MAIZE HISTORY IN EUROPE

Pedro REVILLA

Misión Biológica de Galicia (CSIC). Apartado 28, 36080 Pontevedra, Spain

* previlla@mbg.csic.es

Received: September-19, 2025
Accepted: October-24, 2025
Published on-line: December-04, 2025

Citation:

Revilla P. 2025. Maize history in Europe. Mol 25: 4.

Abstract

Maize (*Zea mays* L.) has a complex and fascinating history in Europe, marked by cultural misconceptions, trade dynamics, and agricultural transformation. Initially mistaken for an Asiatic crop due to its introduction via Mediterranean trade routes dominated by Turks and Portuguese, maize was rapidly adopted across Europe following its discovery in the Americas. Early references to maize appear in 15th and 16th-century chronicles, herbals, and inventories, though confusion with other grains like millet and sorghum persisted. Despite speculation about pre-Columbian presence, most evidence supports its American origin and introduction by Spanish and Portuguese explorers. Maize spread slowly in Spain, particularly in Galicia and the northwest, where it became significant only in the 17th century, often in response to agricultural crises. Its adoption was influenced by factors such as climate adaptation, irrigation development, and food shortages. Over time, maize replaced traditional cereals and became a staple, especially in coastal and Mediterranean regions. By the 19th century, it was widely cultivated and studied, with its uses and benefits well documented.

Resumen

El maíz (*Zea mays* L.) tiene una historia compleja y fascinante en Europa, marcada por malentendidos culturales, dinámicas comerciales y transformación agrícola. Inicialmente confundido con un cultivo asiático debido a su introducción a través de las rutas comerciales mediterráneas dominadas por turcos y portugueses, el maíz se adoptó rápidamente en toda Europa tras su descubrimiento en América. Las primeras referencias al maíz aparecen en crónicas, herbarios e inventarios de los siglos XV y XVI, aunque persistió la confusión con otros cereales como el mijo y el sorgo. A pesar de las especulaciones sobre la presencia precolombina, la mayoría de las evidencias respaldan su origen americano y su introducción por exploradores españoles y portugueses. El maíz se extendió lentamente en España, especialmente en Galicia y el noroeste, donde adquirió importancia solo en el siglo XVII, a menudo como respuesta a crisis agrícolas. Su adopción se vio influenciada por factores como la adaptación climática, el desarrollo del riego y la escasez de alimentos. Con el tiempo, el maíz reemplazó a los cereales tradicionales y se convirtió en un alimento básico, especialmente en las regiones costeras y mediterráneas. Hacia el siglo XIX ya era ampliamente cultivado y estudiado, y sus usos y beneficios estaban bien documentados.

Key words: European maize, history, maize.

The origin (figure 1)

America was called the Indies by Columbus because he believed he had reached the southeast of Asia. Indeed, Columbus and all the Europeans that went to America during the last years of the

Fifteenth century believed that they had reached the Indies, and all the products brought back to Spain were considered of Asiatic or Indian origin. Therefore, even though it seems clear that maize was a new crop when first found by the European explorers of America, it was also clear that they considered maize as an Indian or Asiatic crop. By 1507, when Martin Waldseemüller nominated the new continent as America, maize was already grown in several European countries with the term Indian as part of its name. Moreover, since the main diffusion of maize was made by the Ottoman empire, people believed that the crop was actually Turkish. The commerce in the Mediterranean area was controlled by the Ottoman sailors, which had strong relationships with the Muslims from southern Spain to southeastern Asia. On the other hand, by that time, Portugal dominated the commerce between continents, and had established regular routes around Africa and Asia. Therefore, the American products introduced by the Spanish conquerors in Europe were carried all over the Old World by Turkish and Portuguese traders.

