



## Tannin, Protein Contents And Fatty Acid Compositions of *Silene compacta* Fische Seeds From Bingöl, Turkey

Adil BAKOĞLU<sup>a\*</sup>, Kağan KÖKTEN<sup>b</sup>, Zühal KAVURMACI<sup>c</sup>

<sup>a</sup>Program of Field Crops, Vocational School of Higher Education, University of Bingol, Turkey.

<sup>b</sup>Department of Field Crops, Faculty of Agriculture, University of Bingol, Turkey.

<sup>c</sup>Agricultural Engineer, Erzurum, Turkey

\*Corresponding author: abakoglu@bingol.edu.tr

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### Abstract

The seeds of *Silene compacta* Fische were investigated for their protein, tannin content and fatty acid composition. The protein contents of *Silene* seeds were found to be 15,33%. On the other hand the tannin contents of the same seeds were also found to be 1,9%. The fatty acid compositions of these *Silene compacta* Fische were determined by GC (Schimadzu GC, 17 Ver.3) of the methyl esters of its fatty acids. The seed oils of *Silene compacta* Fische contained palmitic and stearic acids as the major component of fatty acids, among the saturated acids, with small amounts of myristic, palmitoleic, stearic acids and margaric acids. The major unsaturated fatty acids found in the seed oils were oleic, linoleic and linolenic acids. In this study, total proportion of saturated fatty acids of *S. compacta* Fische was found 25,6% while total proportion of unsaturated fatty acids was found 74,4%.

**Key words:** *Silene compacta* Fische, protein, tannin, fatty acids

## Türkiye, Bingöl İlinde Sık Çiçekli Yapışkanotu (*Silene compacta* Fische) Tohumlarının Protein, Tanen ve Yağ Asidi İçerikleri

### Özet

Sık çiçekli yapışkanotu (*Silene compacta* Fische) tohumlarının protein, tanen ve yağ asitleri içerikleri çalışılmıştır. Bitki tohumunun protein içeriği %15.33 olarak bulunmuştur. Diğer yandan bitki tohumunun tanen içeriği yine %1.9 olarak belirlenmiştir. Sık Çiçekli yapışkan otunun (*Silene compacta* Fische) yağ asidi içerikleri yağ asidinin metil esterlerinde Schimadzu GC,17 Ver.3 ile ortaya çıkarılmıştır. Bitki tohumlarının yağ asidi içerikleri doymuş yağ asitlerden myristik palmitoleik, stearik ve margarik asitler düşük miktarda palmitik ve stearik asitler yüksek miktarda içermişlerdir. Tohum yağında bulunan başlıca doymamış yağ asitleri oleic, linoleic ve linolenik olarak bulunmuştur. Bu çalışmada Sık çiçekli yapışkanotu tohumunun toplam doymamış yağ aside oranı %74.4 olurken, doymuş yağ aside oranı %25.6 olarak bulunmuştur.

**Anahtar kelimeler:** Sık Çiçekli Yapışkanotu (*Silene compacta* Fische), protein, tanen, yağ asitleri

### Introduction

The genus *Silene* is a member of the family Caryophyllaceae, known as a large and polymorphic genus, and contains about 300 species all over the world. The genus is represented by 150 taxa in the Flora of Turkey, of which 67 are endemic. This biannual (or perennial) herbal plant flowers in May to August and prefers slopes, coastal zones and pastures among woodlands in 0-2100 m (Coode and Cullen, 1967;

Davis et al., 1988; Vural and Adigüzel, 1996; Güner et al., 2000; Küçükboyacı et al., 2010).

To date, there has been little study of the chemical compositions of *Silene* species. Several studies are devoted to the fatty acid composition of various *Silene* species (Alarcon et al., 2006; Tolibaev et al., 1993; Vardavas et al., 2006).

The fatty acid composition of plants showed different saturated and unsaturated fatty acid concentrations. Linolenic, oleic, palmitic and linoleic acids were found as the abundant

compounds. The seeds are rich in unusual fatty acids and protein (Bakoglu et al., 2009).

The contents of other TUSFA and TSFA components of the seed oils of crops studied were not higher than 1%. Total saturated fatty acid (TSFA) concentrations of oils of crops studied were between 15.79 and 19.75%. On the other hand, total unsaturated FA contents of the seed oils were higher than TSFA, between 74.62 and 80.76%. TUSFA contents of the oils were found as similar. The studies showed that the saturated and particularly unsaturated FA contents of seed oils are closely allied to each other and the main components in the oils are linoleic-oleic type fatty acids (Bagci et al., 2001; Bagci et al., 2004; Bagci and Vural, 2001; Bagci, 2006; Bagci, 2007; Bakoglu et al., 2010).

The objective of the present study was to determine the fatty acids, tannin and protein contents of the seeds of *Silene compacta* Fische grown wild in Turkey.

## Material and Methods

### Seed samples

Matured seeds of *Silene compacta* Fische were collected from various locations in Bingöl province of Turkey between June and August 2009.

### Oil extraction and preparation of fatty acid methyl esters (FAME)

Impurities were removed from the seeds and the cleaned seeds were ground into powder using a ball mill. Lipids were extracted with hexane/isopropanol 2v v<sup>-1</sup> (Hara and Radin, 1978). The lipid extracts were centrifuged at 10.0 g for 5 min and filtered; then the solvent was removed on a rotary evaporator at 40°C.

