Yield, cluster drop and nut traits of three Turkish hazelnut cultivars

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ABSTRACT: The yield, cluster drop and nut traits of the hazelnut cultivars Tombul, Palaz and Çakildak in Turkey were examined during 2001–2002. The cluster drop ranged from 7.5 to 17.0%. The highest yield per shrub with 2,930 g in 2001 and 3,190 g in 2002 was found in cultivar Tombul. This cultivar was also better in terms of the studied fruit traits compared with the other cultivars. In this cultivar (in 2001 and 2002), nut numbers per cluster were 3.87 and 3.46, nut weights were 1.53 and 1.70 g, kernel weights 0.93 and 0.99 g, and kernel proportions were 50.9 and 53.8%.

Keywords: *Corylus avellana*; hazelnut; yield; nut drop; fruit traits

Turkey is one of the most important centres of hazelnut cultivation in the world (Davis 1982). Hazelnuts have been grown for centuries in Anatolia, and adapted to ecological conditions in the Black Sea region. However, there are many problems in the hazelnut industry including an excessive age and small size of many orchards, as well as post-harvest procedures and marketing. There are a lot of standard and local cultivars in Turkey. Tombul, Palaz, and Çakildak are the most common among the standard ones (Köksal 2002). The main objective of this study was to determine the yield, cluster drop and nut traits of these cultivars.

MATERIALS AND METHODS

This study was carried out in an orchard in Fatsa County in Ordu province, Turkey, during 2001–2002. The trial orchard, located at the altitude of 225 m above sea level, was established with shrub training system (a traditional bush form) at the spacing of 4 × 4 m in 1955. Tombul, Palaz, and Çakildak cultivars were used in the study. Regarding shrubs Tombul contained 5 to 7 branches 273 ± 73 mm in diameter, Palaz had 7 to 9 branches 176 ± 54 mm in diameter and Çakildak had 9–12 branches 111 ± 31 mm in diameter. The experimental design was randomized plots. Three replicates and one shrub per replication were used. Statistical analyses were conducted according to Tosun (1991) and the means were compared using Duncan's multiple range tests ($p \leq 0.05$). Vertical bars were also presented in the figures according to the standard error of averages ($p \leq 0.05$).

Harvest was performed in the middle of August. Yield (g) was determined per shrub. A sample of 100 clusters and 200 nuts was used for fruit characteristics. For each sample, the following characteristics were measured: nuts per cluster, nut and kernel weight (g), kernel proportion (%), shell thickness (mm), well-developed kernel (%), empty nut (%) and shrivelled kernel (%). In addition, cluster drop (%) was recorded in June–August.

RESULTS AND DISCUSSION

The cluster drop ranged from 7.5 to 9.3% in 2001 and 7.5 to 17.0% in 2002 (Fig. l). There was no significant difference in cluster drop between the cultivars. In both trial years, the highest yield per shrub was determined in Tombul (Fig. 2). This result is in accordance with the findings of Beyhan and Marangoz (1999). Kurnaz and Serdar (1993) and Bozoğlu (1999) reported that Tombul was a common cultivar especially at the elevation 0–250 m above sea level in Ordu and Giresun because of its high yield. Tombul had higher yield than the other cultivars by 33 or 40% in 2001. In 2002, this cultivar had a higher yield than 2001, opposite to the other cultivars, and yield differences in comparison with the other cultivars were 98 or 124%. The reason for this could likely be biennial bearing differently affecting hazelnut cultivars in that year.

