

Paleolinguistics brings more light on the earliest history of the traditional Eurasian pulse crops

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Summary

Traditional pulse crops such as pea, lentil, field bean, bitter vetch, chickpea and common vetch originate from Middle East, Mediterranean and Central Asia¹. They were a part of human diets in hunter-gatherers communities² and are one of the most ancient cultivated crops^{3,4}. Europe has always been rich in languages⁵, with individual families still preserving common vocabularies related to agriculture^{6,7}. The evidence on the early pulse history witnessed by the attested roots in diverse Eurasian proto-languages remains insufficiently clarified and its potential for supporting archaeobotanical findings is still non-assessed. Here we show that the paleolinguistic research may contribute to archaeobotany in understanding the role traditional Eurasian pulse crops had in the everyday life of ancient Europeans. It was found that the Proto-Indo-European language^{8,9} had the largest number of roots directly related to pulses, such as **arnk'(-)* (a leguminous plant), **bhabh-* (field bean), **erəg[h]-* (a kernel of leguminous plant; pea), **ghArs-* (a leguminous plant), **kek-*, **k'ik'-* (pea) and **lent-* (lentil)^{10,11,12}, numerous words subsequently related to pulses^{13,14} and borrowings from one branch to another¹⁵, confirming their essential place in the nutrition of Proto-Indo-Europeans^{16,17,18}. It was also determined that pea was the most important among Proto-Uralic people^{19,20,21}, while pea and lentil were the most significant in the agriculture of Proto-Altaic people^{22,23,24}. Pea and bean were most common among Caucasians^{25,26}, Basques^{27,28} and their hypothetical common forefathers²⁹ and bean and lentil among the Afro-Asiatic ancestors of modern Maltese³⁰. Our results demonstrate that pulses were common among the ancestors of present European nations and that paleolinguistics and its lexicological and etymological analysis may be useful in better understanding the earliest days of traditional Eurasian crops. We believe our results could be a basis for advanced multidisciplinary approach to the pulse crop domestication, involving plant scientists, archaeobotanists and linguists, and for reconstructing even earlier periods of pulse history.

Pulse crops and languages in Europe

Most of the traditional Eurasian pulse crops, such as pea (*Pisum sativum* L.), lentil (*Lens culinaris* Medik.), field bean (*Vicia faba* L.), chickpea (*Cicer arietinum* L.), bitter (*Vicia ervilia* (L.) Willd.) and common (*Vicia sativa* L.) vetches and grass pea (*Lathyrus sativus* L.) originate from Near Eastern, Mediterranean and Central Asian centres of diversity¹. They were a part of the diets of Palaeolithic hunter-gatherers communities². Pulses were also among the first domesticated plant species³, carrying out the 'agricultural revolution' in post-glacial Europe⁴ (Fig. 1).

