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ORIGIN OF THE EUROPEAN CULTIVATED CARROT

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TAXONOMIC VIEWPOINTS

The cultivated carrot belongs to the genus *Daucus* L. This genus contains a great variety of wild forms. These grow mostly in the Mediterranean areas and in South West Asia, but some representatives are found in tropical Africa, Australia, New Zealand and the American continents.

As far as known cultivated forms have only been derived from the species *Daucus carota* L. Classification of the wild forms of this species is difficult because of a more or less continuous variation in the material. But THELLUNG (20) classifies them in two groups (*eucarota* and *gummiferi*) each consisting of five main types (subspecies). Plants of the group *eucarota* are mostly annuals or biennials; this group comprises the subspecies *maritimus*, *carota*, *maior*, *sativus* (cultivated carrot), and *maximus*. Plants of the group *gummiferi* are often perennials but they die after flowering once; this group includes the subspecies *commutatis*, *hispanicus*, *fontanesii*, *bocconei* and *gummifer*.

Daucus carota s.sp. *carota* is the commonest wild carrot of Europe and S.W. Asia. Once it was generally thought to be the direct source of the cultivated carrot. In the last century an experiment was recorded, in which, in a few generations, a cultivated carrot was bred from seeds collected from wild plants. But in other experiments this result was not obtained, if the wild seeds were collected in an area where previous hybridization between the wild plants and cultivated carrots was excluded (16, 25). So it must be concluded that in the first mentioned experiment the wild plants which, after selection produced a cultivated form, did so only because they themselves had previously been hybridized in nature with cultivated carrots. As the wild type of root is dominant over the cultivated type, the difference between a wild plant and a hybrid is not evident.

THELLUNG (34, 35) has suggested that it is much more probable that the cultivated carrot has developed from a crossing between *D. carota* s.sp. *carota* and *D. carota* s.sp.

maximus. He bases this opinion on the observation that most of the morphological characters of the cultivated carrot are intermediate between those of the two subspecies mentioned.

The subspecies *maximus* grows in inland regions round the Mediterranean. According to VAVILOV (36) there are gene-centres of *Daucus carota* in Asia Minor, Transcaucasia, Iran and Turkmenistan, and in addition in N.W. India, Afghanistan, Tadjikistan, Uzbekistan and western Tian-Shan. An unusually wide variety of cultivated forms is found in Anatolia. So it is possible that the subspecies *sativus* might have originated there.

ANCIENT WRITINGS

Studies in the history of horticulture have not revealed any indication that, in the ancient civilizations of Asia Minor, Egypt and Greece, the carrot had any importance as a food crop (16, 19, 23). It was certainly used as a medicinal herb, at least in Greece, but for this purpose improvement of the edibility of the root of the wild plants was unnecessary.

It is very probable that at the time of the Romans our type of carrot was still unknown as a food crop. As this opinion is not in compliance with that of most authors on this subject, I shall have to discuss the validity of their arguments.

REINHARDT (32) cites the poem "moretum" of VERGILIUS (78-19 B.C.), from which it appears that in the garden of a simple Roman farmer several crops were grown, among which were cabbage, beetroot, leeks, and in his opinion, also carrot. Checking the text of this poem in the edition of the Loeb Classical Library (12) reveals that VERGILIUS mentions the *siser*, which probably is the skirret, but certainly not the carrot.

REINHARDT (32) also cites PLINIUS (23-79 A.D.) from his Naturalis Historiae, to prove the existance of our cultivated carrot at that time. This quotation, according to REINHARDT, says that the emperor TIBERIUS (ruling from 14–37 A.D.) procured his carrots every year from a place in Germania. But here again the word siser is wrongly translated by carrot. That PLINIUS did not speak here of our cultivated carrot is definitely proved by his statement that the siser contains a hard and bitter core running through its whole length, which can be drawn out when it has been boiled, though nevertheless a great part of the bitterness remains (For PLINIUS see 17, 22, 31).

