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Morphological Parameters and Selection of Turkish Edible Seed Pumpkins (*Cucurbita pepo* L.) Germplasm

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***Abstract*—**There is a requirement for registered edible seed pumpkin suitable for eating in Turkey. A total of 81 genotypes collected from the researchers in 2005 originated from Eskisehir, Konya, Nevsehir, Tekirdag, Sakarya, Kayseri and Kirsehir provinces were utilized. The used genetic materials were brought to S5 generation by the research groups among 2006 and 2010 years. In this research, S5 stage reached in the genotype given some of the morphological features, and selection of promising genotypes generated scale were made. Results showed that the A-1 (420), A-7 (410), A-8 (420), A-32 (420), B-17 (410), B-24 (410), B-25 (420), B-33 (400), C-24 (420), C-25 (410), C-26 (410) and C-30 (420) genotypes are expected to be promising varieties.

***Keywords*—**Candidate cultivar, edible seed pumpkin, morphologic parameters, selection.

I. Introduction

PUMPKIN is a kind of vegetable which is used for human nutrition through processing its fruit, flowers and seed. Although pumpkin is generally produced for its fruit [1]. The enculturation processes may be conducted through machines to a large extent, and less affected by diseases and pests. Growing pumpkin seed is important, because it does not require frequent irrigation and may be grown even in completely infertile conditions. The pumpkin seed grown in Turkey are generally made in the type of *Cucurbita pepo* and the type of *Cucurbita moschata* in small amounts [2], [3].

The content of oil and protein are high in the pumpkin seeds with 40-50% oil ratio [4]-[8], 30-40% protein ratio [4], [7]-[9]. Additionally, the pumpkin seed oil is used in human nutrition as salad oil in many countries such as Austria, Slovenia, and Hungary since it has a rich ingredient of carbohydrate, 20-25%, [7] and vitamin E [10]. Similarly, the pumpkin seed oil is consumed in soups and minced meat [11]. However, the use as a cooking oil remain limited due to its color, strong aroma and foaming [7], [12], [13]. It is reported that the pumpkin seed oil prevents the development of prostate cancer and it is heart-friendly [14]. It is also emphasized that consuming 70-80 g of pumpkin seed a day for health [15].

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Since pumpkin has monoic flower structure, the rate of pseudo-fertilization is rather high. For that reason, it is possible that the lines emerging in the end may be different from the type of the original seed. Therefore, one of the biggest problems in growing pumpkin seed as appetizers is the problem of species [16]-[18]. The pumpkin seed in Turkey and other countries is consumed as edible seed.

In this study, it was aimed to obtain pure lines in order to develop candidates of pumpkin seed. In accordance with this purpose, herbal characteristics of 81 pumpkin genotypes at the level of S5 were determined. Furthermore, scoring was conducted in terms of definition of parameters and the species which may become as a candidate were presented.

II. Material and Methods

Plant material employed in the present research was collected from the regions of Turkey; Eskişehir, Konya, Nevşehir, Tekirdağ, Sakarya, Kayseri and Kırşehir through the utilities of Selçuk University Faculty of Agriculture Horticultural Department and the Institute of Anatolian Agricultural Researches.

The study was established in the field of the Institute of Anatolian Agricultural Researches on 20th of May 2011. The planting distance was 2x1.5 m so that there were 20 plants from each genotype. Sowing was conducted by hand and 2-3 seeds were put into each pit and hand thinning was conducted one week after the germination because of remaining one plant in each pit. The processes such as weeding, middle-breaking, watering and fertilizing were regularly conducted on the plants.

In the plants at the flowering period, the pollination was provided through closing the male and female flowers in the evening, plucking the male flower early in the morning.

Plant observations were conducted during start of flowering period; the seed characteristics of fruit were taken after the harvest on September 12-17 in 2011 and after the seeds were taken out.

Mean of the results obtained from the study were taken and interpreted. In the selection of genotypes, the characteristics with defined forms were considered and the determined characteristics were scored as seen in Table I. The genotypes were evaluated through a total score of 500 and they were classified according to their score.

