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Variation in Seed Characteristic among Anatolian Black Pine Populations

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Abstract: ***The study was carried out on characteristics of seed collected from eight seed stand and two seed orchard populations of Anatolian black pine [Pinus nigra Arn. subsp. pallasiana. (Lamb.) Holmboe.] to estimate variation and correlations among characteristics, and also comparison of the populations for characteristics. Averages of seed width and seed length were 6.77 mm and 3.75 mm in polled populations, while they ranged from 6.50 to 7.38 for the seed width, and from 3.55 to 4.03 for seed length, respectively. Averages of seed weight and germination percentage were 2.40 g and 61.55 % in polled populations. Statistically significant differences (0.05>p) for the seed width, seed length and germination percentage were found among populations based on results of analysis of variance. Beside, statistically significant and positive correlations (0.05>p) were found among seed width, seed length and seed weight, while they were not significant (0.05<p) effective on germination percentage.***
Keywords: Black pine, relation, seed orchard, seed stand, variation

I. INTRODUCTION

Turkish forests cover about 10.1 million ha unproductive forest which about 46.7% of total forest area, while Anatolian black pine [*Pinus nigra* Arn. subsp. *pallasiana*. (Lamb.) Holmboe.] covers about 4.7 million ha, of which about 10.1 million ha are considered to be unproductive forests [1]. The inventorial data emphasizes that the species is one of the most important forest tree species for Turkish forestry and the "National Tree Breeding and Seed Production Programme" [2] because of large natural distribution and its commercial value. Seed quality has important role in conversion of unproductive forest to productive forest by forest establishment and also artificial regeneration together with many genetically (i.e., seed source) and environmental effects (i.e., seedling quality and type, nursery practice) [3, 4, 5, 6] and to transmit present gene diversity to next generations by plantations [7]. It has also effective on economical and biological successes of plantations and to produce quality seedlings. Anatolian black pine is also very resistance for plantation of arid area. It is getting importance of seed and seedling quality for the future plantation and selection of suitable seed sources for the areas based on global warming. This study was conducted to examine the morphology and germination performance in seeds collected from eight seed stand and two seed orchard populations of the species to contribute produce better quality seeds, and successful plantations in the species based on comparison of the seed sources and variation among the sources.

II. MATERIAL AND METHOD

Seed data was collected from eight seed stand (SS) and two seed orchard (SO) populations (P1-P10) of the species. Geographic details of the populations were given in Table 1. Seed width (SWI, mm) and seed length (SL, mm) were measured from fifty filled seeds selected randomly from each population. 1000 seed weight (SWE, g) based on eight seed samples included 100 seeds of each sample and germination percentages (GP %) as four replicates were also assessed in the populations according to ISTA rules [8] in the populations in 2014 and 2015.

Table1. Details of the populations

Population Code	Location	Latitude (N)	longitude (E)	Altitude (m)
SS-1	Beysehir- kurucaova	37° 34'	31° 22'	1320
SO-2	Afyon-Hocalar	38° 24'	30° 03'	1200
SS-3	Simav- Korcuk	39° 22'	29° 03'	1400
SS-4	Isparta- Sutculer	37° 32'	31° 08'	1600

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SS-5	Adana-Pos	37° 41'	35° 15'	1350
SS-6	Isparta-Egirdir	37° 47'	30° 56'	1200
SS-7	Kutahya-Aksaz	39° 06'	28° 48'	1300
SS-8	Afyon-Hocalar	38° 40'	30° 33'	1350
SS-9	Kutahya-Kicir	39° 15'	28° 41'	1200
SO-10	Burdur-Golhisar	37° 15'	29° 30'	1150

Collected seed diameter and length data was performed by the following linear ANOVA model for comparison of the populations for the characteristics:

$$Y_{ij} = \mu + P_j + e_{ij}$$

Where Y_{ij} is the observation from the j^{th} seed of the i^{th} population, μ is overall mean, P_i is the random effect of the i^{th} population, and e_{ij} is random error.

Correlations among the characteristics were calculated by Pearson's correlation using SPSS statistical package program.

