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Mineral Composition of Inbred Confectionary Pumpkin Candidates from Turkey Originated Populations

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ABSTRACT: Turkey is one of the most important countries in the production of confectionary pumpkin. The aim of the study is to reveal the amount of some mineral elements in seed coat and the seed of confectionary pumpkin candidates which gathered from different regions of the country and reached in S5 level. In the present study, a total of twenty-seven pumpkin genotypes which were self-pollinated to the level of S5 and two local population characterized genotypes were used as plant material. Contents of P, K, Ca, Fe, Mg, Mn, Cu, S and Zn minerals were determined in the seed coat and seed, separately. Results of the study indicated that the highest content inside of the seeds as following genotypes; "A14" and "A25" for P, "A14" for K, "B17" and "A8" for Ca, "B33" and "C24" for Fe, "A14" for Mg, "C30" and "A32" for Mn, "A14" for Cu, "A14" for S and "A14" for Zn. Seed coat produced the highest content as following; "B14" for P, "A14" for K, "A11" for Ca, "C25" and "B25" for Fe, "A11" for Mg, Ürgüp Sivrisi (population characterized) for Mn, "A33" for Cu, "C18" for S and "A14" for Zn. Consequently, "A14" was found as the highest content of nutritional compounds.

Keywords: Genotype, mineral, quality, seed composition

Türkiye'den Toplanan Popülasyonlardan Elde Edilen Çerezlik Kabak Çeşit Adaylarının Mineral Madde İçerikleri

ÖZET: Türkiye, çerezlik kabak üretiminde en önemli ülkeler arasındadır. Çalışmanın amacı, ülkenin farklı bölgelerinden toplanan ve S5 kademesine ulaştırılan çerezlik kabak ıslah hatlarında tohum kabuğu ve tohumdaki bazı mineral maddelerin miktarını ortaya koymaktır. Bu çalışmada, S5 kademesinde yirmi yedi kabak genotipi ve genotip olarak karakterize edilmiş iki yerel popülasyon kullanılmıştır. Tohum kabuğu ve tohumda P, K, Ca, Fe, Mg, Mn, Cu, S ve Zn minerallerinin içeriği ayrı ayrı belirlenmiştir. Araştırma sonuçlarında, tohum içerisindeki en yüksek mineral madde içeriği P için "A14" ve "A25", K için "A14", Ca için "B17" ve "A8", Fe için "B33" ve "C24", Mg için "A14", Mn için "C30" ve "A32", Cu için "A14", S için "A14" ve Zn için "A14" hatlarında belirlenmiştir. Tohum kabuğunda ise P için "B14", K için "A14", Ca için "A11", Fe için "B25" ve "C25", Mg için "A11", Mn için Ürgüp Sivrisi (popülasyon), Cu için "A33", S için "C18" ve Zn için "A14" hatlarında en yüksek değerler gözlenmiştir. Sonuç olarak A14 en yüksek mineral madde içeriğine sahip genotip olarak tespit edilmiştir.

Anahtar Kelimeler: Genotip, mineral, kalite, tohum bileşimi

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INTRODUCTION

Seeds of many plants are produced for use in human and animal feeding. Environmentally (friendly) production techniques, which are considered to be the basis of sustainability in agricultural production, functional food production to be provided by improving soil characteristics and increasing nutritional value while intensive production techniques are applied among the topics that researchers worldwide are interested in recently (Krzebietke and Sienkiewicz, 2010; Jankowski et al., 2015; Kahraman, 2017a). It is obvious that seeds are the materials to increase desired yield and quality in crop production. Confectionary pumpkin is usually produced for fruit, as well as their seeds used as a snack or in human nutrition due to high-quality oil content (Paris, 2001). Turkey, where biodiversity and varieties vary widely in genetic variation, is located within the origin and boundaries of some cucurbit species, and most of the species of pumpkin belonging to the *Cucurbitaceae* family can be grown easily. While confectionary pumpkin is mostly consumed as a snack in Turkey, in other countries, it is widely used in food, medical and cosmetic fields. The pumpkin has a production value of 41.610 tons with 61.500 hectares in Turkey. According to the data obtained, 32.960 tons of this production takes place in the Central Anatolia region and the cultivation areas are increasing day by day (Tüik, 2015). Edible pumpkin cultivation is not economic especially in inner regions of Turkey, also lack of problem in storage and marketing are among the main reasons why the spread of pumpkin growing in arid and limited irrigation water conditions (Düzeltir, 2004; Keskin, 2007; Yavuz et al., 2015).

