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Full Length Research Paper

Relationships between ages of planting with the important fruit characteristics in hazelnut

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This study was carried out in Güce town of Giresun on 400 to 440 m spacing of Tombul variety between the years 2008 and 2009. The ages of oaks planting were determined as 10, 20, 30, 40, 50, 70 and 90 years. As a statistics between the ages of oaks planted with yield, kernel weight was determined as having very significant negative correlation; between the ages of oaks planted with yield, shell nut weight and the hub shell was found to be negative and significant, between age of oak planting with the shell thickness was found a positive but insignificant relationship.

Keywords: Filbert, Tombul, planting age, statistical relations

INTRODUCTION

Turkey has vast areas suitable for production of hazelnut and has the best-quality hazelnut varieties of the world (Ayfer et al., 1986; Koksal, 2002; Beyhan et al., 2007). For a long time, traditional cultivation prevented the transition to modern cultivation and standard production. Therefore, hazelnut production is made with mixed varieties and types; and our production fields are far from the standardization in terms of shape, quality, and yield (Cetiner et al., 1984). As a result, there are many reasons for low yields per hectare in Turkey. Underestimation of the cultural applications such as continuing on production with old branches, pruning, fertilization, and mixture of the types is at the top of these reasons (Karadeniz et al., 2009). Because of having rough and aslope fields, Black Sea Region makes producing hazelnut possible in various heights; and altitude and age of planting has resulted in vaccination of the quality produced. In the studies that have been carried out so far, the effect of some features on the yield and quality criteria of hazelnut has been investigated, such as altitude, vector, number of branches, and number of fruit in a çotanak (fruit set), but enough research has not been conducted about the effect of age of seedbed planting on these criteria.This study aims to search out the relation between the planting age and the quality factors by determining the changes on the quality factors of the hazelnut depending on the age when planted.

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MATERIALS AND METHODS

As the vegetal material, the seedbeds of Tombul hazelnut variety that has been grown in 2008 to 2009 in the fields of Guragac village of Güce town in Giresun was used as basis. Annual rain of Giresun is 1200 mm and average temperature 14°.

By determining the fields for research, especially in North-West facing vectors, the planting years of seedbeds in the fields of Tombul hazelnut variety was identified by asking the farmers. In the first and the second years, between the dates of 25th March to 5th April and 5th to 15th May, 26% nitrogen was given to the trial fields two times.

In the selected fields, then 10, 20, 30, 40, 50, 70 and 90 year-old seedbeds were determined and 3 branches were chosen from each seedbed. The altitude of the fields was measured by altimeter as 400 to 440 m. In the first and the second years, fruits were harvested in 15th-20th August. Harvested hazelnuts were separated from their husk and dehydrated in the sun, until they contain 12% moisture. Dried hazelnut fruits were conserved with breathable net bags in dry conditions and at room temperature until analysis was taken.

The trial was done with three repetitions by choosing 3 seedbeds and 3 branches on each seedbed according to testing designs of coincidence blocks. Thirty fruits were used for each repetition in the analysis.

For each age the varieties, yield (Y), hub cavity (HC), fruit weight (FW), shell thickness (ST), kernel weight (KW) amounts were determined; and in the weightings, the scale with 0.01 g precision was used and in the measurements, the compass with 0.05 mm precision.All the data for each year were evaluated with TARIST statistical analysis package program and the significance controls of differences between the means were tested by using real data according to LSD multiple comparison method.Fruit criteria evaluated in this study has determined by using the methods which were monitored by Ayfer et al. (1986), Koksal (2002) and Karadeniz and Islam (1999).

RESULTS AND DISCUSSION

In the study which aims to determine the relationship between the planting age of hazelnut the parameters of the yield and the quality, the fruit samples taken in the first and the second years were subjected to physical and chemical assessments and their means were calculated. According to the statistical results on the values of obtained yield, fruit weight, kernel weight, efficiency, hub cavity, shell thickness; it was determined that the age was important to yield, fruit weight, kernel weight, efficiency and shell thickness at 1% level while hub cavity was not (Table 1).