III. RESULTS AND DISCUSSION

A. Characteristics

The averages of the characteristics were presented for the populations in Table 2. Averages of seed width and seed length were 6.77 mm and 3.75 mm in polled populations (Table 1, Figure 1), while they ranged from 6.50 (SS-3) to 7.38 (SO-10) for SWI and from 3.55 (SS-3) to 4.03 (SO-10) for SL in the populations (Table 2, Figure 1).

Table2. Averages of the characteristics for the populations

Population Code	SWI (mm)	SL (mm)	SWE (g)	GP %
SS-1	6.58	3.66	2.40	49.75
SO-2	6.85	3.73	2.35	62.38
SS-3	6.50	3.55	1.95	61.50
SS-4	6.69	3.86	2.74	65.37
SS-5	7.12	3.85	2.86	85.37
SS-6	6.94	3.77	2.50	50.37
SS-7	6.58	3.65	2.12	49.50
SS-8	6.75	3.78	2.23	76.13
SS-9	6.35	3.56	1.93	62.38
SO-10	7.38	4.03	2.93	52.75
Total	6.77	3.75	2.40	61.55

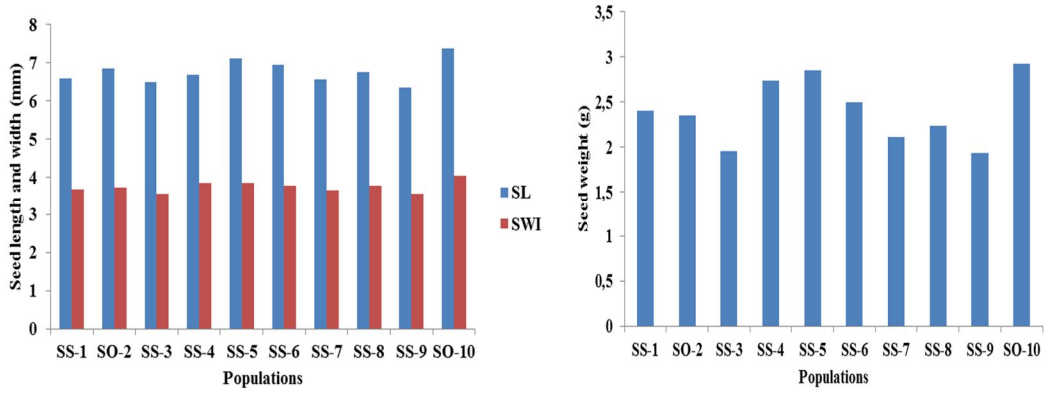

Figure1. Averages of seed width and length (left side), and seed weight (right side) in the populations

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Average seed weight 2.40 g varied between 1.93 (SS-9) and 2.93 (SO-10) (Table 2). Average of germination percentage (GP%) was 61.55 % varied between 49.50 (SS-7) and 85.37 (SS-5) in the populations as presented in Table 2 and Figure 2. It could be said that seed width, seed length and seed weight were higher in seed orchard population (SO-10) than that of stand populations as expected, while it was opposite for germination percentage (Table 2, Figures 2&3). Similar results also were reported for seedling growth in Brutian Pine (*Pinus brutia* Ten.) [4]. Therefore, it was needed to collect more data on field performance of seed sources to draw accurate discussion.

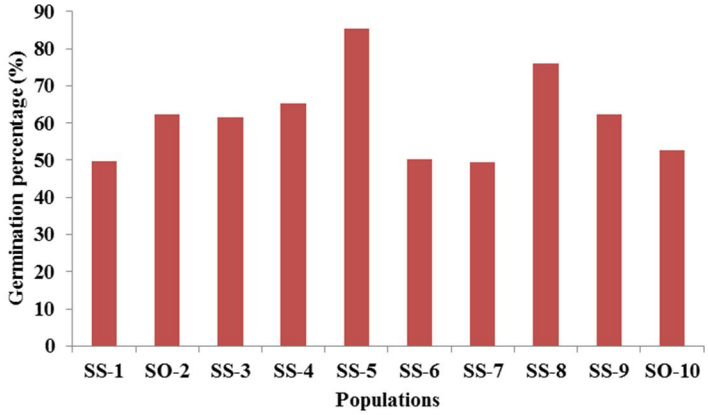

Figure2. Averages of germination percentage in the populations

Large differences were found among populations the characteristics as seen from Table 2 and Figures 1&2. The variation was also supported by results of analysis of variance. The results showed statistically significant difference (*0.05>p*) for the seed width (SWI), seed length (SL) and germination percentages (GP %) among populations (Table 3). This result was well in accordance with the results on seedling morphology in different forest tree species [4, 9, 10]. The results emphasized importance of selection of population to produce quality seeds.

