

The genus *Capsicum* (Solanaceae) in Africa

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ABSTRACT

The genus *Capsicum* (Solanaceae) includes approximately 20 wild species and 4-5 domesticated taxa commonly referred to as 'chilies' or 'peppers'. The pre-Colombian distribution of the genus was New World. The evolutionary history of the genus is now envisaged as including three distinct lines leading to the domesticated taxa. The route of *Capsicum* to the Old World is thought to have followed three different courses. First, explorers introduced it to Europe with secondary introduction into Africa via further exploratory expeditions; second, botanical gardens played a major role in introduction; and third, introduction followed the slave trade routes. Today, pepper production in Africa is of two types, vegetable and spice. Statistical profiles on production are difficult to interpret, but the data available indicate that Nigeria, Egypt, Tunisia and Ghana are the leading producers. Production is mainly a local phenomenon and large acreage is seldom devoted to the growing of peppers. The primary peppers in Africa are *C. annum* and *C. frutescens*.

RÉSUMÉ

LE GENRE CAPSICUM (SOLANACÉE) EN AFRIQUE

Le genre *Capsicum* (Solanacée) inclut approximativement 20 espèces sauvages et 4-5 taxa domestiqués communément dénommés 'chilies' ou 'peppers'. La répartition pré-Colombienne du genre se situait dans le Nouveau Monde. L'histoire de l'évolution du genre est maintenant envisagée comme incluant trois voies distinctes conduisant aux taxa domestiqués. On pense que la migration des *Capsicum* vers le Vieux Monde a suivi trois voies différentes. En premier lieu, des explorateurs l'introduisirent en Europe, puis de là en Afrique, par le biais d'explorations ultérieures en second lieu, les jardins botaniques jouèrent un rôle majeur dans cette introduction et en troisième lieu, l'introduction suivit les routes de la traite des esclaves. Aujourd'hui, la production de *Capsicum* en Afrique est de deux types: légume et épice. Les données statistiques sur la production sont difficiles à interpréter, mais celles disponibles indiquent que le Nigeria, l'Égypte, la Tunisie et le Ghana sont les principaux producteurs. La production est surtout un phénomène local et il est rare que de larges superficies soient consacrées à la culture des *Capsicum*. Les principaux *Capsicum* en Afrique sont *C. annum* et *C. frutescens*.

Capsicum is a New World genus comprising approximately 20 wild species and 4-5 domesticated taxa (Eshbaugh, 1980a; Table 1). Hunziker (1956) divides the genus into the three sections *Capsicum*, *Pseudoacnistus* and *Tubocapsicum*. The monotypic section *Tubocapsicum* contains *C. anomalum*, which is native to Asia and is probably not a true pepper since it is nonpungent and has an atypical fruit for the genus. Furthermore, *C. anomalum* lacks certain natural chemical constituents that are present in all other New World peppers and act as predator retardants. The section *Pseudoacnistus* is also monotypic. Its single species, *C. breviflorum*, has the haploid chromosome number of $n=13$, whereas all true peppers are $n=12$. This species should probably be removed from *Capsicum*. Within the section *Capsicum*, *C. ciliatum* also has a chromosome number of $n=13$ (Pickersgill, 1977), lacks a pungent fruit, and has unusual yellow flowers atypical for the genus. These characteristics suggest that *C. ciliatum* is also not a true *Capsicum*. Other adjustments to a working concept of the genus will undoubtedly have to be made as the various taxa become better known.

