



山黧豆属作物在土耳其的栽培与利用状况

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摘 要:众所周知,山黧豆起源于巴尔干半岛并传播到世界各地。在土耳其,山黧豆属作物有 73 个分类群(约 1/3 为地方特有种),在全国各地均有分布种植,但主要集中在黑海中部、东南部和安纳托利亚东部地区。该文介绍了山黧豆属作物在土耳其全国的分布和在局部地区的食用、观赏等资源利用和保存情况。通常,不同国家人民会因为文化差异形成不同的饮食习惯,但山黧豆大多被用于制作汤、面包或其他咸点。山黧豆的栽培技术则因地制宜,土耳其在边缘土地上进行旱作种植,中国和印度部分地区多采用轮作种植方法等。作为一种极“小众”的作物,山黧豆研究工作的从业人员极少,而且缺乏大型联合研究项目。因此,需要联合化学、表型和分子分析等方法,以保护世界各地包括土耳其在内的地方种质资源,尤其是培育适合土耳其、中国等世界各国的食饲兼用型低 β -ODAP 品种。总之,选育低 β -ODAP 或不含 β -ODAP 的山黧豆品种将有助于丰富人类在食用、饲用和观赏等方面的物种资源利用。

关键词:山黧豆;山黧豆属作物;特有种;濒危物种;饲草;育种

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Brief Introduction of *Lathyrus* Cultivation and Using in Turkey

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Abstract: It is well established that *Lathyrus sativus* has its center of origin in the Balkan Peninsula, from where it spread to the other parts of the world through infusion and naturalization. Turkey has 73 taxa in genus *Lathyrus*, (of which about 1/3rd are endemic) that grow all over the country but are more concentrated in Central Black Sea, South East, and Eastern Anatolia Regions. The current study describes the cultivation and consumption practices of Turkish people where it is not consumed on large scales and is confined to a few locations. The people in different countries of the world have different eating habits depending on their culture. However, most people use them to make soup, bread, or salty snacks using whole, split grains/or powder. The cultivation techniques of the grass pea vary from place to place. These include cultivation under rainfed conditions on marginal lands in Turkey to using Utera method of cultivation in China and some parts of India. Grass pea is a neglected crop and all research work is carried out on an individual basis without the involvement of large or mega projects. There is a need of chemical, phenotypic and molecular characterization with emphasis on conservation of local germplasm world over including Turkey with focus on breeding low β -ODAP cultivars suitable for human and animals consumption everywhere in the world including Turkey and China. It is concluded that the selection of low or no β -ODAP cultivars will help in the pro-

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duction of better cultivars that could be used for food, feed, and ornamental purposes.

Key words: grass pea; species in genus *Lathyrus*; endemism; threatened species; forage; breeding

The Balkan Peninsula is supposed to be the center of origin of grass pea. First archeological remains of the *Lathyrus sativus* (grass pea) have been reported from Ali Kosh (dated 9500—7600 BCE) area of Iran^[1]. Other remains of the species are reported from Jarmo in Northern Iraq (dated 8000 BCE)^[1-2]. Still, other remains of the species were reported from Tepe Sadz, (dated 7500—5700 BCE) in Iran^[1]. About the same age (7000 BC) similar archeological remains of *L. cicera* were reported from Azmaska Moghila, Bulgaria^[3], followed by the archeological finding of *L. sativus* from Atranjikera, India (dated 2000—1500 BCE)^[4]. These discoveries postulate gradual dissemination and diffusion of the plant from West Asia to South and South East Asia including China. However, Vavilov^[5] defined two centers of origin of the species in genus *Lathyrus* namely Abyssinian (Ethiopian) Centre and the Central Asian Centre including Afghanistan, North West British India (Now Khyber Pakhtunkhwa Pakistan), Tajikistan, and the Western Tian-Shan mountain range (Kazakhstan, Kyrgyzstan, and Uzbekistan). Vavilov^[5] indicated that smaller-seeded ecotypes were dominant in the south or southwest Asia. Furthermore, he found large-seeded or cultivated ecotypes in western Asia or the Mediterranean region.

However, the latest phytogeographical and archaeobotanical evidence disagree with the evidence and conclude that the original center of *Lathyrus* lied in the Balkans in the early Neolithic period, 6000 BCE^[6] or the (First) Agricultural Revolution, giving start to cultivation and domestication of economically important legumes. This also suggests possible diffusion and naturalization of the plant from the Balkans to the European countries, Africa, tropical countries, Americas and Australia.