PLINIUS also mentions a cultivated carrot ("pastinaca") that is sown at the beginning of the spring or autumn, and is fairly good in the first year, but better in the second though still very pungent. Evidently he speaks of a perennial type of root crop. If this really belongs to *Daucus carota* it might be a member of the group *gummiferi*, as in this group the perennial character is known. This perennial character and pungency have never been observed as a regular feature in our type of cultivated carrot. Therefore it is incorrect to identify this cultivated "pastinaca" of PLINIUS with our cultivated carrot, as many authors do (5, 16, 19, 30).

PLINIUS knew another kind of "pastinaca", which the Latins called *Gallic pastinaca*, and the Greeks called *daucos*. This contained some different forms. These, however, are not described in book XIX which treats horticulture, but in book XXV which discusses medicinal plants. This proves that they did not belong to the food crops. Only the seed was used of all these forms, except one. The exception was the variety from

Creta, the root of which was valued. This was probably the so called *Daucus creticus* of ancient authors, which later was renamed *Anthamanta cretensis* L. as it was not a *Daucus* at all (10, 13, 20). Therefore, the conclusion of GIBAULT (16), that the Romans used our cultivated carrot, and that the adjective Gallic might suggest its origin in the Gallic lands (e.g. France) is not well founded.

GIBAULT (16) also thought to have recognized carrots in a reproduction of a mural painting of the Roman town Pompeï, that was covered by lava from Vesuvius in the year 79 A.D., and excavated in recent times. However, by checking the reproduction in Pitture d'Ercolano (1), one can be certain that the foliage of the two bunches of roots painted is not *Daucus carota* foliage.

So, of all the arguments I found none is valid. The Romans certainly grew crops with fleshy roots; possibly even some kind of perennial *Daucus* though this is not at all certain; but there is no indication that they knew our type of cultivated carrot (*Daucus carota* s.sp. *sativa*).

As the Romans carried on an extensive trade with a large part of the world, and brought to Italy anything of value, it is very probable that it was not present anywhere else at that time.

REVIVAL OF ROMAN SCIENCE IN EARLY-MEDIAEVAL EUROPE

After the deterioration of the Pax Romana in the fifth century the direct Roman influence in western Europe ended. For a number of centuries the situation was rather troubled and chaotic. But from the eighth and ninth century onwards monks from the south penetrated into the more northern European countries to bring Christianity, but also knowledge and crops from the declined Roman Empire. CHARLEMAGNE temporarily restored much of the former Roman political unity in continental western Europe. He reigned from 768–814, and did a lot to further agriculture and horticulture with the aid of the old Roman knowledge revived by the monks.

This is testified by a number of writings, the contents of which I have studied through VON FISCHER-BENZON (13).

This author mentions first the Hermeneumata. These were originally Roman instruction books for schools, and afterwards periodically copied by successive generations of monks. Among other things they contain a list of names of vegetables in Greek and Latin, and they say that the Latin name *pastinaca* is considered a synonym of the Greek names *stafilinos*, *karota* and *daukos*. But they do not tell us what kind of root crops are indicated by these names.

Then there are some communications from the ninth century. Two inventories of gardens from the time of CHARLEMAGNE have been saved. They contain several names of vegetables but nothing which reminds of a carrot. The Capitulare de villis imperialibus of CHARLEMAGNE is also known. This is a kind of instruction book describing the plants that he wanted grown in gardens. It mentions *carvitas* and *pastinacas*. It is assumed that these names mean carrot and parsnip respectively. Carvitas is thought to be a faulty copy of the name caroita which comes from carota. In the 14th century a carrot was called garroite in France (See 16). Here the o was also replaced by oi. But it is not certain, of course, that *carvitas* was originally *caroitas*.

From the above it is clear that the Greek-Roman names *carota* (or *carvita*) and

pastinaca were adopted, and probably the plants the Romans indicated by these names as well. There is no proof that they were actually grown. But if they were, it is still uncertain which plants they really were.

