

## CHARACTERISTICS OF TURKISH CUCURBITA MAXIMA DUCH SEED OİL

### TÜRK CUCURBITA MAKSİMALARININ ÖZELLİKLERİ

A.AHMET BAŞARAN\*, K. FARUK ÇİFTÇİ\*\*, ŞENAY KÜSMENOĞLU\*\*\*

\*Hacettepe University, Faculty of Pharmacy, Dept. of Pharmacognosy TR-06100, Ankara, Turkey  
\*\* Pharmacy Eğitim, Bursa, Turkey

\*\*\* Gazi University, Faculty of Pharmacy, Dept. of Pharmacognosy, Ankara, Turkey

The oil of *Cucurbita maxima* seeds, which are used as anthelmintic in Turkey was analysed for physical and chemical properties. Methylated fatty acids were analyzed by using gas chromatography and the major compounds were determined as linoleic (%42.6), oleic (%32.6), palmitic (%15.1) and stearic acid (%6.5) and the total amount of unsaturated fatty acids was found as 75%. The iodine value was also a good indicator for the unsaturation of the oil.  $\beta$ -sitosterol was isolated from unsaponifiable fraction of the oil and identified by chromatographic and spectroscopic methods comparing with the authentic sample.

Bu çalışmada Türkiye'de antihelmintik amaçlarla kullanılan *Cucurbita maxima* tohumlarının sabit yağ fiziksel ve kimyasal özellikleri yönünden araştırılmıştır. Metilendirilmiş yağ asitlerinin gaz kromatografik analiz sonuçları incelendiğinde majör bileşiklerin linoleik (%42.6), oleik (%32.6), palmitik (%15.1) ve stearik asit (%6.5) olduğu ve doymamış yağ asitlerini total olarak %75 oranında taşıdığı saptanmıştır. Yağın doymamış asitler yönünden zengin olduğunun diğer bir belirtisi de iyot indisinin yüksekliğidir. Yağın sabunlaşmamış fraksiyonundan elde edilen  $\beta$ -sitosterol, standart maddeler ile kromatografik ve spektroskopik yöntemlerle karşılaştırılarak tayin edilmiştir.

**Keywords:** *Cucurbita maxima*, unsaturated fatty acids,  $\beta$ -sitosterol, gas chromatography.

**Anahtar kelimeler:** *Cucurbita maxima*, doymamış yağ asitleri,  $\beta$ -sitosterol, gaz kromatografisi

## Introduction

Cucurbitaceae is one of the important plant family in food industry and medicine and widely used for both purposes throughout the world. In Turkey, *Citrullus colocynthus*, *Momordica charantia*, *Ecballium elaterium* are some of the well known and important examples of Cucurbitaceae used in herbal folk medicine (1).

*Cucurbita maxima* is a well known plant in Turkey and seeds are widely used as antihelmintic purposes especially in Bursa-Balikesir region.

As there has been no detailed information on the chemical structure of Turkish *C. maxima* seeds, it is planned to investigate the chemical composition of the seeds.

## Material and Methods

### Plant Material

*C. maxima* seeds studied have been collected from the villagers who use them for anthelmintic purposes in Balikesir region. The origin of the seeds were identified by Agricultural Plant Department, Bursa and the literature(2).

### Extraction

Sun dried seeds were ground to a powder and 500 g ground seeds were extracted with n-hexane for 10 hours

in a Soxhlet extractor (3). The extract was filtered and the solvent was evaporated under reduced pressure. The obtained oil was kept in sealed bottles under refrigeration for analyses.

### Chemical Properties of the Oil

The properties including density, acidity, iodine value, ester value, saponification number, unsaponifiable matter %, were performed according to Pharmacopeial procedures(4). Refractive index was determined by an Abbe refractometer (Aus Jena) with temperature adjustment. Optical rotation was carried out by Kreiss type polarimeter. All determinations were performed in triplicate and the mean values were reported.

### Isolation and determination of the sterol

Isolated fixed oil was extracted with 20% alcoholic potassium hydroxide for 3 hours and filtered. The filtrate was then concentrated and dissolved in 500 ml distilled water by gently heating. After cooling, extracted with 200 ml diethyl ether twice. The combined ether fractions were washed with distilled water and evaporated. The residue was dissolved in hot alcohol and left in refrigerator for crystallisation. Chromatographic controls, melting point determination and spectral analysis of the sterol were carried out after recrystallisation (5). Melting point, UV spectrum and FT-IR analysis were carried out by Buchi, Shimadzu UV-160 A, Perkin Elmer 1720-X respectively.

### Identification of fatty acids

Gas chromatographic analysis of the fatty acids was carried out after methylation. The oil was treated with 0.5 N methanolic NaOH and BF<sub>3</sub>-MeOH. Then, methyl

esters were extracted with n-hexane and dried with anhydrous sodium sulphate. The analysis of methyl esters were performed under the conditions given in Table 1 (6).

Table 1. The gas chromatographic conditions used for *C. maxima* oil

Gas chromatograph	: Hewlett Packard 5890
Capillary column	: Ultra 1, Cross-linked Methyl silicon Gum Phase, 50m x 0.2mm 0.3 $\mu$
Detector temp.	: FID-250°C
Injection port temp.	: 250°C
Oven temp.	: 190°C to 250°C (2°C/min)
Carrier gas, flow rate	: Helium - 0.9 ml/min
Split	: 1:50
Chart speed	: 0.5 cm/min. after 9 min 1 cm/min

The determinations of the components was assigned by comparing their retention times with those of authentic specimens on the capillary column as well as peak enrichment.