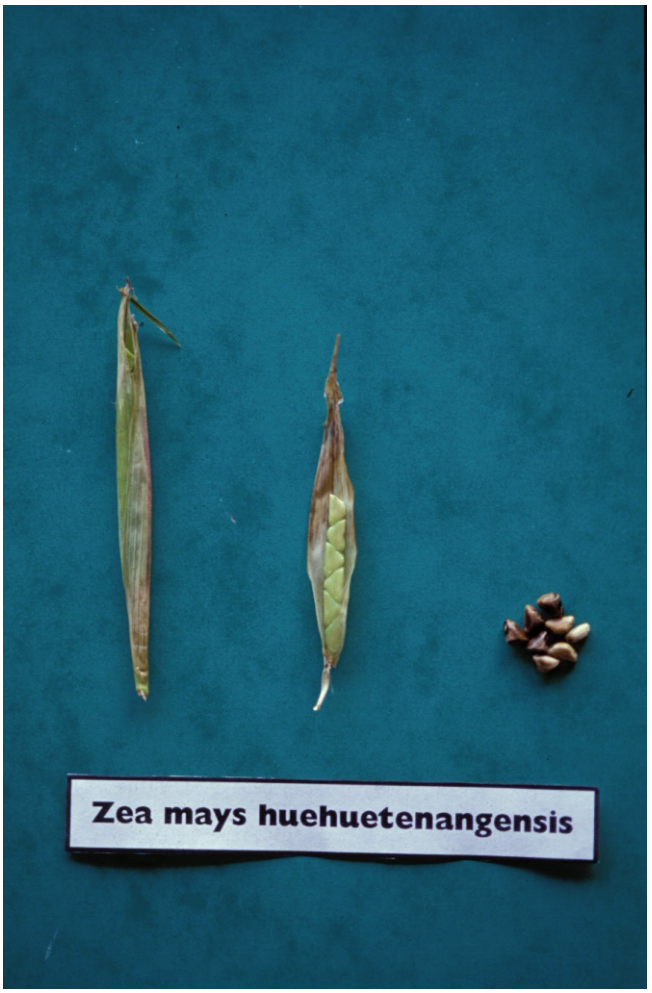

Figure 1. Teosinte, the American wild ancestor of maize

Unfortunately, most of the commercial relationships and interchanges were not recorded by historians and chroniclers because they devoted to wars, conquests and royal lives, rather than to the transcendental movements of people, animals and plants that changed the future of the people and the history of live. The written records of those days are due to travelers and writers such as the editor Valentim Fernandes, who wrote histories of ancient travelers and published the discoveries of the Portuguese explorers in Portugal, or Al-Hassan Ibn Mohammed Al-Wezaz, known as Leo Africanus, who wrote the History of the Arab conquest in Africa. Both mention maize in their text, although Valentim Fernandes uses the name milho zaburro, and Leo Africanus used an Arabic word that was translated as maize but could also have other translations, as previously reported for the Universal treaty of geography written by El Dikr al-aqalim. Leo Africanus mentions several crops he saw in

Africa, although we can never be sure that the imprecise names he used corresponded to maize. However, Grigg (1974) assures that maize was introduced by the Turks in Egypt soon after the invasion in 1517. We cannot be sure about the first introductions, and the evidences of maize cultivation are not consistent until the seventeenth century. For example, according to Hafnagel (1961) maize was introduced in Ethiopia by the seventeenth century, which was the time by which it was introduced in northwestern Spain, according to Perez-García.

The first documents

Desjardins and McCarthy mention several writers that refer to maize in Africa at the beginning of the sixteenth century. Some of them could be more or less reliable, while other use imprecise terms for designing the crops. Nevertheless, as soon as maize became a popular crop in southern Spain, it could have been spread through the Muslim civilization by traders, sailors, warriors, or pilgrims going to the Mecca from Spain and back home to southeastern Asia or any other area in the vast intercontinental Muslim territory.

The imprecise references to crops and foods made by occasional writers, plus the linguistic chaos causes by synonyms and doubtful translations do not allow to trace a rigorous history of maize in the Old World and the subsequent histories have been based on indirect proofs.