The pre-Colombian distribution of the entire genus as defined in this paper is New World. *Capsicum* is a neotropical genus with horizontal range extensions into the subtropics and vertical

range extensions into the warm temperate regions of the Andes. The distributions of the domesticated taxa have been detailed by Heiser (1976), Pickersgill (1971) and Eshbaugh (1970, 1979). Heiser (1976) offers a map of the probable pre-Colombian distribution of the domesticated species which provides a working hypothesis which seems reasonable. Nonetheless, the archeological record for peppers is very incomplete. Pepper use can be dated to 7000 B.C. but the species being used is not always certain (Pickersgill, 1969a). Pickersgill (1969b) has traced the archeological record of chili peppers in Peru and indicates the presence of domesticated *C. baccatum* in the coastal region as early as 2500 B.C. Most species of peppers are confined to South America with an especially rich centre of diversity in Brazil. Many species of *Capsicum*, including *C. galapagoensis* (Ecuador) and *C. tovarii* (Peru), are narrow endemics. Perhaps the widest ranging species is *C. annum* var. *aviculare*, the bird pepper, which occurs from the Amazon to the southern border of the United States, from Arizona to Florida and throughout the Caribbean (D'Arcy & Eshbaugh, 1974).

The domesticated taxa now have a worldwide distribution but at the time Columbus discovered the New World they were much more narrowly distributed. *Capsicum annum* var. *annuum* was Mesoamerican (Pickersgill, 1971). *Capsicum baccatum* var. *pendulum* was restricted to zones west and east of the Andes (Eshbaugh, 1970; Pickersgill, 1971). *Capsicum pubescens* was a midelevational

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TABLE 1.—A synopsis of the genus *Capsicum* (Solanaceae) — after Hunziker, 1956, and Eshbaugh, 1980a, with additions and modifications

Strictly wild species		
<i>C. buforum</i> *	<i>C. dusenii</i>	<i>C. mirabile</i>
<i>C. campylopodium</i>	<i>C. galapagoensis</i>	<i>C. parvifolium</i>
<i>C. chacoense</i>	<i>C. geminifolium</i>	<i>C. scolnikianum</i> *
var. <i>tomentosum</i> *	<i>C. hookerianum</i>	<i>C. schottianum</i>
<i>C. coccineum</i>	<i>C. lanceolatum</i>	var. <i>flexuosum</i> *
<i>C. cornutum</i>	<i>C. leptopodium</i>	<i>C. tovarii</i> *
<i>C. dimorphum</i>	<i>C. minutiflorum</i>	<i>C. villosum</i>

Domesticated species and spontaneous forms (hypothetical wild ancestors or weedy derivatives)	
Domesticated	Wild/Weedy
<i>C. annuum</i> var. <i>annuum</i>	var. <i>aviculare</i> *
<i>C. baccatum</i> var. <i>pendulum</i> *	var. <i>baccatum</i> *
	var. <i>tomentosum</i> *
	(var.) <i>praetermissum</i> *
<i>C. chinense</i> *	(?), <i>C. frutescens</i>
<i>C. frutescens</i>	<i>C. frutescens</i>
<i>C. pubescens</i>	<i>C. cardenasii</i> *
	<i>C. eximium</i> *
	var. <i>tomentosum</i> *

* Taxa added since Hunziker's original treatment.

(2000–2500 m) Andean species (Eshbaugh, 1979). *Capsicum chinense* and *C. frutescens* were Amazonian (Pickersgill, 1971).

The domesticated taxa have a unique evolutionary history for seldom have five species been independently domesticated in different geographical regions from one small genus. Early authors recognized and named many supposedly distinct taxa. Other workers chose to lump all the domesticated taxa under a single name *C. frutescens* (Bailey, 1923) or *C. annuum* (Shinners, 1956). Investigations of the past 25 years have given us a much clearer understanding of the taxonomy and evolution of the domesticated species. The hypothesis that all the domesticated species arose from a single ancestor (Davenport, 1970; Jett, 1973) is no longer tenable. The opposite hypothesis that each domesticate arose from its own unique wild ancestor seems equally unlikely (Heiser *et al.*, 1971). A more likely hypothesis (Eshbaugh, 1980b) which envisages three distinct lines of evolution leading to three subgroups is suggested by data from plant breeding (Emboden, 1961; Eshbaugh, 1964, 1975; Pickersgill, 1971, 1980; Chennaveeraiah & Habib, 1966; Heiser & Smith, 1958; Smith & Heiser, 1957), numerical taxonomy (Pickersgill *et al.*, 1979), and isoenzyme analyses (Jensen *et al.*, 1979; McLeod, 1977; McLeod *et al.*, 1979a, 1979b).