The pumpkin seed has active ingredients that protect and cure diseases, as well as nourishing by the nutrients they contain. For centuries, it has been traditionally used for the treatment of diseases and pests such as prostate and parasites. Nowadays, it is being used increasingly as a modern therapeutic agent or as a medical preparation.

The oil obtained from the pumpkin seeds limits its use as a food product due to its color, foaming properties and sharp flavor. However, in Austria, Slovenia and Romania, it is a commonly used salad oil (Murkoviç et al., 1996). Pumpkin seeds contain approximately 42-54% fat, and fatty acid composition depends on factors such as location, climate and maturity (Murkoviç et al., 1999; Türkmen et al., 2015; Seymen et al., 2016).

The composition of amino acids, fatty acids, minerals and vitamins of pumpkin seeds of different genotypes varies depending on environmental conditions.

The determination of these properties, which are accepted as quality parameters, is important for the evaluation in food, oil and medicine industry. Omega-3 (w-3) and omega-6 (w-6) fatty acids are fatty acids that cannot be synthesized by the human body and must be taken from the outside. These compounds, called essential fatty acids, have very important functions in body metabolism (Murkoviç et al., 1996).

Essential amino acids found in the pumpkin seed protein are *isoleucine*, *leucine*, *lysine*, *methionine*, *phenylalanine*, *threonine*, *tryptophan* and *valine*. These amino acids are essential amino acids that must be taken from the outside for feeding. Pumpkin seed is very rich in vitamins such as Thiamin (B1), Riboflavin (B2), Niacin and Folic Acid from water soluble group B vitamins, and E vitamins from oil soluble vitamins. Pumpkin seeds also contain other vitamins such as A, D and K. These vitamins are a raw material which is used for the enrichment of medical extracts and increases day by day due to antioxidant activities.

The pumpkin seed is also rich in mineral content. Especially P and Mg content are higher than many oil crops. Pumpkin seeds are also an important source of Ca, K, Se, Mn, Fe and Zn minerals (Seymen et al., 2016). The aim of this study is to reveal the amount of mineral elements in seeds and seed coats of confectionary pumpkin candidates which gathered

from different regions of the country and reached S5 level.

MATERIALS AND METHODS

In the present study, a total of 27 selected pumpkin genotypes in S5 stage and 2 local populations which are important in terms of seed shape, size, color and ease of climbing were used as plant material. Mineral analyzes were made on seed coat and seed (inner), separately in dried seeds. Seeds were sown at 100x50 cm spacing according to a randomized block design in three replications with 14 seedlings for each plot. Fertilizers were applied to plants 11 kg da $^{-1}$ P and 4 kg da^{-1} N in seedling planting stage and when fruits were seen 6 kg da^{-1}, N was performed two equal amounts in ten days.

Pumpkin seeds were dried and ground until the weight is constant at 70 °C. About 0.2 g of grounded pumpkin seed was put into a crucible with 15 ml of pure NHO_3 and 2 ml H_2O_2 (30 % w/v). The sample was incinerated in a MARS 5 microwave oven at 210 °C. After a digestion treatment, samples were filtered through a Whatman No 42 filter. The filtrates were collected in 50-ml flasks and analyzed by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES).