Few historical evidences support the pre-Columbian presence of maize in the Old World. After Bonafous, Sauer (1960) supported the pre-Columbian introduction of maize into Europe based on the early introductions of maize in Italy and the Balkans. Jeffreys (1971) become the most important supporter of pre-Columbian maize in Asia. Contrarily to other authors he cites, he clearly states that maize was originated in America, but he does credit the Arabs for the introduction of maize in Asia before Columbus. Jeffreys admit that the Portuguese could have introduced maize in Japan, but rejects the Spanish introduction of maize in Philippines. After identifying Turkey as the responsible for maize spreading in the Old World, Jeffreys reports the references to maize introduction in the Mediterranean countries, including the Iberian Peninsula and Italy. Jefreys (1971) conclusions outline the problem of when and how the pre-Columbian contacts could have happened. Mangelsdorf (1974) extensively discuses several studies suggesting pre-Columbian maize in the Old World, concluding that indisputable evidence was lacking.

Desjardins and McCarthy report the diverse and numerous uses of maize in Nepal, where people believe maize is an ancestral crop. It is hard to imagine how these people lived before maize introduction, although everybody knows that their civilization is several thousands of years older than maize cultivation in that area, irrespectively of who introduced the crop in Asia. Maize probably replaced several crops previously grown for all those traditional recipes and uses and, as anywhere else, it become so popular that, after a couple of generations, maize was considered as ancient as the oldest family.

Thirty years later, not only evidences of pre-Columbian maize in the Old World are still lacking, but also this hypothesis is not considered seriously by most scientists. The most striking evidence for this hypothesis was the discovery of sculptures of maize ears in Indian temples from the XIIth to XIIIth centuries (Johannessen and Parker 1989). These authors concluded that the sculptors should have used large numbers of maize eras in order to find the wide variability reflected in their sculptures. However, Payak and Sachan (1993) argued that “these temple sculptures do not represent maize ears but an imaginary fruit bearing pearls known in Sanskrit as Muktaphala”. These last authors support such conclusion with a deep discussion based on linguistic, religious sculptural, archeological, agricultural, and botanical evidences. Apparently, the evidence was discarded, but the large range of variability of shapes and appearances in maize ears allow the interpretation of several sculptures as maize ears.

Historical evidences

Most historical evidences support the alternative hypothesis of an American origin of maize and the role of Columbus expedition on introducing this crop into the Old World. Darwin had no doubt about the American origin of maize after he observed the cultivation of this crop during his voyage in the Beagle; and several archeological studies now support this believe (Desjardins and McCarthy). The first European document reporting the discovery of maize was probably the log-book of Columbus's first voyage, which apparently was lost, allowing the diffusion of conjectures that cannot be rejected with evidences. According to Weatherwax (1954) the first available European documents describing maize were a note from Nicolo Syllacio published in Pavia (Italy) in 1494, and the book "De Orbe Novo Decades" published in 1494 by Pedro Martyr. The description of a new crop in those documents probably refers to maize, although the authors do not know the name that would become common in most European languages for maize.

Sauer (1966) explains that, when the Spanish empire began in Central America, maize was of increasing importance as the conquerors approached the mainland. Columbus expedition made his first bread out of cassava, but maize was more convenient for larger conservation of maize. The conquerors brought maize and Indian women with then in order to have something to eat in their successive settlements. Maize become a common supply for them, and they actually brought a sample of maize back to Spain, where Peter Martyr (cited by Sauer 1966) planted and described the crop. Columbus described maize in his third voyage saying that he had brought that seed to Spain (Salvador de Madariaga 1940, cited by Finan 1950). Peter Martyr was the chronicler of Columbus' travels and reported the plant of maize in 1511 as a completely new crop, comparing the size of maize with peas (Finan 1950). The first descriptions of maize made by Coma (cited by Sauer 1966), Gómara, and Acosta (cited by Finan 1950), show that this plant was completely unknown to them because they compare the new crop to other crops they knew from their homeland, like pea, Panicum, cane, etc. They quickly knew that maize was very important for the natives because they produced good bread and a kind of wine, and they prepared many different dishes from maize. The Spanish explorers realized that this crop was a worthy source of provisions that replaced their original Spanish foods.

