Cotton is a soft, fluffy staple fiber that grows in a boll, or protective case, around the seeds of the cotton plants of the genus *Gossypium* in the family of *Malvaceae*. The fiber is almost pure cellulose. Under natural conditions, the cotton bolls will tend to increase the dispersal of the seeds.[clarification needed]

The plant is a shrub native to tropical and subtropical regions around the world, including the Americas, Africa, and India. The greatest diversity of wild cotton species is found in Mexico, followed by Australia and Africa.[1] Cotton was independently domesticated in the Old and New Worlds.

The fiber is most often spun into yarn or thread and used to make a soft, breathable textile. The use of cotton for fabric is known to date to prehistoric times; fragments of cotton fabric dated from 5000 BC have been excavated in Mexico and between 6000 BC and 5000 BC in the Indus Valley Civilization. Although cultivated since antiquity, it was the invention of the cotton gin that lowered the cost of production that led to its widespread use, and it is the most widely used natural fiber cloth in clothing today.

Current estimates for world production are about 25 million tonnes or 110 million bales annually, accounting for 2.5% of the world's arable land. China is the world's largest producer of cotton, but most of this is used domestically. The United States has been the largest exporter for many years.[2] In the United States, cotton is usually measured in bales, which measure approximately 0.48 cubic meters (17 cubic feet) and weigh 226.8 kilograms (500 pounds)

Main article: Types of cotton

There are four commercially grown species of cotton, all domesticated in antiquity:

Gossypium hirsutum – upland cotton, native to Central America, Mexico, the Caribbean and southern Florida (90% of world production)

Gossypium barbadense – known as extra-long staple cotton, native to tropical South America (8% of world production)

Gossypium arboreum – tree cotton, native to India and Pakistan (less than 2%)

Gossypium herbaceum – Levant cotton, native to southern Africa and the Arabian Peninsula (less than 2%)

The two New World cotton species account for the vast majority of modern cotton production, but the two Old World species were widely used before the 1900s. While cotton fibers occur naturally in colors of white, brown, pink and green, fears of contaminating the genetics of white cotton have led many cotton-growing locations to ban the growing of colored cotton varieties.

History

Main article: History of cotton

Indian subcontinent

Indus Valley Civilization, Early Phase (3300-2600 BC)

The earliest evidence of cotton use in the Indian subcontinent has been found at the site of Mehrgarh and Rakhigarhi where cotton threads have been found preserved in copper beads; these finds have been dated to Neolithic (between 6000 and 5000 BC).[4][5] Cotton cultivation in the region is dated to the Indus Valley Civilization, which covered parts of modern eastern Pakistan and northwestern India

between 3300 and 1300 BC.[6] The Indus cotton industry was well-developed and some methods used in cotton spinning and fabrication continued to be used until the industrialization of India.[7] Between 2000 and 1000 BC cotton became widespread across much of India.[8] For example, it has been found at the site of Hallus in Karnataka dating from around 1000 BC.[9]

Mexico

Cotton fabrics discovered in a cave near Tehuacán, Mexico have been dated to around 5800 BC.[10] The domestication of Gossypium hirsutum in Mexico is dated between 3400 and 2300 BC.[11]

Peru

In Peru, cultivation of the indigenous cotton species Gossypium barbadense has been dated, from a find in Ancon, to c 4200 BC,[12] and was the backbone of the development of coastal cultures such as the Norte Chico, Moche, and Nazca. Cotton was grown upriver, made into nets, and traded with fishing villages along the coast for large supplies of fish. The Spanish who came to Mexico and Peru in the early 16th century found the people growing cotton and wearing clothing made of it.

Arabia

The Greeks and the Arabs were not familiar with cotton until the Wars of Alexander the Great, as his contemporary Megasthenes told Seleucus I Nicator of "there being trees on which wool grows" in "Indica".[citation needed] This may be a reference to "tree cotton", Gossypium arboreum, which is a native of the Indian subcontinent.