There are also communications from two monasteries. WALAFRIDUS STRABUS (807–849), who became abbot of the Benedictine monastery at Reichenau in 843, composed a hymn on agronomy and horticulture and on the plants grown then, but he did not mention anything that might be a carrot or a parsnip. In the building plan for a new monastery at St. Gallen near the lake Constance, which also contained the planting scheme for a vegetable garden, the name *pastinachus* is mentioned. What plant was meant is again uncertain. It may have been the parsnip or another plant the Romans called *pastinaca*.

The problem here is similar to that presented by the ancient Roman writings. There is no evidence that our type of cultivated carrot was known. Probably, with the revival of Roman science there was also a return of several plants known to the Romans.

That the carrot was not indigenous in Europe at that time is confirmed by the inventory of plants in the "Physica" of the holy HILDEGARD, who lived from 1098–1179, and was abbess of convents at Disibodenberg and Bingen. In this inventory the parsnip is mentioned (under the Latin name *Pastinaca* and the German name *Morkrut*), but not the carrot.

PREHISTORIC SEED FINDS IN EUROPE

Since a few millennia B.C. agriculture has been practised on the loess lands north and west of the Danube, stretching from Hungary to Northern Germany and from Galicia to Belgium and the south eastern point of the Netherlands, and on the black earth areas from the Balkans to the Dnieper in Southern Russia (6). During this long period there must have been ample opportunity to find a useful type of wild carrot, to improve it and derive a form worthy of cultivation from it. Indeed some authors have claimed the existence of an indigenous cultivated carrot in Europe before the time of the Romans (BERTSCH, 4).

They base this conclusion on the fact that *Daucus* seeds were found in some excavations of neolithic and bronze age sites in Switzerland and Southern Germany.

NEUWEILER (27) found a dozen seeds at the Utoquai in Zürich dating from about 2000–3000 B.C., and small quantities of seeds in many places in the ancient lake dwelling "Sumpf" near Zug from the late bronze period. In one case these *Daucus* seeds were sticking to a potsherd together with seeds of spelt, barley, broad beans and some other plants. This suggests that the *Daucus* seeds were not present by chance but had been put there intentionally.

BERTSCH (3) found two seeds on a neolithic site in the Schussen valley near Ravensburg, and he cites a find of seven seeds in a late neolithic lake dwelling in the Lake Constance.

NEUWEILER (27) also found some seeds at sites of ancient Celtic and Roman settlements in Switzerland.

From this evidence (especially Sumpf) it seems plausible to conclude that *Daucus* seeds were intentionally collected for human use at that time, but there is no proof, that they were collected for cultivation. Since it is known that in ancient times *Daucus* seeds were very generally used for medicinal purposes, it is much more probable that they were collected for medicinal use. The fact, that there is no definite evidence that

the Romans or the Europeans at the time of CHARLEMAGNE knew our kind of cultivated carrot supports this opinion.

PURPLE AND YELLOW CARROTS FROM THE ARAB COUNTRIES

The first clear description of carrots which are related to our present cultivated types comes from the Arab countries after the spread of Mohammedanism.

LAUFER (24) who studied the history of cultivated plants in Iran and China, concluded, after having criticized earlier authors, that the Persians became acquainted with the cultivated carrot in the 10th century A.D. He is of the opinion that there is no valid evidence that the carrot was known in India before that time. He cites a Chinese author who says that the carrot was introduced into China during the Yuan dynasty (A.D. 1260–1367), probably from Iran.

The communications of the Arab author IBN-AL-AWAM (7) are very interesting. He wrote a book on agriculture in Spain in the 12th century A.D., and cited still older authors. He includes pieces from a book on Nabathean agriculture, which according to CLÉMENT-MULLET (a translator of the book of AL-AWAM) was composed in the 10th century. The Nabatheans lived in the north-west fringe of Arabia, but the data in his book may apply to all Asia Minor.

