

Effect of Hazelnut Growing Methods on the Growth Structure and Crown Habit

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Abstract: The study was carried out over 1999 – 2006 at the Experimental Station in the town of Kardzhali on two hazelnut cultivars: Tonda Romana (*C. avellana* L.) of vigorous growth and Ran Trapezundski (*C. maxima* Mill.) of poor growth. The experiment included parallel studies of the variants: bush-trained plants, single-stem trained own-rooted trees, single-stem trained trees obtained by grafting on seedling rootstocks of the Turkish filbert form No. 7-23 of *C. columbia* L. species. The results showed that in the juvenile period of hazelnut plant development the method of growing did not exert any significant effect on the growth structure, the type of fruiting wood and the indices characterizing the crown habit (shape, density and deviation angle of the skeleton branches).

The type of growing was determined by moderately vigorous shoots in the hazelnut cultivars Tonda Romana and Ran Trapezundski from the third to the eighth year of their cultivation.

The highest reproductive capacity in Ran Trapezundski cultivar was exhibited by moderately vigorous and weak shoots, while in Tonda Romana cultivar – by the poor growing and short ones. The interdependency of the catkin quantity and the different types of shoots was established neither in Tonda Romana nor in Ran Trapezundski cultivars.

Key words: hazelnut, growing method, growth habits.

Introduction

A specific biological characteristic in hazelnut is that all the growing points have the capacity to form vegetative growth. All the different growth points are set along the vegetative axes of the shoots, the fact being the reason for classifying the shoot types according to shoot length. In our country, the morphological cate-

gorization of hazelnut shoot types was made by Kavardzhikov (1983). There are no data available in specialized scientific literature on the interdependence of the growth structure in the juvenile period of hazelnut plants and the methods of growing. The comparative experiment with hazelnut plants trained to bush or to a single-stem – both own-rooted and grafted on the Turkish filbert (*C. colurna* L.) – set up at the Experimental Station in the town of Kardzhali, enabled detailed studies to be performed. The results obtained provided new information on the reproductive habits of the hazelnut crop.

Material and Methods

The study was carried out over 1999-2006 at the Experimental Station in the town of Kardzhali on two hazelnut cultivars: Tonda Romana (of vigorous growth) – a typical representative of common hazelnut species (*C. avellana* L.) and Ran Trapezundski (of poor growth) originating from *C. maxima* Mill. The experiment included three variants in three replications for each cultivar. The variants studied were: bush-trained plants, single-stem trained own-rooted trees, single-stem trained trees obtained by grafting on seedling rootstocks of the Turkish filbert form No. 7-23. The plants were grown at a planting distance of 5x4 m. The trees were trained to a free-growing crown and the bushes had 3-4 main stems. Cultural practices were employed following the conventional technology of cultivation and the observations were conducted by the methods of studying plant resources in fruit species (Nedev *et al.* 1979).

The following characteristics were reported: growth structure – determined by counting the number of each shoot type: short shoots of 1-5 cm in length; weak of 6-15 cm in length; moderately vigorous of 16-35 cm in length and long – over 35 cm in length (Kavardzhikov 1979); crown shape – determined by visual observation; crown density – determined by visual observation; deviation angle of the skeleton branches /in degrees/ – reported by measuring. The type of fruiting wood was established by counting the different shoot types on the control branches and the number of fruit buds initiated on them.

Results and Discussion

Growth Structure

Until the second vegetation, all the studied trees and bushes formed mainly short and weak shoots (Table 1). Later the number of short shoots abruptly decreased to make up but the smallest share in the growth structure at the end of the period. During the third vegetation, the development of a few long shoots of about 36.5 cm length was observed in the grafted variants. The wood pattern in most of the tested plants during the greater part of the juvenile period (from the second to the eighth vegetation) was determined by the category of the moderately vigorous shoots. The training system, the cultivar and the type of grafting did not exert any significant effect on the established tendency. As shown by the results of the study, differences in the growing wood were established, which were directly dependent mainly on the age period of the

hazelnut plants. In the grafted plants of both cultivars, the long shoots prevailed over the short ones after the fourth year. In Tonda Romana cultivar the relative share of the long shoots was bigger than in Ran Trapezundski. In the eighth year, only the grafted plants of Tonda Romana cultivar formed increment, the long shoots prevailing.

Tab. 1. Growing wood structure (%), the average for the period 1999-2006

Growing methods (Variants)		Bush		Single-stem Own rooted		Single-stem grafted on <i>No</i> 7-23 rootstock (<i>C. colurna</i>)		LSD 5 %	
Relative share of different types of shoots (%)									
short	Tonda Romana	22.62	b	26.25	a	24.42	ab	2.08	
	Ran Trapezundski	27.00	b	28.88	a	27.75	ab	1.81	
weak	Tonda Romana	31.75	a	29.38	ab	28.88	b	2.60	
	Ran Trapezundski	28.75	a	28.88	a	26.29	a	3.13	
moderately vigorous	Tonda Romana	31.75	a	31.13	a	30.96	a	2.04	
	Ran Trapezundski	31.38	a	29.50	b	31.88	a	1.52	
long	Tonda Romana	13.88	ab	13.25	b	15.75	a	2.43	
	Ran Trapezundski	12.38	b	12.75	ab	14.08	a	1.40	