According to the Columbia Encyclopedia:[9]

Cotton has been spun, woven, and dyed since prehistoric times. It clothed the people of ancient India, Egypt, and China. Hundreds of years before the Christian era, cotton textiles were woven in India with matchless skill, and their use spread to the Mediterranean countries.

Iran

In Iran (Persia), the history of cotton dates back to the Achaemenid era (5th century BC); however, there are few sources about the planting of cotton in pre-Islamic Iran. The planting of cotton was common in Merv, Ray and Pars of Iran. In Persian poets' poems, especially Ferdowsi's Shahname, there are references to cotton ("panbe" in Persian). Marco Polo (13th century) refers to the major products of Persia, including cotton. John Chardin, a French traveler of the 17th century who visited the Safavid Persia, spoke approvingly of the vast cotton farms of Persia.[13]

China

During the Han dynasty (207 BC - 220 AD), cotton was grown by Chinese peoples in the southern Chinese province of Yunnan.[14]

Egypt

Though known since antiquity the commercial growing of cotton in Egypt only started in 1820's, following a Frenchman, by the name of M. Jumel, propositioning the then ruler, Mohamed Ali Pasha, that he could earn a substantial income by growing an extra-long staple Maho (Barbadence) cotton, in Lower Egypt, for the French market. Mohamed Ali Pasha accepted the proposition and granted himself the monopoly on the sale and export of cotton in Egypt; and later dictated cotton should be grown in preference to other crops. By the time of the American Civil war annual exports had reached $16 million (120,000 bales), which rose to $56 million by 1864, primarily due to the loss of the Confederate supply on the world market. Exports continued to grow even after the reintroduction of US cotton, produced now by a paid workforce, and Egyptian exports reached 1.2 million bales a year by 1903.

Europe

Cotton plants as imagined and drawn by John Mandeville in the 14th century

During the late medieval period, cotton became known as an imported fiber in northern Europe, without any knowledge of how it was derived, other than that it was a plant. Because Herodotus had written in his Histories, Book III, 106, that in India trees grew in the wild producing wool, it was assumed that the plant was a tree, rather than a shrub. This aspect is retained in the name for cotton in several Germanic languages, such as German Baumwolle, which translates as "tree wool" (Baum means "tree"; Wolle means "wool"). Noting its similarities to wool, people in the region could only imagine that cotton must be produced by plant-borne sheep. John Mandeville, writing in 1350, stated as fact the now-preposterous belief: "There grew there [India] a wonderful tree which bore tiny lambs on the endes of its branches. These branches were so pliable that they bent down to allow the lambs to feed when they are hungrie [sic]." (See Vegetable Lamb of Tartary.) By the end of the 16th century, cotton was cultivated throughout the warmer regions in Asia and the Americas.

The Vegetable Lamb of Tartary

Britain

Main article: Calico Acts

The English East India Company introduced the Britain to cheap calico and chintz cloth on the restoration of the monarchy in the 1660s. Initially imported as a novelty side line, from its spice trading posts in Asia, the cheap colourful cloth proved popular and overtook the EIC's spice trade by value in the late 17th

century. The EIC embraced the demand, particularly for calico, by expanding it's factories in Asia and producing and importing cloth in bulk, creating competition for domestic woollen and linen textile producers. The impacted weavers, spinners, dyers, shepherds and farmers objected and the calico question became one of the major issues of National politics between the 1680s and the 1730s. Parliament began to see a decline in domestic textile sales, and an increase in imported textiles from places like China and India. Seeing the East India Company and their textile importation as a threat to domestic textile businesses, Parliament passed the 1700 Calico Act, blocking the importation of cotton cloth. As there was no punishment for continuing to sell cotton cloth, smuggling of the popular material became commonplace. So dissatisfied with outcome of the first act; in 1721, Parliament passed a stricter addition, this time, prohibiting the sale of most cottons, imported and domestic (exempting only thread Fustian and raw cotton). The exemption of raw cotton from the prohibition initially saw 2 thousand bales of cotton imported annually, to become the basis of a new indigenous industry, initially producing Fustian for the domestic market, though more importantly triggering the development of a series of mechanised spinning and weaving technologies, to process the material. This mechanised production was concentrated in new cotton mills, which slowly expanded till by the beginning of the 1770's seven thousand bales of cotton were imported annually, and pressure was put on Parliament, by the new mill owners, to remove the prohibition on the production and sale of pure cotton cloth, as they could easily compete with anything the EIC could import.