TABLE I
SELECTION CRITERIA FOR THE CLASS AND GIVEN RELATIVE SCORES [19], [20]

Selection criteria			Sc
Seed shape	Narrow elliptical	4	20
	Elliptical	5	
	Large elliptical	4	
Seed color	Light cream	4	15
	Cream	5	
	Dark cream	3	
1000 seed weight	Big (>250 g)	5	20
	Middle (200-250 g)	3	
	Minor (<200 g)	1	
Fruit/plant	2-3	3	10
	4-5	5	
	6-7	4	
Seed yield/fruit	< 50 g	2	10
	50-80 g	4	
	> 80 g	5	
Seed yield /plant	100-200 g	2	10
	200-400 g	4	
	>400 g	5	
Easiness of seed coat crackling	Easy	3	15
	Difficult	1	

III. RESULTS AND DISCUSSION

The lines are collected from different regions of Turkey. Measurements and observations taken from the 81 edible seed pumpkin genotypes were shown in Tables II-IV. Table V shows the total weighted score for each genotype, the rating results.

It was found in the study that 30 genotypes (37%) were vertical, 25 genotypes (31%) were semi-creeping ones, and 26 of them were creeping plants. Among those genotypes, 75 (92%) put forth branches while 6 (7%) did not put branches forth. The 17 of the genotypes (21%) had silver stains on their leaves while 64 (79%) had no stains. When the lobs on the leaves were analyzed, 3 (4%) had few if any lobs, 37 (46%) had few lobs, 32 (39%) had moderate number of lobs and 9 (11%) had many lobs. 30 (37%) of the fruits which are suitable for seeding had no spots, 17 (21%) had yellow spots while 34 (42%) had green spots. Among those genotypes, 11 (14%) had little density of spots, 25 (31%) had intensive and 15 (18%) had higher density of spots. When the color of ripe fruit was analyzed, 21 (24%) were yellow, 2 (2%) were green, 15 (18%) were green-yellow greyish, 22 (27%) were dark yellow-green greyish, 17 (21%) were light yellow and 4 (5%) were dark yellow (Table II).

When the genotypes were analyzed, 59 (72%) of the genotypes had short, 18 (22%) had medium and 4 (5%) had long fruit sizes. When the fruit width of the genotypes was analyzed, 1 (1%) was found narrow, 13 (16%) were medium and 67 (83%) were wide. The fruit index of 70 (86%) genotypes were found round, 8 (10%) were elliptic and 3 (4%) were long. As for the seed index, 1 (15) was narrow elliptic, 36 (44%) were elliptic and 44 (54%) were wide elliptic. The seeds of 12 (15%) genotypes were found small, 40 (49%) genotypes were found medium and 29 (36%) were found big. When the color of the seeds was analyzed, 7 (9%) of the genotypes were found light cream, 68 (84%) were cream and 6 (7%) were dark cream. Cracking of 68 (84%) genotypes was easy while 13 (16%) were difficult to crack (Table III).

TABLE II
PLANT, LEAF, FLOWER AND FRUIT IN THE S5 STAGE OF EDIBLE SEED PUMPKIN

Genotype	Appearance of plant	Branch prolongation	Silvery Leaves Stain	Slice of leaf	Spot color	Spot density	Fruit color
A1	1	1	2	2	4	3	5
A3	2	1	2	2	4	2	5
A4	2	1	2	2	2	2	4
A5	3	1	2	3	4	2	2
A6	2	1	2	3	-	-	6
A7	3	1	1	2	4	1	2
A8	1	2	2	3	-	-	6
A10	2	1	1	2	-	-	2
A11	1	2	2	2	2	1	3
A12-1	1	1	2	3	4	2	5
A12-2	3	1	2	3	4	2	5
A13	3	1	1	2	2	3	4
A14	1	2	2	3	4	3	5
A15	3	1	2	2	4	1	7
A16	2	1	1	2	2	3	4
A18	1	1	2	2	2	2	4
A20	3	1	1	2	4	2	5
A21	3	1	2	1	2	2	4
A23-1	2	1	2	3	4	2	5
A23-2	2	1	1	3	2	3	4
A24	2	1	2	3	2	2	4
A25	1	1	2	4	2	2	4
A26	2	1	2	3	-	-	2
A28	3	1	2	4	-	-	2
A29	3	1	2	3	-	-	6

