Yield and characteristics of leaf in bay laurel (*Laurus nobilis* L.) populations

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ABSTRACT

Some growth (height, stem diameters and crown diameter) and leaf characteristics (size, number and weight) of Bay laurel (*Laurus nobilis* L.) were investigated in the thesis. Variations and relations among characteristics were also studied for the populations.

Averages of tree height, diameters at breast height and base, and crown diameter were 5.9 m, 7.36 cm, 9.94 cm and 3.51 m in the populations, respectively. Averages of leaf length and width, and number of leaf were 7.99 cm, 3.28 cm, and 5265 in the populations, respectively. Fresh leaf weight of individual tree decreased from 2.46 kg to 1.71 kg after dried. Significant differences ($p<0.05$) were found among populations for the growth and leaf characteristics except of leaf width according to results of analysis of variance.

There was generally significant ($p<0.05$) phenotypic correlations among growth and leaf characteristics.   © 2016 Trade Science Inc. - INDIA

KEYWORDS

Tree;
Height;
Diameter;
Laurus;
Leaf.

INTRODUCTION

Forests is used many purposes especially to produce wood and non-wood products. Turkey has 21.6 million hectares forest area of which 46.7% (10.1 million ha) is unproductive[1]. However, it is known that unproductive forest is also a source of non-wood products such as essential oil and leaf production. Bay laurel (*Laurus nobilis* L.) or also called, sweet bay,

Figure 1 : Leaf of Bay laurel

bay tree, true laurel, Grecian laurel, laurel tree or simply laurel is one of the important plant species for non-wood products because of its commercial leaf (Figure 1) used in different industries[2].

The species is evergreen. It is getting importance

TABLE 1 : Location of studied populations

Population code	Latitude (N)	Longitude (E)	Altitude (m)
Egirdir (E-450)	37.589°	30.867°	450
Bucak (B-470)	37.363°	30.619°	470
Bucak (B-590)	37.351°	30.590°	590

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Figure 2 : Views from the populations

TABLE 2 : Averages, range and standard deviation of the growth characteristics

Characters	Populations	Average	Minimum	Maksimum	St. deviation
H (m)	E-450	11.2	1.8	30	5.22
	B-470	2.52	0.7	4.2	0.77
	B-590	3.0	1.0	4.4	0.75
	General	5.9	0.7	30	5.19
DBH (cm)	E-450	14.79	4.0	34.0	6.48
	B-470	1.44	0.65	3.4	0.67
	B-590	4.12	1.0	8.5	1.58
	General	7.36	0.65	34.0	7.09
D_0 (cm)	E-450	19.21	8.0	40.0	7.53
	B-470	3.19	1.0	11.0	2.05
	B-590	5.44	1.50	8.0	1.29
	General	9.94	1.0	40.0	8.62
CD (m)	E-450	4.2	0.45	10.0	2.32
	B-470	5.14	1.50	13.0	2.4
	B-590	1.51	0.7	3.3	0.50
	General	3.51	0.45	13	2.44

TABLE 3 : Results analysis of variance for growth characteristics

Characters	Source of variation	Sum of squares	Degrees of freedom	Mean of squares	F value	*P*
H	Between groups	1466.459	2	733.230	69.784	0.000
	Within group	903.614	86	10.507		
	Total	2370.073	88			
DBH	Between groups	2995.687	2	1497.844	90.020	0.000
	Within group	1430.957	86	16.639		
	Total	4426.644	88			
D_0	Between groups	4578.764	2	2289.382	100.237	0.000
	Within group	1964.208	86	22.840		
	Total	6542.972	88			
CD	Between groups	211.136	2	105.568	29.059	0.000
	Within group	312.434	86	3.633		
	Total	523.570	88			

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of the species because of large harvesting period of its leaf. Size and height of Bay laurel belong to Laurel family vary greatly generally from 3 meters to 10 meters even up to 20 meters in optimal condition[3,4]. *Laurus nobilis* is a widespread relic of the laurel forests that originally covered much of the Mediterranean Basin when the climate of the region was more humid. The laurel forests gradually retreated, and were replaced by the more drought-tolerant sclerophyll plant communities familiar today. Most of the last remaining laurel forests around the Mediterranean are believed to have disappeared approximately ten thousand years ago, although some remnants still persist in the mountains of southern Turkey, northern Syria, southern Spain, north-central Portugal, northern Morocco, Canary Islands and in Madeira[5]. Despite large distribution and commercial leaf of the species, limited studies were carried out on the species.

The study was carried out to estimate some growth (height, stem diameters and crown diameter) and leaf characteristics including yield and their interaction and variations in the populations to contribute forestry and agricultural practices of the species.

MATERIAL AND METHODS

Studied populations

The growth and leaf data was collected 30 individual plants sampled randomly, from each three natural populations (Figure 2) in end of 2015. Geographic

TABLE 4 : Averages, range and standard deviation of the leaf characteristics

Characters	Populations	Average	Minimum	Maksimum	St. deviation
NL	E-450	11137	10	38000	9019
	B-470	1317	98	3800	1206
	B-590	2170	425	4250	1056
	General	5265	10	38000	7143
FLW (g)	E-450	0.52	0.27	0.83	0.16
	B-470	0.33	0.18	0.43	0.05
	B-590	0.33	0.20	0.40	0.04
	General	0.40	0.18	0.83	0.14
LL (mm)	E-450	8.83	5.79	11.97	1.56
	B-470	7.50	5.36	9.80	1.10
	B-590	7.50	5.81	10.07	0.94
	General	7.99	5.36	11.97	1.39
LW (mm)	E-450	3.39	2.34	4.57	0.50
	B-470	3.19	2.26	4.33	0.53
	B-590	3.34	2.45	5.93	0.78
	General	3.28	2.26	5.93	0.62
DLW (g)	E-450	0.37	0.12	0.69	0.14
	B-470	0.24	0.10	0.32	0.05
	B-590	0.24	0.14	0.29	0.03
	General	0.29	0.10	0.69	0.11
TFLW (g)	E-450	5618	7	17794	4421
	B-470	443	34	1365	418
	B-590	710	136	1332	362
	General	2457	7	17794	3628
TDLW (g)	E-450	3885	5	12316	3210
	B-470	322	24	975	305
	B-590	518	85	1001	269
	General	1713	5	12316	2571

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properties of the studied populations are given in TABLE 1.