1 Cultivation

Grass pea or mürdümük (Turkish vernacular name) is a collective name given to all species in

the genus *Lathyrus* found in almost every region of Turkey^[7]. Most of them are distributed and concentrated in the Central Black Sea region along with Eastern and Southeastern Anatolian ecogeographic Regions^[8-9]. Turkey is known as the gene center of many genus of Fabaceae including *Lathyrus*^[10]. Only common grass pea (*Lathyrus sativus* L.) vernacular yayigin mürdümük (Turkey), [or 家山蠶豆 (Chinese), Indian pea, white pea or chickling vetch (English), lentille d'Espagne (French), cicerchia (Italian), chícharo (Portuguese, Spanish), کیسری (Urdu)] and red pea or red vetchling (*L. cicera*) are cultivated on a very small scale in Turkey^[11].

1.1 Cultivation in Turkey and some selected countries

Correct statistics about the area under grass pea cultivation is not available. However, it is well known that grass pea grows in Adıyaman, Burdur, Bursa, Çankırı, Denizli, Elazığ, Kütahya, Malatya, Nevşehir, Samsun, Usak, Mugla provinces and surrounding areas under natural or cultivated conditions on limited scales for grain production to feed ruminants. Some reports suggest that Downy grass pea (*L. hirsutus*) was cultivated in Western and Central Anatolian regions before 1970^[12]. Similarly, sweet pea (*L. odoratus*) was grown as an ornamental plant in Anatolia^[13]. Grass pea is tolerant to drought and can grow with 200—400 mm per annum rainfall and about 10% relative humidity everywhere including northwestern China, with acceptable yield^[14].

They are cultivated by broadcast method over earlier prepared seedbeds in September or October preferably after the first winter rains along with cereals (generally wheat) in Turkey. They are also sown as a spring crop in rotation with other crops like wheat and is either grazed or harvested manually in Turkey. The farmers do not irrigate, fertilize, and apply herbicides or pesticides to the crop^[15-16].

Although six grass pea varieties have been developed and registered, their certified seeds are

rarely available. Therefore, the farmers mainly depend on their own seeds harvested from previous years' crops or borrow the seeds from their neighbors/relatives or purchase non-branded seeds from the local markets without any consideration of their quality.

Similarly, grass pea is cultivated on limited scales in the Sindh province of Pakistan that is largely used as feed^[17]. There is limited research on grass pea the world over and is counted as an abandoned or orphan crop due to very limited research and most of the available germplasm in the gene banks are untouched^[18] in India. Grass pea cultivation is not legal^[19] in most of the Indian states excluding their use for feed and domestic consumption.

Contrarily, grass pea cultivation in South East Asia (China) is done through ‘utera’ method^[18, 20]. The farmers broadcast grass pea seeds into cultivated rice crop fields. The seeds begin to grow after draining the water after harvest with sufficient water imbibition to germinate them. The farmers prefer the use of small-seeded varieties. They believe these seeds have a thick seed coat with potential resistance against water for a longer time under flooded water of rice and could germinate easily after drainage^[20]. The farmers of southeast China also cultivate the grass pea under rain-fed conditions. The crops are grown on marginal lands with minimum or low inputs including soil nutrients in form of fertilizer. Utera is not practiced in any part of Turkey as rice cultivation is performed under restricted conditions by a license from the state^[21].

1.2 β-ODAP contents

It was reported that the β-ODAP (β-Noxalyl-L-α, β-diaminopropionic acid) content of seeds should be less than <1.5 mg · g⁻¹ (0.15%) for safe consumption^[22]. ICARDA Syria conducted a study to determine the β-ODAP contents of many lines belonging to *L. sativus*, *L. cicera* and *L. ochrus* species (Table 1). The study determined the highest and the lowest β-ODAP contents in *L. ochrus* and *L. cicera* lines in the same sequence^[23]. Aleator *et al.*^[24] reported average β-ODAP content

of 0.48% in *L. sativus*, 0.16% in *L. cicera* and 0.57% in *L. ochrus*.