Mineral contents of the samples were quantified against standard solutions of known concentrations which were analyzed concurrently (Kahraman, 2014).

Instrument: ICP-AES (Varian-Vista Model)

RF power: 0.7–1.5 kW (1.2–1.3 kW for axial)

Plasma gas flow rate (Ar): 10.5–15 l/min^{-1}. (radial) 15 l/min^{-1}. (axial)

Auxiliary gas flow rate (Ar): 1.5 l/min^{-1}.

Viewing height: 5–12 mm

Copy and reading time: 1–5 s (max. 60 s)

Copy time: 3 s (max. 100 s)

The study was conducted with three replications, and results of the research were analyzed for statistical significance by analysis of variance (Püskülcü and İkiz, 1989).

RESULTS AND DISCUSSIONS

In the study, significant differences were found between some nutrient content in seed coat and the seed of the 27 selected genotypes at the S5 stage and 2 local populations (Table 1; Table 2).

As a result of the nutrient analysis, the contents of P, K, Ca, Fe, Mg, Mn, Cu, S and Zn of seeds (inner) are statistically significant in the confectionary pumpkin (Table 1).

While P content was highest in the "A14" and "A25" genotypes with 3963 and 3888 mg kg^{-1} respectively, the "C24" genotype had the lowest value with 1575 mg kg^{-1}. The highest value in the K content was obtained from the "A14" genotype with 12102 mg kg^{-1}, while the lowest value was obtained from the "B24" genotype with 3996 mg kg^{-1}. The highest Ca content was obtained from the "B17" and "A8" genotypes with 2851 and 2769 mg kg^{-1} respectively, and the lowest Ca content was obtained from the "B20" genotype with 1311 mg kg^{-1}. In the Fe content, the "B33" and "C24" genotypes gave the highest values with 227 mg kg^{-1} and 224 mg kg^{-1}, while the "B20" and "A24" genotypes gave the lowest values with 70 mg kg^{-1} and 65 mg kg^{-1}, respectively. When Mg contents were examined, the "A14" genotype gave the highest value with 2754 mg kg^{-1}, while the "A4" genotype had the lowest value with 1202 mg kg^{-1}. When the Mn contents were examined, the "C30" and "A32" genotypes gave the highest values with 27.86 mg kg^{-1} and 25.82 mg kg^{-1}, while the "A1" genotype had the lowest value with 5.99 mg kg^{-1}. When the Cu content was examined, the "A14" genotype gave the highest value with 23.16 mg kg^{-1}, while the "A5" genotype with 10.39 mg kg^{-1}gave the lowest value.

The highest S content was obtained from "A14" genotype with 1719 mg kg^{-1}, while the lowest value was obtained from B24 genotype with 727 mg kg^{-1}. When Zn contents were examined, the "A14" genotype gave the highest value with 29.16 mg kg^{-1}, while the "C24", "A3" and "A4" genotypes gave the lowest values with 9.26, 9.22 and 8.99 mg kg^{-1} respectively.

Table 1. Mineral content of the seeds (inner part) of some selected confectionary pumpkin genotypes at S5 stage (mg kg^{-1})