According to this book the carrot is a plant the root of which is eaten, but not the foliage. There are two kinds, one is red, which is the most juicy and tasty, and the other has a green colour blending into yellow; the latter is coarser than the former. In the climate of Babylonia they are sown between August 26 and October 5, and grown during the winter season. Warmth deteriorates their tastiness and makes them acrid, whereas cold, irrigation with fresh water, frequent northern winds, and even snow are favourable. The carrot is eaten with vinegar, salt, olive oil, and certain vegetables or cereals. The common people also eat it instead of bread.

At Sevilla, in the Arab part of Spain, the carrots were also grown during the winter season.

During the following centuries more and more communications on carrots appeared in Europe. As the types that are described in the book of the Nabatheans can be recognized in the early European descriptions, and even many of the cooking recipes are more or less the same, it seems highly probable that the European carrots have been developed from material originating from the Arab countries.

Written documents prove the acquaintance with carrots in the 13th century in Italy, in the 14th century in France, Germany and the Netherlands, and in the 15th century in England.

PIER DE CRESCENZI (8), an Italian writer on husbandry, who lived 1231–1320, and probably wrote just after 1300, mentioned *Pastinaca sylvestris*, *Daucus creticus*, and a third 'pastinaca' that was red, and could be eaten raw, or cooked with turnips as a beautifully red compote.

GIBAULT (16) quoted from a 14th century French book, titled *Ménager de Paris* "Carrots are red roots which are bought in the market in bunches, and in every bunch a white one".

From the papers of a guild from the 14th century at Lübeck in Germany it appears, according to HOFMANN (21), that onions, garlic, cabbage, turnips, a kind of peas ('krickelarften') and carrots were grown there by the vegetable growers.

According to SANGERS (33) in the 14th century onions, garlic, cabbage and carrots were grown around most towns in the Netherlands. In 15th century documents from a convent at Rijnsburg near

Leyden he saw that the inhabitants had eaten 'white carrots' (probably parsnips) and red carrots.

ALICIA AMHERST (2) states that in a list of plants at the beginning of an English book of cooking recipes from the 15th century, under the heading 'rotys for a gardyn', karettes = carrots are also mentioned.

More detailed indications are found in some herbals and botanical works from the 16th, 17th and 18th centuries. A survey of the names, descriptions and drawings given herein has been composed in table 1.

As in the book of the Nabatheans, two types of carrots are described, a red type and a yellow one. From the colour-indications "brown red", "blackish red", "atrorubens" or "atrorubente" (= dark red), and "redder than a red beet", it is evident that the carrots that formerly were called red, were indeed purple, like red beet and red cabbage. In several writings of a somewhat later period, which will be discussed in a following article, it is said that the purple carrot is tender, juicy and tasty.

Orange red carrots appear at a much later date. As the first specimens of this new type were not praised for their tastiness or tenderness, the qualifications "tasty" and "tender" in writings prior to about 1700, given to a "red" carrot are another indication that the purple carrot is meant. Consequently the "red" carrot in the book of the Nabatheans must also be a purple one. In Egypt today they still grow a carrot variety with "small purple roots which are sweet and tender" (24a).

Lastly the following cooking recipes suggest a strong relation to the Nabathean recipe.

DE VILLE (37) writes in 1680: the roots are eaten fried or cooked with oil, salt or vinegar.

ELSSHOLTZ (11) says in 1684 that the Walloons, the French, the Brabanders, and the Hollanders cook the purple carrot in the ordinary way, or they make a winter salad from it. Therefore they are first cooked until soft in water, then peeled and sliced, and then vinegar, oil, salt and pepper are added. They can also be fried in different ways with butter and onions, or with flour and butter.

Similar recipes are found in the herbal of ZWINGER (38).

In conclusion it may be stated that all the evidence produced makes it highly probable that the initial European carrot material originally came from the Arab countries. The first carrots may indeed have been selected in the gene-centre of Anatolia.

