

Japanese Civilization (Part 22)

The Old World Cottons

By Kawakatsu Heita

R. A. SILOW made extensive investigations into the genetic aspects of taxonomic divergence in the diploid Asiatic cottons. He maintained that; (a) taxonomically, the relationship between two cultivated Asian species, *G. arboreum* and *G. herbaceum*, was similar to that of the New World species, which reached full fertility in the current generations. Sterility was developed and two species were disintegrated later, and (b) *G. herbaceum* and *G. arboreum* were not only separated by a genetic barrier, but by ecological adaptabilities as well. There are three independent lines of evidence to confirm Silow's findings: (1) The species integrity was maintained when cultivated cottons were grown with commercial crops; *G. arboreum*

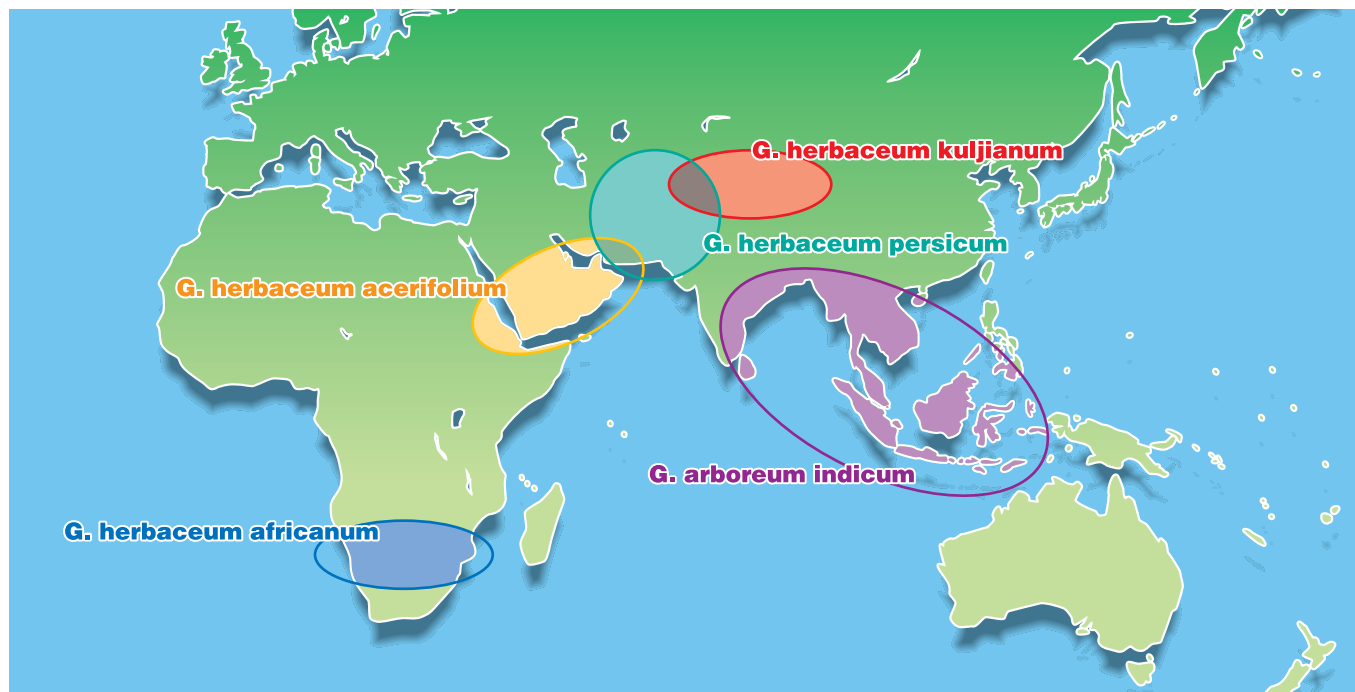
and *G. herbaceum* were commercially cultivated together in western India and in parts of Madras for many years without a breakdown of the species distinction; (2) Before the genetic distinction between *G. arboreum* and *G. herbaceum* was decoded, comprehensive and long-term efforts were made in Southern India to interbreed commercially acceptable cottons. These consistently failed to produce material of agricultural value, and it was remarked that "the better the single plant selection in any generation, the worse the segregates that appeared in its progeny." (3) In crosses made for the genetic analysis of species difference, a wide range of unbalanced types were created in segregating generations.

