

The rocoto pepper: a novel crop capsicum

The *Solanaceae*, or nightshade family, is an economically important group of plants consisting of more than 2500 species. Over 30 species are cultivated as food crops around the world, amongst these are the potato (*Solanum tuberosum*), tomato (*S. lycopersicum*), aubergine (*S. melongena*) and the vegetable peppers (*Capsicum spp.*). The capsicums make up a diverse genus of around 35 species of shrubs which originated in South America. Truly wild species are only found in Latin America, but five species are commonly cultivated in various parts of the world. These are: sweet/chilli peppers (*Capsicum annuum*), Scotch bonnet (*C. chinense*), tabasco (*C. frutescens*), aji (*C. baccatum*) and rocoto (*C. pubescens*). They are prized for their distinctive 'pods' which have high culinary value.

Rocoto (*Capsicum pubescens*) was one of the first domesticated plants in the Americas, and was already in cultivation by around 6000 BC. This took place in the Andean region, probably in Bolivia. Many years later, post-Columbian explorers in the sixteenth and seventeenth centuries noted that the rocoto was the most common pepper used by the Inca population of Peru. Rather than being used as an everyday vegetable it would have been an essential ingredient of food preparations used for ceremonies involving Incan royalty and members of the priesthood. *C. pubescens* is generally known as the rocoto in the Andes (locoto in Bolivia); this name originates from the Spanish word for rock: roca, as the fruits are particularly hard-fleshed. The Kichwa people of the Andes know it as rocot-uchu.

Traditional cultivation/use

Rocoto occurs only in cultivation and is grown throughout the Andes, from Columbia to Chile, and also to a lesser extent in Costa Rica, Honduras, Guatemala, southern Mexico and Indonesia. Cultivation of the rocoto is more or less unknown outside of these regions, and this may be due to its requirement for a long growth season, with cool, but frost-free conditions. It is well-adapted to cooler temperatures and is grown at an altitude of 1500-3500m, mostly in small-scale family plots, or as an occasional in gardens. Rocotos give spiciness and colour to local dishes and sauces, and lend unique flavours which other capsicums cannot provide. Exports are infrequent, meaning that the rocoto is, as yet, still a rarity in the UK.

General characteristics

Rocoto was first given its scientific name *Capsicum pubescens* in the 18th century by explorers studying the flora of Peru and Chile. 'Pubescens' refers to the hairy appearance of all the aerial parts, not found in any other common *Capsicum*. In the UK the rocoto is sometimes referred to as the tree chilli, as it is the most robust of all the cultivated forms. Young plants tend to become quite woody within several months. Given suitable growth conditions they can reach 2m in height and as much in breadth within a year. The habit



Young shoot showing covering of hairs



Detail of rocoto flower



Assorted rocoto pods: blocky and conical-blocky forms

is generally erect but, as the branches gain length and weight, they tend to develop a scrambling appearance. As the plant matures, young branches tend to become vine-like, latching onto earlier growth or other vegetation nearby. The root system is relatively shallow, but extensive, and lateral roots may reach 1.5m in length after two years. Leaves are lanceolate with a pointed tip, and may reach 15cm in length and 7.5cm in width. Flowers are either solitary or in groups of up to four. The corolla consists of up to nine fused lobes and may reach 2.5cm diameter. It may be either purple throughout, purple suffused with white specks, or with a white central region and purple corolla lobes; a faint white margin is common. Anthers are purple and white at maturity. Flowers are largely self-pollinated, but insect-pollination is frequent.



Cross section of pod, showing thick pericarp and black seeds

The fruits have a thick pericarp, making them quite fleshy, and may be red, yellow or orange, according to variety. Mature bushes may produce 50 or more fruits in one growing season. Rocoto fruit pods show a narrow range of morphological diversity, with five main forms: spherical, blocky (bell pepper-shaped), conical, ovoid and cylindrical-pointed. Intermediate forms also occur, giving a wide range of possible shapes and sizes. Pods measure up to 8cm long and 7cm across, and weigh up to 100g. There may or may not be a pronounced 'neck,' where the pod adjoins the remains of the calyx. The pedicel is always relatively long



Ovoid fruit form

(at least half the length of the pod), curved and thickened. The seeds are black and rugose (wavy), unlike the other cultivated species, whose seeds are generally a pale brown colour and flat. In South America, traditional varieties with particular pod forms are favoured in certain districts. These are often given local names referring to the village or town where they are grown. In Mexico, varieties producing spherical pods are known as chile manzano (apple chilli), and those with ovoid pods as chile perón (pear chilli). Mexican yellow-fruited varieties are generally referred to as canario (canary) or cera (wax) chillies. There are very few commercial rocoto cultivars; several have recently been developed for cultivation in Mexico, for example: 'Chapingo Amarillo' and 'Puebla', which both have spherical, yellow pods.

Growing in the UK

The rocoto is adapted to the tropical highlands of South America and will therefore thrive under cooler conditions than those preferred by other hot peppers. However, some form of protection is needed for cultivation in the UK, at least during the colder months. Trials undertaken by the author over the last eight years in West Cornwall have shown that production under polythene (14m x 6m polytunnels) can be substantial.

Because of the long growing season required, rocoto seeds should be sown by early January at the latest. A constant temperature of 22-25°C should give germination within seven days; germination rates are generally very high. Seedlings and developing plants should be provided with constant heat, ideally around 20-25°C, as for other *Capsicum* species. By mid-April (providing there is no risk of frost) young plants will be ready to plant out with a spacing of around one plant per 2.25m² to allow for optimum production and adequate air flow around the luxuriant growth of the branches. The nutrient requirements of the rocoto are relatively low, and moderately fertile soil with a neutral or slightly acidic pH should be adequate. Drip-irrigation at soil level is preferable because it

keeps humidity levels around the foliage at a minimum, thus reducing the risk of mildews, etc. The rocoto is relatively pest-resistant, probably because of a different genetic ancestry to the common capsicums. The dense, hairy covering on all young parts also helps to deter invertebrate pests.