2 Eating habits and pharmaceutical uses

Grass pea cultivation was carried out in the Western Black Sea (Zonguldak Beycuma) until the 1980s. Although the species is generally grown as a forage crop, its grains are rarely used as human food in Turkey. *L. sativus* is rarely used for human consumption as a pilaf, soup or snack made up of a mixture of chickpea and grass pea seeds in Turkey. The seeds are also soaked in water overnight followed by draining this water ensued by boiling them in fresh water. This process results in > 90% reduction in β-ODAP level in the seeds ending up with a negligible risk of lathyrism. Lathyrism has not been reported in any village where tender leaves and branches are used as salads or in cooked form^[24-26].

Human consumption of grass pea is also reported in countries like India, Ethiopia, Bangladesh, Nepal, Northwest China, Italy, Spain, France, Afghanistan and some parts of Russia^[1, 27-29]. People of Pakistan, Nepal, Bangladesh, India, and other south Asian countries like to make soup from boiled or split grains (called dal or dal shorba) or flour (besin). The kneaded flour mixture is also used to roast chicken, potato, fish or mixed vegetable fritters (called pakorhey)^[30]. Bengali people from Bangladesh and East Bengal (India) make grass pea flour bread. Adulteration of chickpea flour with grass pea flour has also been reported in India. Nepali people use split grass pea soup with rice. The people of northern Ethiopia and Eritrea mix grass pea flour to make enjera

Table 1 β-ODAP contents determined in three *Lathyrus* species in a study in Hayda (Syria)^[23]

Species	Number of lines	Mean percentage /%	Difference in percentage/%
<i>L. sativus</i>	70	0.492	0.070—0.750
<i>L. cicera</i>	24	0.159	0.096—0.220
<i>L. ochrus</i>	16	0.615	0.400—0.710

(fermented pancake) after mixing it with wheat, tef, maize, sorghum, and barley^[31]. The southeast Asian people also use newly germinated tender young leaves as a vegetable^[30, 32]. The green pods and seeds are also cooked as green vegetables or are eaten as very popular snacks after boiling and salting.

Besides using grass pea as food and feed^[33], the Chinese scientists have developed several medicinally important products using grass pea metabolite β -ODAP for using it as a hemostatic agent at the time of surgery^[34], that is used for treatment of hemorrhage and thrombopoiesis^[35-36] and avoid tooth wound bleeding^[37].

3 Ornamental uses

There are 73 annual and perennial species and taxon in genus *Lathyrus* that grow and are found in Turkey as indicated in Table 2^[38]. These grow like weeds and have potential applications in the ornamental or medicinal plants industry. Most of them are very similar in appearance and are pronounced by similar names or different names locally at their habitats, therefore, writing of their vernacular names was avoided in this paper to prevent confusion and complexity. Many of these show different levels of threat and endemism as indicated by the International Union for Conservation of Nature (IUCN).

Although all grass pea is used as cut flowers, vase plants, garden and graveyards decoration in their natural habitats/areas by the amateur roadside vendors or local dealers in flowering plants, no statistics or study is available about their production and sale in a real sense.

There are reports from many European countries like Italy, France, Spain, Portugal, and United Kingdom, etc. about the use of many *Lathyrus* species like *L. belinensis*, *L. chloranthus*, *L. vernus*, *L. tingitanus*, *L. grandiflorus*, *L. latifolius*, *L. rotundifolius* and *L. sativus* as commercial cut flowers and garden plants^[39-43].

4 Conservation of *Lathyrus* genetic resources

Grass peas is a neglected crop plant. Al-

though, there are several works about the conservation of genetic resources abroad; there are no or negligible works towards safeguarding the local *Lathyrus* species in Turkey under *ex-situ* conditions. Two national seed or gene banks are working in Turkey but they lack all collections of the seeds of the species in genus *Lathyrus* grown naturally in Turkey. Turkish researchers are working on an individual basis supported by the projects from Tubitak (Scientific and Technological Research Council of Turkey) or BAP (Directorates of the Scientific Research Projects) of the respective universities or the research organizations.

