

COTTON, a word derived from *Kutn*, or *Ku'un*, one of the names given by the Arabs to this substance, is a filamentous matter produced by the surface of the seeds of various species of *Gossypium*. [GOSSYPIMUM.] It consists of vegetable hairs, of considerable length, springing from the surface of the seed-coat, and filling up the cavity of the seed-vessel in which the seeds lie. Hairs are extremely common on the surface of plants; frequently however they are unobserved, in consequence of their small number and minuteness; while on the other hand in some cases they give plants, such as the Mullein for instance, a remarkable hoary appearance. On the surface of seeds they are uncommon; and yet in the *Malvaceæ* and their allies, to which the cotton plants belong, they not only exist abundantly on the seeds of that genus, but in several other species. Vegetable hairs are one of the many forms in which the cellular substance of vegetation is developed, and they consequently partake of two of the great characteristics of that form of tissue, namely, thinness and transparency. In the cotton they are long weak tubes, which, when immersed in water and examined under the microscope by transmitted light, look like flat narrow transparent ribands, all entirely distinct from each other, and with a perfectly even surface and uniform breadth. At certain distances along the hair, an interruption occurs, which looks as if it proceeded from the turning round or twisting of the hair during its growth. On each side opposite these interruptions a slight indentation is observed. Sometimes a slight trace of fine grains is discernible in the interior, but more frequently the hairs seem empty. If strained singly they have little strength and readily break, and it is only when many are entangled together that they acquire any appreciable degree of strength. In all these points cotton differs from the vegetable matter that constitutes linen; the latter consists of woody tissue, in the state of long tubes, but is at once distinguished by the tubes adhering in bundles, which it is difficult under a microscope to break up into their component parts; the tubes are thick-sided, and will not acquire a riband-like appearance when viewed in water, but rather resemble extremely minute thermometer tubes. When they are jointed together the articulation is oblique, the ends of the tubes being pointed and overlying each other; and finally, in each particular tube of the woody tissue, delicate as it may be, there is a sufficiently appreciable degree of

toughness when an attempt is made to break it. In short, cotton is a development of cellular tissue. Linen is a form of vascular tissue. Hence it is easy to distinguish with certainty linen from cotton manufactured articles, in cases of doubt; and hence also the well-known superiority of linen to cotton in strength: the latter is manufactured from the most delicate part of plants, the former from the toughest. [TISSUES, VEGETABLE.]

Cotton is produced by many different species and varieties of the genus *Gossypium*, which consists of herbaceous or nearly herbaceous plants, varying in height from 3 or 4 to 15 or 20 feet, according to the sort. Sometimes the branches become woody, but they always partake very much of the herbaceous character. The leaves are downy and more or less lobed, being sometimes however near the top of the stem undivided; at their base is seated a pair of awl-shaped stipules. The flowers are either yellow or dull purple, and have the ordinary structure of the Malvaceous Family; each is surrounded by three heart-shaped bracts, which are more or less lacerated. The calyx is a bluntly 5-toothed cup. The seed-vessel is a capsule opening into from 3 to 5 lobes, and then exposing many seeds enveloped in cotton, which sometimes adheres to them so firmly that it is separated with difficulty; sometimes it parts freely from them; in some sorts it is long and in others comparatively short, giving rise to the commercial names of Long Staple and Short Staple.

The qualities of these hairs most valued by the manufacturer are length of staple, strength, and silkiness. In these respects cotton differs very much, and it is when these three properties are combined in the highest degree that the cotton obtains the highest prices in the markets.

Cotton-plants are found wild in both the Old and New World. Herodotus and Arrian speak of the cotton-plant as indigenous in India, and the cloth found in Peruvian tombs sufficiently attests its having existed in that country long before it could possibly have been carried to America by eastern intercourse. In fact the wild American cotton-plants are specifically different from those of the Old World; but at the present day the cotton of the West is cultivated in Asia and Africa, while that of the East has long since been introduced to the American plantations.

