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**The origin of *Vicia faba* (*Fabaceae*): a quest of five decades****Abstract**

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The ancestry of broad bean *Vicia Faba*, one of the most important cultivated legumes, baffled scholars for many years. Until some half-century ago only meager evidence of charred broad bean was unearthed in archaeological excavations. A living putative wild progenitor has been remained obscured. During the last five decades significant archaeobotanical evidence from the Mediterranean basin was accumulated, illuminating the importance of this legume at the dawn of agriculture. Several recent excavations in the Near East revealed large quantities of Neolithic broad bean, suggesting that it was an important part of the crop assemblage of the early farmers some 10,000 years ago. Also, charred seeds found recently suggest that pre-agricultural hunter-gatherers used the same species before its cultivation as early as 14,000 years ago, hence revealing the wild ancestry of this crop.

*Key words:* broad bean, horse bean, Yiftahel, Ahiud, Neolithic.

**The quest for the wild ancestry of *Vicia faba***

Faba bean (broad bean, horse bean, *Vicia faba* L.) with its high protein content is an important crop of the Mediterranean Basin and the northern temperate zone (Bond 1995). The plant is a hardy erect annual and some of the cultivars are resistant to drought. During the thousands years of *V. faba* cultivation many cultivars were bred, most of the large seeds varieties are for culinary consumption. Small seeds cultivars, although popular as food in certain regions are mainly used for other purposes like fodder, green manure and nitrogen fixing rotation crop (Temesgen & al. 2015). A living wild type of this cultivated species is not known and it is possible that it is either extremely restricted in its geographical distribution or that it is extinct.

Until a half-century ago most of the archaeological remains of *V. faba* were recorded mainly from relatively late Bronze Age sites at the Mediterranean Basin and Central Europe. It was only later, mainly through the 1960s and on that earlier *Vicia* seeds were unearthed. These were found mainly in a range of Neolithic sites in the Near East (Hopf 1969; Zohary & Hopf 1988). However, even in these Neolithic sites not only the finds were very little, but it was difficult to tell whether the *Vicia* seeds found there were of true

cultivated faba beans or of the related wild species of the resembling *V. narbonensis* complex (see below). Thus, Zohary & Hopf (1973, 1988) admitted that at that time, identification of Neolithic faba bean was not satisfactory.

Moreover, the wild ancestry of this crop remained elusive. The question as to the identity of the wild progenitor of faba bean puzzled scholars for many decades: On one hand researchers have recognized several related wild species that morphologically resembles *Vicia faba* (Bennett & Maxted 1997), but on the other hand they were all ruled out from its ancestry because of their different genetics. Some of these related wild species are part of the *Vicia narbonensis* complex, e.g. *V. narbonensis* L., *V. hyaenisciamus* Mouterde and *V. galilea* Plitman & Zohary (Plitmann 1965; Bennett & Maxted 1997). Their morphological resemblance to cultivated *V. faba* led researchers to investigate their cytology and to attempts of crossing them with the crop. The results of Schäfer (1973) and Ladizinsky (1975) showed that neither of these related species could be regarded as the wild progenitor of *V. faba* as the chromosome number of these three wild species was found to be  $2n=14$  whereas that of *V. faba* is  $2n=12$ . Accordingly, crossability between the wild species and the crop was practically zero (Schäfer 1973; Ladizinsky 1975). In all, Zohary (1977) concluded that the evidence from archaeobotanical remains and the living plants suggest that the search for the origin of Neolithic faba bean and the obscured progenitor should be focused in the Mediterranean Basin and the Near East.

Indeed, several years later, the first sound evidence of cultivated Neolithic *Vicia faba* was revealed during the excavations at the Neolithic site of Yiftahel, lower Galilee, Israel (Kislev 1985). Here, some 2,600 *V. faba* seeds were found in a PPNB (Pre Pottery Neolithic B) obvious agricultural context: these beans were found along with some 1.4 million (7.5 kg) charred cultivated lentil (*Lens culinaris* Medik.) seeds and their accompanying field weed *Galium tricornutum* Dandy seeds (Garfinkel & al. 1988). These sensational findings were reinforced two decades later during extensive salvage excavations at the same site. This time, more than 1,000 *V. faba* seeds were found (Khalaily & al. 2008). Also, some 250,000 lentil seeds were found along with their infesting weed *Galium tricornutum* as well as several dozens of *Triticum dicoccoides* (Asch. & Graebn.) Schweinf. seeds (Rottenberg, pers. obs.). The seeds were dated to some 10,000 years ago.

### Recent findings

Two additional salvage excavations were conducted in the following years around Yiftahel. The first, in nearby Nahal Zippori, where several dozens of faba bean and lentil seeds were found in a Neolithic context (Caracuta & al. 2017). The second Neolithic site, at Ahiud (18 km NW of Yiftahel) revealed large quantities of legumes dated to some 10,200 years ago (Pre Pottery Neolithic B). More than 2,000 *V. faba* seeds and many additional fragments were unearthed. Significantly, in one of the excavation squares, additional seeds of the related *V. narbonensis* were found, and by their more spherical appearance they were clearly distinguished from the true agricultural *V. faba* found there (Caracuta & al. 2017). Several hundred seeds of *Lens*, *Pisum* and *Lathyrus* spp. were found as well. Elsewhere, in both nearby and remoter regions, small quantities of faba bean seeds were

excavated in the meantime at several other sites in the Near East (Tanno & Willcox 2006; Galili & al 2009; and see ref. 9-18 in Caracuta & al. 2017).

Finally, after decades of archaeobotanical pursuit, also the elusive progenitor was found: recently, six charred seeds of pre-agricultural *V. faba*, dated to 14,000 years ago were unearthed in Israel during an ongoing excavation project at El-Wad, Mt. Carmel. The researchers suggested that this wild type progenitor of faba bean was used by the local hunter-gatherers several millennia before domestication (Caracuta & al. 2016).

## Conclusion

It was not before the 1960s that faba bean was assigned to as one of the major Neolithic crops. Since then, archaeobotanical evidence have been accumulating, showing that faba beans were cultivated in many parts of the Near East during the very early days of agriculture (Zohary & al. 2012; Caracuta & al. 2017). Significantly, in some of these sites, faba bean was found to be used alongside other legumes in an unmistakable agricultural context of the Pre Pottery Neolithic B some 10,000 years ago. The Large quantities of *V. faba* seeds found in these sites clearly indicate that this legume was of a main importance to the first farmers there.

Although not known today as a living wild species, the recent archaeobotanical evidence suggest that wild *V. faba* existed and was used by hunter-gatherer communities even before agricultural times (Caracuta & al. 2016). In all, faba bean should be regarded as one of the most important and main legumes used at the dawn of agriculture.

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