Genotype	Appearance of plant	Branch prolongation	Silvery Leaves Stain	Slice of leaf	Spot color	Spot density	Fruit color
A31	1	1	1	3	4	1	6
A32	3	1	2	2	4	2	5
A33	1	1	2	3	2	2	4
A34	2	1	2	2	2	2	4
B1	2	1	2	2	-	-	2
B2	2	1	1	2	-	-	6
B4	1	1	2	3	2	3	4
B8	3	1	2	3	4	3	5
B11	1	1	1	3	-	-	2
B12	1	1	2	2	2	2	4
B13	1	1	2	3	-	-	6
B14	3	1	2	2	-	-	6
B16	3	1	2	3	-	-	2
B17	2	1	2	3	-	-	6
B18	2	1	1	1	-	-	2
B19	1	1	2	4	4	2	2
B20	2	1	2	2	-	-	6
B21	2	1	2	2	-	-	2
B22	1	1	2	2	4	1	6
B23	2	1	1	2	-	-	6
B24	3	1	2	3	4	2	5
B25	3	1	1	1	4	2	5
B26	3	1	2	3	-	-	2
B27-1	1	1	2	4	-	-	2
B27-2	1	1	2	3	-	-	2
B28	3	1	1	2	2	2	7
B31	1	1	2	2	4	2	5
B32	3	1	2	2	4	1	2
B33	1	1	2	2	4	1	7
B34-1	1	1	2	3	4	2	5
B34-2	2	1	2	4	4	2	5
C1	1	1	2	4	4	3	5
C2	2	1	2	3	-	-	6
C3	2	1	2	3	-	-	6
C4	3	1	2	2	4	2	5
C5	1	1	2	4	-	-	6
C7	3	1	2	2	-	-	6
C8	1	1	2	4	4	2	5
C11	2	1	2	2	-	-	2
C12	1	2	2	2	4	1	6
C13	2	1	2	2	2	3	4
C16	1	2	1	3	2	3	4
C17	1	1	2	3	-	-	6
C18	1	1	2	2	4	3	5
C19	3	1	2	2	-	-	2
C21	1	1	1	3	4	1	7
C24	2	1	1	3	-	-	2
C25	1	1	2	4	4	3	5
C26	1	2	2	2	2	3	4
C27	3	1	2	2	4	1	2
C28	3	1	2	3	4	2	5
C30	3	1	2	2	-	-	2
C31	2	1	2	3	4	3	5
C32	2	1	2	3	-	-	3
C33	3	1	1	3	4	3	5
C34	2	1	2	2	4	1	2

Note: Appearance of plant: perpendicular-1, semi-wrapping-2, wrapping-3; Branch prolongation: presence-1, absence-2; Silvery Leaves Stain: presence-1, absence-2; Slice of leaf: presence or very few-1, slight-2, medium-3, excess-4, excessive-5; Spot color on the matured fruit: cream-1, yellow-2, orange-3, green-4; J=Density of spot: slight-1, intense-2, excess-3; K=Color on matured fruit: cream-1, yellow-2, green-3, green-yellow-mealy-4, dark yellow-green mealy-5, light yellow-6, dark yellow-7, orange-8.