The Origin and Spread of the Old World Cottons

According to George Watt, "no species of *Gossypium* is known, in its original habitat, to be annual." Historical and botanical evidence clearly shows that the primitive cottons were perennial. Since cotton plants were originally long-lived perennials, the natural limits of genus distribution were fixed by climatic conditions favorable to this habit of growth.

As mentioned previously (Part 19), differentiation in the Old World complex of cultivated cottons led to the establishment of two clearly defined species, *G. arboreum* and *G. herbaceum*. Concerning the origin of both species, one conjecture is that the Indus civilization in the middle of 3000 BC effectively divided the area which formed the primary center of origin into two, because of the absence of a well-organized community to maintain irrigation facilities.

Figure 1 Distribution of the Old World cottons at the time of Marco Polo (13th century)



Source: Joseph Hutchinson, "The history and relationships of the world's cottons," *Endeavour*, 21 (1962):7

A radical transformation of cotton cultivation then occurred as a consequence of the intensification of agriculture: the establishment of the supremacy of annual cropping. Human selection of precocious crops for annual cultivation greatly extended the limits of the original perennial cottons.

However, in the 13th century all Indian cottons were yet perennials. The geographical distribution of the two species around the time of Marco Polo is shown in Figure 1. By that time *G. herbaceum* cotton had already spread to Persia and Central Asia, where the perennial cotton crop must have been very limited because of the severe winters. The sequence of development of annual varieties of *G. herbaceum* presents no difficulty once an annual type, which could be harvested before the cold winters, had been established.

In Persia, the annual persicum variety was developed to meet the limitations imposed by cold winters, and further

north the very short season kuljianum variety arose in response to selection in an area of short, hot summers and long, cold winters.

Later, when the advantages of the annual varieties became apparent in India, *G. herbaceum* was carried south to replace *G. arboreum* and gave rise to the wightianum variety in western India. The geographical distribution of *G. herbaceum* in the modern age is shown in Figure 2.

It was first believed that *G. arboreum* mutated from a cultivated stock of *G. herbaceum*, partly because there was no truly wild *G. arboreum* and *G. herbaceum* cell was more primitive than *G. arboreum*. This idea is rejected and what is now accepted is that the species were separately adopted from the wild.

According to Joseph Hutchinson, *G. arboreum* cottons were first domesticated in Gujerat. *G. arboreum* developed into six geographical varieties: soudanense in Africa, indicum in western

India and the peninsula, burmanicum in eastern Bengal, Assam and Burma, sinense in China, and bengalense in northern and central India. (Figure 3)

The species can be divided into two groups, namely, the indicum cottons and the burmanicum cottons. Bengalense and sinense arose from the two annual varieties.

Levant Cottons

The so-called Levant cotton belonged to the typical form of *G. herbaceum*, called persium. Hutchinson describes the characteristics of the crop:

“Small, annual sub-shrubs, with stiff stems and few or no vegetative branches.” Twigs and leaves sparsely hairy or glabrous. Leaves large, almost fleshy, very broad lobed (not more than half cut), flat. Bolls usually rather large and round, sometimes tapered and prominently shouldered; pale green, generally only cracking and remaining closed when ripe, sometimes opening widely.