Around 1505 there is a reference to maize bread, where the crop is compared to the already established maize crops in the Balearic island, therefore, according to Sauer, maize was already cultivated in the Mediterranean at the beginning of the sixteenth century. As the Spaniards advanced through Central America, they often used maize for their nourishment, and they brought seed from a settlement to the next one, therefore, contributing to the diffusion of Caribbean races into Central American mainland. Actually, the Spaniards took some natives for growing maize seed that they had to bring as the expeditions were advancing towards new lands. The Spaniards learned from the natives how to make several foods and drinks out of maize, actually Bonafous (1836) found many common uses of maize between Spain and America.

Gonzalo Fernández de Oviedo visited America in 1513 and published the History of Indies in 1526, including a chapter on maize (Finan 1950). Later, Francisco López de Gómara visited America and wrote the General History of the Indies in 1552 with detailed descriptions of maize. These early reports and the subsequent references to maize "were describing it to a world which has never seen it" using familiar comparisons (Finan 1950). Oviedo speculated that maize could be the same plant as millet, described by Pliny in the first century (Cayo Plinio Segundo 1999) as brought from India. After Oviedo, several reporters tended to associate maize with the plants described by Pliny, which caused confusion among subsequent authors, like Lobelius, who first denied the American origin of maize (1576, cited by Finan 1950) and later (1605) mentions an American origin of maize. Oviedo reported that maize was grown in Avila (a town in the center of Spain) in 1530, whose description corresponds to the appearance of exotic maize grown in temperate regions.

Brandolini (1970) states that Columbus first observed maize in 1492 in the Bahamas, and maize was cultivated in Seville (South of Spain) in 1494, from where quickly expanded by the Mediterranean

area. Brandolini obtained this information from a text written by Peter Martyr in 1530 (cited by Brandolini 1970), where he describes maize as a totally new and unknown crop in Spain in 1494. According to this source, maize come to Spain with the second expedition of Columbus, which included eight Italians. One of them, Michele da Conti, wrote about maize in an Italian journal (Brandolini 1979). Maize was then introduced into Spain and the part of Italy belonging to Spain by the end of the fifteenth century. Columbus wrote that maize was grown in Spain by the time he came from his third voyage (Finan 1950). It is believed that maize was cultivated in Spain, as an ornamental plant by 1520 (Font Quer 2000). In 1525 Oviedo mentions that maize was growing near Madrid (Finan 1950; Bouza-Brey 1953). In Italy, the first reference to maize was made by Belon (1520, cited by Ceballos 1953). During the sixteenth century, maize was used as a curious exotic crop from America in the south of Spain and Portugal but, at the end of that century, several demographic and agricultural crises in northern Spain made people look for new solutions as the expansion of new crops like maize (Pérez García 1992).

Even though the first Spanish explorers were publishing their chronicles of the New World from the beginning of the sixteenth century, the first herbalist seem to ignore these chronicles when they describe maize in the herbariums of than time, and they did not mention that the origin of maize was America (Finan 1950). This discordance has confounded subsequent authors is some French and Italian publications in the eighteenth century cited by Ceballos (1953). This author says that the first botanist who assured the American origin of maize was the French author Berneud in 1918 and 1825. Finan (1950) review the presence of maize in the herbals of the sixteenth century and found maize first reported in the herbal of the German Bock in 1539, who called it “strange grain”; this botanist explains that the crop was new in Germany and probably came from India and he called maize “*Frumentum asiaticum*” trying to relate the new crop with the previous reports of Latin authors. A previous herbal written by Brunfels in 1530 did not mention maize. The first illustration of maize appears in the herbal of Fuchs, published in 1542, and that illustration was copied in further editions of Bock’s herbal. Fuchs reported that maize was grown in all German gardens by 1542 and come from Turkey, where it was used when other grains were scarce. Therefore, maize expanded through Germany in less than 12 years. According to Meyer (Iltis 2000), maize introduced from Asia, Turkey and Greece was cultivated in Germany in 1543. However, this crop was not successful in Britain, perhaps because the British did not like it (Greig 1996) or due to a lack of adaptation. Portuguese herbalists did not mention maize in their descriptions of flora from Portuguese colonies in Orient (Finan 1950).