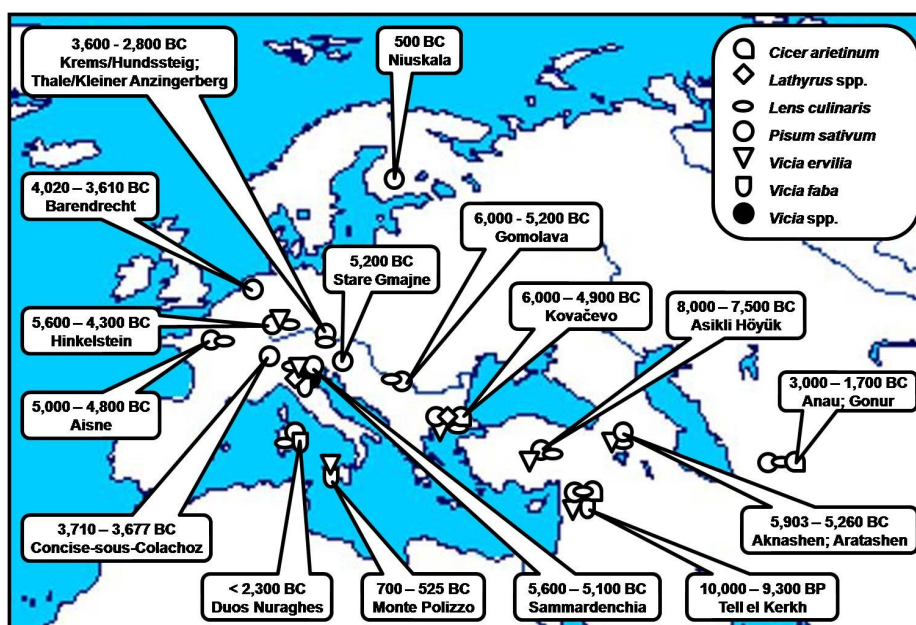


Fig. 1. Some of the oldest archaeobotanical findings of ancient Eurasian pulse crops in Europe and its neighbouring regions

Europe has been home to at least 300 extinct and living languages⁵. Today, it is dominated by seven great families, namely Indo-European, Uralic, Altaic, Caucasian, Kartvelian, Basque and Afro-Asiatic. Despite a constant evolution and numerous interactions, the European languages families retained common vocabularies related to many aspects of everyday life such as agricultural plants^{6,7}.

Evidence on the early pulse history based upon the attested roots in diverse Eurasian proto-languages remains insufficiently clarified, while its potential for supporting archaeobotanical findings is still non-assessed.

Words the ancient Eurasians used for pulse crops

The most significant language family in Europe today is Indo-European. From their homeland in Pontic-Caspian steppe⁸, the speakers of the Proto-Indo-European language produced branches such as Albanian, Armenian, Baltic, Celtic, Germanic, Hellenic, Italic and Slavic⁹. There are several Proto-Indo-European roots directly related to traditional Eurasian pulse crops (Fig. 2). The root **arnk(ʰ)-*, *arenko-* (a leguminous plant)^{10,11} was preserved only in Old Greek with *ἀρακος*, denoting a leguminous plant (Fig. 2), that gave the Modern Greek *αρακάς*, denoting pea (Table 1). The Proto-Indo-European roots **bhabh-*, *bhabhā* (field bean)^{10,11} and **lent-*, **lent-s-* (lentil)^{10,11} proved to be extremely conservative in both morphology and meaning, producing numerous proto-derivatives (Fig. 2) and modern descendants, denoting the same in almost all cases (Table 1). The root **erəg^w[h]-*, *ereg^w(h)o-*, *erog^w(h)o-* (a kernel of leguminous plant; pea)^{10,11} gave the words denoting pea in modern Germanic languages (Table 1), as well as the words for bitter vetch in Latin (Fig. 2) and pea in some of its modern descendants (Table 1). The Proto-Indo-European **ghArs-*, *ghers-2* (a leguminous plant)^{10,11} survived only in Proto-Slavic (Fig. 2) and all modern Slavic languages, denoting pea¹² (Table 1). The Proto-Indo-European root **kek-*, **k'ik'*, *kiiker-* (pea)^{10,11} lost its original meaning and began to denote mostly chickpea (Fig. 2, Table 1). There are also roots that subsequently began to be related to pulse crops (Table 1), mostly having a descriptive nature¹³, such as **g^r[a]n-*, **grān-* (grain, corn), **leb-* (blade), **pis-* (to thresh), **(s)ter(ə)p-* (end, edge) and **weik-* (to avoid)¹⁴. The evolution of the Proto-Indo-European roots directly and subsequently related to pulse crops is characterised by a rather rich exchange among individual branches¹⁵ and by other neighbouring language families (Table 1). The wealth and diversity of the results of this lexicological and etymological analysis confirms that the Proto-Indo-European society, unlike certain viewpoints¹⁶, was highly agricultural with pulse crops playing a prominent role^{17,18}.

