
Araştırma Makalesi / Research Article

The Lipide-Soluble Vitamin Contents of Some *Lathyrus L.* Species

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Abstract

In the present study, lipide-soluble vitamin contents in the seeds of the *Lathyrus L.* taxa (*Lathyrus sylvestris L.*, *Lathyrus sphaericus Retz.*; *Lathyrus pratensis L.*, *L. aphaca L. var. modestus P.H.*, *L. aphaca L. var. biflorus Post.*, *L. aphaca var. pseudoaphaca (Boiss.) P.H. Davis*, *Lathyrus odoratus L.*, *Lathyrus hierosolymitanus Boiss.*, *Lathyrus tauricola P.H. Davis*) were determined by using HPLC. Data obtained from present study showed that studied *Lathyrus* taxa have high beta-caroten content (146,5±1,73-375,0±3,35 µg/g). present study found that *Lathyrus pratensis* has the highest gamma-tocopherol content (158,9±3,65 µg/g) whilst *L. aphaca var. pseudoaphaca (Boiss.) P.H. Davis* has highest D3 vitamin content (43,2±2,18 µg/g) among studied taxa. However, it was found that the r-tocopherol, a-tocopherol, a-tocopherol acetate, retinol, retinol acetate, D2 and K1 vitamins of studied *Lathyrus* taxa were lowest.

Keywords: HPLC, *Lathyrus*, Lipide-soluble vitamins.

Bazı *Lathyrus L.* Türlerinin Yağda Çözünen Vitamin İçerikleri

Öz

Bu çalışmada, HPLC ile *Lathyrus L.* türlerinin (*Lathyrus sylvestris L.*, *Lathyrus sphaericus Retz.*; *Lathyrus pratensis L.*, *L. aphaca L. var. modestus P.H.*, *L. aphaca L. var. biflorus Post.*, *L. aphaca var. pseudoaphaca (Boiss.) P.H. Davis*, *Lathyrus odoratus L.*, *Lathyrus hierosolymitanus Boiss.*, *Lathyrus tauricola P.H. Davis*) tohumlarındaki yağda çözünen vitamin içerikleri belirlenmiştir. Bu çalışmadan elde edilen veriler göstermiştir ki çalışılan *Lathyrus L.* türleri yüksek beta karoten içeriğine sahiptirler (146,5±1,73-375,0±3,35 µg/g). Bu çalışmada çalışılan türler arasında *Lathyrus pratensis*'in en yüksek gamma-tokoferol içeriğine (158,9±3,65 µg/g) sahip olduğunu *L. aphaca var. pseudoaphaca (Boiss.) P.H. Davis*'in ise en yüksek D3 vitamini içeriğine (43,2±2,18 µg/g) sahip olduğu bulunmuştur. Bununla birlikte, çalışılan *Lathyrus L.* türlerinin r-tokoferol, a-tokoferol, a-tokoferol asetat, retinol, retinol asetat, D2 ve K1 vitamin içeriklerinin oldukça düşük olduğu bulunmuştur.

Anahtar kelimeler: HPLC, *Lathyrus*, Yağda Çözünen Vitaminler.

1. Introduction

Legumes are consumed as significant source of protein in the many regions of world particularly in the developing countries with limited consumption of animal protein [1-2]. Legumes have low in fat, and high protein, carbohydrates, and mineral contents [3-4]. Several studies demonstrated that legumes reduced cardiovascular, diabetes, cancer and obesity risks [4-6].

Lathyrus L. is an important grain legume which contains 187 species and distributed mainly Mediterranean, Irano-Turanian, America and East Africa regions [7-9]. *Lathyrus L.* species are used as ornamental, food and feed crops [10-11]. *Lathyrus L.* have 75 taxa and separated into 10 sections in

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Turkey [12-17]. *Lathyrus* and other some genus belong to *Leguminosae* have important place due to rich phytochemical compositions [9,18]. *Lathyrus* L. includes high carbohydrate, protein, mineral and phenolic content [9,19-22]. However, there were no enough studies about phytochemical content and antioxidant capacity of *Lathyrus* [9]. The goal of present study is to determined the lipide-soluble vitamin contents of *Lathyrus* L. taxa.