TABLE III
FRUIT AND SEED CHARACTERISTICS IN THE S5 STAGE OF EDIBLE SEED PUMPKIN

Genotype	Fruit size	Fruit diameter	Fruit index	Seed index	Seed weight	Seed color	Easiness of seed coat crackling
A1	Middle	Wide	Circular	Elliptical	Big	Cream	Difficult
A3	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
A4	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
A5	Short	Wide	Circular	Elliptical	Big	Dark cream	Easy
A6	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
A7	Short	Wide	Circular	Elliptical	Big	Cream	Easy
A8	Middle	Wide	Circular	Elliptical	Big	Cream	Easy
A10	Short	Wide	Circular	Elliptical	Middle	Cream	Easy
A11	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
A12-1	Short	Wide	Circular	Elliptical	Middle	Cream	Easy
A12-2	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
A13	Short	Wide	Circular	Elliptical	Middle	Light cream	Easy
A14	Long	Middle	Lengthy	Large elliptical	Minor	Cream	Easy
A15	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
A16	Short	Wide	Circular	Elliptical	Big	Cream	Difficult
A18	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
A20	Short	Wide	Circular	Elliptical	Middle	Cream	Easy
A21	Short	Wide	Circular	Elliptical	Minor	Cream	Easy
A23-1	Middle	Wide	Circular	Large elliptical	Big	Dark cream	Easy
A23-2	Middle	Wide	Lengthy	Elliptical	Big	Cream	Easy
A24	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
A25	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
A26	Middle	Wide	Circular	Large elliptical	Middle	Cream	Easy
A28	Short	Middle	Circular	Large elliptical	Big	Cream	Easy
A29	Short	Middle	Circular	Large elliptical	Middle	Cream	Easy
A31	Short	Middle	Circular	Elliptical	Middle	Cream	Easy
A32	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
A33	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
A34	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
B1	Short	Wide	Circular	Elliptical	Middle	Dark cream	Easy
B2	Short	Wide	Circular	Large elliptical	Minor	Cream	Easy
B4	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
B8	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
B11	Short	Wide	Circular	Narrow elliptical	Minor	Light cream	Difficult
B12	Short	Wide	Circular	Large elliptical	Middle	Dark cream	Easy
B13	Middle	Middle	Elliptical	Large elliptical	Middle	Cream	Easy
B14	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
B16	Short	Middle	Circular	Large elliptical	Middle	Cream	Easy
B17	Middle	Wide	Circular	Elliptical	Big	Cream	Easy
B18	Middle	Wide	Circular	Large elliptical	Middle	Cream	Easy
B19	Middle	Wide	Elliptical	Elliptical	Middle	Cream	Easy
B20	Middle	Wide	Circular	Large elliptical	Big	Cream	Easy
B21	Short	Wide	Circular	Large elliptical	Minor	Cream	Difficult
B22	Short	Middle	Elliptical	Elliptical	Middle	Light cream	Easy
B23	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
B24	Middle	Wide	Elliptical	Elliptical	Big	Cream	Easy
B25	Short	Wide	Circular	Elliptical	Big	Cream	Easy
B26	Short	Wide	Circular	Elliptical	Minor	Cream	Easy
B27-1	Short	Middle	Elliptical	Elliptical	Middle	Cream	Difficult
B27-2	Short	Middle	Circular	Elliptical	Minor	Cream	Easy
B28	Short	Wide	Circular	Large elliptical	Minor	Cream	Easy
B31	Middle	Wide	Circular	Large elliptical	Middle	Cream	Easy
B32	Short	Wide	Circular	Large elliptical	Middle	Light cream	Easy
B33	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
B34-1	Middle	Wide	Circular	Large elliptical	Middle	Dark cream	Easy
B34-2	Short	Wide	Circular	Elliptical	Middle	Cream	Easy
C1	Short	Wide	Circular	Large elliptical	Minor	Cream	Easy
C2	Short	Middle	Circular	Large elliptical	Minor	Cream	Easy