The first of these subgroups, the 'purple flowered taxa,' includes the domesticate *C. pubescens* and two

closely related wild taxa, *C. cardenasii* and *C. eximium*.

The other two subgroups belong to the 'white flowered taxa'. One of these subgroups includes the domesticate *C. baccatum* var. *pendulum* and wild *C. baccatum* var. *baccatum* and var. *tomentosum* as well as *C. praetermissum*. Depending upon the treatment, *C. praetermissum* is seen as a distinct species or variety of *C. baccatum*.

The third group includes a complex of three domesticated taxa, *C. annuum* var. *annuum*, *C. frutescens*, and *C. chinense* and the wild forms of *C. annuum*, designated var. *aviculare*. The domesticated plants and most of the wild plants are easily classified into distinct species but in some wild plants the distinctions are blurred, perhaps indicating their origin in a single primitive species.

It appears that the domesticated peppers had their centre of origin in south-central Bolivia with subsequent migration and differentiation into the Andes and Amazonia (McLeod *et al.*, 1982).

At the time the New World was discovered the only domesticated species to be widespread in the West Indies were *C. annuum* and *C. frutescens*. Exploration along the east and west coast of South America established contact with *C. chinense* and *C. baccatum* var. *pendulum*. Contact with *C. pubescens* did not come until the explorers reached the Andes. For reasons that remain unclear, the latter two taxa

did not become part of the early exchange of plants between the hemispheres. *Capsicum baccatum* var. *pendulum* was introduced to the Old World in the 20th century, whereas *C. pubescens* is still confined to the more mountainous regions of southern Mexico, Central and South America.

The question arises, 'how did *Capsicum* reach the Old World and more particularly Africa?' The most likely explanation suggests several distinct routes for introduction. First, Columbus and other explorers, finding a spice as hot as anything known in Europe, collected this plant and moved it to Europe (Anghiera, 1555). From there the fruits and seeds were probably taken to Africa during the travels of the many explorers of that continent. The earliest introductions were most certainly *C. annuum* and *C. frutescens*. The Spanish and Portuguese were instrumental in the introduction of chilies into western Africa and the Congo Basin (Miracle, 1967). It is also possible that *Capsicum* was introduced as a by-product of trading, missionary work, or colonial invasion.

Second, it is likely that various European botanical gardens were instrumental in introducing *Capsicum* into the colonies of Great Britain, the Netherlands, and France. This remains to be documented. However, it has also been suggested that Arab traders moved *Capsicum* into east Africa. The third, and last important exchange route was by way of the slave trade. It is suggested (Pickering, 1879; McClure, 1982) that ship captains returning to the west coast of Africa introduced many West Indian plants, including perhaps *C. annuum*, *C. frutescens*, and probably *C. chinense*.

The early history of the introduction of *Capsicum* into Africa is not well documented and is somewhat unclear, but by the 1800's reports of *Capsicum* species began to appear in the literature. Hooker (1849) reported *C. annuum* to be a common

cultivated plant in Sierra Leone. Farquhar (1816) listed *C. annuum* and *C. frutescens* in his catalogue of exotic plants cultivated in Mauritius with the comment that *C. frutescens* was naturalized. Jardin (1891) mentioned the presence of wild *C. annuum* var. *aviculare* (= var. *minimum*) in Gabon with the vulgar name Ntogolo. Wherever *Capsicum* was introduced, it became popular as an easily grown cheap spice resource. Today, the market places of most African countries are brightened by quantities of peppers for sale.