Genotype	P	K	Ca	Fe	Mg	Mn	Cu	S	Zn
A 1	2318 b-g	11354 ab	1601 j-m	90 e-g	1994 b-g	5.99 m	16.96 c-g	1208 b-f	16.52 b-e
A 3	2340 b-g	7415 c-f	2226 b-h	157 b-e	1690 d-ı	15.35 d-j	11.68 J-L	860 d-h	9.22 e
A 4	1683 fg	6365 d-g	1571 k-m	91 e-g	1202 ı	12.41 ı-l	12.52 h-l	777 gh	8.99 e
A 5	2273 b-g	6862 d-g	1766 ı-l	114 c-g	1743 c-ı	13.87 f-k	10.39 l	610 f-h	11.23 de
A 7	1935 d-g	7734 c-f	1866 g-l	100 d-g	1607 e-ı	12.52 ı-l	16.49 e-g	921 c-h	12.41 c-e
A 8	2437 b-g	8736 b-d	2769 a	214 ab	1871 b-h	17.21 c-f	20.70 ab	1134 b-h	14.61 b-e
A 11	2287 b-g	5640 e-g	2122 c-ı	81 fg	1889 b-h	18.38 b-d	12.12 ı-l	971 c-h	13.28 b-e
A 14	3963 a	12102 a	1791 h-l	129 c-g	2754 a	10.29 l-m	23.16 a	1719 a	29.16 a
A 18	2898 a-f	6863 d-g	2124 c-ı	125 c-g	2008 b-g	16.36 c-h	16.84 d-g	1036 b-h	14.43 b-e
A 24	2774 a-g	6690 d-g	1513 lm	65 g	1734 c-ı	12.32 ı-l	12.31 ı-l	890 d-h	12.13 c-e
A 25	3888 a	8550 b-e	2046 d-j	179 a-c	2354 ab	21.80 b	15.55 e-ı	1400 ab	17.98 b-d
A 32	2456 b-g	7644 c-f	2285 b-g	132 c-g	1925 b-h	25.82 a	11.02 k-l	1204 b-f	11.83 c-e
A 33	2349 b-g	5684 d-g	2053 d-ı	119 c-g	1813 b-h	13.08 h-l	18.36 b-e	932 c-h	13.87 b-e
A 34	3499 ab	8400 b-f	2596 ab	132 c-g	2325 a-c	16.65 c-g	14.07 g-k	1306 a-c	16.02 b-e
B 14	1980 c-g	5724 d-g	2312 b-f	110 d-g	1447 g-ı	15.73 d-ı	13.52 g-L	951 c-h	12.94 b-e
B 16	2601 b-g	6854.0 d-g	2230 b-h	141 c-f	1821 b-h	17.79 c-e	14.71 f-j	1056 b-h	15.60 b-e
B 17	3240 a-c	7307 c-f	2851 a	113 c-g	2189 a-e	19.67 bc	16.24 e-g	1202 b-f	19.36 bc
B 20	3072 a-d	7790 c-f	1311 m	70 g	2031 b-g	15.09 d-j	13.93 g-l	1243 b-d	20.39 b
B 24	2170 b-g	3996 g	1831 h-l	78 fg	1588 f-ı	11.33 k-m	12.31 ı-l	727 h	14.36 b-e
B 25	2091 c-g	5348 fg	1856 g-l	115 c-g	1508 f-ı	17.34 c-e	17.87 b-f	864 d-h	13.14 b-e
B 33	1970 c-g	7717 c-f	2511 a-c	227 a	1696 d-ı	14.41 e-k	20.34 a-d	1036 b-h	12.71 b-e
C 18	2832 a-g	10193 a-c	1938 f-l	155 b-e	2243 a-d	8.87 mn	15.95 e-h	1229 b-e	18.17 b-d
C 24	1575 g	6882 d-g	2439 a-d	224 a	1342 hı	12.25 j-m	11.68 j-l	750 gh	9.26 e
C 25	2557 b-g	10219 a-c	1857 g-l	103 d-g	2062 b-f	14.92 e-j	14.31 f-k	1109 b-h	16.30 b-e
C 26	3189 a-d	8664 b-e	2415 a-e	75 fg	2032 b-g	13.76 g-k	15.52 e-ı	1222 b-f	18.07 b-d
C 27	1766 e-g	6383 d-g	1528 k-m	104 d-g	1515 f-ı	14.69 e-k	13.77 g-L	775 gh	11.89 c-e
C 30	3067 a-d	6227 d-g	2163 b-ı	160 a-d	1974 b-g	27.86 a	12.60 h-l	1143 b-g	16.58 b-e
1	3032 a-e	7958 c-f	1972 e-k	106 d-g	2075 b-f	15.20 d-j	20.43 a-c	1319 a-c	17.17 b-d
2	2375 b-g	6544 d-g	1557 k-m	80 fg	1619 e-ı	12.80 ı-l	11.09 kl	816 e-h	11.45 de
LSD%5	1283	3092	445	67.2	597	3.42	3.59	416	7.75