Only 82 of 160 *Lathyrus* species in the world are (as mentioned in Annex 1 of the International Treaty on Plant Genetic Resources for Food and Agriculture) under *ex-situ* protection^[44]. There is a need to collect and characterize *Lathyrus* species spread over different regions in the World. By *ex-situ* (for instance, seed storage in gene banks) and in situ (i. e., within the natural habitats) methods^[44-45]. The ICARDA (International Center for Agricultural Research in Dry Areas) has conserved about 3 600 accessions that represent 45 species in genus *Lathyrus* from 40 countries^[46]. Similarly, 2 720 accessions have also been conserved in the NBPGR (National Bureau of Plant Genetic Resources, New Delhi India)^[47]. Please refer Patto Vaz and Rubiales^[48] for more details. All species of *Lathyrus* should be considered for the conservation and genetic resources, but the collection and conservation studies on the agriculturally important *L. sativus*, *L. cicera* and *L. ochrus* species are more intense^[47]. Among these materials, 1 627 of them belong to *L. sativus*, 183 of them belong to *L. cicera* and 136 of them belong to *L. ochrus*.

ICARDA has 3 038 *Lathyrus* collections of which 370 collections belong to Turkey; including 16, 52, and 3 collections belonging to *L. sativus*, *L. cicera* and *L. ochrus* species. These species in genus *Lathyrus* were mainly collected from the Central Anatolia, the Mediterranean and South East Anatolia regions^[49].

Table 2 Number of species and taxon in genus *Lathyrus* growing in Turkey along with their level of threat and endemism as per IUCN and other related details^[38]

No.	Species	Living form	Growth form	Flowering months	Habitat	Altitude/m	Endemism	Element	Distribution in Turkey	General distribution
1	<i>Lathyrus aureus</i>	Perennial	Weed	May-July	Forests and bushes	15—2 000	Non endemic	Black sea	North western Turkey, Northern and Continental Anatolia	Bulgaria, Romania, Caucasus, Greece
2	<i>Lathyrus libani</i>	Perennial	Weed	April-June	Forests, on rocky lime stone pastures	750—1 650	Non endemic	Eastern Mediterranean ocean	Southern Anatolia (Amanos-mountains)	Lebanon
3	<i>Lathyrus vernus</i>	Perennial	Weed	April-May	Forests, thickets, rocky terraces	60—1 400	Non endemic	Europe-Siberia	North Anatolia	Europe to Northeast Siberia
4	<i>Lathyrus venetus</i>	Perennial	Weed	May-June	Forests (Abies-Fagus), weedded lands	600—950	Non endemic	Europe-Siberia	North Anatolia	Corsica, Italy, Balkans, Central Europe, Central and South Russia