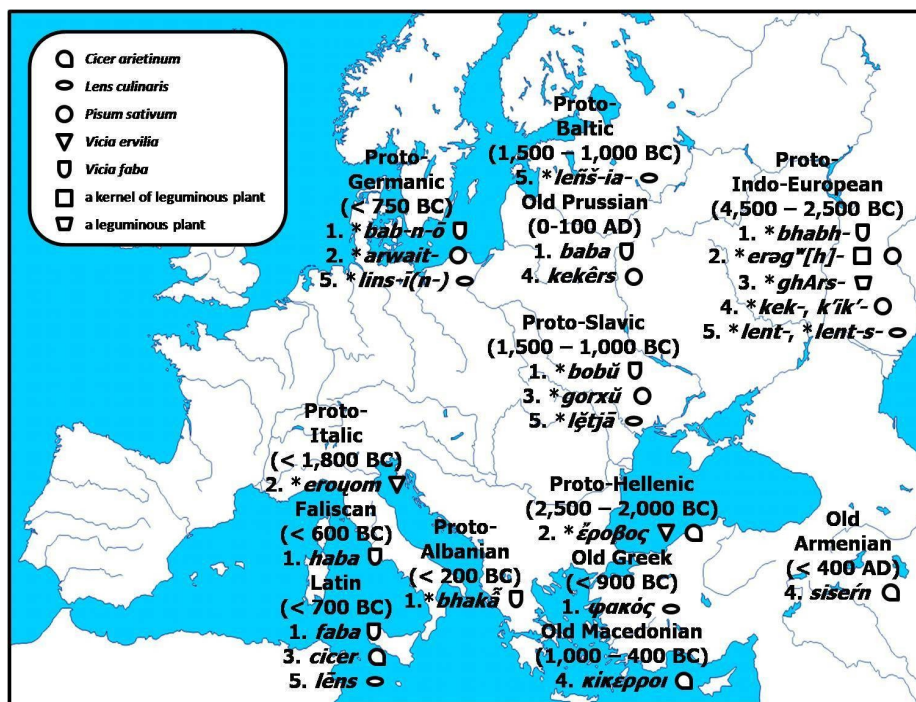


Fig. 2. Linguistic and geographical evolution of the Proto-Indo-European roots directly related to ancient Eurasian pulse crops

A study on the pulse crops in Uralic language reveals a high degree of borrowings from neighbouring families, especially by those branches whose speakers migrated far from their original homeland in westernmost Siberia¹⁹ such as Finnic and Hungarian. Those who remained, namely Permic and Mordvinic, share the features of the initial word denoting pea²⁰ (Table 1), with a possibility that it resembles the Proto-Uralic **kača*, primarily denoting cavity and hollow²¹ (Fig. 3).

The Proto-Altaic roots **bükrV* (pea) and **ziäbsa* (lentil)²² proved highly conservative among their direct derivatives (Fig. 3) and their modern descendants²³ (Table 1). This may support the grounds that these two crops were the most important pulses both for the Proto-Altaic people and the modern Altaic, especially Turkic, nations, despite rapid migrations from one homeland to another.

Table 1. A selection of the direct and indirect modern descendants of the most ancient roots in European language families originally and subsequently related to some traditional Eurasian pulse crops