*1-Control Population- I (Eskişehir). 2- Control Population -II (Ürgüp sivri)

As a result of the nutrient analysis, the contents of P, K, Ca, Fe, Mg, Mn, Cu, S and Zn of seeds coats are statistically significant in the confectionary pumpkin (Table 2). When we looked at the P content, the "B14" genotype gave the highest value with 14075 mg kg^{-1}, while the Eskisehir control population gave the lowest value with 7416 mg kg^{-1}. The highest K content was obtained from the "A14" genotype with 9467 mg kg^{-1}, while the lowest value was obtained from the "C27" genotype with 5228 mg kg^{-1}. The highest Ca content was obtained from the "A11" genotype with the 688 mg kg^{-1}, while the lowest value was obtained from the "A25" and "C25" genotypes with 289 mg kg^{-1} and 288 mg kg^{-1}. When we look at the Fe contents, the highest value is obtained from the "B25" and "C25" genotypes with 279.4 and 281.04 mg kg^{-1}, while the other applications are in the same group. When Mg content was examined, the "A11" genotype gave the highest value with 3559 mg kg^{-1}, while the "C27" genotype gave the lowest value with 2463 mg kg^{-1}. When the content of Mn was examined, Ürgüp sivrisi control population gave the highest value with 44.47 mg kg^{-1}, while the "A32" genotype gave the lowest value with 20.81 mg kg^{-1}.

When Cu contents were examined, the "A33" genotype gave the highest value with 23.74 mg kg^{-1}, while the "B24" and "A34" genotypes gave the lowest value with 14.01 mg $kg^{-1}$and 13.73 mg kg^{-1}. S content was highest in the "C18" genotype with 2922 mg kg^{-1}, the lowest in the "C27" genotype with 1996 mg kg^{-1}. When Zn contents were examined, the "A14" genotype gave the highest value with 61.12 mg kg^{-1}, while the "A34" and "B24" genotypes gave the lowest values with 27.58 mg kg^{-1} and 27.57 mg kg^{-1} respectively.

P content contained in the crust of pumpkin seeds is higher about three times more than the seed coat. Phosphorus is especially high in protein-rich products and has an important place in the diet. It has been reported that there are high amounts P in dairy products, dry pulses, pumpkin seeds, nuts and walnuts (Kacaroğlu Vicdan and Gülseven Karabacak, 2014; Kahraman et al., 2015). It has been determined that the contents of different genotypes grown in different regions are different in the study of a confectionary pumpkin seed in Turkey. In the study, while the same genotype had the best P content in all regions, genotypes were found different P value. Among the genotypes, P content was between 6800 and 17510 mg kg^{-1} (Ermiş, 2010). The reason why our results are lower than the results of the related reports is thought to have originated from difference ecological conditions and genotypes. Some researchers have reported that changes in mineral content are affected by genetic, climate, soil and even the maturation period of seeds (Akwaowo et al., 2000; Glew et al., 2006). Phosphorus content in a different study in the hull-less pumpkin seed was found between 3569-9108 mg kg^{-1} (Seymen et al., 2016). The present results are in line with the results of Seymen et al., 2016.

Potassium, magnesium, iron, copper and sulfur contents were similar in seed and seed coat, as well. Potassium is an element that acts an important role in the workings of the heart and muscles. Potassium is high in vegetables and fruits, and it is also known as a rich source of potash in the pumpkin seed (Kacaroğlu Vicdan and Gülseven Karabacak, 2014). Iron is an important mineral for hemoglobin and myoglobin in the body.