Figure 2 Distribution of *G. herbaceum*

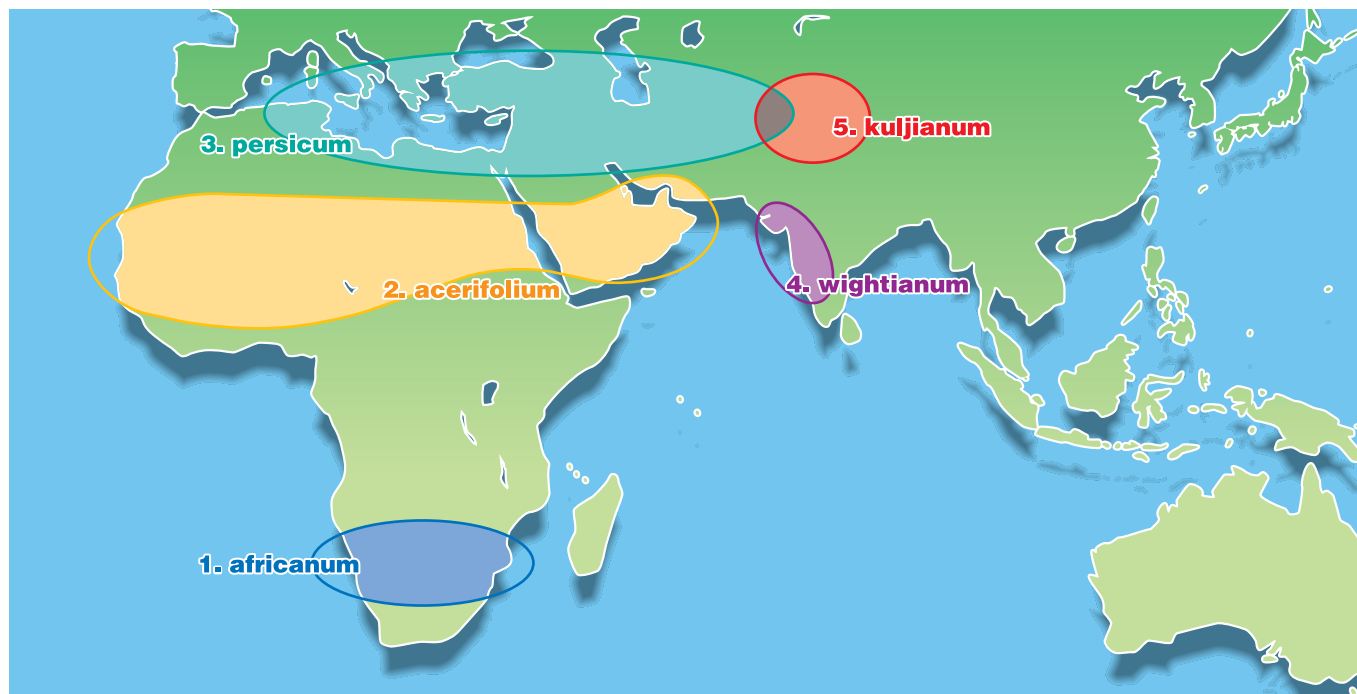
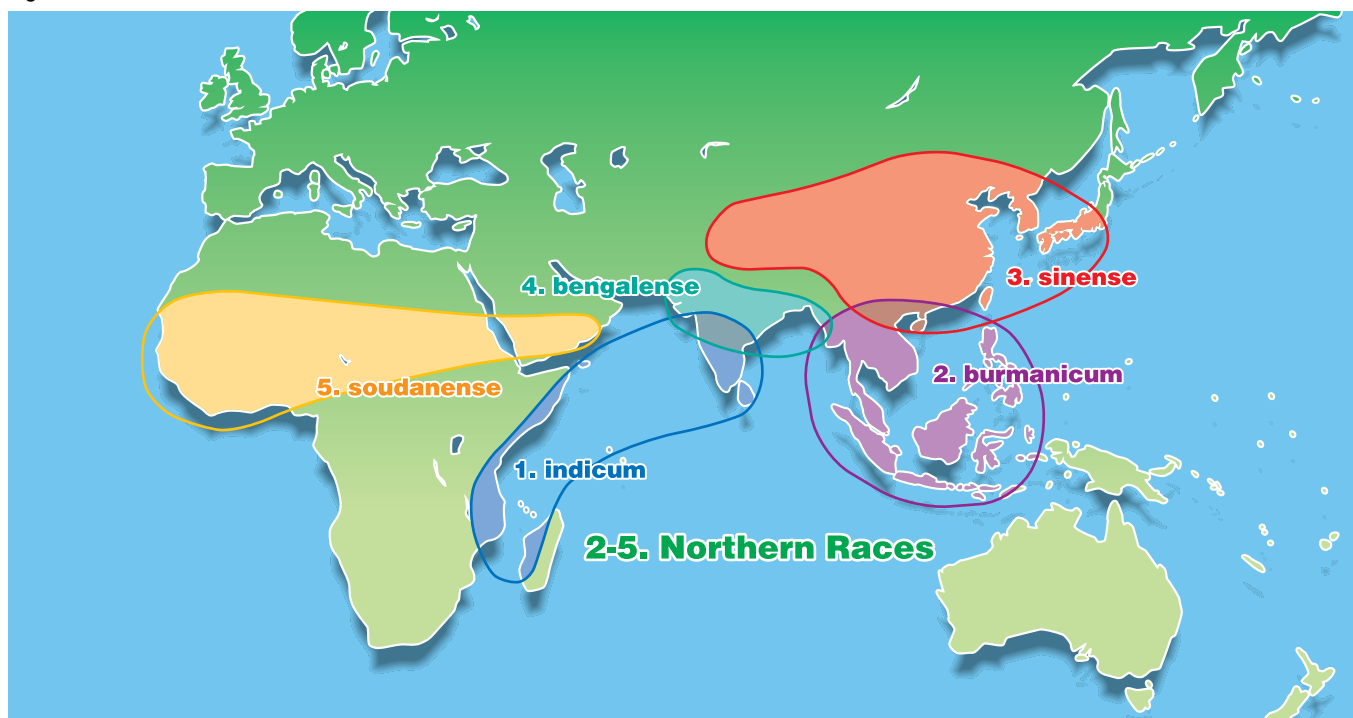