### Capillary GLC

Fatty acids in the lipid extracts were converted into methyl esters by means of 2% sulphuric acid (v v<sup>-1</sup>) in methanol (Christie, 1990). The fatty acid methyl esters were extracted with hexane. Then the methyl esters were separated and quantified by gas chromatography and flame ionization detection (Schimadzu GC, 17 Ver.3) coupled to a glass GC 10 software computing recorder. Chromatography was performed with capillary column (25 m in length) and 0.25 mm in diameter, Permabound 25, Machery – Nagel, Germany using nitrogen as carrier gas (flow rate 0.8 ml min<sup>-1</sup>). The temperatures of the column, detector and injector valve were 130-220 and 240-280°C, respectively. Identification of the individual method was performed by frequent comparison with authentic standard mixtures that were analyzed under the same conditions.

### Determination of protein and tannin contents

The extracts were prepared in 70% aqueous acetone (v v<sup>-1</sup>). Total phenols were measured by using the Folin-Ciocalteu method and the results are expressed as tannic acid (Merck; Darmstadt, Germany) equivalent. Protein precipitation capacity of tannins was measured by the method of Makkar et al. (1995) for the protein precipitation assay, seed extracts were prepared in 50% aqueous methanol as presence of acetone interferences with these assays. Nitrogen content (Crude protein = Nx6.25) in the seeds was determined by Kjeldahl method (AOAC, 1990). Protein and tannin analyses were carried out in triplicate.

**Table 1.** Total protein (%), tannin contents (%) and fatty acid composition of *Silene compacta* Fische from Turkey.

Plant species	Fatty Acid Components							
	14:0	16:0	16:1 Δ9	18:0	18:1 Δ9	18:2 Δ9, 12	18:3 Δ9, 12, 15	20:0
<i>Silene compacta</i> Fische	0.49	20.75	--	2.48	8.51	33.58	30.4	0.91

  

Plant species	Fatty Acid Components						Protein (%)	Tannin (%)
	20:1	22:0	24:0	24:1	TSFA	TUSFA		
<i>Silene compacta</i> Fische	0.29	0.61	0.38	1.63	25.6	74.4	15.33	1.9

14:0: myristic acid, 16:0: palmitic acid, 16:1Δ9: palmitoleic acid, 18:0: stearic acid, 18:1Δ9: oleic acid, 18:2Δ9,12: linoleic acid, 18:3Δ9,12, 15: linolenic acid, 20:0: arachidic acid, 20:1: gadoleic acid, 22:0: behenic acid, 24:0: lignoceric acid, TSFA: Total saturated fatty acid, TUSFA: Total unsaturated fatty acid

## Results and Discussion

In this study, the total protein amount, fatty acid composition and tannin contents of *Silene compacta* Fische from Turkey were determined. The results of the fatty acid total protein and tannin contents are shown in Table 1. It can be seen that the qualitative fatty-acid compositions of seeds parts of the species of *Silene* were identical and consisted of 11 acids. Their quantitative compositions differed. This was evident in the content of the principal acids, the saturated one of which was palmitic acid the unsaturated ones, two essential fatty acids linoleic acid and linolenic acid.

The fatty acid compositions of *Silene compacta* Fische was determined by GC of the methyl esters of its fatty acids. The seed oils of *Silene compacta* Fische contain palmitic (20.75%) and stearic acids (2.48%) as the major component of fatty acids, among the saturated acids, with small amounts of myristic, palmitoleic, stearic acids and margaric acids. The major unsaturated fatty acids found in the seed oils were oleic (8.51%), linoleic (33.58%) and linolenic acids (30.4%). In this study, total proportion of saturated fatty acids of *Silene compacta* Fische was 25.6% while total proportion of unsaturated fatty acids was 74.4%, and the same results was reported to *Silene brauhica* by Tolibaev (1993). Küçükboyacı (2010) reported that unsaturated fatty acid contents in *S. cserei* subsp. *aeoniopsis* (87%) and *S. vulgaris* (68%). The fatty acid compositions of the seeds of *S. vulgaris* and *S. cserei* subsp. *aeoniopsis* were very similar, but the percentages of main compounds were found to be different. The main compounds were identified as unsaturated fatty acids such as linoleic acid (38.4 and 65.4%) and oleic acid (28.6 and 17.8%), and a saturated fatty acid, palmitic acid (17.4 and 8.8%), in both seed oils, respectively. GC/MS analysis demonstrated that *S. cserei* subsp. *aeoniopsis* seed oil was remarkably rich in linoleic acid (65.4%). Another study was identified that *S. brachuica*, *S. viridiflora* and *S. wallichiana* unsaturated fatty acids were linoleic (11.0, 18.8 and 22.5%), oleic acid (10.3, 5.4 and 8.3 %) and saturated fatty acid, palmitic acid (18.5, 24.7 and 26.6) respectively (Mamadaileva et al., 2010).

The seed protein and tannin contents have been identified to 15,33 and 1.9%. In this study, total protein yield was higher than *Silene viridiflora* (5.88%) (Eshmirzaeva et al., 2005). On the other hand, the tannin contents of some species were determined to be in high levels in *Lathyrus cicera* (6.33%) and in low levels in *Trigonella foenum-graceum* (0.67%). In the other species, the tannin contents were determined as

0.70, 0.77, 1.63 and 2.17% (Kocak et al., 2011). In another study, tannin amount of some crops were between 0.77-1.73% (Kökten et al., 2011).

It appears from aforementioned studies that there are many *Silene* species whose chemical compositions, the fatty acids, protein and tannin contents have not been studied yet. Thus we believe that the results of our study encourage further screening for the chemical composition of other *Silene* species that have not been studied earlier. In conclusion, with regard to the protein amount, fatty acid composition and tannin contents, the genus *Silene* requires further investigation, and our research team is currently engaged in an intensive study on this research areas.

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