5	<i>Lathyrus niger</i> alttū <i>niger</i>	Perennial	Weed	May-June	Forests and oak bushes, shaded lands	0—1 000	Non endemic	Europe-Siberia	North western Turkey and Southern Anatolia (Amanos-mountains)	Europe (Exc. North east) North west Africa, Caucasus, Northern Iran
6	<i>Lathyrus incurvus</i>	Perennial	Weed	June-August	Meadows and bushes by the river	600—2 000	Non endemic	Unknown	Continental Anatolia	South and Central Russia, Caucasus and western Iran,
7	<i>Lathyrus palustris</i> alttū <i>palustris</i>	Perennial	Weed	June-July	Swampland	0—1 000	Non endemic	Europe-Siberia	Northern Turkey	Europe, Central and Eastern Europe, East Asia
8	<i>Lathyrus pallescens</i>	Perennial	Weed	June-July	Mountain steppe, meadows, rocky slopes	1 800—2 200	Non endemic	Unknown	Eastern Anatolia	North Balkans, Hungary, Romania, Central and Southern-Russia, Crimea, Caucasus
9	<i>Lathyrus brachypterus</i> variety <i>brachypterus</i>	Perennial	Weed	May-July	Pastures, rocky slopes	1 500—2 500	Endemic	Iran-Turan	Central and Southern Anatolia	Turkey
10	<i>Lathyrus brachypterus</i> variety <i>hauss knechtii</i>	Perennial	Weed	May-July	Pastures, rocky slopes	1 500—2 500	Endemic	Iran-Turan	Eastern Anatolia	Turkey
11	<i>Lathyrus karsianus</i>	Perennial	Weed	June-July	Coasts, cliffs and forest of <i>Pinus sylvestris</i> meadows on the edge	2 000—2 300	VU endemic	Europe-Siberia	North Eastern Anatolia	Turkey
12	<i>Lathyrus bitlisicus</i>	Perennial	Weed	July	Igneous rocks	2 500	EN endemic	Iran-Turan	Eastern Anatolia	Turkey
13	<i>Lathyrus satdagdensis</i>	Perennial	Weed	June	Stony slopes	1 900—2 150	VU endemic	Iran-Turan	South Eastern Anatolia	Turkey
14	<i>Lathyrus nivalis</i>	Perennial	Weed	June-August	Rocky slopes and roughness, often on lime stones	2 400—3 200	LC endemic	Iran-Turan	South Eastern and Southern Anatolia	Turkey
15	<i>Lathyrus armenus</i>	Perennial	Weed	June-July	Marshy meadows, water channels, fallow fields	1 270—2 800	LC endemic	Iran-Turan	Eastern neighbour Armenia, Central and Southern Anatolia	Turkey
16	<i>Lathyrus cyaneus</i> variety <i>cyaneus</i>	Perennial	Weed	May-June	Moist grass land, rarely on rock surfaces	1 670—2 800	Non endemic	Hirkan-Black sea	North Eastern Anatolia	Caucasus
17	<i>Lathyrus cyaneus</i> variety <i>pinnatus</i>	Perennial	Weed	May-June	Moist grass land, rarely on rock surfaces	1 670—2 800	NT endemic	Hirkan-Black sea	Eastern Anatolia	Turkey
18	<i>Lathyrus digitatus</i>	Perennial	Weed	April-June	Pine forests (<i>Pinus brutia</i> , <i>Pinus nigra</i>), oak groves, maquis, rocky slopes	200—1 550	Non endemic	Eastern Mediterranean ocean	Central Anatolia	Western Italy, Greece, Crimea Cyprus

