Park and also I have not seen it flower, presumably because it doesn't get time before the onset of cold weather in late autumn. Yacon is another plant almost unknown outside South America, but despite its rarity in New Zealand this is still the most likely country to find it in outside its homeland.



Fig. 7 Botanical illustration of pepino, *Solanum muricatum* (as *Solanum variegatum* Ruiz & Pavon) from Ruiz and Pavon, *Flora Peruviana, et Chilensis*, Plates 153–325, Vol. 2, Tab. 162 (1798–1802). Image courtesy Missouri Botanical Garden, www.botanicus.org.

Cape gooseberry, *Physalis peruviana*, and pepino, *Solanum muricatum*

We often grow these two well-known Andean species in Packe Street Park but they are short-lived herbaceous plants and usually don't survive the winter. If seed is sown in the spring they can produce their edible fruits before the autumn frosts if kept in the warmest possible place. Along with potatoes discussed previously, both cape gooseberry and pepino are in the very large solanum family (Solanaceae) that is so diverse in South America. Cape gooseberry, sometimes known as Inca berry, has a yellow-orange, cherry-sized, globular berry that is enclosed in a papery brown jacket (hence the cape is really the enlarged floral calyx), the main difficulty being to know when the berries are ripe without opening the jacket. There is no trouble in this way over the pepino (Fig. 7) because its large pendulous creamy-yellow and usually purple-streaked and more or less sub-globular fruits are very conspicuous and can grow to 15 cm long or more although are usually only about 8 to 10 cm in our garden. In the late 1970s and early 1980s there were efforts to commercialise pepino

in New Zealand, and several cultivars were developed, but this venture did not succeed. Both fruits are mostly eaten fresh but those of cape gooseberry are sweeter than those of the pepino. Also, cape gooseberry makes very good jam.

Before leaving the Solanaceae family I must mention the well-known and popular capsicums and chilli peppers, *Capsicum* species, which we sometimes have in the Park in warm places. Capsicums are similar in respect to habit and cultivation condition needs to pepino. Again capsicums and chilli peppers have a long history in the Andes going back to the time of the Incas. The peppers at that time were small and very hot and by the time of Columbus they had been taken north at least as far as Mexico and were popular amongst the Aztecs too. Since then there have been extensive breeding programmes, especially in North America; the result being the great range of different peppers that are used across the world today with large and mild as well as hot peppers.

Ugni, *Ugni molinae*, and feijoa, *Acca sellowiana*

The main member of this duet of fruit crops to be discussed is ugni, *Ugni molinae*, because feijoa is not quite an Andean plant since it originates from the mountains of southern Brazil and was most likely unknown to the people of the Andes. Feijoa, *Acca sellowiana* (syn. *Feijoa sellowiana*; Fig. 8), is very well known throughout New Zealand although not much elsewhere overseas outside South America. Also it is hardy enough to grow freely outside in Canterbury. Both species belong to the very large myrtle family (Myrtaceae) that is so abundant in the southern hemisphere. Ugni (Fig. 9) is sometimes called strawberry myrtle elsewhere and this is an acceptable English alternative to the Chilean name. But in New Zealand, as with oca, we unfortunately persist in calling it by a totally wrong name. In this case cranberry or New Zealand cranberry is erroneously used, but although the berries are roughly the same size and shape as true cranberries their taste bears no resemblance, let alone the appearance of the plants. True cranberries are closely related to blueberries and thus are in the very different and unrelated family Ericaceae. I enjoy the ugni berries in

autumn and can hardly pass a bush without eating a few of these deliciously fragrant fruits. Ugni is quite hardy and the little round leathery evergreen leaves can stand up to wind and cold. In New Zealand it is sometimes grown as a hedge because of its dense habit. I remember seeing it obviously naturalised on the Chatham Islands where in open and exposed, windswept boggy areas low ugni bushes are locally common. Again, ugni is scarcely known or grown outside its Andean homeland in Central Chile except for New Zealand.



Fig. 8 Botanical illustration of feijoa, *Acca sellowiana* from Curtis's *Botanical Magazine*, Vol. 124 [Ser. 3, Vol. 54], Tab. 7620 (1898) [M. Smith]. Image courtesy Missouri Botanical Garden, www.botanicus.org.