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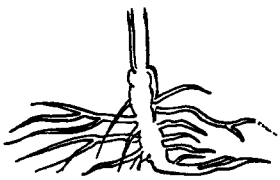
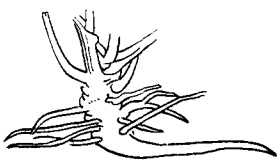
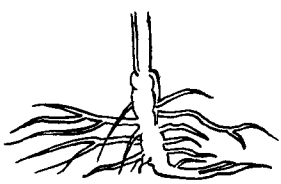
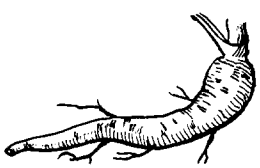
SUMMARY

1. Ancient and modern literature, as far as accessible to the author, has been studied to find indications of the origin of the European cultivated carrot.
2. Contrary to most writers on the same subject, it is concluded that there is no evidence that our type of cultivated carrot (*Daucus carota* s.sp. *sativa*) was known to the Romans, or to the Europeans at the time of CHARLEMAGNE (± 800 A.D.) or before.

TABLE 1. SURVEY OF NAMES, DESCRIPTIONS AND DRAWINGS OF CARROTS

Author	Time, locality	Purple carrot	Yellow carrot
FUCHS (14)	1543 Germany	Carote or Red Carrot (*Pastinaca sativa prima*) Root long and brown red. 	Yellow Carrot (*Pastinaca sativa altera*) Root long and yellow. 
DODOENS (9)	1554 Belgium Mecheln	Red Carrot or Carote (*Staphylinus niger*) Root long, thick, internally and externally brown red. 	Yellow Carrot (*Staphylinus luteus*) Root long, thick, internally and externally yellow. 
GERARDE (15)	1597 England London	Red Carrot or Black Carrot (*Pastinaca sativus tenuifolia*) Root long, thick, single, of a blackish red colour.	Yellow Carrot (*Pastinaca sativus tenuifolia*) Root long, thick, single, of a fair yellow colour. 
PARKINSON (29)	1640 England London	Common Red Carrots (*Pastinaca sativa altera tenuifolia atrorubens*). 	Common Yellow Carrots (*P. tenuifolia sativa lutea*). 

Author	Time, locality	Purple carrot	Yellow carrot
MUNTING (26)	1672 Netherlands Groningen	Red Carrot (*Daucus sativus radice rubra*)	Yellow carrot (*Daucus sativus radice lutea*)
DE VILLE (37)	1680 France Lyon	Red Carrot (*Pastinaca tenuifolia sativa, radice atrorubente*) 	
NYLANDT (28)	1682 Netherlands Amsterdam		Yellow Carrot (*Pastinaca tenuifolia sativa lutea*) Root long, thick.
ZWINGER (38)	1774 Switzerland Basel	Red Carrot (*Pastinaca tenuifolia, sativa radice atrorubente or Carota rubra*) Root as large or larger than that of the yellow carrot; completely red, even much redder than the root of the red beet. 	Yellow Carrot (*Pastinaca tenuifolia sativa, radice lutea vel alba or Pastinaca sativa lutea*) Root one foot long, round, juicy, thick, yellow. 

3. It is highly probable that the initial European carrot material originally came from the Arab countries, and found its way into Europe in about the 13th and 14th centuries.

SAMENVATTING

Oorsprong van de Europese cultuurwortel

1. Oude en nieuwe literatuur, voor zover toegankelijk voor de schrijver, is bestudeerd om aanwijzingen te vinden over de oorsprong van de Europese cultuurwortel.
2. In tegenstelling met de meeste schrijvers over hetzelfde onderwerp, wordt geconcludeerd dat er geen houdbaar bewijs is dat ons type cultuurwortel (*Daucus carota* s.sp. *sativa*) reeds bekend was aan de Romeinen of aan de Europeanen ten tijde van KAREL DE GROTE (± 800 n. Chr.) of daarvoor.
3. Het is zeer waarschijnlijk dat het eerste Europese wortelmateriaal in oorsprong afkomstig was uit de Arabische landen, en zijn weg in Europa heeft gevonden omstreeks de 13e en 14e eeuw.

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