The situations in which cotton-plants have been advantageously cultivated are included between Egypt and the Cape of Good Hope in the eastern, and between the southern banks of the Chesapeake Bay and the south of Brazil, in the western hemisphere. It has not been found to succeed beyond the parallels that limit those countries. In the equinoctial parts of America Humboldt found it at 9000 feet elevation above the sea; in Mexico as high as 5500 feet; and Professor Royle saw it at the elevation of 4000 feet on the Himalayas. It seems generally to prefer the vicinity of the sea in dry countries, and the interior districts of naturally damp climates. Thus, while the best cotton is procured in India from the coast of Coromandel, or other maritime districts, and in the southern states of the American Union from certain coast-islands, the coast cotton of Pernambuco is inferior to what is produced in the interior of that country. These facts lead to the inference that it is not merely temperature by which the quality of cotton is affected, but a peculiar combination of heat, light, and moisture; the most favourable instance of which may be assumed to be the coast of Georgia and the Carolinas, and the worst to be Java and the coast of Brazil.

That this should be so would, in the absence of positive evidence, be probable, considering the nature of cotton. We have seen that it is a hairy development of the surface of the seed; and nothing in the organisation of plants is more affected by the situation they live in than their hairs: thus many water-plants which have scarcely any hairs, when transferred to a dry exposed station are closely covered with such organs, and *vice versa*. The quantity of hair is also affected in an extraordinary degree by local circumstances. The Venetian sumach-plant, when in flower, has its flower-stalks nearly naked; a large proportion of the flower stalks has no fruit, and becomes covered with very copious long hairs, whence the French call this plant *Arbre à Perruque*; but those flower-stalks which do bear fruit remain hairless. In this case the local cause is probably the abundant food thrown by the system of the sumach-plant into the flower-stalks for the nourishment of the fruit; and the fruit not forming, the food intended for it is expended in the formation of hairs upon the surface of the flower-stalk. This is only an accident, but local circumstances conducive to the formation of cotton in excess may be permanent, and derived from the situations in which the plants grow. In a damp cloudy climate the food procured from the soil may not be concentrated upon the surface of the seed, but may be expended in the production of excessive quantities of leaves, and of proportionally few flowers; or it may pass off into the atmosphere in the form of a mere exhalation, a small proportion only being consolidated; or in a dry climate the soil may not be able to furnish food enough to the plant out of which to form more cotton than it is absolutely its specific property to produce under any circumstances. Or, lastly, there may be a mean where the powers of vegetation are called into their utmost activity by warmth and abundant food, and where, nevertheless, the dryness of the atmosphere and the brightness of the sun, constantly acting upon the surface of the cotton pods (seed-vessels), may drive back the juices from the surface of the latter to that of the seeds, and

thus augment the quantity and improve the quality of the cotton itself; this may explain the action of climate upon this substance.

The question is however rather more complicated; the different specific qualities of different varieties of the cotton-plant must be also taken into account. A considerable number of varieties of cotton is certainly cultivated, although little is correctly known about them. In some of them the cotton is long, in others it is short; this has it white, that nankeen-coloured: one may be cultivated advantageously where the mean winter temperature does not exceed 46° or 48°, and another may require the climate of the tropics. This is just what happens with all cultivated plants. Some vines will produce only sweet wine, others only hard dry wine, and some are suited only to the table; some potatoes are destroyed by a temperature of 32°, while others will bear an average English winter; only one kind of wheat produces the straw from which the fine Leghorn plait for bonnets is prepared. But to multiply such instances is unnecessary. There can then be no doubt that the quantity and quality of cotton will depend partly upon climate and partly upon the specific properties of particular varieties.

The Cotton-Plant, or *Gossypium*, must not be confounded with the Cotton-Tree, *Bombax*, or *Eriodendron*. The latter has also cottony seeds, but they cannot be manufactured into cloth.

For further information see COTTON MANUFACTURE, in ARTS AND SC. DIV.

(Royle, *Illustrations of the Botany and other Branches of the Natural History of the Himalayan Mountains, and of the Flora of Cashmere*, article 'Malvaceæ'.)