

COCHINEAL

The Cochineal (*Dactylopius coccus*) is a scale insect in the suborder Sternorrhyncha, from which the crimson-colored dye carmine is derived. A primarily sessile parasite native to tropical and subtropical South America and Mexico, this insect lives on cacti from the genus *Opuntia*, feeding on plant moisture and nutrients.



The insect produces carminic acid that deters predation by other insects. Carminic acid, which occurs as 17-24% of the weight of the dry insects, can be extracted from the insect's body and eggs and mixed with aluminum or calcium salts to make carmine dye (also known as cochineal). Carmine is today primarily used as a food coloring and for cosmetics.

The carmine dye was used in Central America in the 15th century for coloring fabrics and became an important export good during the colonial period. After synthetic pigments and dyes such as alizarin were invented in the late 19th century, natural-dye production gradually diminished. Health fears over artificial food additives, however, have renewed the popularity of cochineal dyes, and the increased demand has made cultivation of the insect profitable again, with Peru being the largest exporter.

There are other species in the genus *Dactylopius* that can be used to produce cochineal extract, but they are extremely difficult to distinguish from *D. coccus*, even for expert taxonomists, and the latter scientific name (and the vernacular "cochineal insect") is therefore commonly used when one is actually referring to other biological species. The primary biological distinctions between species are minor differences in host plant preferences, in addition to very different geographic distributions.

Farming

A nopal cactus farm for the production of cochineal is traditionally known as a nopalry. There are two methods of farming cochineal: traditional and controlled. Cochineals are farmed in the traditional method by planting infected cactus pads or infecting existing cacti with cochineals and

harvesting the insects by hand. The controlled method uses small baskets called Zapotec nests placed on host cacti. The baskets contain clean, fertile females that leave the nests and settle on the cactus to await insemination by the males. In both cases the cochineals have to be protected from predators, cold, and rain. The complete cycle lasts 3 months during which the cacti are kept at a constant temperature of 27 °C (81 °F). Once the cochineals have finished the cycle, the new cochineals are ready to begin the cycle again or to be dried for dye production.



To produce dye from cochineals, the insects are collected when they are approximately ninety days old. Harvesting the insects is labor-intensive, as they must be individually knocked, brushed, or picked from the cacti and placed into bags. The insects are gathered by small groups of collectors who sell them to local processors or exporters.

Several natural enemies can reduce the population of the insect on its cacti hosts. Of all the predators, insects seem to be the most important group. Insects and their larvae such as pyralid moths (order Lepidoptera), which destroy the cactus, and predators such as lady bugs (Coleoptera), various Diptera (such as Syrphidae and Chamaemyiidae), lacewings (Neuroptera), and ants (Hymenoptera) have been identified, as well as numerous parasitic wasps. Many birds, human-commensal rodents (especially rats) and reptiles also prey on cochineal insects. In regions dependent on cochineal production, pest control measures have to be taken seriously. For small-scale cultivation, manual methods of control have proved to be the most effective and safe. For large-scale cultivation, advanced pest control methods have to be developed, including alternative bioinsecticides or traps with pheromones.

Uses

Traditionally cochineal was used for coloring fabrics. During the colonial period, with the introduction of sheep to Latin America, the use of cochineal increased, as it provided the most

intense color and it set more firmly on woolen garments than on clothes made of materials of pre-Hispanic origin such as cotton, agave fibers and yucca fibers. Once the European market had discovered the qualities of this product, their demand for it increased dramatically, and by the start of the seventeenth century it was traded internationally. Carmine became strong competition for other colorants such as madder root, kermes, Polish cochineal, Brazil wood, and Tyrian purple, as they were used for dyeing the clothes of kings, nobles and the clergy. For the past several centuries it was the most important insect dye used in the production of hand-woven oriental rugs, almost completely displacing lac. It was also used for painting, handicrafts, and tapestries. Cochineal-colored wool and cotton are still important materials for Mexican folk art and crafts.

Today, it is used as a fabric and cosmetics dye and as a natural food coloring. In artist's paints, it has been replaced by synthetic reds and is largely unavailable for purchase due to poor light fastness. When used as a food additive the dye must be included on packaging labels. Sometimes carmine is labeled as E120. A small number of people have been found to have allergies to carmine, ranging from mild cases of hives to atrial fibrillation and anaphylactic shock, with 32 cases documented to date. Carmine has been found to cause asthma in some people. Cochineal is one of the colors that the Hyperactive Children's Support Group recommends be eliminated from the diet of hyperactive children. Natural carmine dye used in food and cosmetics can render the product unacceptable to vegetarian or vegan consumers, many Muslims consider carmine-containing food forbidden (haraam) because the dye is extracted from insects, and Jews also avoid food containing this additive.

Cochineal is one of the few water-soluble colorants that resist degradation with time. It is one of the most light- and heat-stable and oxidation-resistant of all the natural colorants and is even more stable than many synthetic food colors. The water-soluble form is used in alcoholic drinks with calcium carmine; the insoluble form is used in a wide variety of products. Together with ammonium carmine they can be found in meat, sausages, processed poultry products (meat products cannot be colored in the United States unless they are labeled as such), surimi, marinades, alcoholic drinks, bakery products and toppings, cookies, desserts, icings, pie fillings, jams, preserves, gelatin desserts, juice beverages, varieties of cheddar cheese and other dairy products, sauces, and sweets. The average human consumes one to two drops of carminic acid each year with food.

A new U.S. Food and Drug Administration regulation will require all foods and cosmetics containing cochineal to declare it on their ingredient labels as of January 5, 2011.

Carmine is considered safe enough for use in eye cosmetics. A significant proportion of the insoluble carmine pigment produced is used in the cosmetics industry for hair- and skin-care products, lipsticks, face powders, rouges, and blushes. A bright red dye and the stain carmine used in microbiology are often made from the carmine extract, too. The pharmaceutical industry uses cochineal to color pills and ointments.

WWW.BOLIVIANLAND.NET