Finan also writes that the American origin of maize was suggested for the first time in 1570 in the herbal of the Italian Matthiolus after the “General and Natural History” of Oviedo and other sources. The Spanish herbalist Monardes reports maize growing in America in 1569 (Finan 1950). Suggestions of botanists about the origin of maize were based on speculations transmitted orally, while the chronicles of America written by the Spanish explorers were based on their own observations. Finan (1950) reports a list of the different origins of maize suggested by them. Those theories can be summarized in the following way: there was a North American flint-type of maize brought into Europe from Asia and a Caribbean flint-type of maize brought from America via Spain.

Larramendi (1769) states that maize was introduced in the province of Guipúzcoa (north of Spain) before 1625, from where it expanded to other provinces. Although he does not mention the date of introduction, he states that the introduction was made by Gonzalo de Percáiztegui. According to Arocena (1933) this man lived from 1538 to 1576 and he has not possibly been in America. Murguía (1907) found the first concluding reference to maize in Galicia (the northwest of Spain) in documents of the Monastery of Sobrado in 1634, but never before. He believed that maize was generalized during the eighteen century. This reference was used by subsequent authors (Pérez García 1982). According to Carvallo (1864, cited by Bouza-Brey 1953), maize was introduced in the province of Auturias (north of Spain) during the first third of the seventeenth century. (Bouza-Brey (1953) assures that there was no previous mention to the presence of maize in Galicia (the northwest of Spain) before the

seventeenth century based on a previous publication of Murguía (1882, cited by Bouza-Brey 1953). Pérez García (1978) extensively reviewed the History of maize introduction into the northwest of Spain. He states that maize arrived to the south of Spain, from where passed to Portugal between 1525 and 1545.

The first reference about maize in Galicia found by Pérez García was in 1610. According to this author, maize was introduced in the northwest of Spain by the coast close to the border of Portugal and expanded towards the interior part of the region during the seventeenth century. Such expansion was fast in the coastal region up to 300 m above sea level. Coutinho (1917, cited by Bouza-Brey 1953) says that maize came to Portugal between 1515 and 1525. From Portugal maize arrived to the northwest and north of Spain. Bouza-Brey reports a document written by Amandi saying that Gonzalo Mendez de Cancio, governor of Florida in the sixteenth century imported maize from that American province to his original Spanish region, Asturias (north of Spain). Bouza-Brey says that he investigated this reference and found several documents that supported the introduction of maize by Mendez de Cancio in 1604. Irrespective of the reliability of this assertion, the introduction of maize in Asturies is associated to the crisis of the end of the sixteenth century (Pérez García 1992). Because of these crisis, northern Spanish regions become importers of cereals, but after the expansion of maize the crisis was palliated and by 1612 Asturias was exporting maize and by 1679 maize occupied more than half of the arable land in the northern coast. The crisis was less important in Galicia (the northwest) and the Basque Country (the central north), thus maize generalization was retarded in those areas (Pérez García 1992). Saavedra (1999) reports that when maize expanded in Galicia during the first half of the seventeenth century, many transformations were going on, such as an important increase in number of habitants, fragmentation of plots, and expansion of cultivated land. Such expansion was slow due to the large geographical diversity of that region.

An important crop

In the seventeenth century, in the north of Portugal maize was considered nurture for vulgar people (Vasconcellos 1936, cited by Bouza-Brey 1953). The low prestige of maize made food and the new requirements of the new crop might have produced some rejection among farmers and consumers at the beginning, limiting the expansion of maize cultivation (Pérez García 1982). On the other hand, maize expanded by the Mediterranean area during the sixteenth century from eastern Spain to the Balkans. Bouza-Brey (1953) assumes that maize was in Morocco by 1531 and was cultivated in France during the seventeenth century. Even though maize expanded so quickly, it was not a relevant crop in Italy until the end of the sixteenth century, and in Portugal, Spain, and France until the seventeenth century.