Genotype	Fruit size	Fruit diameter	Fruit index	Seed index	Seed weight	Seed color	Easiness of seed coat crackling
C3	Short	Wide	Circular	Large elliptical	Middle	Cream	Difficult
C4	Short	Wide	Circular	Large elliptical	Middle	Light cream	Easy
C5	Middle	Narrow	Lengthy	Large elliptical	Middle	Cream	Easy
C7	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
C8	Middle	Wide	Circular	Elliptical	Big	Cream	Difficult
C11	Short	Wide	Circular	Elliptical	Minor	Dark cream	Easy
C12	Short	Wide	Circular	Large elliptical	Middle	Cream	Easy
C13	Middle	Wide	Elliptical	Elliptical	Middle	Cream	Difficult
C16	Middle	Wide	Circular	Elliptical	Big	Light cream	Easy
C17	Short	Wide	Circular	Large elliptical	Minor	Cream	Difficult
C18	Middle	Middle	Elliptical	Elliptical	Middle	Cream	Easy
C19	Short	Wide	Circular	Large elliptical	Middle	Cream	Difficult
C21	Short	Middle	Circular	Large elliptical	Middle	Cream	Easy
C24	Middle	Wide	Circular	Elliptical	Big	Cream	Easy
C25	Middle	Wide	Elliptical	Elliptical	Big	Cream	Easy
C26	Short	Wide	Circular	Elliptical	Big	Cream	Easy
C27	Short	Wide	Circular	Elliptical	Middle	Cream	Easy
C28	Short	Wide	Circular	Elliptical	Big	Cream	Difficult
C30	Middle	Wide	Circular	Elliptical	Big	Cream	Easy
C31	Short	Wide	Circular	Elliptical	Middle	Cream	Difficult
C32	Short	Wide	Circular	Large elliptical	Big	Cream	Easy
C33	Short	Middle	Circular	Elliptical	Big	Cream	Difficult
C34	Short	Wide	Circular	Elliptical	Middle	Light cream	Difficult

When the yield factors of the genotypes were analyzed, the average yield per plant was found 114 g and the biggest yield was obtained from A3 genotype as 282 g. It is followed by the genotypes of C31 (226 g), B21 (214 g), B28 (200 g) and B26 (199 g), respectively. The researchers reported that the yield per plant in edible seed pumpkin was found between 200 g and 500 g [17]-[19], [22], [21].

The highest yield per fruit was taken from the genotype A18 with a yield of 160 g and it was followed by B25 (104 g), A8 (102 g), B33 (95 g) and B23-2 (94 g), respectively. Generally, seed yield per fruit was in the expected level and had shown similarity to the conducted studies [16], [19], [21], [23].

TABLE IV
YIELD AND YIELD COMPONENTS IN THE S5 STAGE OF EDIBLE SEED PUMPKIN

Genotype	Yield (g/plant)	Yield (g/fruit)	Fruit number (number/plant)	Fruit weight (kg)	Seed diameter (mm)	Seed length (mm)	1000 seed weight (g)
A1	82	91	0,90	3,13	12.33	20.47	256.8
A3	282	92	3,06	2,80	10.88	20.48	233.2
A4	59	43	1,35	3,50	11.16	20.41	244.0
A5	152	55	2,79	4,13	11.78	20.05	300.0
A6	103	61	1,70	5,38	10.34	20.04	269.0
A7	142	59	2,42	2,73	12.98	21.24	343.8
A8	148	102	1,45	3,92	11.54	20.08	335.6
A10	55	44	1,25	2,47	11.52	20.39	206.4
A11	15	12	1,30	2,55	11.69	21.67	230.6
A12-1	159	75	2,12	3,79	10.09	16.5	243.4
A12-2	143	63	2,25	3,60	12.15	22.54	268.0
A13	169	57	2,94	3,67	11.9	19.19	208.4
A14	55	37	1,50	2,87	12.15	24.13	182.2
A15	146	63	2,30	2,33	9.23	19.97	273.8
A16	90	53	1,70	3,80	12.43	20.05	265.4
A18	40	160	0,25	2,75	11.78	21.17	275.4
A20	98	45	2,16	1,87	10.12	17.73	211.6
A21	24	38	0,64	4,20	12.2	20.79	64.4
A23-1	107	85	1,25	5,33	11.13	21.66	296.0
A23-2	122	94	1,30	4,85	12.16	21.27	280.2
A24	87	56	1,55	2,27	9.59	17.39	213.4
A25	149	65	2,30	2,47	10.03	20.82	213.2
A26	116	77	1,50	2,80	9.12	20.97	232.0
A28	118	25	4,80	1,53	11.77	21.78	261.2