Table3. Results analysis of variance for the characteristics

Characteristics	Source of variaton	Sum of squares	Degrees of freedom	Mean of squares	F value	*P*
SWI	Between groups	9.629	9	1.070	9.564	.000
	Within group	54.812	490	0.112		
	Total	64.440	499			
SL	Between groups	43.026	9	4.781	13.273	.000
	Within group	176.490	490	0.360		
	Total	219.515	499			
GP	Between groups	0.513	9	0.057	41.402	.000
	Within group	0.041	30	0.001		
	Total	0.554	39			

Seed populations were grouped by Duncan's multiple range test after determination of the differences for for the seed width, seed length and germination percentage. According to results of Duncan's multiple range test, seed sources had at four homogenous groups for both seed length and germination percentage, and five homogenous groups for seed width (Table 4). It showed seed width had larger variation than that of the other characteristics (Table 4).

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Table4. Results of Duncan's multiple range test

Population Code*	Seed length (SL)	Seed width (SWI)	Germination percentages (GP)
SS-1	ab	ab	a
SO-2	c	bc	b
SS-3	ab	a	b
SS-4	bc	c	b
SS-5	d	c	d
SS-6	cd	bc	a
SS-7	ab	ab	a
SS-8	bc	bc	c
SS-9	a	a	b
SO-10	e	d	a

*; the same letters are significantly different ($p<0.05$).

Statistically significant and positive correlations ($0.05>p$) were found among seed width (SWI), seed length (SL) and seed weight (SWE), while they had no significant ($0.05<p$) effect on germination percentage (**GP** %) (Table 5).

Table5. Relations among the characteristics

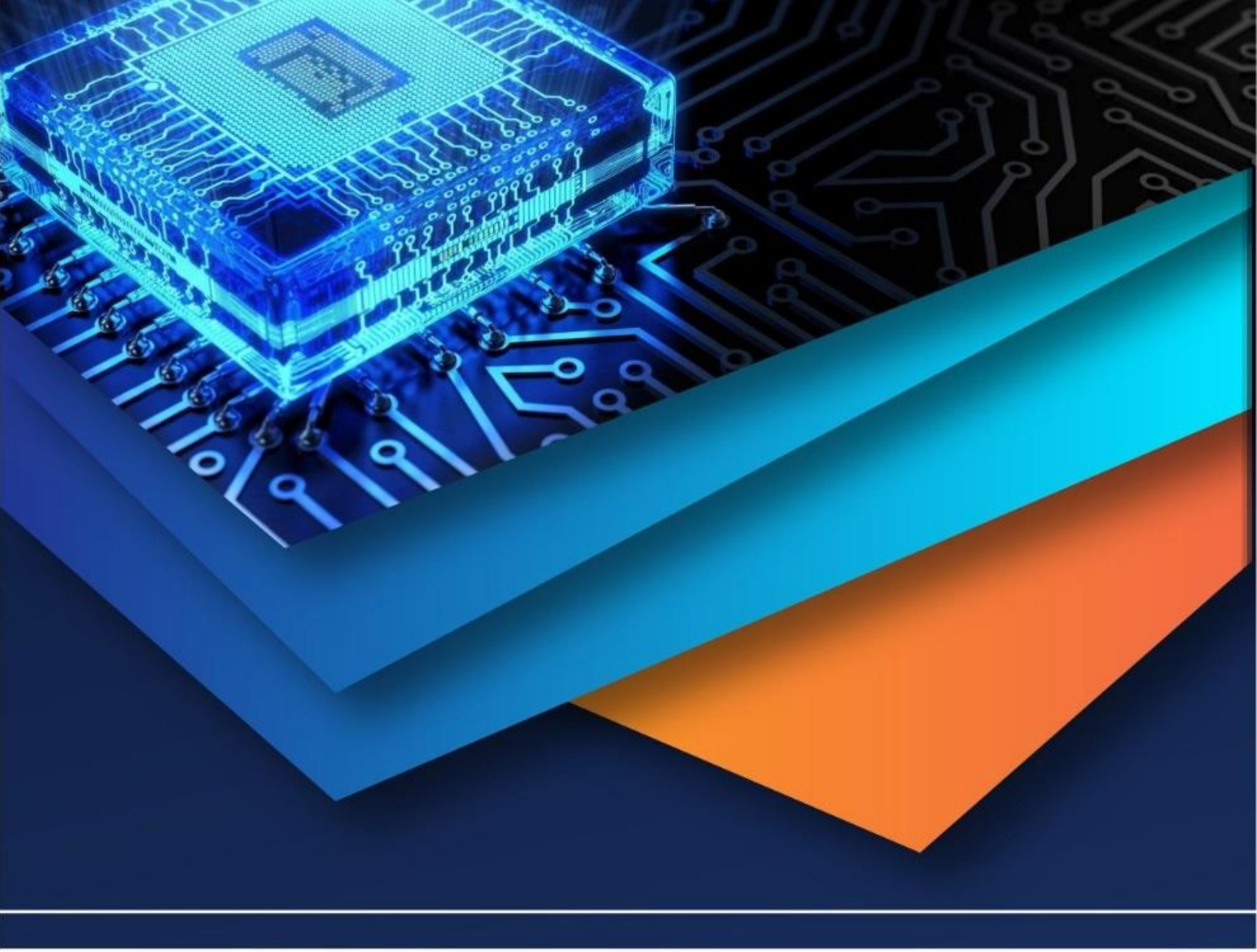
	SL	SWI	SWE	GP
SL	-			
SWI	0.901*	-		
SWE	0.850*	0.928?	-	
GP	NS	NS	NS	-