Figure 3 Distribution of *G. arboreum*

Source: Hutchinson, "New evidence on the origin of the Old World cottons," *Heredity*, 8 (2), (1954) : 235-6.

Seeds large, fuzzy. Lint copious, and of fair quality. Distribution: Iran and Baluchistan, Afghanistan, Russian Turkestan, Iraq, Syria, Turkey, Greece and the Mediterranean islands. It was widely spread around the Mediterranean by the Moslem invasion and was the earliest cotton cultivated in the Nile delta in Egypt."

Indian Cottons

The botanical study of cottons in India provides a clear indication that the former status of the ancient Indian cotton plant underwent a change from the 18th century. The old fine cottons (*G. arboreum* var. *neglectum* forma *Indica*) were replaced by coarse, high-ginning types of *G. arboreum* var. *neglectum* forma *Bengalensis*.

Marco Polo referred to the perennial cotton plant in Gujerat: "The growth of these trees is such that up to 12 years they produce for spinning, but from 12 to 20 an inferior fibre only." There

was less incentive to grow annuals in India than in more northern countries, and until the advent of the British in India, there appears to be no record of the cultivation of annual types.

The fine spinning and weaving commonly associated with Dacca muslins was made possible by the selection of fine-quality types among perennials. These cottons were developed from *G. arboreum*. Such cotton was fine in staple, and seemed to have been triennial, as Price reported in Dacca in 1844: "I found the triennial kind scarcely able to bear the weight of boll that was on it; it has a fine silky staple, and the *riots* or local farmers informed me that they get from 12 annas to a rupee per maund more for it than for the annual kind."

Referring to tests carried out on Dacca muslin, Nazir Ahmad stated that the mean fiber length of the cotton used in the manufacture of this fine material was found to be just about an inch, and the fiber-weight per inch was 0.12 to 0.15 x 10 oz. and the yarn was

so fine that there were only 10 to 15 fibers in a cross section of the yarn.

Although the Dacca muslins were the best known of India's fine textiles, fine spinning and weaving was carried on in all parts of India, and fine cottons, some of which were exported to Dacca, were grown to meet the demand. These cottons were of old Hindu perennials.

A change occurred in the Indian cotton crop, with the introduction of an annual variety of *G. herbaceum* cotton into India, probably from Iraq, a developing interest in the potential of annual production marked "the beginning of the second phase in the development of the Indian crop."