2. Materials and Methods

2.1. Collection of plant materials

In the present study, lipid-soluble vitamin contents in mature seeds of the *Lathyrus* taxa (*L. sphaericus*; *L. pratensis*; *L. aphaca* L. var. *modestus*; *L. aphaca* L. var. *biflorus*; *L. aphaca* var. *pseudoaphaca*; *L. odoratus*; *L. hierosolymitanus*; *L. tauricola*) were examined. Sample plants were gathered from the natural habitats and details about the materials are explained in Table 1.

Table 1. Localities of studied *Lathyrus* taxa

Taxa	Locality
<i>L. sphaericus</i>	Isparta, Aksu hydroelectric power plant near, 1020 m
<i>L. pratensis</i>	Konya-Beyşehir Golyaka, Kubad-ı Abad palace around, 1230 m
<i>L. aphaca</i> var. <i>modestus</i>	Isparta-Egirdir Balkiri village, 910 m
<i>L. aphaca</i> var. <i>biflorus</i>	Burdur-Bağsaray, 870 m
<i>L. aphaca</i> var. <i>pseudoaphaca</i>	Isparta-Egirdir Kovada lake near, 900m
<i>L. odoratus</i>	Muğla-Dalyan Iztuzu road, 10 m
<i>L. hierosolymitanus</i>	Muğla-Marmaris Icmeler-Bozburun road 3 rd km 450 m
<i>L. tauricola</i>	Isparta-Kovada Lake near, 900 m.

2.2. Extraction of plant materials

1 g seed used to determine the lipide-soluble vitamin contents. The seeds are extracted with hexane/isopropanol (3:2 v/v) [23]. Extracts were centrifuged at 10.000 g for 5 minutes and filtered. The solvent was removed on a rotary evaporator at 40°C. After that lipid-soluble vitamins were extracted based on the method of Sánchez-Machado [24] with some changes. The results were repeated three times.

2.3. Chromatographic analysis and quantification of lipid-soluble vitamins

Seeds were treated with acetonitrile/methanol (75/25 v/v) and were injected 50 µL to HPLC (Shimadzu, Kyoto Japan). Supelcosil TM LC18 (250 x 4.6 mm, 5 mm, Sigma, USA) column was used and acetonitrile/methanol (75/25 v/v) was used as the mobile phase. The elution was conducted at a flow-rate of 1 ml/min. The temperature of analytical column was adjusted at 40 °C. Detection was conducted at 320 nm for retinol (vitamin A) and retinol acetate, and 215 nm for δ-tocopherol, vitamin D2 and D3, α-tocopherol, α-tocopherol acetate, 235 nm for vitamin K1. Class Vp 6.1 software assisted at work up of the data [25]. The results of analysis were uttered as µg/g for samples.

3. Results and Discussion

The lipide-soluble vitamin contents of studied *Lathyrus* L. taxa were given Table 2.

Table 2. The lipide-soluble vitamin contents of studied *Lathyrus* taxa

Lipide-soluble vitamins (µg/g)										
Taxa	Beta carotene	Gamma tocopherol	R-tocopherol	D2	D3	a-tocopherol	a-tocopherol acetate	K1	Retinol	Retinol acetate
<i>L. sphaericus</i>	156,1±1,66	4,1±0,56	-	0,9±0,2	37,3±1,85	-	-	-	0,1±0,03	0,3±0,04
<i>L. pratensis</i>	209,2±2,71	158,9±3,65	-	0,7±0,01	24,0±1,19	2,6±0,09	2,4±0,03	-	-	0,3±0,02
<i>L. aphaca</i> L. var. <i>modestus</i>	151,3±3,06	74,7±2,11	-	1,5±0,5	40,3±1,24	0,8±0,04	1,7±0,04	-	0,4±0,02	0,6±0,07
<i>L. aphaca</i> L. var. <i>biflorus</i>	146,5±1,73	30,1±1,32	-	0,1±0,01	32,7±0,97	-	1,5±0,04	-	0,1±0,01	0,3±0,01
<i>L. aphaca</i> var. <i>pseudoaphaca</i>	283,0±3,12	76,0±1,23	0,2±0,03	-	43,2±2,18	0,1±0,01	2,3±0,01	0,1±0,02	0,3±0,01	0,5±0,01
<i>L. odoratus</i>	336,8±1,93	9,4±0,64	-	-	24,3±1,15	1,5±0,06	-	1,5±0,57	0,4±0,06	0,6±0,02
<i>L. hierosolymitanus</i>	353,2±2,22	63,1±1,66	0,1±0,01	-	12,8±0,41	0,2±0,02	-	-	0,2±0,02	0,4±0,02
<i>L. tauricola</i>	375,0±3,35	59,7±2,17	0,5±0,02	-	33,9±0,94	2,2±0,04	1,7±0,09	-	0,3±0,02	0,9±0,04