Genotype	Yield (g/plant)	Yield (g/fruit)	Fruit number (number/plant)	Fruit weight (kg)	Seed diameter (mm)	Seed length (mm)	1000 seed weight (g)
A29	174	67	2,58	2,53	10.89	20.33	230.0
A31	112	39	2,88	2,11	11.47	18.85	217.2
A32	79	53	1,47	3,25	12.51	22.88	313.8
A33	84	54	1,55	3,87	11.59	20.98	268.6
A34	91	48	1,90	2,33	11.54	21.77	245.8
B1	95	56	1,70	2,73	11.24	19.62	214.2
B2	120	37	3,21	2,80	11.24	21.42	180.4
B4	126	69	1,83	3,71	7.74	19.49	256.8
B8	128	57	2,25	1,87	10.93	21.68	254.2
B11	22	28	0,80	2,50	11.08	16.28	180.4
B12	83	50	1,65	2,20	10.15	18.51	217.6
B13	135	67	2,00	2,73	8.87	19.44	236.6
B14	143	51	2,78	2,87	10.16	18.86	208.4
B16	199	56	3,55	2,40	10.77	20.78	246.6
B17	115	64	1,80	4,00	12.99	20.27	273.4
B18	107	68	1,56	4,62	10.55	20.97	242.2
B19	79	51	1,55	3,93	10.96	17.84	213.0
B20	57	76	0,75	4,30	10.44	21.06	288.8
B21	214	71	3,00	2,93	9.55	17.25	184.0
B22	95	51	1,88	2,80	10.08	17.94	230.8
B23	111	53	2,11	3,33	11.41	21.13	237.6
B24	78	47	1,67	4,27	11.52	20.44	276.0
B25	94	104	0,90	4,00	11.78	20.74	327.8
B26	78	41	1,92	2,83	12.36	20.8	171.4
B27-1	103	37	2,75	2,13	11.99	18	215.4
B27-2	156	73	2,15	2,00	11.31	18.1	151.6
B28	200	61	3,30	2,47	9.84	21.97	187.8
B31	162	67	2,40	3,00	9.31	19.17	227.6
B32	177	45	3,89	1,27	9.31	19.84	202.2
B33	90	95	0,95	3,80	10.53	19.52	256.0
B34-1	120	57	2,13	3,13	10.18	19.66	214.0
B34-2	88	47	1,89	2,60	11.29	19.23	244.2
C1	100	69	1,45	2,93	10.85	20.23	194.0
C2	142	38	3,74	1,27	8.3	22.21	188.0
C3	99	35	2,80	1,93	8.93	22.32	213.2
C4	68	75	0,90	3,90	10.4	18.67	248.8
C5	106	69	1,55	2,67	10.32	19.43	214.0
C7	143	33	4,37	1,27	9.6	17.69	205.2
C8	101	42	2,40	3,73	11.91	19.67	267.2
C11	131	51	2,55	2,20	11.42	19.77	176.0
C12	84	62	1,37	2,31	10.19	18.67	209.2
C13	65	57	1,15	3,33	11.96	18.97	235.4
C16	44	71	0,61	3,43	12.52	21.69	332.8
C17	103	45	2,30	2,20	10.06	21.19	197.4
C18	90	69	1,30	3,00	11.52	20.09	240.0
C19	112	55	2,05	2,47	10.89	21.2	205.6
C21	157	69	2,26	2,80	9.2	16.69	225.4
C24	129	85	1,53	5,36	11.67	20.62	264.8
C25	119	68	1,75	3,07	11.8	19.95	323.4
C26	181	75	2,42	2,47	10.81	19.27	269.0
C27	67	39	1,72	4,00	11.91	21.13	235.0
C28	110	47	2,35	3,27	11.45	19.89	278.2
C30	95	83	1,15	6,20	11.94	20.71	290.4
C31	226	71	3,20	3,00	9.26	19.38	213.0
C32	103	50	2,05	2,33	11.28	22.49	332.8
C33	166	55	3,00	2,67	11.1	18.85	266.8
C34	123	53	2,30	2,13	10.27	17.59	206.0
Mean	114	59	2.02	3.06	10.92	20.05	239