## Results and Discussion

Chemical screening of *C. maxima* seeds showed that protenoids, catechic tannins and saponins and fixed oil were the major constituents (7). The fixed oil obtained was a dark brown with a green tint liquid. Its odor was faintly nut-like. The results of the physical and chemical properties were tabulated in Table 2.

Table 2. The properties of *Cucurbita maxima* seed oil

Yield %	: 29.45	Acidity	: 1.15
Density	: 0.8956	Saponification value	: 201.04
Refractive index	: 1.4617	Unsaponifiable matter %	: 0.80
Optical rotation	: Inactive	Iodine value	: 105.33

When the results were investigated, it can be seen that *Cucurbita maxima* oil had a low value for acidity an unsaponifiable matter. Saponification value was in the range reported in literature (8-12). The oil had relatively high iodine value reflecting a high degree of unsaturation.

The gas chromatographic analyses were given in Table 3. The retention times of the com-

ponents were calculated by external standards.

Table 3. The results of GLC analysis of *Cucurbita maxima* oil

Compound Name	Ret. Time (min)	%
Caproic acid	2.5	0.38
Caprylic acid	2.9	0.44
Capric acid	3.6	0.59
Palmitic acid	11.1	15.10
Linoleic acid	15.6	42.63
Oleic acid	15.8	32.59
Elaidic acid	15.9	0.74
Stearic acid	16.6	6.45
Unknowns	4.1; 11.5	1.08

GLC analyses of the fatty acid methyl esters also showed the degree of unsaturation. Linoleic acid was found to be the dominant fatty acid 42.63%, followed by oleic acid 32.59%. Palmitic acid 15.1% was the major saturated fatty acid. The total unsaturated acid content was 75.22% while the unknowns were only 1.08% of the oil.

Unsaponifiable part of the oil was investigated from the point of view of sterols and was found to be rich in sterols.  $\beta$ -sitosterol, a phytosterol gained interest as a promising medicine in prostatahyperplasia in recent years, was first detected by TLC (Kieselgel GF<sub>254</sub>, Toluene : Aceton (85:15) and vanilline-H<sub>2</sub>SO<sub>4</sub> %1 as adsorbent, solvent system and revelator resp.) comparing with standart sample and was isolated after recrystallisation with the yield of 0.45%.

$\beta$ -sitosterol, mp 137°C; UV max. (MeOH) 283.4 (Br. Sh) nm; FT-IR (KBr pellets) 3436 (OH), 2919-2850 (C-H), 1645 (C-C), 1040 (C-O) cm<sup>-1</sup>. The chemical structure was confirmed by comparing the data with those obtained by standart sample as well as references (6,13).

In conclusion, because of the high content of unsaturated fatty acids, the seed oil *Cucurbita maxima* could be utilized in food industry in diets such as corn oil as well.

Furthermore, according to the literature,

the general pharmacodynamic activity of the various solvent extracts of *C.maxima* seeds showed that seeds possessed potent anthelmintic properties (14) which may also be needed for investigation from the point of chemical compounds and their activity.

#### References

1. Baytop, T.: "Türkiye'de Bitkilerle Tedavi", İ.Ü. Yayınları No:3255, İstanbul (1984)
2. Ekinci, A.S.: "Genel Sebzecilik", pp. 384, Baha Matbaası, İstanbul (1974)
3. Farnsworth, N.R.: J. Pharm. Sci., 55, 225 (1966)
4. Sezik, E., Başaran, A.A.: J.Fac.Pharm. İstanbul, 21, 121, (1985)
5. Küsmenoğlu, Ş., Mutlugil, A., Şener, B.: Proceedings of the 6th Symposium On Plant Originated Crude Drugs, Ankara 1986, May 16-19, pp. 351, 1987
6. Küsmenoğlu, Ş., Rockwood, L.L., Gretz, M.R.: Phytochemistry, 28, 2601 (1989)
7. Çiftçi, K.F.: *Cucurbita maxima* Duch Tohumları Üzerinde Farmakognozik Araştırmalar, H.Ü. Yüksek Lisans Tezi, Ankara, (1995)
8. Lazos, E.S.: Chimica Chronica, New Series, 15, 91 (1986)
9. Lazos, E.S.: J. Food Sci., 51, 1382 (1986)
10. Ghaleb, M.L., Farines, M., Soulier, J.: Revue Française des Corps Gras, 38<sup>e</sup> Annee, No 1/2, 17 (1991)
11. Chisholm, M.J., Hopkins, C.Y.: Canadian Journal of Chemistry, 42, 560 (1964)
12. Pfannhauser, W., Scheidler, I., Woidich, H.: Fette Seifen Anstrichmittel, 82, 232 (1980)
13. "Merck Index", Ninth Edition, Martha Windholz (Ed.) pp. 8294, Merck & Co. Inc. New Jersey (1976)
14. Srivastava, M.C., Tewari, J.P., Singh, S.W., Gupta, M.I., Mishra, K.C.: Labdev, 5, 64 (1967)

Accepted: 01.04.1997