Any consideration of pepper production in Africa poses certain difficulties. First and foremost is that reliable statistics are difficult to find and document. Second, peppers are grown for two different uses; first as a green vegetable crop and second as a condiment. In some countries the statistics for these two types of crops are merged while in others they are separate. Table 2 provides some data on area cultivated, yield, and production for green chilies in Africa. The three leading producers of these kinds of peppers are Nigeria, Egypt and Tunisia. However, such statistics fail to show how important red pepper is as a spice in native villages throughout Africa.

This is illustrated in the case of Zaire where production of green chili has been fairly consistent since 1977 at 17 000 metric tons (FAO, 1980). The statistics for 1968 do not indicate that peppers were an important crop at that time (World Atlas of Agriculture). Neither source has anything to say about pepper production as a condiment, yet it is clear (Miracle, 1967) that spice peppers were widely grown in Zaire at this time but primarily for local consumption. He reports that spice peppers have been cultivated throughout Zaire by various tribal peoples including the northern Mongo, a forest dwelling people, who grow the crop intermixed with bananas-plantains, peanuts, tobacco, and various vegetables and that they also have been grown by

TABLE 2.— Chilies + peppers, green production in Africa (adapted from the 1979 FAO Production Yearbook) (5/25/80)

	Area harvested (1000 ha)				Yield (kg/ha)				Production (1000 mt)			
	1969-71	1977	1978	1979	1969-71	1977	1978	1979	1969-71	1977	1978	1979
Africa	124	136	144	148	6649	6953	6858	6980	826	944	989	1032
Egypt	7	8	10	10F	17069	14828	15706	15894	127	123	156	165F
Ghana	28	19	22F	23F	3188	3026	2955	3043	88	59	65F	70F
Ivory Coast	2	3F	3F	3F	8034	7200	7200	7115	16	18F	18F	19F
Libya	1	4F	4F	4F	5373	2250	2250	2250	3	9F	9F	9F
Mauritius					3085	4286	5000	5000	1			
Nigeria	60	65F	67F	68F	8061	9077	8955	9118	484	590F	600F	620F
Sudan			1F	1F	7862	8696	8000	8000	3	4F	4F	4F
Tunisia	23	32F	34F	35F	4013	3906	3529	3657	91	125	120	128
Zaire	3	4F	4F	4F	4010	3951	3952	3953	13	16F	17F	17F

F = FAO estimate.

the northern and southern Songe; the Holohalo; the Lewale; the Banda, who use *C. annuum* as a vegetable and *C. frutescens* as a spice; the Lele, etc.

Another selected example that illustrates the potential for pepper production in Africa is the Malagasy Republic. Pepper production takes place along the south-eastern coast and amounted to 1 900 metric tons in 1965 (World Atlas of Agriculture, 1976). Virtually the entire crop is consumed locally and there is no export market. The crop represents both vegetable and spice peppers. Disease is a serious problem for the crop and may well limit its production. Nonetheless, *Capsicum* production is important and ranks among the top 15 crops for the country.

It is not the intent of this paper to consider production in Africa on a country by country basis. The cases of Zaire and the Malagasy Republic are offered here simply to illustrate several points. First, pepper production is of two types, vegetable and condiment. Second, the reporting statistics do not adequately indicate what kinds of peppers are being grown and for which of the two aforementioned purposes. Third, pepper production is, to a large extent, local and large acreages are seldom given over to growing the crop. Finally, *Capsicum* is rarely an important commercial crop anywhere in Africa.

Today, the most common type of peppers to be found in Africa belong to either the species *C. annuum* (vegetable) or *C. frutescens* (spice). *Capsicum chinense* is present in Africa, but is not nearly so widespread as the other two species which were almost certainly introduced into Africa in the 16th and 17th centuries. *Capsicum annuum* and *C. frutescens* seed is spread by birds. These species have become naturalized in southern Africa and most likely further north.

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