Apart of the speculations and anecdotes about introductions of maize in the Old World, maize did not become a significant crop until the seventeenth century in most European places. The crops grown in Europe in sixteenth century were not significantly different from those of the previous centuries. Actually, the crops mentioned in some books of agriculture from the fifteenth or sixteenth century are not very different from those reported in the first century after Christ by the Roman authors Cayo Plinio Segundo (1999) or Lucio Junio Moderato Columela (1979), or by the Arab author Abu Zacaria (1878) in the middle age. Books of agriculture published at the beginning of the sixteenth century in Spain (Herrera 1818) or Italy (Venuti 1516; Crescentio 1614), or at the beginning of the seventeenth century (Agustí 1988), however, mention crops that have been partially or totally replaced by maize and that may have been cause of confusion, mainly sorghum, millet and Panicum, but also wheat or other crops previously used as source of carbohydrates. The above-mentioned edition of Herrera, published in 1818, has some additions presumably written about the end of the seventeenth or beginning of the eighteenth centuries, where maize is considered as a regular crop. In fact, Herrera (1818) describes already a maize pest which description suggest *Sesamia nonagrioides* (Lef.), the main maize pest nowadays in the Mediterraneum area. Also, by 1836, when Bonafous wrote his Histoire Naturelle Agricole et Economique du Maïs, maize was already an important crop in most

Mediterranean countries, and many aspects of maize were deeply studied, from the origin to the diverse uses of maize in several European countries, where maize had become a traditional product (figure 2).

Figure 2. Mexican maize partially adapted to Pontevedra

Reliable data of area and production is not available until the twentieth century, however some information about maize cultivation can be found. In 1507, the inventory of goods made after the death of the third Duke of Medina Sidonia, reveals that maize brought from the Indies had been planted and harvested in Vejer, a town of the southern Spanish province of Cadiz (L.I. Álvarez de Toledo, Duchess of Medina Sidonia, personal communication). Pérez García (1978) reported some data from monasteries and churches. He studied the introduction of maize in the northwest of Spain based on the inventories of goods and similar documents. In the northwest of Spain, there are no references of maize in the inventories until 1631.

Apparently, the reasons for the delayed acceptance of maize as an important crop, could be lack of adaptation, which could have been palliated with the introduction of maize from higher American latitudes. Besides, maize was not immediately adopted by Europeans as food, because they had wheat and other cereals established since several centuries, and because the maize bread is too different from the wheat maize to be accepted as a substitute. Europeans had to be hungry in order to accept such a variation in their diet.

Pérez García (1978 1982) finds some relationship among agricultural crisis and establishment of maize, e.g. farmers accept a new crop when they need to try something new to overcome a deficit that they cannot solve with the traditional crops. In Northwestern Spain there were several recurrent crises during the seventeenth century, due to diseases and rapid demographic growth, that required new solutions to food production. In the coast of northwestern Spain, maize became a popular crop after 1634, replacing millet, wheat and rye. In the inner areas, maize was not present at all before 1630, but it was introduced slowlier than in the coast and the introduction followed the courses of rivers. Maize introduction in northwestern Spain was associated with intensive agriculture that tried to suppress fallow land and increase manure through higher animal production using marginal land. Also intercropping and alternation of maize with legumes played a role on new requirements of fertilization. Legumes were a crop of increasing importance in European agriculture, particularly common bean was probably introduced in Europe around 1500 (Zeven 1997). Once maize entered these regions, replaced the other crops in three to four years. As higher lands were reached, maize expansion became slower probably due to lack of adaptation. The main problem for the incipient crop was summer drought, and the solution was the development of irrigation systems that took place in that century. Although maize came to Spain earlier than to any other European country, this crop expanded slowly to most Spanish regions, while it was adopted quickly in many other countries around the Mediterranean Sea and towards the east, all the way to China.

Wheatherwax and Randolph (1955) document the fast expansion of maize with the reports of specimens collected in Italy in 1532 and in the Euphrates river in 1574. These authors credited the Portuguese for the introduction of maize along the western coast of Africa, India and China by 1575, and explained the phenomenal rapidity of this expansion by its superiority over most food plants of the Old World.