In general, the northern cottons were short and coarse, but they possessed a high ginning out-turn, whereas the *indicum* cottons were comparatively fine in staple but low in ginning out-turn. The selection of annual types of *G. arboreum* cottons gave rise to the annual *bengalense* of northern India,

which was a variety of the northern cottons and was a rather uniform group of early, high ginning, relatively coarse cottons. The spread of bengalense into all parts of India took place as a result of the demand for a high ginning percentage, but lowered the quality. The reasons for this change are: (a) a large export trade in raw cotton to China created preference for quantity over quality; (b) cheap machine-made cotton goods from England began to compete successfully with the fine hand-made local muslins, resulting in a reduction in the fine cotton cultivation. In 1844, Price, an American planter engaged by the government to investigate the state of cotton cultivation in Bengal, reported that:

“Sonergong is one of the principal manufacturing places in this district of the fine muslin fabrics, and I am informed, at one time cultivated a considerable quantity of the Dacca Kuppas, but whether for the loom becoming more profitable than the plough, or for the want of demand for that article, the riots appear to have entirely neglected cultivation as the lands on which they cultivated cotton at one time, are now, and have been for a length of time, a dense jungle.”

Moreover, (c) the mill industry in India which was concerned with coarse counts led to the development of a marked premium for ginning percentage as against the comparatively small advantage of high quality. Since there were no safeguards against adulteration, the self-defenced cultivator produced the high-ginning coarse cottons in place of the low-ginning types.

The coarse stapled bengalense spread in northern India during the 19th century, and was widely extended at the expense of finer indicum in the Central Provinces and northern Dacca, and

they displaced herbaceum cottons in parts of western India, too. It also spread to the indicum areas of Maharashtra and Andhra Pradesh at the expense of the Indicum. The area covered by bengalense was widely increased in the 19th century, and a great quantity of the cotton-growing area changed over from medium stapled to coarse-stapled.

At the beginning of the 20th century, the northern Bengalense, which had displaced the southern indicum so successfully in the Central Provinces and Khandesh, was introduced into the herbaceum tract of Kathiawar; under the name of Matthio, it spread until it made up a very large proportion of the Dhollera crop.

In the Punjab the development of the canal irrigation system greatly enhanced the area for cultivation. These extensions all involved an increase in the amount of coarse-stapled Indian cottons, and constituted a source of serious weakness to India's position in the cotton markets of the West. There were attempts to hybrid short-stapled Indian cottons and American uplands. However, because of the sterility barrier mentioned earlier, these were abortive. After the failure of the attempt to introduce American cottons at the time of the cotton famine, for the next half-century the Indian crop was virtually and entirely developed from *G. arboreum* and *G. herbaceum*.

■ The Far Eastern Cottons – Sinense

Of the Far Eastern countries, China was among the first to develop annual forms of arboreum, since most of the crop was grown in areas where the cold winters would preclude the growing of perennials on a field scale. Sinense

varieties are the earliest-fruited forms of the species and developed a distinctive character to separate them from the two main Indian types, Bengalense and Indicum.

R. A. Silow noted the botanic classification of the Far Eastern cottons that: in their extreme earliness and their glabrous tendency, the Far Eastern cottons were “establishing a norm distinct from that for the species in general, and they might well be separated under the name sinense.”

Distribution was confined to China, Japan, Manchuria and Formosa where no perennials can survive. Though a wide range of variation developed within the limits of the early habit imposed by a short growing season, sinense continued to be a new and extremely important source of variability, which led to the eventual establishment of a full varietal distinction within *G. arboreum*.

In China, Manchuria, Korea and Japan, only early annual cottons could survive, and the spread of cotton into that region followed the development of the early annual habit characteristic of sinense.

At the end of the Middle Ages, the Old World cotton which originated in India reached its maximum historical extent in the Eurasian continent, stretching from Spain to China, and on to Japan.

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(Continued in Part 23)

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Main References

Joseph Hutchinson, *The Application of Genetics to Cotton Improvement*, Cambridge, 1959
Evolution Studies in World Crops, Cambridge, 1974
 “New evidence on the origin of the Old World cottons” *Heredity* 8-2 1954
 “History and relationships of the world cottons” *Endeavour* 21, 1962
 Hutchinson et al., *Evolution of Gossypium*, Oxford, 1947

British Parliamentary Papers 1847 xlii (439)
 Kang Chao, *The Development of Cotton Production in China*, Cambridge, Massachusetts, 1977
 Marco Polo, *The Travels*, Penguin Books 1958
 R. A. Silow, “The genetics of species development in the Old World cottons,” *Journal of Genetics*, 1944
 G. Watt, *The Wild and Cultivated Cotton Plants of the World*, London 1907