The acts were repealed in 1774, triggering a wave of investment in mill based cotton spinning and production, doubling the demand for raw cotton within a couple of years, and doubling it again every decade, into the 1840's[15]

India's cotton-processing sector changed during EIC expansion in India in the late 18th and early 19th centuries. From focusing on supplying the British market to supplying East Asia with raw cotton. As the Artisan produced textiles were no longer competitive with those produced Industrially, and Europe preferring the cheaper slave produced, long staple American, and Egyptian cottons, for its own materials

Cultivation

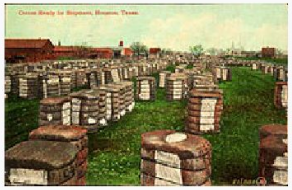
Cotton field

Cotton plant

A cotton field, late in the season

Cotton plowing in Togo, 1928

Picking cotton in Armenia in the 1930s. No cotton is grown there today.



Cotton ready for shipment, Houston, Texas (postcard, circa 1911)

Cotton modules in Australia (2007)

Successful cultivation of cotton requires a long frost-free period, plenty of sunshine, and a moderate rainfall, usually from 60 to 120 cm (24 to 47 in). Soils usually need to be fairly heavy, although the level of nutrients does not need to be exceptional. In general, these conditions are met within the seasonally dry tropics and subtropics in the Northern and Southern hemispheres, but a large proportion of the cotton grown today is cultivated in areas with less rainfall that obtain the water from irrigation. Production of the crop for a given year usually starts soon after harvesting the preceding autumn. Cotton is naturally a perennial but is grown as an annual to help control pests.[19]Planting time in spring in the Northern hemisphere varies from the beginning of February to the beginning of June. The area of the United States known as the South Plains is the largest contiguous cotton-growing region in the world. While dryland (non-irrigated) cotton is successfully grown in this region, consistent yields are only produced with heavy reliance on irrigation water drawn from the Ogallala Aquifer. Since cotton is somewhat salt and drought tolerant, this makes it an attractive crop for arid and semiarid regions. As water resources get tighter around the world, economies that rely on it face difficulties and conflict, as well as potential environmental problems.[20][21][22][23][24] For example, improper cropping and irrigation practices have led to desertification in areas of Uzbekistan, where cotton is a major export. In the days of the Soviet Union, the Aral Sea was tapped for agricultural irrigation, largely of cotton, and now salination is widespread.[23][24]

Cotton can also be cultivated to have colors other than the yellowish off-white typical of modern commercial cotton fibers. Naturally colored cotton can come in red, green, and several shades of brown.[25]

Harvesting

Offloading freshly harvested cotton into a module builder in Texas; previously built modules can be seen in the background

Cotton being picked by hand in India, 2005.

Most cotton in the United States, Europe and Australia is harvested mechanically, either by a cotton picker, a machine that removes the cotton from the boll without damaging the cotton plant, or by a cotton stripper, which strips the entire boll off the plant. Cotton strippers are used in regions where it is too windy to grow picker varieties of cotton, and usually after application of a chemical defoliant or the natural defoliation that occurs after a freeze. Cotton is a perennial crop in the tropics, and without defoliation or freezing, the plant will continue to grow.