It has significant effects protection from fatigue and disease, as well as on growth and development (Karadeniz, 2004; Kahraman, 2017b). In a study conducted in our country, it was found to be potassium 3820-14370 mg kg^{-1}, magnesium 4100-7710 mg kg^{-1} and iron 38.90-128.70 mg kg^{-1}. In the study, it was reported that the contents of phosphorus, potassium and magnesium are high and iron and zinc are low in pumpkin seeds (Ermiş, 2010). All genotypes are considered to have higher nutrient content due to ecological reasons and harvesting time. In another study, however, K between 2704 and 10332 mg kg^{-1}, Mg between 1352 and 3938 mg kg^{-1}, Fe between 20.41 and 71.50 mg kg^{-1}. Cu between 8.18 and 23.49 mg kg^{-1} were obtained from pumpkin seeds (Seymen et al., 2016). The present results are in line with the results of Seymen et al., 2016.

Table 2. Mineral content of the seed coat of some selected confectionary pumpkin genotypes at S5 stage (mg kg^{-1})

Genotype	P	K	Ca	Fe	Mg	Mn	Cu	S	Zn
A 1	11360 a-f	9071 ab	367 f-ı	105.34 b	3104 b-f	26.20 f-k	15.17 h-k	2833 a-c	54.95 a-c
A 3	10416 d-g	8163 a-g	459 b-g	65.98 b	3009 b-g	29.76 c-j	16.26 d-k	2629 a-f	29.15 jk
A 4	11551 a-f	8180 a-f	295 hı	97.27 b	3151 b-e	31.51 b-h	18.51 b-g	2609 a-g	55.31 a-c
A 5	10568 d-g	8270 a-f	436 b-h	62.59 b	2958 c-g	35.67 b-e	16.27 d-k	2488 b-g	41.00 h-j
A 7	10983 b-g	678 g-j	571 ab	79.75 b	3048 b-g	23.91 h-k	18.81 b-e	2277 f-h	57.26 a-c
A 8	11223 b-g	7751 b-ı	441 b-g	86.57 b	2940 c-g	38.38 ab	18.97 b-d	2547 a-g	42.18 d-ı
A 11	12196 a-e	8600 a-d	688 a	90.72 b	3559 a	33.12 b-f	15.34 h-k	2852 ab	33.81 h-k
A 14	13441 ab	9467 a	328 g-ı	79.33 b	3269 a-c	24.38 h-k	18.46 b-g	2280 ab	61.12 a
A 18	10160 d-h	6579 h-k	411 d-ı	63.95 b	2884 d-g	25.41 g-k	19.05 b-d	2274 f-h	39.18 f-k
A 24	10507 d-g	7688 b-j	442 b-g	77.19 b	3027 b-g	28.29 d-k	15.84 e-k	2409 d-g	32.71 h-k
A 25	9389 f-h	7263 d-j	289 ı	62.31 b	2682 gh	26.41 f-k	17.24 c-j	2315 e-h	31.41 ı-k
A 32	9868 e-h	7356 c-j	369 e-ı	65.59 b	2755 f-h	20.81 k	14.33 j-k	2766 a-d	36.19 g-k
A 33	11930 a-f	6931 f-j	488 b-f	99.24 b	3274 a-c	35.92 b-d	23.74 a	2697 a-e	57.44 ab
A 34	10659 c-g	8311 a-f	353 f-ı	73.09 b	2880 d-g	27.77 f-k	13.73 k	2514 a-g	27.58 k
B 14	14075 a	8415 a-e	556 a-c	72.01 b	3118 b-f	30.30 c-ı	18.64 b-f	2761 a-d	52.54 a-e
B 16	10289 d-g	7167 e-j	335 g-ı	56.82 b	2847 e-h	25.11 g-k	15.53 g-k	2295 e-h	34.93 g-k
B 17	11006 b-g	7359 c-j	434 b-h	55.42 b	2911 c-g	30.43 c-ı	17.14 c-j	2423 d-g	47.07 b-g
B 20	9605 e-h	6547 ı-k	326 g-ı	69.15 b	2910 c-g	22.85 ı-k	15.34 h-k	2211 gh	29.89 ı-k
B 24	10102 d-h	7131 e-j	436 b-h	70.12 b	2921 c-g	28.45 d-k	14.01 k	2488 b-g	27.57 k
B 25	10681 c-g	6454 ı-k	409 d-ı	279.4 a	2984 b-g	29.36 c-j	15.77 f-k	2585 a-g	34.82 g-k
B 33	10287 d-g	6350 jk	549 a-d	67.50 b	2877 d-g	28.19 e-k	18.67 b-f	2274 f-h	42.20 d-ı
C 18	13356 a-c	8938 ab	349 f-ı	88.93 b	3354 ab	28.49 d-j	18.04 b-h	2922 a	56.88 a-c
C 24	11150 b-g	7993 b-g	398 e-ı	79.87 b	3081 b-f	36.84 a-c	19.02 b-d	2664 a-f	40.75 e-j
C 25	11868 a-f	8196 a-f	288 ı	281.04 a	3176 a-e	32.40 b-g	20.89 ab	2530 a-g	49.03 a-f
C 26	11959 a-f	7963 b-h	493 b-f	61.20 b	3240 a-d	22.24 j-k	18.83 b-e	2853 ab	44.91 c-h
C 27	8585 gh	5228 k	397 e-ı	53.94 b	2463 h	24.34 h-k	14.79 ı-k	1996 h	36.13 g-k
C 30	11122 b-g	7251 d-j	426 c-ı	67.50 b	2908 c-g	31.38 b-h	18.91 b-d	2444 c-g	44.91 c-h
1	7416 h	7185 e-j	375 e-ı	61.07 b	2892 c-g	29.61 c-j	17.33 c-ı	2550 a-g	39.49 f-k
2	12644 a-d	8720 a-c	514 b-e	86.78 b	3155 b-e	44.47 a	20.13 bc	2622 a-f	53.95 a-d
LSD %5	2746	1388	144	151	384	7.68	3.00	407	12.48