Family	Root	Originally related	
		Direct descendants	Indirect descendants**
Indo-European	* <i>arnk</i> (^h)-, <i>arenko</i> - (a leguminous plant)	1) Greek <i>αρακάς</i> (pea)	-
	* <i>bhabh</i> -, <i>bhabhā</i> (bean)	1) Albanian <i>bathe</i> (bean) 2) Baltic: Lithuanian <i>pupa</i> (bean) 3) Germanic: Danish <i>bønne</i> , English <i>bean</i> , German <i>Bohne</i> (bean) 4) Greek <i>φακή</i> (lentil) 5) Italic: Italian <i>fava</i> , Sardinian <i>fa</i> , Spanish <i>haba</i> (bean) 6) Slavic: Polish <i>bób</i> , Serbian <i>bob</i> , Ukrainian <i>bib</i> (bean)	3) → Celtic Goidelic cf. Scottish Gaelic <i>pònaire</i> (bean) 5) → Celtic Brythonic cf. Breton <i>fav</i> (bean) 5) → Basque: <i>baba</i> (bean) 6) → Indo-Iranian: Romani <i>boba</i> (bean) and <i>boobi</i> (pea) 6) → Italic: Romanian <i>bob</i> (bean) 6) → Uralic: Finnish <i>papu</i> , Ingrian <i>papu</i> (bean) 6) → Altaic: Kalmyk <i>bob</i> (bean)
	* <i>erəg</i> ^w [<i>h</i>]-, <i>ereg</i> ^w (<i>h</i>)o-, <i>erog</i> ^w (<i>h</i>)o- (a kernel of leguminous plant; pea)	1) Germanic: Dutch <i>erwt</i> , Faroese <i>ertur</i> , Norwegian <i>ert</i> (bean) 2) Greek <i>ρεβίθιά</i> (chickpea) 3) Italic: Galician <i>erVELha</i> , Portuguese <i>erVELha</i> , Romansh <i>erViglia</i> (pea)	1) → Italic: Asturian and Leonese <i>arbeyu</i> , West Lombard <i>erbion</i> (pea) 1) → Uralic: Saami <i>earta</i> (pea) 2) → Slavic: Macedonian <i>urov</i> (bitter vetch)
	* <i>ghArs</i> -, <i>ghers</i> -2 (a leguminous plant)	1) Slavic cf. Bulgarian <i>grah</i> , Czech <i>hrách</i> , Russian <i>gorokh</i> (pea)	1) → Albanian <i>groshë</i> (common bean) 2) → Italic: Aromanian <i>grāshac</i> (pea)
	* <i>kek</i> -, * <i>k'ik'</i> -, <i>kīker</i> (pea)	1) Armenian <i>siser</i> (chickpea) 2) Italic: cf. Catalan <i>cigró</i> , French <i>pois-chiche</i> , Ligurian <i>cēxe</i> (chickpea)	2) → Albanian <i>qiqër</i> (chickpea) 2) → Germanic: Swedish <i>kikärt</i> (chickpea) 2) → Slavic: Slovak <i>cícer</i> (chickpea) 2) → Uralic: Estonian <i>kikerhernes</i> (chickpea) 2) → Basque <i>txitxirio</i> (chickpea) 2) → Afro-Asiatic: Maltese <i>cicra</i> (chickpea)
	* <i>lent</i> -, * <i>lent-s</i> - (lentil)	1) Baltic: Latvian <i>lēca</i> (lentil) 2) Germanic: Flemish <i>lins</i> , Icelandic <i>linsa</i> (lentil) 3) Italic: Corsican <i>lentichja</i> , Occitan <i>mendilh</i> , Walloon <i>lintile</i> (lentil) 4) Slavic: Croatian and Serbian <i>leća</i> , Slovenian <i>leča</i> (lentil)	3) → Celtic: Irish <i>lintile</i> (lentil) 4) → Uralic: Võro <i>lääts</i> (lentil)
	Uralic	* <i>kača</i> (pea?)	1) Finno-Permic: Erzya <i>ksnav</i> , Komi <i>an'kytsh</i> , Moksha <i>snavnja</i> (pea) 2) Ugric: Khanty <i>an'kəš</i> , Mansi <i>an'kas</i> (pea)
Altaic	* <i>būkrV</i> (pea)	1) Mongolic: Kalmyk <i>bürčөг</i> (pea) 2) Turkic: Chuvash <i>pärça</i> (pea), Gagauz <i>borchaq</i> (pea), Turkish <i>burçak</i> (bitter vetch)	2) → Uralic: Hungarian <i>borsó</i> (pea)
	* <i>zjābsa</i> (lentil)	1) Turkic: Bashkir <i>jasmyq</i> , Kazakh <i>jasimiq</i> , Tatar <i>jasmyq</i> (lentil)	1) → Uralic: Udmurt <i>jasnyk</i> (lentil)
Caucasian	* <i>hōwl(ā)</i> (bean; lentil)	1) Avar-Andi-Dido: Andi <i>holi</i> (bean), Avar <i>holó</i> (bean), Tsez <i>hil</i> (pea) 4) Circassian: Abkhaz <i>k'yrk'yrra</i> (pea), Adyghe <i>ceshā</i> (bean), Kabardian <i>cesh</i> (pea)	-
	* <i>qōr'ā</i> (pea)	2) Lak-Dargwa: Dargi <i>qara</i> , Lak <i>quIru</i> (pea) 3) Lezgi: Lezgi <i>xaru</i> (bean) 4) Nakh: Chechen <i>qō</i> , Ingush <i>qe</i> (bean)	4) → Indo-Iranian: Ossetic <i>qædur</i> (bean; lentil) 4) → Altaic: Karachay-Balkar <i>hans qudoru</i> (bean)

