



A Brief Review on the Early Distribution of Pea (*Pisum sativum* L.) in Europe

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Summary: Pea was a part of the everyday diet of the European hunter-gatherers at the end of the last Ice Age. The major criteria to determine the domestication in pea are non-dehiscent pods, larger seed size and smooth seed testa. Pea seeds were found among the earliest findings of cultivated crops at the site of Tell El-Kerkh, Syria, from 10th millennium BP. Along with cereals and lentil, pea has definitely become associated with the start of the 'agricultural revolution' in the Old World. Pea entered Europe in its south-east regions and progressed into its interior via Danube. Its distribution was rapid, since the available evidence reveals its presence in remote places at similar periods. The linguistic evidence supports the fact that pea had been present in nearly all regions of Europe. Most of European peoples have their own words denoting pea, meaning that it preceded the diversification of their own proto-languages.

Key words: archaeology, crop history, distribution, Old Europe, pea, *Pisum sativum* L.

Introduction

Legumes (*Fabaceae* Endl.) are one of the richest plant families in the world, extending with hundreds of genera and thousands of species over all continents. Numerous members of this family have economic importance and have been used for diverse purposes, including human consumption, animal feeding and green manure, for millennia (Mikić et al. 2006). One of such species is pea (*Pisum sativum* L.), being one of the most widespread and most cultivated annual legume crops, especially in temperate regions (Mikić et al. 2007).

The aim of this brief review is to remind the pea research community on a part of its rich history, as well as to encourage further archaeological research and its integration into a holistic legume history of the Old World.

Centres of Origin

It is widely accepted that many of the traditional European grain legumes, such as chickpea (*Cicer arietinum* L.), lentil (*Lens culinaris* Medik.) and common vetch (*Vicia sativa* L.) originate primarily

from the Near Eastern centre of diversity. Among them is pea, with the Near Eastern centre as the primary, while both Mediterranean and African are considered the secondary centres or diversity (Zeven & Zhukovsky 1975).

An abundant presence of the wild taxa of pea, such as red-yellow pea (*Pisum fulvum* Sm.), as well as of beautiful vavilovia (*Vavilovia formosa* (Stev.) Fed.), the closest relative of the genera *Pisum* L. and *Lathyrus* L. (Kenicer et al. 2009), in the local floras of the Near East region, may be regarded as another testimony that it was the very centre of an eventual distribution of pea in all directions. It is considered that the phenomenon of pod dehiscence, present in pea and other related genera, with an ability of shattering the seeds up to 2 m in diameter, significantly contributed to the spreading of these species.

The only wild or semi-wild taxon of pea present in Europe is tall pea (*Pisum sativum* L. subsp. *elatius* (Steven ex M. Bieb.) Asch. & Graebn. var. *elatius* (Steven ex M. Bieb.) Meikle), that still may be found in southern regions of the Balkans and the Black Sea coast, i.e. in Greece, Bulgaria and Serbia, with latter as the northernmost border of its areal (Mikić et al 2009a).

Process of Domestication

Grain legumes, including pea, had been known to humans before they became cultivated. Together with vetches (*Vicia* spp.) and vetchlings

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(*Lathyrus* spp.), pea was a part of the everyday diet of the hunter-gatherers at the end of the last Ice Age in Europe, as witnessed by the remains from the site of Santa Maira, Spain, from 12,000–9,000 BP (Aura et al. 2005).

In all plant species, the process of domestication led to certain morphological changes that, in many aspects, strongly resemble the methods of selection used in contemporary plant breeding programmes (Ljuština & Mikić 2008). In grain legumes, the major criteria to determine the domestication are non-dehiscent pods, larger seed size and smooth seed testa.

It seems that the pea gene *Dpo*, controlling pod dehiscence (Weeden et al 2002), underwent modifications during the domestication and thus became responsible for the development of non-dehiscent genotypes. Larger seed size in cultivated forms in comparison to that in wild ones is not typical only for grain legumes, but is often very hard to interpret. A smooth testa, due to the domestication, is the most reliable characteristic in telling wild from cultivated forms (Butler 1998).

Apart from these three major indicators, there are several other indicators of the pea domestication, such as absent seed dormancy, dwarf growing habit, less prominent basal branching, neutral photoperiodical reaction and improved grain quality (Weeden 2007).

The remains of domesticated grain legumes often occurring at high frequencies during the 10th and 9th millennia (Willcox et al. 2007) may contribute to the possibility that the domestication of grain legumes could predate cereals (Kislev & Bar-Yosef 1988). However, little is known about the early stages of pulse domestication and there is very little evidence of how, when and where they were domesticated, mostly due to a fact that all those changes, being mostly morphological, have not survived to the present day.

Among the earliest findings of cultivated grain legumes is the site of Tell El-Kerkh, Syria, from 10th millennium BP, with the seeds of lentil, bitter vetch (*Vicia ervilia* (L.) Willd.), chickpea, grass pea (*Lathyrus sativus* L.), faba bean (*Vicia faba* L.) and pea (Tanno & Willcox 2006).

Conquest of Europe

It is quite certain that pea was one of the most ancient crops that entered Europe, after it had become more suitable place for living again, following the end of the last Ice Age. Thus pea, along with several cereals and lentil (Ljuština &

Mikić 2010), has definitely become associated with the start of the 'agricultural revolution' in the Old World (Erskine 1998).