TABLE V
CLASSIFICATION SCORE IN THE S5 STAGE OF EDIBLE SEED PUMPKIN

Genotype	Seed shape	Seed color	1000 seed weight	Fruit/plant	Seed yield/fruit	Seed yield /plant	Easiness of seed coat crackling	Total score
A1	100	75	100	30	50	20	45	**420**
A3	80	75	60	50	50	40	45	**400**
A7	100	75	100	30	40	20	45	**410**
A8	100	75	100	30	50	20	45	**420**
A32	100	75	100	30	40	20	45	**410**
B17	100	75	100	30	40	20	45	**410**
B24	100	75	100	30	40	20	45	**410**
B25	100	75	100	30	50	20	45	**420**
B33	80	75	100	30	50	20	45	**400**
C24	100	75	100	30	50	20	45	**420**
C25	100	75	100	30	40	20	45	**410**
C26	100	75	100	30	40	20	45	**410**

The average number of fruits per plant was 2.02 fruit /plant. The highest number of fruits was take from the genotype C7 with 4.37 pieces and it is followed by B32 (3.89 pieces), C2 (3.74 pieces), B16 (3.55 pieces) and B28 (3.3 pieces), respectively. The researchers determined that the number of fruit per plant in the edible seed pumpkin was between 1 and 9 [16], [19], [21], [22]. In our study, the scarcity of yield per plant resulting from the scarcity of fruit per plant comes from uncontrollably picking the inseminated fruit in the plants until the genotypes are appropriated. When the average fruit weight of the genotypes was considered, the heaviest fruit was obtained from C30 genotype with 6.20 kg; it was followed by the genotypes of A6 (5.38 kg), C24 (5.36 kg), A23-1 (5.33 kg) and A23-2 (4.85 kg), respectively.

When the seed width was analyzed, the highest value was obtained from B17 genotype with 12.99 mm and it was followed by the genotypes A7 (12.98 mm), C16 (12.52 mm), A16 (12.43 mm) and B26 (12.36 mm), respectively. The biggest seed height was obtained from the genotype A14 with 24.13 mm and it is followed by the genotypes of A32 (22.88 mm), A12-2 (22.54 mm), C3 (22.32 mm) and C2 (22.21 mm), respectively. The desired shape of the edible seed pumpkin was the seed in the elliptic form and narrow elliptic seeds were also evaluated as appetizers. In this study, it is determined that pumpkin group pumpkin seeds had the length/diameter rate as 1.91 [1]. When the weight of 1000 seeds was analyzed, the best value (343.8 g) was obtained from A7 genotype and then A8 (335.6 g), C32 (332.8 g), C16 (332.8 g) and B25 (327.8 g), (Table IV). In the conducted studies, the weight of 1000 seeds was about 200 g [16], [19], [24] and the results we obtained from our genotypes indicate that the seeds were wiper. As a result of the conducted weighted evaluation, the genotypes having the score over 400 were regarded hopeful. When the Table V was analyzed, 13 genotypes; A1, A3, A7, A8, A32, B17, B24, B25, B33, C24, C25, C26 and C30, receiving a score over 400 were found hopeful.

IV. CONCLUSION

The agriculture of edible seed pumpkin seed has been gradually increasing in Turkey in recent years. Although pumpkin seeds are consumed as dried nuts in Turkey and some countries, it is used in the production of chocolate, candy, sweets and cakes. Moreover, it draws attention with its quality and high oil content. It is also employed in cooking. When the causes such as they do not require much maintenance, they are easy to store, and they do not have marketing problem are added, the charm of growing pumpkin for their seed can be better understood. Although they have such advantages in production, there are also numerous problems in growing edible seed pumpkin which require solution. The biggest problem in the agriculture of edible seed pumpkin is the need for sort or sorts which are one-to-one in terms of high quality, shape, color, massiveness, thickness of its edges and ease of cracking, and registered.

In the present study, 13 genotypes at the stage of S5 such as A1, A3, A7, A8, A32, B17, B24, B25, B33, C24, C25, C26 and C30 were found candidates. According to the available results, those genotypes will be tested for yield and standard types will be developed in order to provide contribution to the economy of the country. Genotypes were brought to the stage of S5 and the opportunity of developing hybrids may be obtained in the following stage.

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