Cotton continues to be picked by hand in developing countries.[43]

Top 10 Cotton Producing Countries (in metric tonnes)				
Rank	Country	2010	2012	2014
1	China	5,970,000	6,281,000	6,532,000
2	India	5,683,000	6,071,000	6,423,000
3	United States	3,941,700	3,412,550	3,553,000
4	Pakistan	1,869,000	2,312,000	2,308,000
5	Brazil	973,449	1,673,337	1,524,103
6	Uzbekistan	1,136,120	983,400	849,000
7	Turkey	816,705	754,600	697,000
8	Australia	386,800	473,497	501,000
9	Turkmenistan	230,000	295,000	210,000
10	Mexico	225,000	195,000	198,000
Source: UN Food & Agriculture Organization[151]				

Fiber properties

This section needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. (December 2012) (Learn how and when to remove this template message)

Property Evaluation

Shape Fairly uniform in width, 12–20 micrometers;

length varies from 1 cm to 6 cm (½ to 2½ inches);

typical length is 2.2 cm to 3.3 cm (⅞ to 1¼ inches).

Luster high

Tenacity (strength)

Dry

Wet

3.0–5.0 g/d

3.3–6.0 g/d

Resiliency low

Density 1.54–1.56 g/cm³

Moisture absorption

raw: conditioned

saturation

mercerized: conditioned

saturation

8.5%

15–25%

8.5–10.3%

15–27%+

Dimensional stability good

Resistance to

acids

alkali

organic solvents

sunlight

microorganisms

insects

damage, weaken fibers

resistant; no harmful effects

high resistance to most

Prolonged exposure weakens fibers.

Mildew and rot-producing bacteria damage fibers.

Silverfish damage fibers.

Thermal reactions

to heat

to flame

Decomposes after prolonged exposure to temperatures of 150 °C or over.

Burns readily.

Cotton fibers viewed under a scanning electron microscope

The chemical composition of cotton is as follows:

cellulose 91.00%

water 7.85%

protoplasm, pectins 0.55%

waxes, fatty substances 0.40%

mineral salts 0.20%

Cotton genome

This article may be too technical for most readers to understand. Please help improve this article to make it understandable to non-experts, without removing the technical details. The talk page may contain suggestions. (January 2011) (Learn how and when to remove this template message)

A public genome sequencing effort of cotton was initiated[69] in 2007 by a consortium of public researchers. They agreed on a strategy to sequence the genome of cultivated, tetraploid cotton. "Tetraploid" means that cultivated cotton actually has two separate genomes within its nucleus, referred to as the A and D genomes. The sequencing consortium first agreed to sequence the D-genome relative of cultivated cotton (G. raimondii, a wild Central American cotton species) because of its small size and limited number of repetitive elements. It is nearly one-third the number of bases of tetraploid cotton (AD), and each chromosome is only present once.[clarification needed] The A genome of G. arboreum would be sequenced next. Its genome is roughly twice the size of G. raimondii's. Part of the difference in size between the two genomes is the amplification of retrotransposons (GORGE). Once both diploid genomes are assembled, then research could begin sequencing the actual genomes of cultivated cotton varieties. This strategy is out of necessity; if one were to sequence the tetraploid genome without model diploid genomes, the euchromatic DNA sequences of the AD genomes would co-assemble and the repetitive elements of AD genomes would assembly independently into A and D sequences respectively. Then there would be no way to untangle the mess of AD sequences without comparing them to their diploid counterparts.

The public sector effort continues with the goal to create a high-quality, draft genome sequence from reads generated by all sources. The public-sector effort has generated Sanger reads of BACs, fosmids, and plasmids as well as 454 reads. These later types of reads will be instrumental in assembling an initial draft of the D genome. In 2010, two companies (Monsanto and Illumina), completed enough Illumina sequencing to cover the D genome of G. raimondii about 50x.[70] They announced that they would donate their raw reads to the public. This public relations effort gave them some recognition for sequencing the cotton genome. Once the D genome is assembled from all of this raw material, it will

undoubtedly assist in the assembly of the AD genomes of cultivated varieties of cotton, but a lot of hard work remains.