Once well-established, the young plants soon become fast-growing, and strong pruning in early summer, before flowering, is necessary. This helps plants to develop a more compact habit, otherwise they can become quite straggly. Pruning bushes in the same row to maintain a hedge about 1.5m high helps to contain the plants and to make harvesting easier later on. Support will be required as growth becomes more extensive. Temperatures should not be allowed to rise above 35°C for any length of time, so careful ventilation in continual sunny weather is necessary. Flowers will develop from mid-July onwards, and may continue until December or January, according to temperatures. Unlike other capsicums, a relatively cool night-time temperature (as low as 10°C) will be adequate to maintain substantial flower production. Provided the soil is adequately fertile there is no need to restrict the number of developing fruits per bush, as their size and quality should not be affected. The first pods should mature by late September, and from then on a steady supply of rocotos will be harvestable into the winter. In the absence of hard frosts, pods will be harvestable until April of the next year. Rocoto plants can produce up to 50 or so fruits in their first year under polythene in the UK. This can continue for several seasons, but production will drop substantially after three or four years. Rocoto bushes may live for as long as ten years.



Red rocoto hedge

Photos: John Samuels

The foliage can withstand freezing temperatures for short periods without damage, and whole plants can tolerate temperatures as low as -3 degrees C for a night or two. To ensure winter survival, bushes can be pruned back to around 10cm high at the onset of harsh weather, then covered with straw. If the growing environment can be kept frost-free, new shoots will eventually appear from the bases of the stems in the spring. The pods are relatively cold-tolerant and will also survive temporarily freezing temperatures without their quality being affected. Alternatively, fruiting branches with pods that are at least 75% ripe may be removed from the plant and kept indoors to allow 'ripening on the vine.' This may take several weeks at room temperature.

Rocoto plants can also be raised from cuttings taken from semi-woody stems and branches in the autumn; these will root readily, without the need for artificial treatment. These can be planted out under polythene earlier than young first-year plants, because they are more robust. They will also flower at least two weeks earlier. As an alternative to protected cropping, rocoto bushes fare well outdoors in the UK, from late Spring to early Autumn. They should be planted in adequately-sized pots and kept in a sheltered spot. If soil fertility is maintained and roots are pruned back every year, potted plants may continue production for several years.



Stem cutting, after 2 months

Photos: John Samuels

Culinary aspects

The flesh of the rocoto is moderately pungent and has a rich, distinctive flavour. However, as in other hot peppers, it is the placenta ('veins') and seeds that provide the spiciness. Pungency is considerable and measures around 30,000-50,000 Scoville units and can be much higher, according to growing conditions and ripeness of the fruit. Rocoto possesses a distinctive range of capsaicinoids (the substances responsible for the 'heat'), meaning that the pungency of the rocoto has a different basis to other common species. This helps to explain why some find it even more overpowering than the hottest Scotch bonnet chillies. Rocoto is prized for its explosive flavour, and has a legendary reputation in Latin America. It is known affectionately in Mexico as *chile caballo* (horse chilli), as the fruits have a, 'kick like a horse!' In the Andes, Kichwa-speaking people describe it as *gringo huanuchi* ('gringo killer!'). Rocoto pods can be used in similar ways to other hot peppers; they are also popular in raw sauces or salsas in which flavour as well as heat is required. The blocky and round forms can be filled and baked, in a similar way to bell peppers. Pickling and freezing are useful means of preservation, but only the long, narrow rocoto forms can be dried, as they have relatively thinner pericarp tissue.

Novel crop potential

In summary, the information above indicates that the rocoto is a unique and interesting crop which could find a place alongside the other cultivated *Capsicums* in this country. The following points list the main aspects of its novel crop potential for the UK:

- (i) it is a rare crop which is not commonly grown in the UK, or found in food outlets;
- (ii) it has strong culinary appeal, with an interesting appearance and taste;
- (iii) because of (i) and (ii) it is a lucrative crop, with considerably higher market value than common bell/hot peppers (*C. annuum*);
- (iv) it has a long fruiting period, and harvesting is possible for 6-7 months of the year;
- (v) rocotos are robust, half-hardy and relatively pest-resistant;
- (vi) they do not require large inputs of nutrients or extended management ;
- (vii) because of (v) and (vi) the rocoto is an ideal candidate for organic/low-input production.

The rocoto is a lesser-known hot pepper that has an eight thousand-year history, and yet is hardly known outside of Latin America. As more growers become familiar with it, it is likely that it will find its rightful place alongside the other *Capsicums* that are cultivated in the UK.

Seed sources

Few seed outlets in the UK supply rocoto seed but at the time of writing Real Seeds (www.realseeds.co.uk), based in Newport, Wales, has seed available. Alternatively, visit: www.pepperseeds.eu, based in Amsterdam, Netherlands, who also stock seed.

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Further reading

There are very few detailed sources of information on the rocoto, but the following may be useful to those interested in exploring its potential further.

- Andrews J. 1984. *Peppers: the Domesticated Capsicums*. University of Texas Press: Austin.
- Basu SK, De AK. 2003. *Capsicum: historical and botanical perspectives*. In: De AK, (ed.), *Capsicum: the genus Capsicum*, pp. 1-15. Taylor & Francis Ltd: London.
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John Samuels

John is an independent horticultural consultant and plant taxonomist. His main interests are food species of the Solanaceae family, their wild relatives and plant biodiversity. Novel Solanaceae Crops Project, Penzance, UK; john.samuels@virgin.net