续表 2 Continued Table 2

No.	Species	Livingforms	Growth form	Flowering months	Habitat	Altitude/m	Endemism	Element	Distribution in Turkey	General distribution
19	<i>Lathyrus tukhtensis</i>	Perennial	Weed	May-July	Pine forests, oak thickets, mountain pastures, rocky lime stone slopes	700—2 000	LC endemic	Unknown	Continental Anatolia	Turkey
20	<i>Lathyrus variabilis</i>	Perennial	Weed	April-May	Forests, oak thickets, rocky slopes	1 000—1 700	Non endemic	Eastern Mediterranean ocean	Southern Anatolia (excluding Taurus and Amanos mountains)	Lebanon
21	<i>Lathyrus spathulatus</i>	Perennial	Weed	April-May	<i>Pinus brutia</i> forest, deciduous forests, <i>Quercus coccifera</i> Maquis shrubs	400—1 520	Non endemic	Eastern Mediterranean ocean	Southern Anatolia	Western Syria
22	<i>Lathyrus elongatus</i>	Perennial	Weed	April-May	Groves, Maquis shrub land, frigana	350—1 520	NT endemic	Unknown	Southern Anatolia (Silician Taurus)	Turkey
23	<i>Lathyrus cilicicus</i>	Perennial	Weed	May	Maquis shrub land, cereal fields, cliffs	600—1 300	VU endemic	Eastern Mediterranean ocean	Southern Anatolia	Turkey
24	<i>Lathyrus boissieri</i>	Perennial	Weed	June-July	Steppe, cerea land fallow fields, wet slopes	1 000—2 000	Non endemic	Iran-Turan	Eastern Anatolia	Western Iran, Iraq
25	<i>Lathyrus pratensis</i>	Perennial	Weed	June-July	Wet lands, stream banks, bushes	0—2 300	Non endemic	Europe-Siberia	Thrace, Northern continental and South Western Anatolia	North Western Europe, Africa Ethiopia, Lebanon, Northern Iraq, Caucasus, Central Asia, Himalayas
26	<i>Lathyrus layardii</i>	Perennial	Weed	June-July	Wet meadows and Salix thickets	1 575—1 800	VU endemic	Iran-Turan	Eastern Anatolia	Turkey
27	<i>Lathyrus laxiflorus</i> alttür <i>laxiflorus</i>	Perennial	Weed	Unknown	Forests, thickets, shady shores	0—1 900	Non endemic	Unknown	Thrace and Outer Anatolia	Sothern Italy, Balkans, Crimea Caucasus, Northern and North-west Iran, Western Syria
28	<i>Lathyrus laxiflorus</i> alttür <i>angustifolius</i>	Perennial	Weed	Unknown		1 200—1 430	Endemic	Eastern Mediterranean ocean	Southern Anatolia (Amanos-slave koms Antt-foroslar)	Turkey
29	<i>Lathyrus czechoslovakianus</i>	Perennial	Weed	June-July	Sparse forests, rocky slopes, eroded shores	1 150—2 200	LC endemic	Unknown	Continental Anatolia and neighbouring North Anatolia	Turkey
30	<i>Lathyrus roseus</i> alttür <i>roseus</i>	Perennial	Weed	May-July	Forests (<i>Picea</i> , <i>Pinus</i>), thickets (<i>Quercus Corylus</i>)	30—1 800	Non endemic	Hirkan-Black sea	Northern and Eastern Anatolia	Crimea Caucasus, Northern and North Western Iran
31	<i>Lathyrus roseus</i> alttür <i>hermonis</i>	Perennial	Weed	June	Steep northern slopes of valleys	1 300—1 580	Non endemic	Unknown	Southern Anatolia	Syria, Lebanon, Jordan
32	<i>Lathyrus grandiflorus</i>	Perennial	Weed	May	Heath and rocky slopes	200—200	Non endemic	Unknown	Western Anatolia	Greece, Southern Balkans, Macedonia, Southern Italy, Sicily
33	<i>Lathyrus tuberosus</i>	Perennial	Weed	June-July	Wet meadows, grassy shores, fallow fields	1 000—2 150	Non endemic	Europe-Siberia	Continental Anatolia	Europe (North and South excluding), Caucasus, Western Iran, Siberia, Central Asia
34	<i>Lathyrus rzedundifolius</i> alttür <i>miniatus</i>	Perennial	Weed	June-July	Bushes (usually on the Northern slopes), hedges, very moist meadows, cereal and fallow fields	1 000—2 200	Non endemic	Unknown	East and North Eastern Anatolia	Caucasus, Northern Iraq, Northern Iran
35	<i>Lathyrus undulatus</i>	Perennial	Weed	April-June	Deciduous forests, fences, roadsides	0—600	VU endemic	Black sea	North Western Anatolia	Turkey
36	<i>Lathyrus sylvestris</i>	Perennial	Weed	April		—1	Non endemic	Europe-Siberia	North Anatolia	Europe, North West Africa Caucasus