Data collection

Following growth and leaf data were collected from the populations;

Tree height (H), diameter at base (D_0), diameter at breast height (DBH) and crown diameter (CD); number of leaf (NL), fresh leaf weight (FLW), leaf length (LL), leaf width (LW), dry leaf weight (DLW), total fresh leaf weight/individual (TFLW) and total dry leaf weight/individual (TDLW). The fresh leafs were dried in indoor at 18-20 ^{0}C during two days to measure dry weight of leafs

Data analysis

The following linear ANOVA model was used for comparison of the populations for leaf and growth characteristics:

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

Where *Yij* is the observation from the *jth* plant of the *ith* population, *i* is overall mean, P*i* is the random effect

of the *ith* population, and *e*ij is random error.

Correlations among cone production and growth characters were calculated by Pearson's correlation using SPSS statistical package program.

RESULTS AND DISCUSSION

Growth characteristics

Averages, range and standard deviation of the growth characteristics were given in TABLE 2 for the populations. There were large differences among populations and within population for growth characteristics (TABLE 2).

Averages of tree height, diameter at breast height, diameter at base and crown diameter were 5.9 m, 7.36 cm, 9.94 cm and 3.51 m, respectively, while there were large differences among populations and within population for growth characteristics (TABLE 2). The differences were also supported by results of analysis of variance (TABLE 3). These results were well accordance with early results on the species[3,4].

Statistically significant differences (≤*0.05*) were

TABLE 5 : Results analysis of variance for leaf characteristics

Characters	Source of variation	Sum of squares	Degrees of freedom	Mean of squares	F value	*P*
NL	Between groups	181858303	2	90929152	29.27	0.000
	Within group	267113523	86	31059712		
	Total	448971827	88			
FLW	Between groups	0.816	2	0.408	39.58	0.000
	Within group	0.887	86	0.010		
	Total	1.703	88			
LL	Between groups	36.639	2	18.320	11.81	0.000
	Within group	133.332	86	1.550		
	Total	169.971	88			
LW	Between groups	0.314	2	0.157	0.408	0.666
	Within group	33.085	86	0.385		
	Total	33.398	88			
DLW	Between groups	0.362	2	0.181	21.06	0.000
	Within group	0.739	86	0.009		
	Total	1.102	88			
TFLW	Between groups	524782978	2	26239149	35.61	0.000
	Within group	633626360	86	7367748		
	Total	115840938	88			
TDLW	Between groups	247860606	2	12393030	31.9	0.000
	Within group	334067574	86	3884506		
	Total	581928181	88			

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TABLE 6 : Relations among the characteristics

	H	DBH	D_0	CD	NL	LL	LW	TFLW
H	-							
DBH	0.82	-						
D_0	0.82	0.98	-					
CD	-0.34	-0.28	-0.33	-				
NL	0.46	0.50	0.50	-0.27	-			
LL	0.43	0.45	0.48	NS	0.22	-		
LW	NS*	0.81	NS	NS	NS	0.35	-	
TFLW	0.49	0.55	0.55	-0.31	0.89	0.46	NS	-
TDLW	0.50	0.55	0.55	-0.30	0.84	0.51	NS	0.98

*; NS relation is not statically significant

found among populations for growth characteristics based on results of analysis of variance (TABLE 3). These results emphasized large selection potential of the species.

Leaf characteristics

Averages of number of leaf, fresh leaf weight, leaf length, leaf width, dry weigh, total fresh weight of leaf and total dry weight of leaf were 5265, 0.4 g, 7.99 mm, 3.28 mm, 0.29 g, 2475 g and 1713 g (TABLE 4).

There were large differences among populations and within population for the leaf characteristics (TABLE 4). For instance, numbers of leaf were between 10 and 38000 in population E-450 (TABLE 4). The differences were also well accordance with results of analysis of variance (TABLE 5).

Statistically significant differences (≤ 0.05) were found among populations for leaf characteristics except of leaf width based on results of analysis of variance (TABLE 5). These results showed importance of individual selection to produce higher leaf product in the species.

Correlations

There was generally significant ($p<0.05$) phenotypic correlations among growth and leaf characteristics (TABLE 6).

Tree height (H), diameter at base (D_0) and diameter at breast height (DBH) had statistically significant and positive effective on leaf characteristics (TABLE 6). The result can play important role in future practices of the species.

CONCLUSIONS

The studied genotypes were sampled in limited area of the species. New studies should be conducted by large genotypes and populations. Therefore, it was needed to collect more data on future years from the species to draw accurate conclusions.

REFERENCES

[1] Anonymous; Forest inventory of Turkey. General Directorate of Forestry of Turkey, (**2015**).
[2] E.Putievsky, E.Davin, N.Jnir, D.Sanserovich; The essential oils from cultivated Bay Laurel. Israel, Journal of Botany, **33**, (**1984**).
[3] A.Green; Field guide to herbs and spices. Quirk boks, (**2006**).
[4] Y.S.Lewis; Spices and herbs for the food industry. Food Trade Press, Orpington, England, (**1984**).
[5] R.Ansin, Z.C.Ozkan; Spermatophyta. Karadeniz Technical University press, (**2006**).