



Ethnobotanical Leaflets

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Erythroxylum: The Coca Plant

By April Rottman

The coca plant is a member of the order Geraniales and the family Erythroxylaceae. There are four genera with an estimated 200 species in Erythroxylaceae (De Witt, 1967). Coca was first described as *Erythroxylum* by A.L. Jussieu in 1783. It was given the binomial *Erythroxylum coca* by Lamarck in 1786.

Early botanists believed that all coca plants were of the same species. Later researchers found that two species of domesticated coca existed. These are *Erythroxylum coca* Lam. and *Erythroxylum novogranatense* (Morris) Hieron (Rury and Plowman, 1983). The two species have two varieties, *Erythroxylum coca* Lam. var. *coca*, *E. coca* var. *ipuda* Plowman, *E. novogranatense* (Morris) Hieron var. *novogranatense*, and *E. novogranatense* var. *truxillense* (Rusby) Plowman (Plowman, 1983).

Distribution

Coca is grown in South America, Africa, Ceylon, Taiwan, Indonesia and Formosa (De Witt, 1967). Coca is most commonly associated with its center of origin, the South American Montana zone of the eastern Andes below 2000m (Bray & Dollery, 1983).

According to Rury and Plowman (1983) *E. coca* var. *Coca*, Huanuco or Bolivian coca is the ancestral variety. Bolivian coca grows in the moist tropical forests of the eastern Andes of Peru and Bolivia. This variety is the only one of the four found growing wild. Bolivian coca is the major source of commercially produced coca leaves and cocaine.

Amazon coca, *E. coca* var. *ipuda* is cultivated in the lowland Amazon. It has been suggested that this variety is a lowland cultigen of Bolivian coca. In contrast to Bolivian coca it is not found growing wild (Rury and Plowman, 1993).

E. novogranatense var. *truxillense* or Trujillo coca is a hardy, drought resistant variety. It is found growing in river valleys of coastal Peru and other arid areas of this region. Bohm, Ganders & Plowman (1982) state that this variety displays many characteristics that are intermediate between *E. coca* var.

coca and *E. novogranatense* var. *novogranatense*, and may represent an evolutionary stage between these species.

E. novogranatense var. *novogranatense* or Colombian coca is cultivated in both moist and dry areas in the Colombian mountains. It is also drought tolerant and is not found growing outside Cultivation. Evidence shows that this variety maybe the most evolved species (Rury & Plowman, 1983).

Cultivation

Coca plants are small evergreen shrubs with reddish brown bark. They have many small branchlets with elliptical-obovate opposite leaves measuring 4-7 cm. in length and 3-4 cm. wide. The plants possess small yellowish-green flowers, which develop into red drupes. The leaves of the Colombian coca are smaller and less pointed at the end than Bolivian coca leaves (De Witt, 1967).

Andean natives grow coca from seed. The women collect the drupes when they are almost ripe. The drupes are placed in a basket and allowed to set until the fruit becomes soft. The pulp is then washed away and the seeds are allowed to dry in the sun.

The seeds are then placed in seed beds and germinate in approximately 24 days. When seedlings have four leaves a lattice covering is placed over them protecting them for a year.

When the young plants reach a height of 30-40 -cm. they are transplanted to prepared fields. This transplanting is done during the rainy season. At three years the plants may produce a small harvest of leaves. After the third year leaves are harvested, by the women, three or four times a year (Bastien, 1987). Yields may range from 1,500-2,000 lbs. of dry leaves/acre/year and planting are renewed every twenty years (Purseglove, 1977).

Pests that affect the coca plants range from weedy species that rob seedlings of soil nutrients and light to insect species such as the cuqi, an ant, which cuts roots and chews leaves, and ulo, a butterfly and its larva, which eat the plant. Another insect species known as mounga burrows into the trunk and destroys the plant and taja, a fungus, grows on leaves and branchlets (Gottlieb, 1976).

History and Uses

Plowman (1983) stated that coca maybe one of the oldest domesticated plants dating back 2000-3000 years, and that the four current varieties were domesticated in pre- Columbian times. Evidence of its early domestication was found an the Santa Elena peninsula in south west Ecuador. Ceramic lime containers were found in this area dating back to the Valdivia Culture. These artifacts along with samples of coca leaves found in burial sites in Peru support the early existence of cultivated coca. Not only was coca grown in prehistory, but evidence indicates coca was distributed to areas where it was not grown during this period. Hastorf (1987) suggests that the Wanka populations had access to coca. The closest coca producing area was 50 km away from Wanka populations, and was situated on the eastern

slope of the Andes. This suggests that coca was not only important for local populations, but may have become economically important during prehistoric times.

Coca leaves have been used for centuries as a stimulant. Pre-Incan Indians used the leaves to relieve altitude sickness (hypoxia), hunger and fatigue. When the Spanish invaded South America they initially outlawed coca leaves, but later provided coca leaves to their slaves who worked the precious metal mines in the mountains because they realized this increased productivity (Gottlieb, 1976).

In 1859 Albert Niemann isolated the alkaloid cocaine and in 1860 Angelo Mariani introduced "Vin Mariani" a wine, coca drink. Mariani amassed a fortune from this drink with the help of notable persons such as Sarah Bernhardt, Queen Victoria of England, Thomas Edison and Pope Leo the XIII.

By 1868 cocaine had been recognized as a local anesthetic. And in 1984 Freud wrote about his experience with cocaine in *Uber Coca*. In 1886 John Styth Pemberton,

of Atlanta, Ga., introduced Coca-cola which contained cocaine until 1904. Coca-cola is still made from coca leaves, but the cocaine has been removed (Gottlieb, 1976).

Modern medicine has used cocaine to treat eczema, shingles (herpes zoster) and has been found to be an effective bactericide against Gram-negative bacteria and coccus bacteria (Bastien, 1987). It was used as a topical anesthetic and a spinal anesthetic, but has been replaced by synthetic forms such as procaine (Gottlieb, 1976).

The most common ancient and modern native use of coca is chewing the leaves. The leaves are placed in the cheek. The Andeans then adds to the leaves alkaline from an ash ball or *lipta*. This ball is sometimes placed in a gourd or *poporo* and a stick is used to withdraw the ash and place it in the wad of leaves. The alkaline releases the cocaine contained in the leaves. The amount of cocaine found in the two ounces of dried leaves that an Indian consumes in a day is very small about 0.7 grains (Emboden, 1972).

Coca leaves are used today as they were centuries ago in divination. The leaves are read much like tea leaves might be read to see the future. This method is also employed to find lost objects or to find a thief (Bastien, 1987).

Modern herbalists have many uses for coca leaves. Some of the uses include: relieving altitude illness (hypoxia), treating gastrointestinal disorders, relieving the discomfort of colds, bruises, sore joint and muscles, swollen and sore feet and headaches (Bastein, 1987).

Conclusion

The leaves of the coca plant are used by Andean Indians to relieve fatigue and pangs of hunger, but also provide some nutritive value. Duke, Aulik & Plowman (1975) found that 100 gm of Bolivian coca

leaves satisfied the dietary allowance for calcium, iron, phosphorous, vitamin A, vitamin B and vitamin E.

The Andean culture and the coca plant have thrived for centuries. It is ironic that this same plant that is used as a cure in its homeland is the source for so much abuse and misunderstanding in other parts of the world.

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