Pea entered Europe in its south-east regions and roughly progressed into its interior via Danube. Its distribution was a rapid one, since the available evidence reveals its presence in mutually remote places at similar periods. It is only Iberian Peninsula where *Lathyrus* crops seem to be most abundant of all grain legumes including pea (Mikić et al 2009b).

The following selection of archaeological findings offers nice examples that confirm the extreme importance pea had in the primeval European agriculture.

5790-5630 BC, Kovačevo, southeast Bulgaria. The final early Neolithic site in southwest Bulgaria, with lentil, grass pea, chickling vetch (*Lathyrus cicera* L.) and bitter vetch found along with pea and several cereal species (Marinova & Popova 2008).

5600-4300 BC, south-western Germany. The results of more than 100 archaeobotanical investigations from this region reveals that pea was one of the commonest pulses, with similar curves with high presence values in the early Neolithic, the Bronze and Iron Ages and in the early Medieval period and most frequent in the early Neolithic and in the Bronze Age (Rösch 1997).

5470-5260 BC, Aknashen, Armenia. A still disputable presence of pea, along with lentil and bitter vetch, could be an evidence of the pea distribution to the opposite, easternmost, regions of Europe (Hovsepian & Willcox 2007).

5000-4800 BC until 600 AD, the modern Paris area, France. Here pea was one of the first introduced crops, along with lentil and cereals (Bakels 1999).

3900 BC, Lake Constance, southern Germany. In a Neolithic village Hornstaad Hürrle I A, there were found carbonised seeds and non-carbonised pods (Maier 1999).

3400-3300 BC, Lake Biel, Switzerland. A Late Neolithic site where the small numbers of peas was found, as another confirmation that due to poor preservation it is not possible to reliably indicate the role of peas in this period (Brombacher 1997).

2750-2500 BC, an Early Bronze age site of Arslantepe, Malatya, central Turkey. According to the present evidence, pea was used much less than chickpea and equally to lentil (Sadori et al 2006), with no evidence that it was grown there, but perhaps imported from somewhere else. This could lead to a conclusion that pea in some

regions, such as this one, just passed through further and was not truly cultivated.

1600-1300 BC, a Bronze Age Vatin culture settlement of Židovar, Banat, northern Serbia. Archaeobotanical research of this multi-layered site revealed that pea was in use along with other grain legumes, such as lentil or vetch (Medović 2003). Pea was cultivated in the Serbian section of Danube quite early (Renfrew 1979) and was found in the sites such as the Neolithic Starčevo, the Neolithic - Early Iron Age - La Tène site of Gomolava (Van Zeist 2001/2002), the Bronze and Early Iron Age site Feudvar (Kroll 1998) and the Early Iron Age site of Gradina upon Bosut (Medović 2010).

700-200 BC, a Celtic, La Tène site in Dürrnberg, Austria. Here, in a salt-mining and metal-working settlement, pea was used as a sole legume with cereals, significantly contributing to the quality of miners diets (Swidrak 1999).

600-400 BC, four late Hallstat and early La Tène sites in Baden-Württemberg, Germany. Together with lentil, bitter vetch and faba bean, pea was an important crop in everyday nutrition (Stika 1999).

100-200 AD, a Gallo-Roman cemetery in Moselle, France. Pea seeds were found among the other crops as grave offerings. (Preiss 2005).

The linguistic evidence supports the fact that pea had been present in nearly all regions of Europe before the modern European language families were developed. Peoples like Indo-Europeans, Turkic, Caucasians or Basques, each have their own words denoting pea, meaning that it preceded the diversification of their own proto-languages into their contemporary descendants (Mikić 2009). Similar is with other most ancient legume crops, such as lentil (Mikić 2010). Among the most ancient words denoting pea in European languages are the Proto-Indo-European **kek-*, the Proto-Turkic **burčak*, the Proto-Caucasian **qōr'ā* and the Proto-Basque **ilhar* (Mikić et al 2008).

Conclusions

As one of the most ancient crops in the world, pea played an important role in the introduction of agriculture in post-glacial Europe, often representing the main pulse in the diets of local communities across the continent. The future research on this subject certainly must make a more detailed map of its paths over Europe and, especially, its long-term and essentially important ties with the pea domestication and distribution in Asia Minor, Near East and North Africa.

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Kratki pregled ranog širenja graška (*Pisum sativum* L.) u Evropi

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Izvod: Grašak je predstavljao deo svakodnevne ishrane evropskih lovaca-sakupljača krajem poslednjeg ledenog doba. Glavni kriterijumi za određivanje odomaćivanja graška su nepucajuće mahune, krupno seme i glatka semenjača. Semena graška pronađena su među najstarijim ostacima gajenih biljaka na lokalitetu El-Kerk u Siriji, starosti 10,000 godina. Zajedno sa strninama i sočivom, grašak je odigrao ključnu ulogu u otpočinjanju 'poljoprivredne revolucije' u Starom svetu. Grašak je ušao u Evropu u njenim jugoistočnim delovima i prodro u unutrašnjost uz Dunav, šireći se brzo, što je potvrđeno njegovim prisustvom na udaljenim mestima u slično vreme. Lingvistički dokazi takođe govore u prilog da je grašak brzo postao prisutan u skoro svim delovima Evrope. Većina evropskih naroda poseduje svoje sopstvene reči za grašak, što znači da je postojao pre razvika njihovih prajezika.

Ključne reči: arheologija, grašak, istorija useva, *Pisum sativum* L., Stara Evropa, širenje