*1- Control Population- I (Eskişehir). 2- Control Population -II (Ürgüp sivri)

When calcium content is taken into account, pumpkin seeds contain four times more than seed coats. Ca is a mineral that is essential for human health. It is important for the development of bones, health of teeth and red cells (Karadeniz, 2004). It is known that pumpkin seed is rich in Ca, Mn and Zn in the seed coats those two times more than seeds. It has been reported that the content of Zn in the pumpkin

seed is between 52.30-130.70 mg kg^{-1} (Ermiş, 2010). Results obtained from our genotypes are lower and are thought to be caused by ecological change and harvesting time. However, in another study, mineral matter contents were determined between Ca 77-526 mg kg^{-1}, Mn 12.77-42.04 mg kg^{-1}, Zn 27.13-83.04 mg kg^{-1} (Seymen et al., 2016). The results we obtained are similar to the work done.

CONCLUSION

Consequently, the confectionary pumpkins in Turkey are a type of vegetable that is economically attractive as an alternative to grain products in barren lands. In the present study, the content of the nutrients in the seeds and seed coats of the confectionary pumpkin is revealed. Varied data obtained from different genotypes act an important role in breeding works. Future studies focused on breeding should take care of gene pools must have determined contents of nutritional elements, and for human health care; it is necessary to using of high nutritional valued varieties in crossing studies. In the screened genetic pool, the A14 genotype was the highest genotype of the nutrient content. §In terms of nutrient element contents; P, K, Ca and Mg are the predominant elements of confectionary pumpkins seeds and seed coats. Additionally, Fe was found as the highest in seed coat and seed, while S was higher in seed coat.

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