续表 2 Continued Table 2

No.	Species	Livingforms	Growth form	Flowering months	Habitat	Altitude/m	Endemism	Element	Distribution in Turkey	General distribution
37	<i>Lathyrus belinensis</i>	Annual	Weed	April-June	Lime stone rocky hill edges and edges of cultivated fields	330—560	Endemic	Eastern Mediterranean ocean	Southern Anatolia	Turkey
38	<i>Lathyrus saxatilis</i>	Annual	Weed	April-May	Rocky slopes, roadsides	30—600	Non endemic	Mediterranean	Outer and Central Anadolu	Southern Europe, Crimea Cyprus, Syria Desert, Cyrenaica
39	<i>Lathyrus vinealis</i>	Annual	Weed	April-May	Destroyed steppe, vineyards, fallow fields	900—1 300	Non endemic	Iran-Turan	Eastern Anatolia (Mesopotamia)	Western Iraq, Western Iran
40	<i>Lathyrus sphaericus</i>	Annual	Weed	April-May	Pine forests, foothills, southern pine forests	10—2 000	Non endemic	Unknown	Outer Anatolia, Continental Anatolia	Southern Iraq, Iran, Central Asia
41	<i>Lathyrus inconspicuus</i> variety <i>inconspicuus</i>	Annual	Weed	April-May	Cereal and fallow fields	0—1 500	Non endemic	Unknown	Turkey (Excluding North and East corners)	Southern Europe, South western Central Asia
42	<i>Lathyrus inconspicuus</i> variety <i>stenophyllus</i>	Annual	Weed	May	Rocky slopes, Quercus vegetation	780—1 500	Non endemic	Unknown	North Eastern Anatolia (Mesopotamia)	Syria, North West and Central Iran, Eastern, Afganistan
43	<i>Lathyrus tauricola</i>	Annual	Weed	May-June	Sparse pine forests	800—1 300	EN endemic	Eastern Mediterranean ocean	Southern Anatolia	Turkey
44	<i>Lathyrus woronowii</i>	Annual	Weed	May	Thickets	—1	Endemic	Unknown	North Eastern Anatolia	Turkey
45	<i>Lathyrus setifolius</i>	Annual	Weed	March-April	Rocky slopes, deciduous oak forests, frigana thickets	20—800	Non endemic	Mediterranean	Outer Anatolia	South Europe, Crimea North Africa Western Syria, Caucasus
46	<i>Lathyrus annuus</i>	Annual	Weed	Unknown	Bushes, hedges, wet meadows between rocks, fields	0—1 000	Non endemic	Mediterranean	Thrace, Outer Eastern (Southern corner) Anatolia	Mediterranean, Syria Desert, Northern Iraq, Azerbaijan, North Iran, Central Asia
47	<i>Lathyrus hierosolymitanus</i>	Annual	Weed	May	Cereal fields	500	Non endemic	Eastern Mediterranean ocean	Southern Anatolia	Western Syria, Northern Egypt, Syrenaica
48	<i>Lathyrus cassius</i>	Annual	Weed	May-June	<i>Pinus brutia</i> forests, scrub, volcanic eruptions	0—1 650	Non endemic	Eastern Mediterranean ocean	South and South Eastern Anatolia	Western Syria, Cyprus, Northern Iraq
49	<i>Lathyrus gorgoni</i> variety <i>gorgoni</i>	Annual	Weed	April-June	Cereal and fallow fields, wet meadows, ditches	0—1 070	Non endemic	Eastern Mediterranean ocean	South and South Eastern Anatolia	Sicily, Sardinia, Northern Sinai, Western Syria, Cyprus, Northern Iraq
50	<i>Lathyrus gorgoni</i> variety <i>pilosus</i>	Annual	Weed	April-June	Grain and fallow fields, wet meadows, ditches	0—1 070	Non endemic	Eastern Mediterranean ocean	North, North Western and South Anatolia	Northern Iraq
51	<i>Lathyrus pseudo-cicera</i>	Annual	Weed	April-May	Fallow fields	150—750	Non endemic	Iran-Turan	Eastern Anatolia (Mesopotamia)	Northern Egypt, Palestine, Syria Desert, Northern Iraq, Western Iran
52	<i>Lathyrus cicera</i>	Annual	Weed	April-May	Oak thickets, <i>Pinus brutia</i> forest, rocky slopes, vine yards, grain and fallow fields	5—2 000	Non endemic	Unknown	Thrace, Outer and Central Anatolia, Eastern (Southern corner) Anatolia	Greece, Crimea North Africa Cyprus, Western Syria, Syria Desert, Northern Iraq, Central Asia
53	<i>Lathyrus sativus</i>	Annual	Weed	April-June	Everywhere	0—1 520	Non endemic	Unknown	Turkey (Excluding North east)	South and Central Europe, Northern Africa, South Western Asia
54	<i>Lathyrus blepharicarpus</i>	Annual	Weed	March-April	Hills, grassy places	100—600	Non endemic	Eastern Mediterranean ocean	Southern Anatolia	Western Syria, Cyprus
55	<i>Lathyrus marmoratus</i>	Annual	Weed	March-May	Rocky hill slopes, forests	75—1 700	NT Nonendemic	Unknown	Southern Anatolia	Northern Egypt, Western Syria, Syria Desert

