Archaeological Evidence of the Domestication of Lentil (\textit{Lens culinaris}) and Its Distribution in Europe

M. Ljuština\textsuperscript{1} and A. Miki\textsuperscript{2}* 

\textsuperscript{1}University of Belgrade, Faculty of Philosophy, Belgrade, Serbia; \textsuperscript{2}Institute of Field and Vegetable Crops, Novi Sad, Serbia. *Corresponding author: mikic@ifvcns.ns.ac.rs; aleksandar.mikich@gmail.com

Abstract

Lentil originated in the Near Eastern centre of diversity. The oldest archaeological remains of lentil in Europe are from the Franchthi cave in Greece, dated to 11,000 BC. Together with pea, vetches and vetchlings, lentil was a part of the everyday diet of the hunter-gatherers at the end of the last Ice Age in Europe and the very early Holocene. It is not possible to differentiate the wild lentils from the cultivated small-seeded lentil, while it is not until the fifth millennium BC that lentil seeds larger than the wild lentils are found, which were unequivocally domesticated. Among the earliest findings of cultivated grain legumes is the site of Tell El-Kerkh in Syria, from 10th millennium BP. Lentil was one of the first crops that entered Europe from Asia Minor after it become a more suitable place for living following the end of the last Ice Age. Along with pea and several cereal species, lentil ultimately became associated with the beginning of the ‘agricultural revolution’ in the Old World. Lentil roughly progressed from the south-eastern parts of Europe into its interior via Danube, and from Syria to Armenia and Georgia, leaving rich archaeological evidence.

Key words: Lentil, archaeological evidence, domestication, distribution, Europe.

The origin of lentil

Legumes (\textit{Fabaceae} Endl.) are one of the most abundant plant families in the world, comprising hundreds of genera and thousands of species widespread over all continents. Many members of this family have economic importance and have been used for various purposes over millennia for human consumption, animal feeding and green manure [1]. One such species is lentil (\textit{Lens culinaris} Medik.), being the most widespread and most cultivated annual legume crop.

It is widely accepted that many traditional European grain legumes, such as chickpea (\textit{Cicer arietinum} L.), pea (\textit{Pisum sativum} L.) and common vetch (\textit{Vicia sativa} L.) originated primarily in the Near Eastern centre of diversity. Lentil is also among them with the Near Eastern centre as the primary centre of diversity [2]. It is presumed that the progenitor of cultivated lentil is its wild relative \textit{Lens culinaris} ssp. \textit{orientalis} [3].

The local floras of the Near East region are rich in the wild taxa of lentil, pea, vetches and vetchlings (\textit{Lathyrus} spp.), as well as of beautiful vavilovia (\textit{Vavilovia formosa} (Stev.) Fed.), the closest relative of the genera \textit{Pisum} L. and \textit{Lathyrus} L. [4]. This could be considered as another proof that it was really the centre of origin and eventual distribution of lentil in all directions, especially westward. The phenomenon of pod dehiscence, present in lentil and other related genera and providing them with an ability of shattering the seeds up to 2 m in diameter, significantly contributed to the natural spread of these species.
Grain legumes including lentil had been known to humans in Europe before they became a cultivated crop. The oldest archaeological remains of lentil in Europe are from the Franchthi cave in Greece, dated to 11,000 BC [5]. Together with pea, vetches and vetchlings, lentil was a part of the everyday diet of the hunter-gatherers at the end of the last Ice Age in Europe and early Holocene (12,000–9,000 BP), as witnessed by the remains from the site of Santa Maira in Spain [6].

The Domestication of Lentil

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: in grain legumes, the major criteria to facilitate domestication are non-dehiscent pods, larger seed size and smooth seed testa.

It is probable that the lentil gene controlling pod dehiscence mutated to recessive state, became a prominent property for human selection and domestication, leading to the development of non-dehiscent genotypes, similar to the pea gene \(Dpo\) [7]. Larger seed size in the cultivated forms in comparison to that in wild strains is unique not only to grain legumes, which possibly was a result of selection by the early farmers. Smooth testa, also a result of selection in the course of domestication, is the most reliable characteristic in telling wild from the cultivated forms [8].

The remains of the domesticated grain legumes, occurring at high frequencies during the 10th and 9th millennia [9], indicate to the possibility that the domestication of grain legumes predated cereals [10]. Little is known about the early stages of domestication of grain legumes and it is not easy to determine how, when and where they were domesticated first, mostly due to a fact that all those changes, being mostly morphological, did not survive to the present day.

In the case of lentil, it is not possible to differentiate wild from the cultivated small-seeded lentil, while it is not until the fifth millennium BC that lentil seeds larger than the wild type are found, which were unequivocally domesticated [11].

Among the earliest findings of cultivated grain legumes is the site of Tell El-Kerkh, Syria, from the 10th millennium BP, having the seeds of lentil, bitter vetch (\(Vicia ervilia\) (L.) Willd.), chickpea, grasspea (\(Lathyrus sativus\) L.), faba bean (\(Vicia faba\) L.) and pea [12].

Lentil in Old Europe

Lentil was one of the first crops that entered Europe from Asia Minor after it became a more suitable place for living at the end of the last Ice Age. That way lentil, along with pea and several cereal species, was ultimately associated with the onset of the ‘agricultural revolution’ in the Old World [13].

Lentil probably progressed from the south-eastern parts of Europe into the interior of the continent via Danube. Its distribution was rapid as the available evidence reveals its presence in remote places in similar periods, as shown by the following selection of archaeological finds.

5790–5630 BC, Kovaèevo, southeast Bulgaria. The final early Neolithic site in southeast Bulgaria, with pea, grasspea (\(Lathyrus sativus\)), chickling vetch (\(Lathyrus cicera\) L.) and bitter vetch found along with lentil and several cereal species [14].

5600–4300 BC, south-western Germany. The results of more than 100 archaeobotanical investigations from this region reveal that lentil was one of the most common 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 Ages [15].

5470–5260 BC, Aknashen, Armenia. The evidence of lentil, along with bitter vetch and perhaps pea is a nice example of the pea distribution to the easternmost regions of Europe [16].

5000–4800 BC, the area of modern Paris, France. Here lentil was one of the first introduced crops, along with pea and cereals [17].

1800 BC, a Bronze Age Vatin culture settlement of Æidovar, Banat, northern Serbia. Archaeobotanical research of this multi-layered
site revealed that lentil was in use along with other grain legumes, such as, pea or vetch [18].

700–500 BC, Monte Trabocchetto, Western Liguria, Italy. Some edible legumes, such as, lentil, faba bean and bitter vetch were found in this early Iron Age hill fort [19].

600–400 BC, four late Hallstat and early La Tène sites in Baden-Wurttemberg, Germany. Lentil was an important crop in everyday nutrition together with pea, bitter vetch and faba bean [20].

Conclusions
The rich archaeological evidence of the presence of lentil in diverse part of Europe shows that this crop has always been one of the most important components of human diets throughout the history in this part of the Old World. This evidence is also a significant reminder for many European countries where lentil has become a neglected and underutilized crop in the recent past.

References