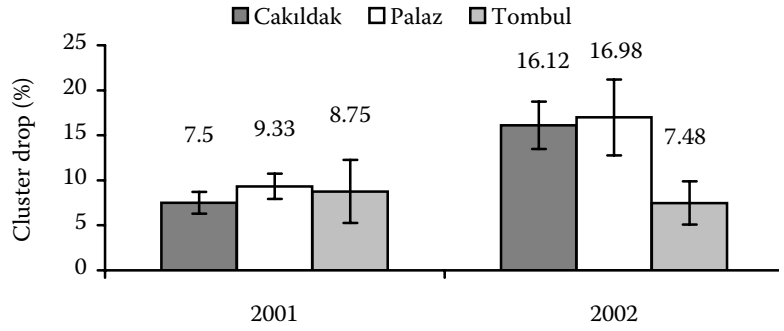

Fig. 1. Cluster drop of three hazelnut cultivars in trial years

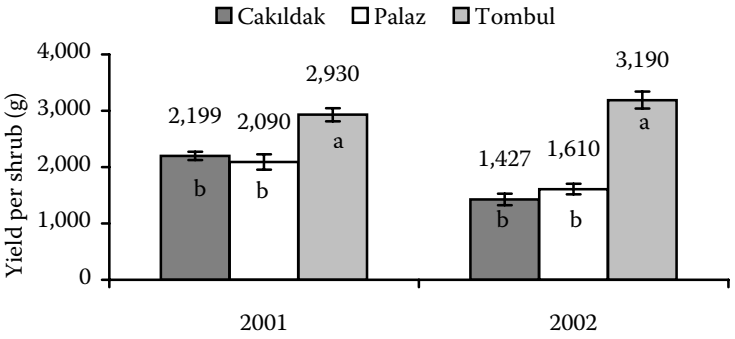

Fig. 2. Yields (g) per shrub of three hazelnut cultivars in trial years

Nut numbers per cluster were highest in Tombul in both years (Tables 1 and 2). In 2001, nut and kernel weights were higher in Tombul and Palaz than Çakildak (Table 1). The highest kernel proportion was in Tombul although there was no significant difference in shell thickness between the cultivars. There were no significant differences between the cultivars in terms of nut and kernel weights, and shell thickness in 2002 (Table 2). Kernel proportion was again the highest in Tombul as in the previous year. The lowest percentage of shrivelled kernels (%) was determined in Tombul in both years.

In the present study, the best quality nuts were from Tombul. The results of this study are in agreement with Beyhan and Demir (2001). Thompson (1982) reported that many people consider Tombul to be the best cultivar in the world. However, it was suggested that nut and kernel weights were higher

Table 1. Nut and kernel traits of three hazelnut cultivars in 2001

Cultivars	Number of nuts per cluster	Nut weight (g)	Shell thickness (mm)	Kernel proportion (%)	Kernel weight (g)	Proportion of well developed kernels (%)	Proportion of shrivelled kernel (%)
Çakildak	2.70 b	1.17b	0.79	47.6 b	0.62 b	86.1	9.5 b
Palaz	2.87 b	1.47 a	0.90	47.3 b	0.81 a	83.0	6.1 b
Tombul	3.87 a	1.53 a	0.86	50.9 a	0.93 a	86.5	3.2 a

Means followed by the same letter are not significantly different at the 0.05 level

Table 2. Nut and kernel traits of three hazelnut cultivars in 2002

Cultivars	Number of nuts per cluster	Nut weight (g)	Shell thickness (mm)	Kernel proportion (%)	Kernel weight (g)	Proportion of well developed kernels (%)	Proportion of shrivelled kernel (%)
Çakildak	2.30 b	1.63	0.81	51.0 b	0.90	92.2	4.7 b
Palaz	2.50 b	1.66	0.89	50.8 b	0.94	88.8	4.4 b
Tombul	3.46 a	1.70	0.84	53.8 a	0.99	92.4	2.6 a

Means followed by the same letter are not significantly different at the 0.05 level

in Palaz than Tombul, although the proportion of the kernel was higher in Tombul (Beyhan, Marangoz 1999; Beyhan 2000; Bostan 2001a,b). This case may result from using different genotypes of these main cultivars and environmental factors. Islam and Özgüven (2001) reported that there was great contradiction within these main cultivars. Some clonal selection studies were carried out among the main hazelnut cultivars in Turkey. The clones of the main cultivars selected by Balta et al. (1997), Demir and Beyhan (2000) and Islam and Özgüven (2001) had higher nut and kernel weight, nut number per cluster, and kernel percentage than the cultivars presented in this study. Genetic diversity of the selected clones from the main cultivars should be further proven. For this reason, a study was carried out to determine the genetic diversity for some selected hazelnut genotypes (Demir 2004). These studies should also be carried out for other selected hazelnut clones. Therefore, nursery plants of the improved clones should be used for establishing new orchards.

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Received for publication March 8, 2005
Accepted after corrections April 5, 2005

Výnos, opad souplodí a některé plodové znaky u tří tureckých odrůd lísky

ABSTRAKT: Předmětem výzkumu, který se uskutečnil v Turecku v letech 2001 a 2002, bylo hodnocení výnosu, opadu souplodí a některých plodových znaků u odrůd lísky Tombul, Palaz a Çakildak. Opad souplodí u hodnocených odrůd kolísal v rozmezí od 7,5 do 17,0 %. Nejvyšší výnos z keře byl zjištěn u odrůdy Tombul, u níž v r. 2001 dosáhl hodnoty 2 930 g a v r. 2002 dokonce 3 190 g. Tato odrůda byla rovněž nejlepší ve všech hodnocených plodových znacích. V průměru u tohoto

kultivaru bylo v r. 2001 zjištěno 3,87 a v r. 2002 3,46 oříšků v souplodí, hmotnost oříšků (v těchto letech) činila 1,53, resp. 1,70 g, hmotnost jádra 0,93, resp. 0,99 g a podíl jádra na celkové hmotnosti oříšků 50,9, resp. 53,8 %.

Klíčová slova: *Corylus avellana*; líska obecná; výnos; opad oříšků; plodové znaky

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