At the end of the correlation analysis, the relationships were investigated between age groups, yield and important quality criteria (Table 2); negative and very important correlation between age group and yield, and kernel weight and efficiency; negative and important correlation between fruit weight and hub cavity; and unimportant correlation between fruit weight and shell thickness were determined. Positive and very important correlation between yield and fruit weight, kernel weight and efficiency; positive and important correlation for hub cavity, and also negative and unimportant correlation for shell thickness were identified. Positive and very important correlation among fruit weight, kernel weight and efficiency; negative and very important correlation for shell thickness, and also positive and unimportant correlation for hub cavity were determined. Positive and very important correlation between kernel weight and efficiency; negative and very important correlation with shell thickness, and also very important correlations with hub cavity were identified. Negative and important correlation between efficiency and shell thickness; and important correlations with hub cavity were determined. It was seen that there are unimportant correlations between hub cavity and shell thickness.

Planting age directly affects yield in a negative way, and it has 6.74% effect rate. Planting age indirectly affects fruit weight because of its effect on yield in a negative way and it has 4.38% effect rate. Its indirect effect on kernel weight is negative and its effect rate is 4.60% while it indirectly affects efficiency negatively and its effect rate is 4.96%. Its indirect effect on hub cavity is negative and it has 6.13%; and its indirect effect on shell thickness is positive with 2.23% effect rate (Table 3).

The direct effect of planting age on fruit weight is negative with 29.53% effect rate. Planting age indirectly affects yield because of its effect on fruit weight in a negative way and it has 25.07% effect rate. Its indirect effect is negative on kernel weight with 27.02% effect rate, on efficiency with 23.79% effect rate, on hub cavity with 24.85% effect rate. Its indirect effect is positive on shell thickness with 31.53% effect rate (Table 3).

The direct effect of planting age on kernel weight is positive with 48.23% effect rate. Planting age indirectly affects yield with positive 47.07% effect rate, fruit weight with positive 48.22% effect rate, efficiency with positive 48.08% effect rate, hub cavity with a positive 46.09% effect rate, shell thickness with negative 48.90% effect rate because of its effect on kernel weight (Table 3).

The direct effect of planting age on efficiency is negative with a 22.82 % effect rate. Planting age indirectly affects yield with a negative 20.87% effect rate, fruit weight with a negative 17.46% effect rate, kernel weight with a negative 19.77% effect rate, hub cavity with a negative 22.05% effect rate, shell thickness with a positive 16.53% effect rate because of its effect on efficiency (Table 3).

The direct effect of planting age on hub cavity is negative with a 0.63% effect rate. Yield is indirectly affected negatively by planting age because of its effect on hub cavity with a 0.12%, fruit weight with a 0.08%, kernel

Table 1. The hazelnut values of average yield, fruit weight, kernel weight, efficiency, hub cavity, shell thickness obtained in 2008-2009 years.

Fruit criteria	10 Years	20 Years	30 Years	40 Years	50 Years	70 years	90 years	LSD	F
Yield	665.730^{a}	511.833^{b}	508.937^{b}	504.093^{b}	583.760^{ab}	347.707^{c}	307.837^{c}	115.764	20.747***
Fruit weight	1.747^{ab}	1.733^{ab}	1.693^{ab}	1.773^{ab}	1.813^{a}	1.667^{b}	1.470^{c}	0.122	14.942***
Kernel weight	0.930^{ab}	0.903^{bc}	0.873^{bc}	0.917^{b}	1.000^{a}	0.833^{c}	0.683^{d}	0.079	28.332***
Efficiency	53.303^{ab}	52.240^{abc}	51.630^{bc}	51.640^{bc}	55.090^{a}	49.723^{cd}	46.657^{d}	3.237	12.214***
Hub cavity	2.867^{a}	2.673^{ab}	2.763^{ab}	2.550^{ab}	2.507^{ab}	2.663^{ab}	2.403^{b}	0.609	1.191^{NI}
Shell thickness	1.020^{b}	0.963^{bc}	0.947^{bc}	0.887^{c}	0.943^{bc}	0.907^{c}	1.150^{a}	0.105	12.604***

There is no difference between the means that displayed with the same letters. *: at 5% level importance (p≤0.05), **: at 1% level importance (p≤0.01), NI: Not ımportant.

Table 2. Correlation coefficients belonging to the planting age and important quality criteria of the fruits.