Basque	<i>*il̥ha-r</i> (pea; vetch; bean)	1) Basque <i>ilar</i> (pea)	-
Afro-Asiatic (Semitic)	<i>*adaš-</i> (lentil)	1) Maltese <i>ghads</i> (lentil)	-
	<i>*pūl-</i> (bean)	1) Maltese <i>fula</i> (bean)	(Arabic) → Indo-Iranian: Kurdish <i>polik</i> (bean)
Subsequently related			
Family	Root	Direct descendants	Indirect descendants**
	<i>*g^or[a]n-</i> , <i>*grān-</i> (grain, corn)	1) Baltic: Latvian <i>zirņi</i> , Lithuanian <i>žirnis</i> (pea)	1) → Uralic: Karelian <i>herneh</i> , Livonian <i>jernōd</i> , Veps <i>herneh</i> (pea)
	<i>*leb-</i> (blade)	1) Old Greek <i>λοβός</i> (pod)	1) → Armenian <i>lobi</i> (bean) 1) → Slavic: Russian <i>lobiya</i> (lablab bean) 1) → Altaic: Azeri <i>lobya</i> (bean) 1) → Kartvelian: Georgian <i>lobio</i> (bean)
Indo-European	<i>*pis-</i> (to thresh)	1) Italic: Friulian <i>bîsi</i> , Italian <i>pisello</i> , Picard <i>pos</i> (pea)	1) → Albanian <i>bizele</i> (pea) 1) → Celtic: Irish <i>pis</i> , Welsh <i>pysen</i> (pea) 1) → Germanic: <i>pea</i> (pea) 1) → Hellenic: Greek <i>πιπέλι</i> (pea) 1) → Altaic: Turkish <i>bezelye</i> (pea)
	<i>*(s)ter(ə)p-</i> (end, edge)	1) Hellenic: Greek <i>θέρμος</i> (white lupin)	1) → Italic: Portuguese <i>tremoceiro</i> , Spanish <i>altramuz</i> (white lupin)
	<i>*weik-</i> (to avoid)	1) Italic: French <i>vesce</i> , Italian <i>veccia</i> , Spanish <i>veza</i> (vetch)	1) → Armenian <i>vik</i> (vetch) 1) → Baltic: Lithuanian <i>vikis</i> (vetch) 1) → Celtic: Welsh <i>gwŷg</i> (vetch) 1) → Germanic: German <i>wicke</i> (vetch) 1) → Slavic: Polish <i>wyka</i> (vetch) 1) → Altaic: Turkish <i>fiğ</i> (vetch)