Present study showed that studied *Lathyrus* species have high beta-carotene content. *Lathyrus tauricola* has highest beta-carotene content (375,0±3,35 µg/g) while *Lathyrus aphaca* L. *biflorus* has lowest beta-carotene content (151,3±3,06 µg/g). The D3 content of studied *Lathyrus* species have found between 43,2±2,18 µg/g (*Lathyrus aphaca* L. *pseudoaphaca*) and 12,8±0,41 µg/g (*Lathyrus hierosolymitanus*). *Lathyrus pratensis* has high gamma tocopherol 158,9±3,65 µg/g whilst *Lathyrus sphaericus* has low gamma tocopherol content (4,1±0,56 µg/g). The a-tocopherol contents of studied *Lathyrus* taxa are between 0,2±0,02 µg/g and 2,6±0,09 µg/g. *Lathyrus sphaericus* and *Lathyrus aphaca* L. *biflorus* don't have a-tocopherol content. The studied five *Lathyrus* taxa have a-tocopherol acetate content (1,5±0,04-2,3±0,01 µg/g). The other studied taxa don't have a-tocopherol acetate content. This study demonstrated that studied *Lathyrus* taxa have lowest K1 vitamin content. Furthermore, the retinol and retinol acetate contents of studied *Lathyrus* taxa quite low.

4. Conclusion

Legumes are consumed high levels especially Asia, Africa and South America [26]. Studies showed that legumes have complex carbohydrates, vitamins, fibers, polyphenols [27] and they play significant role many disease such as cancer, diabetes [9]. Tocopherols, are lipide-soluble vitamins which play important role against free radical damages in the cell [28]. Studies indicated that tocopherols inversely connected with cardiovascular disease, cancer and insulin resistance [28-30]. In this study, it was determined that *Lathyrus* taxa have low r-tocopherol, a-tocopherol and a-tocopherol acetate amounts. However, studied *Lathyrus* taxa have high gamma tocopherol content (30,1±1,32-158,9±3,65 µg/g) except for *Lathyrus sphaericus* has 4,1±0,56 µg/g and *Lathyrus odoratus* has 9,4±0,64 µg/g. On the contrary, Fernandez-Marin et al. [31] determined that of all tocopherols, γ -tocopherol was the most abundant isoform in all species, apart from *Vigna* and *Arachis*, where δ -tocopherol and α -tocopherol were the main isoforms, respectively. It was found that all of the legumes studied demonstrated the presence of γ -tocopherol in relatively high levels, with the exception of black beans study done by Wyatt et al. [32]. Similarly, Sahin et al. [33] found that *Lathyrus* taxa have high δ -tocopherol, α -tocopherol, α -tocopherol acetate. They also found that vitamin D3 content of studied *Lathyrus* taxa was high [33]. However, present study vitamin D3 content of studied taxa varied from 12,8±0,41 µg/g to 43,2±2,18 µg/g.

Present findings indicated that *Lathyrus* taxa have high beta-carotene varied from 375,0±3,35 µg/g to 146,5±1,73 µg/g. *Lathyrus tauricola* has highest beta-carotene content. Chavan et al. [34] found that carotene content of *Lathyrus* is 12.17 mg/100g. Also, Korus et al. [35] showed that carotene content of *Lathyrus* is 31.5 mg/100g. However, Mamatha et al. [36] found that studied legumes including *Phaseolus*, *Vigna*, *Lens* and *Cicer* have lowest a-and b-carotene contents. On the other hand, studied *Lathyrus* taxa have lowest r-tocopherol, vitamin D2, vitamin K1, retinol and retinol acetate amounts. Similarly, Sahin et al. [33] determined that retinol, retinol acetate, vitamin D2 were trace amounts in studied taxa. However, Arslan [9] indicated that legumes include K vitamin together with vitamin B1, B2, B6, vitamin C, vitamin E.

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