Fruiting Wood

In order to establish the actual and the potential reproductive capacity of hazelnut plants, it was necessary to identify the location of the female flowers and the catkins in the separate shoot categories. The first mixed buds were formed only on short shoots. In Ran Trapezundski cultivar after the second vegetation until the end of the study period most of the female flower organs (from 60 % to 65 %) were initiated on moderately vigorous and in weak shoots (from 23 % to 31 %) and fewer (from 5 % to 9 %) – on short shoots. Tonda Romana cultivar differed, as a significant part of the mixed buds (35 % to 51 %) was initiated on weak shoots and 15 % to 21 % of them – on short ones. The relative share of the mixed buds formed on long shoots was the smallest (from 7% to 9%). The established tendency was most obviously demonstrated by the grafted trees of both cultivars and, with few exceptions, it also referred to the own-rooted variants. The experimental data obtained during the juvenile period of the hazelnut cultivars confirmed the results of previous studies (Kavardzhikov 1984, Nikolova 2005) on the fruiting habits of Tonda Romana and Ran Trapezundski cultivars. Of the two studies cultivars, Ran Trapezundski showed comparatively better combination of the distribution of fruiting shoots and mixed buds, as the moderately vigorous shoots accounted for a significant share of the growth structure. The analysis of the results showed that the training system in hazelnut plants did significantly affect the type of fruiting wood, which was more likely a cultivar specific characteristic.

In contrast to the female flower organs, there was no strict differentiation between the separate types of shoots as far as catkin initiation was concerned. In the grafted variants of both cultivars the terminal point in most of the shoots (short and weak) had catkins until the third vegetation. During that period in Tonda Romana cultivar a small number of male inflorescences were formed on the moderately

vigorous shoots. Until the eighth vegetation, catkins were formed almost evenly on shoots over 5 cm in length. That tendency was not observed in the own-rooted variants that initiated catkins later. Male inflorescences were formed on the longer shoots.

Crown Habit

During the period of study the crown shape of all the trees and bushes of Ran Trapezundski cultivar was close to spherical and that of Rimski cultivar resembled a truncated cone. The former was more sprawling and the latter – more upright-growing. Until the fourth growing season, a tendency to form more compact and upright-growing crowns was also observed both in grafted and own-rooted trees of Ran Trapezundski cultivar. It was due to the fact that during the juvenile period the continuators of the skeleton branches and the ramifications grew in a more upright position closer to the vertical, which contributed to forming a more compact and tight crown. After the fifth vegetation period all the trees of Ran Trapezundski cultivar formed the cultivar specific spherical crown shape. The stated results showed the crown shape in hazelnut to be a typical cultivar trait which was not significantly affected by the growing method.

In the juvenile period the crowns of the trees and bushes of Ran Trapezundski cultivar were denser compared to those of Tonda Romana. That was probably due to the fact that throughout the period of study all the experimental plants of Ran Trapezundski cultivar initiated more abundant but shorter shoot formation, developed smaller crowns and exhibited poorer growth vigor as compared to Tonda Romana cultivar. In both cultivars, the bushes had the densest crowns and the single-stem trained own-rooted trees – the loosest ones.

One of the most important traits characterizing the crown habit is the deviation angle of the skeleton branches. Over the study period, the values of the said characteristic in the trees of Tonda Romana and Ran Trapezundski cultivars ranged from 25° to 30° and from 30° to 35°, respectively. The established tendency referred to both grafted and own-rooted trees.

Conclusion

Over the juvenile period of hazelnut crop the growing method employed did not have any significant effect on the growth structure, the type of fruiting wood and the crown habit.

The category of the moderately vigorous shoots determined the wood pattern of Tonda Romana and Ran Trapezundski hazelnut cultivars from the third to the eighth vegetation period.

For Ran Trapezundski cultivar the greatest production capacities were manifested by the moderately vigorous and the weak shoots and for Tonda Romana cultivar – by the weak and the short ones.

In both hazelnut cultivars studied, i.e. Tonda Romana and Ran Trapezundski, interdependency of the catkin quantity and the different types of shoots was not established.

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UTICAJ NAČINA UZGOJA LESKE NA STRUKTURU RASTA I FORMIRANJE KRUNE

- originalni naučni rad -

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Rezime

U periodu od 1999-2006, u Oglednoj stanici u gradu Kardžali, izvršeno je ispitivanje dve sorte leske: Tonda Romana (*C. avellana* L.) bujnog rasta i Ran Trapezundski (*C. maxima* Mill.) slabog rasta. Ogled je obuhvatio paralelna istraživanja sledećih varijanti: biljaka u obliku žbuna, samoukorenjenih stabala, stabala dobijenih kalemljenjem na podlogu sejanca turske leske br. 7-23 vrste *C. colurna* L. Rezultati su pokazali da, u ranom periodu rasta leske, način gajenja nije značajno uticao na strukturu rasta, vrstu rodnog drveta i pokazatelje formiranja krune (oblik, gustinu i ugao odstupanja skeletnih grana).

Način uzgoja određen je pomoću umereno bujnih izdanaka kod sorti leske Tonda Romana i Ran Trapezundski od treće do osme godine uzgoja.

Najveću sposobnost reprodukcije kod sorte Ran Trapezundski ispoljili su umereno bujni i slabi izdanci, a kod sorte Tonda Romana – slabo bujni i kratki izdanci. Medjuzavisnost kvaliteta resa i različitih vrsta izdanaka nije utvrđena ni kod sorte Tonda Romana, ni kod sorte Ran Trapezundski.