**Numbers denote the direct descendants the word was borrowed from

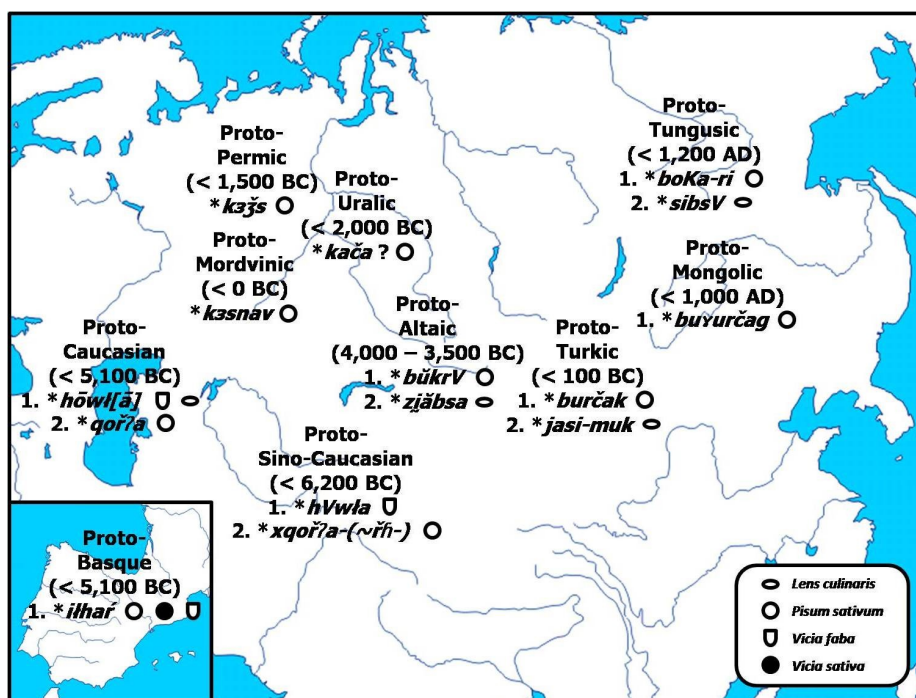


Fig. 3. Linguistic and geographical evolution of the Proto-Uralic, Proto-Altaic and Proto-Sino-Caucasian roots directly related to ancient Eurasian pulse crops

The Caucasian roots **hōwl(ā)* (bean; lentil) and **qōr'ā* (pea)²⁴ are also considered rather well-preserved, with rich evolution within its own family and borrowings by its closest neighbours²⁵, especially Kartvelian²⁶ (Table 1). The former root is connected with the Proto-Basque root **il̥ha-r* (pea; vetch; bean)²⁷ by the supporters of the hypothesis about the Dené-Caucasian language super-family²⁸, where the two roots have a common origin (Fig. 3) and where the ancestors of both Caucasian and Basque peoples are considered the two descendants of the Palaeolithic hunter-gatherers retreating into the mountains when the last Ice Age ended and new peoples inhabited Europe²⁹.

The rich Afro-Asiatic language family in Europe is represented only by Maltese, where the words denoting pulses were derived from the Proto-Semitic roots **adaš*- (lentil) and **pūl*- (bean)³⁰.

Integrated approach to pulse crop history

The presented results demonstrate that the Eurasian pulse crops such as pea, lentil or field bean, usually regarded as traditional, indeed were ordinary among the ancestors of European nations. They also witness that paleolinguistics with its lexicological and etymological analysis may be useful in better understanding the earliest days of their cultivation. It is to be anticipated that the outcome of this preliminary research could be a solid basis for advanced multidisciplinary approach in studying the pulse crop domestication, involving plant scientists, archaeobotanists and linguists, as well as for reconstructing even earlier periods of pulse species common history.

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Supplementary Information is linked to the online version of the paper at www.nature.com/nature.

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Author Contributions

A.M.M. designed and coordinated the research; A.M.M. did the research on Albanian, Armenian, Baltic, Celtic, Hellenic, Indo-Iranian, Uralic, Altaic, Caucasian, Basque and Afro-Asiatic lexicology and etymology; A.P.M. did the archaeobotanical research; V.M.M. did the research on Slavic lexicology and etymology; B.T.Ć. and A.I.Ć. did the research on Italic lexicology and etymology; V.B.Đ. did the research on Germanic lexicology and etymology; B.Đ.K. did the research on crop history; A.M.M. wrote the paper; All authors discussed the results and commented on the manuscript.

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