Fruit criteria	Year	Yield	Fruit weight	Kernel weight	Efficiency	Hub cavity	Shell thickness
Year	1000	-	-	-	-	-	-
Yield	-0.775**	1000	-	-	-	-	-
Fruit weight	-0.539*	0.743**	1000	-	-	-	-
Kernel weight	-0.560**	0.817**	0.956**	1000	-	-	-
Efficiency	-0.566**	0.821**	0.785**	0.929**	1000	-	-
Hub cavity	-0.473*	0.415	0.336	0.365	0.396	1000	-
Shell thickness	0.219	-0.249	-0.701**	-0.637**	-0.488*	-0.21	1000

*: at 5% level importance (p≤0.05), **: at 1% level importance (p≤0.01).

Table 3. Path analysis results about the direct and indirect effects of planting age on important quality criteria of the fruit.

Fruit criteria	Direct Effect		Indirect effect											
			Yield		Fruit weight		Kernel weight		Efficiency		Hub cavity		Shall thickness	
	Effect	Effect rate (%)	Effect	Effect rate (%)	Effect	Effect rate (%)	Effect	Effect rate (%)	Effect	Effect rate (%)	Effect	Effect rate (%)	Effect	Effect rate (%)
Yield	-0.8918	6.74	-	-	-0.6622	4.38	-0.7283	4.60	-0.7320	4.96	-0.3703	6.13	0.2218	2.23
Fruit weight	-4.4694	29.53	-3.3189	25.07	-	-	-4.2749	27.02	-3.5090	23.79	-1.5026	24.85	3.1346	31.53
Kernel weight	7.6303	48.23	6.2318	47.07	7.2982	48.22	-	-	7.0908	48.08	2.7864	46.09	-4.8615	48.90
Efficiency	-3.3653	22.82	-2.7622	20.87	-2.6421	17.46	-3.1273	19.77	-	-	-13333	22.05	1.6433	16.53
Hub cavity	-0.0381	0.63	-0.0158	0.12	-0.0128	0.08	-0.0139	0.09	-0.0151	0.10	-	-	0.0080	0.08
Shell thickness	0.0724	0.73	-0.0180	0.14	-0.0508	0.34	-0.0462	0.29	-0.0354	0.2399	-0.0152	0.25	-	-

weight with 0.09%, efficiency with a 0.10% effect rates. Planting age indirectly affects yield in a positive way with 0.08% effect rate because of its effect on shell thickness.

The direct effect of planting age on shell thickness is positive with 0.73% effect rate. Yield is indirectly affected negatively by planting age because of its effect on shell thickness with 0.14%, fruit weight with 0.34%, kernel weight with 0.29%, efficiency with 0.24%, hub cavity with a 0.25% effect rates.

According to the study which aims to investigate the effects of different seedbed ages in similar conditions on yield and quality criteria of hazelnut, it can be seen that generally, hazelnut yield and quality parameters are decreasing while seedbed age is increasing. As a more general statement, until a certain age (50 years), difference is not seen among the factors that make up the yield and quality criteria, but it can be clearly observed that the same criteria decrease at later ages. The results obtained in the study generally have similarity with early literatures (Karadeniz et al., 2009; Okay et al., 1986), and occurred differences are thought to be due to the various ecological factors, different soil structure, feeding and watering conditions. Indeed, in the conducted studies, these emphasized that hazelnut planting age is economically 60 and the fields that completed 60 years should be renewed (Karadeniz et al., 2009; Karadeniz, 2006; Okay et al., 1986).

CONCLUSİON

Analyzing the results, it is seen that the best values in terms of hazelnut yield and quality are in 10 to 50 year-old fields in Giresun ecology; 10 year-old fields come into prominence; yield and fruit weight, kernel weight, efficiency as important criteria are reasonably decreased in 70 and 90 year-old fields. These results show that in order to increase yield and quality, old fields should be uprooted gradually and replanting should be done and thus high efficiency can be gained again from inadequate fields. In addition, by taking so much criteria into consideration such as soil fertility, vector, variety and cultural applications, it is a must to conduct similar studies in different areas and determine the effects of planting age on yield and quality.

Conflict of interest

The authors have not declared any conflict of interest.

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