Other Andean plants in Packe Street Park

We grow a few cucurbits, including pumpkins and marrows (Cucurbitaceae) in Packe Street Park, and the species of most of these originate in the Andes. The usual pumpkin grown is the grey 'Whangaparoa Crown' which is a cultivar of the main pumpkin species *Cucurbita maxima*. This has a long history of cultivation in the Andes for it and other cucurbits were a mainstay of the Incas and other peoples there. Of course, as with all such plant species that have become popular world-wide, there has been so much breeding and selection in the last 500 years or thereabouts that usually today the modern cultivars derived from them are quite different from their progenitors of several thousand years ago. In the same way, the marrows and courgettes or zucchinis that we often

grow in New Zealand has changed considerably from the species, *Cucurbita pepo*, that is originally from North or Central America.



Fig. 9 Botanical illustration of ugni, *Ugni molinae*. Drawing: Tessa Read.

A plant not usually associated with the Andes is the strawberry (Rosaceae). However there is an Andean strawberry, *Fragaria chiloensis*, and the result of crossing this with the North American scarlet strawberry, *Fragaria virginiana*, gave the world the modern strawberries of commerce. Thus all the large strawberries that we regularly eat are derived from this hybrid called botanically *Fragaria × ananassa*. The bringing together of these two species took place in France in the early 18th century. On the other hand that little alpine strawberry with its very small fruits that we also sometimes grow in our Park belongs to the European *F. vesca*.

I should make a brief mention of Andean plants that we cannot grow in Packer Street because it is too cold. Not surprisingly they come from lowland and thus subtropical and tropical parts of the central and northern Andes. Some are not well known beyond the Andean Region although again New Zealand has often been in the forefront of introducing them to the rest of the world. Some have an obvious economic potential, but one must go further north in New Zealand to see growing cherimoya, *Annona cherimola*, in the custard apple family (Annonaceae), and chamburo or mountain pawpaw, *Vasconcellea pubescens* (usually known as *Carica pubescens*). Incidentally, the usual

pawpaw fruits sold here is the tropical species that is still botanically *Carica papaya* (Caricaceae). Some of the passion fruits, especially some of the banana ones, *Passiflora* species in the *Tacsonia* group (Passifloraceae), are from the Andes and were known to the Incas. Although not very hardy in Christchurch itself these plants grow wild and can fruit prolifically on Banks Peninsula and in warm places on the Canterbury coast to the north, so much so that these vines can become a nuisance.



Fig. 10 Botanical illustration of quinoa, *Chenopodium quinoa* from *Curtis's Botanical Magazine*, Vol. 65 [Ser. 2, Vol. 12], Tab. 3641 (1839) [W.H. Fitch]. Image courtesy Missouri Botanical Garden, www.botanicus.org.

Finally, although we don't grow any plants with edible seeds, there are several in two genera that should be mentioned to round off this discussion of Andean plants. The most important species in the region was (and probably still is) the quinoa, *Chenopodium quinoa* (Chenopodiaceae; or Amaranthaceae as it may now instead belong), a food that the Incas regarded to be so vital that it was considered sacred according to *Lost crops of the Incas* where it is stated that the Inca Emperor planted the first seed using a golden spade (Fig 10). Many forms of quinoa were and still are available. Quinoa seeds are said to be one of the best sources of protein in plants. They are ground to form flour and this is available from health food shops in Canterbury. In the same genus is our very common weed *Chenopodium album* or fathen from the Old World that I often cook the leaves of.

The second genus with at least one important seed-producing species is *Amaranthus* (Amaranthaceae). *A. caudatus*, kiwicha or love lies bleeding (Fig. 11), was also an important food crop for Andean people. Thus it seems to be indigenous to this region and not to Asia, although these days it is such a well-known crop plant in temperate climate areas like the Himalaya that it seems as if it must originate from there.



Fig. 11 Botanical illustration of love lies bleeding, *Amaranthus caudatus* from Vietz, F.B., *Icones plantarum medico-oekonomico-technologiarum*, Vol. 3, Tab. 266 (1806). Image courtesy Missouri Botanical Garden, www.botanicus.org.

Community gardens and small patches of common land are useful places to trial these non-commercial but useful food plants. They add variety to our local food larder and a back-up for people needing to augment their diet. These are plants that have sustained humans for thousands of years in their homeland. I can do no better than quote from the *Lost crops of the Incas* where the authors state "...one country outside the Andes already has had considerable experience and success with them – New Zealand".

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