续表 2 Continued Table 2

No.	Species	Livingforms	Growth form	Flowering months	Habitat	Altitude/m	Endemism	Element	Distribution in Turkey	General distribution
56	<i>Lathyrus stenophyllus</i>	Annual	Weed	April-June	Rocky lime stone slopes, <i>Pinus brutia</i> forest, scrub, foliage	—1	Non endemic	Eastern Mediterranean ocean	Southern Anatolia	Crete, Western Syria
57	<i>Lathyrus lycicus</i>	Annual	Weed	May-June	Shores	0—420	Endemic	Eastern Mediterranean ocean	Southern Anatolia	Turkey
58	<i>Lathyrus phaeotitanus</i>	Annual	Weed	May-June	Scrubs	70	EN endemic	Eastern Mediterranean ocean	Southern Anatolia	Turkey
59	<i>Lathyrus hirsutus</i>	Annual	Weed	May-June	Bushes and grass lands, cultivatedland	0—1 000	Non endemic	Unknown	North Anatolia	South and Central Europe, Crimea Lebanon, North Africa Caucasus, North Iran, Caspiansea
60	<i>Lathyrus chrysanthus</i>	Annual	Weed	May-June	Fallow fields	750	Non endemic	Iran-Turan	Eastern Anatolia (Mesopotemia)	Lebanon, Syria Desert
61	<i>Lathyrus chloranthus</i>	Annual	Weed	June-July	Bushes near shores and streams, volcanic slopes, wheat fields	600—1 800	Non endemic	Iran-Turan	Continental Anatolia	Northern Iraq, Iran, Ermenistan
62	<i>Lathyrus trachycarpus</i>	Biennial	Weed	May-June	Plains	700	VU endemic	Iran-Turan	Eastern Anatolia (Mesopotemia)	Turkey
63	<i>Lathyrus clymenum</i>	Annual	Weed	April-May	Frigana fields, watersides	0—100	Non endemic	Mediterranean	North western Turkey, Western and Central Anatolia O. Anadolu	Southern Europe, K. Afrika
64	<i>Lathyrus ochrus</i>	Annual	Weed	May-July	On the edge of groves, lawns, roadsides, rarely cultivated	0—50	Non endemic	Mediterranean	K. ve B. Turkey	Mediterranean
65	<i>Lathyrus gloeospermum</i>	Annual	Weed	April-May		780	Non endemic	Eastern Mediterranean ocean	South Eastern Anatolia	Palestine
66	<i>Lathyrus missolia</i>	Annual	Weed	May-July	<i>Pinus nigra</i> forest, oak thicket, grassland, swamps	0—1 900	Non endemic	Unknown	Turkey	Western, Central and Southern Europe, Crimea Caucasus, Northern Iraq, North western Africa
67	<i>Lathyrus aphaca</i> variety <i>aphaca</i>	Annual	Weed	April-May		0—100	Non endemic	Unknown	North Western Anatolia	Greece, Sicilya, Cyprus, Iran
68	<i>Lathyrus aphaca</i> variety <i>afinis</i>	Annual	Weed	April-June	Rocky lime stone slopes, meadows, fields, stream banks, frigana	0—1 700	Non endemic	Eastern Mediterranean ocean	Turkey	
69	<i>Lathyrus aphaca</i> variety <i>biiflorus</i>	Annual	Weed	April-June	Fields swampy land, devastated steppe, roadsides	0—1 900	Non endemic	Unknown	Turkey (excluding Northeast Anatolia)	
70	<i>Lathyrus aphaca</i> variety <i>floribundus</i>	Annual	Weed	May-June	<i>Pinus brutia</i> forest, rocky lime stone slopes	150—1 100	Non endemic	Unknown	Continental Anatolia	
71	<i>Lathyrus aphaca</i> variety <i>pseudopaphaca</i>	Annual	Weed	April-May	<i>Pinus brutia</i> forest, rocky lime stone slopes	0—1 000	Non endemic	Eastern Mediterranean ocean	Western and Northern Anatolia	
72	<i>Lathyrus aphaca</i> variety <i>modestus</i>	Annual	Weed	May	Lime stone slopes, scrub, fallow fields	500—1 300	Non endemic	Eastern Mediterranean ocean	Southern Anatolia	Cyprus
73	<i>Lathyrus stenolobus</i>	Annual	Weed	May-June	Groves	—1	DD endemic	Unknown	Southern Anatolia (Amanos mountains)	Turkey

Note: * DD. Data deficient; EN. Endangered; ENDEM. Endemic; LC. Leastconcern; NT. Nearthreatened; VU. Vulnerable^[38]

5 Conclusion

The collection and protection of *Lathyrus* species are of great importance because of protein, carbohydrates, and mineral elements. There is a need to characterize the *Lathyrus* species found in Turkey or elsewhere for chemical, phenotypic and molecular characteristics. This will facilitate the breeding of low or zero β -ODAP cultivars. Local populations of these species are concentrated in pockets spread over the map of Turkey. Detailed and complete information about yield, quality, and β -ODAP contents in these populations has yet to be

determined. This could be done through a coordinated International or National Research program/consortium involving taxonomists, breeders, agronomists, molecular biologists, economists, experts in analytical chemistry, pharmacognosy, etc. A collective approach could facilitate in identifying and categorizing the species suitable for different ecologies and their safe use in agriculture, pharmaceutical industry, ornamental plants industry, and others. These species could be introduced as intercrops in wheat and other crops of local farming systems with tremendous advantages.

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