A detailed and complete history of maize in the Old World has been published by Desjardins and McCarthy and can be found at http://www.nal.usda.gov/research/maize/

References

Agustí M. 1988. Llibre dels secrets dàgricultura, casa rústica i pastoril. De. Alta Fulla. Barcelona, Spain.
Álvarez de Toledo L.I. África versus Amárica. La Fuerza del Paradigma. Centro de Documentación de Junta Islámica. Spain.
Arocena F. 1933. La introducción del maíz: Gonzalo de Percaztegui. Revista Internacional de Estudios Vascos 24 : 362-364.
Bonafous M. 1836. Histoire naturelle agricole et économique du maïs. Paris, France.
Bouza-Brey F. 1953. Noticias históricas sobre la introducción del cultivo del maíz en Galicia. Bol. Real Acad. Hist. 132: 35-72.
Brandolini A. 1970. Razze europee di mais. Maydica 15: 5-27.
Brandolini A. 1979. Origine, introduzione e difusione del mais. L'Italia agricola 116: 48-54.
Ceballos L. 1953. El maíz y la dura. Edit. Maestre. Madrid. Spain
Columela LJM. 1979. Los doce libros de Agricultura. Translated from Latin to Spanish by J.M.
Crescentio P. 1614. De agricultura vulgare. Biblioteca Capitular y Colombina. Sevilla, Spain.
Grigg DB. 1974. The Agricultural Systems of the World: an Evolutionary Approach. Cambridge University Press, UK.
Desjardins AE, McCarthy SA, Milho, Makka, and Yu Mai Early jeys of Zea mays to Asia. http://www.nal.usda.gov/research/maize
Finan JJ. 1950. Maize in the great herbals. Chronica Botanica Company, Waltham, Mass., U.S.A.
Font Quer, P. 2000. Plantas Medicinales. El Dioscórides Renovado. 2nd ed. Ed. Península, Barcelona, Spain.
Hafnagel HP. 1961. Agriculture in Ethiopia. FAO, Rome.

Iltis HH. 2000. Homeotic sexual translocation and the origin of maize (*Zea mays*, Poaceae): A new look at an old problem. Econ. Bot. 54: 7-42.
Herrera GA. 1818. Agricultura general. Imprenta Real. Madrid. Spain
Jeffreys MDW. 1971. Pre-Coumbian maize in Asia. Pp. 376-400. InRiley CL, Kellwy JC, Johannessen CL, Parker AZ. 1989. Maize ears sculptured in 12th and 13th century a.d. India as indicators of pre-Columbian diffusion. Economic Botany 43 : 164-180.
Larramendi M. 1769. Corografía o descripción general de la muy noble y muy leal Provincia de Guipúzcoa. San Sebastián, Spain.
Mangelsdorf PC. 1974. Corn its origin evolution and improvement. Harvard Univ. Press. Cambridge, Massachusetts. U.S.A.
Murguía M. 1907. ¿Cuándo se generalizó el cultivo del maíz en Galicia? Boletín de la Real Academia Gallega T. II.
Payak MM, Sachan JK. 1993. Maize ears not sculptured in 13th century Somnathpur temple in India. Economic Botany 47: 202-205.
Pérez García JM. 1978. Aproximación al estudio de la penetración del maíz en Galicia. En: La historia social en sus fuentes de protocolos. Univ. Santiago de Compostela, Spain.
Pérez García JM. 1982. O millo en Galicia: un estado da cuestion. Revista Galega de Estudios Agrarios 7/8 : 87-104.
Pérez García JM. 1992. Le maïs dans le nord-ouest de la péninsule Iberique durant l'ancient regime. Pp. 90. In : Flaran, plantes et cultures nouvelles en Europe occidentale au Moyen Age et à l'epoque moderne
Plinio Segundo C. 1999. Historia Natural. Translated from Latin to Spanish by F. Hernández. Visor Libros. Madrid, Spain.
Sauer CO. 1960. Maize into Europe. Acts Int. Americanist Congress 34: 777-787. Vienna.
Sauer CO. 1966. The early Spanish main. University of California Press, Berkeley and Los Angeles. California, U.S.A.
Venuti A. 1516. De agricultura opusculum. Biblioteca Capitular y Colombina. Sevilla, Spain.
Weatherwax P. 1954. Indian corn in old America. Macmillan, New York.
Zacaria A. 1878. Libro de Agricultura. Translated to Spanish by J. Banquery. Bioblioteca Científico Literaria. Sevilla, Spain.