NS; correlation is not statistically significant; *; correlation is statistically significant($0.05>p$).

The correlations could be used in future studies on the species such as seed quality.

REFERENCES

[1] Anonymous, 2016. Forest inventory of Turkey. General Directorate of Forestry of Turkey, pp. 28, Ankara, Turkey.
[2] Koski, V., Antola, J., 1993. National tree breeding and seed production programme for Turkey 1994-2003. The Research Directorate of Forest Tree Seeds and Tree Breeding, 52 pp., Ankara
[3] Yazici, N., 2010. Determination of water consumption of some coniferous seedlings and its relation with meteorological parameters, Graduate School of Natural and Applied Science, Suleyman Demirel University, PhD. Thesis, Isparta, Turkey.
[4] Dilaver, M., Seyedi, N., Bilir, N., 2015. Seedling quality and morphology in seed sources and seedling type of Brutian pine (Pinus brutia Ten.). World Journal of Agricultural Research, 3:83-85.
[5] Tebes, N.T., Seyedi, N., Bilir, N., 2015. Morphological characteristics and quality in Black pine (Pinus nigra Arnold. subsp. pallasiana) seedlings. International Journal of Latest Research in Science and Technology, 4:7-9.
[6] Yilmazer, C., Bilir, N., 2016. Effect of Seedling Type in Morphology and Quality of Brutian pine (Pinus brutia Ten.) Seedlings. IJSRST, 2(5):237-240.
[7] Bilir, N., Kang, KS., Zang, D., Lindgren, D., 2004. Fertilit
[8] y variation and status number between a base population and a seed orchard of Pinus brutia. Silvae Genetica,53:161-163.ISTA,.
[9] 1999. International Rules for Seed Testing. Seed Science and Technology, 27, Supplement, Zurich, Switzerland.Bilir, N., Kaya, C., Ulusan, M. D., 2010. Morphological Characters and Quality in Stone Pine (Pinus pinea L.) Seedlings of Aydin Provenance. Forestry Faculty Journal of Kastamonu University, 10 (1). 37-43.
[10] Cercioglu, M., Bilir, N., 2016. Seed source effect on quality and morphology of Turkish red pine (Pinus brutia Ten.) seedlings. Reforesta, 2:1-5



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