

CHARACTERIZATION OF NEW FRUIT AND GRAPE PLANTATIONS IN THE SOUTHEASTERN PART OF HUNGARY

KARAKTERIZACIJA NOVIH PLANTAŽA VOĆA I GROŽĐA U JUGOISTOČNOM DELU MAĐARSKE

Judit PETŐ, Attila HÜVELY, Viktor József VOJNICH

Pallas Athena University, Faculty of Horticulture and Rural Development, 6000 Kecskemét, Hungary, Mészöly Gyula Square 1-3.
e-mail: judit.peto@kfk.kefo.hu

ABSTRACT

As part of environmental management programs, fruit planting and replanting has been receiving a stronger emphasis. Planning and designing grape and fruit plantations require farmers to use cost-effective technologies and reduce energy consumption. The purpose of this paper is to examine the distribution, area, type and number of plantations in the south-eastern part of Hungary over a period of seven years (2009-2015). The results obtained suggest that vineyards were the most predominant plantation types in the period under consideration, with the exception of 2012. Apricot, cherry and plum plantations were the most prevalent of all the fruit plantations included in the study. The most favourite types of grapes were green (white). In 2013, fruits claimed the highest share in the total structure of plantations examined. The average area of a planned fruit garden was about 33 % larger than that of a vineyard. The number and composition of new plantations in the south-eastern part of Hungary were in accordance with the public regulations.

Keywords: fruit, grape, plantation, environmental support, soil tests.

REZIME

Kao deo programa upravljanja zaštitom životne sredine, sadnja i obnavljanje voćnjaka dobijaju jači naglasak. Planiranje i projektovanje plantaže grožđa i voća zahtevaju od farmera da koriste ekonomične tehnologije uz smanjenje potrošnje energije. Cilj ovog rada je ispitivanje distribucije, površine, vrste i broja plantaža u jugoistočnom delu Mađarske u periodu od sedam godina (2009-2015). Dobijeni rezultati ukazuju na to da su vinogradi najzastupljeniji tipovi plantaža u posmatranom periodu, izuzev iz 2012. godine. Najviše su zastupljene plantaže cveća, višnje i šljive koje su bile uključene u sve studije. Najomiljenije vrste grožđa bile su zelene (bele). U 2013. godini voće je potvrdilo svoje najveće učešće u ukupnoj strukturi ispitivanih plantaža. Prosečna površina planiranog voćnog zasada bila je oko 33% veća od površina vinograda. Broj i sastav novih plantaža u jugoistočnom delu Mađarske su u skladu sa javnim propisima.

Cljučne reči: voće, grožđe, plantaža, podrška životnoj sredini, ispitivanje tla.

INTRODUCTION

Many technological innovations in vine and fruit production led to an increased production of fruits, grape and wine, although the demand stayed almost constant in the developed countries. Latest technologies are focused on the environment-friendly plant growing and efficient management of natural resources.

Proper site selection and soil properties, as well as good air and water drainage, are critical for quality fruit production. These considerations are essential to avoid infections and deficiencies. Therefore, soil samples are continuously analyzed in the Soil and Plant Testing Laboratory at the Faculty of Horticulture and Rural Development, Pallas Athena University. Taking soil test results into consideration is necessary for farmers to minimize environment loading. The results obtained serve as a base for soil protection plans, which are made by soil protection experts. Sandy soils, which are very frequent in our region, warm up rapidly so a crop is likely to mature few days earlier than that grown in clay soils. Nevertheless, sandy soils tend to be less fertile, featuring a lower water-holding capacity. Consequently, farmers often have to build irrigation systems in their plantations and use low water-consuming growing technologies. Fruit plantation soil should have a fairly high water-holding capacity (Várallyay, 2005, Ramos and Martínez-Casanovas, 2006). Fruit planting and replanting has been receiving a stronger emphasis since it was realized that some vineyards, owing to their location, would not be likely to yield

grapes of the required quality. Therefore, increased financial incentives for giving up vineyards, so-called grubbing-up schemes, were introduced in the late 1980s, reducing the surplus production of grapes in Europe. Vines are mostly endemic in our region, as sandy soils (typical of the Bács-Kiskun county) are vastly immune to the phylloxera virus (*Györffy Molnár et al., 2009*). Nevertheless, sandy soils tend to be less fertile and have a lower water-holding capacity (*Bogoni et al, 1995*). Leaf analysis is also essential in assessing the status of crops in plantations.

The purpose of this paper is to examine the distribution, area, type and number of plantations in the south-eastern part of Hungary over a period of seven years (2009-2015).

MATERIALS AND METHODS

The soil sampling in this research was performed by registered soil protection experts affiliated with the Soil and Plant Testing Laboratory of the Faculty of Horticulture and Rural Development in Kecskemét, Hungary. The planned establishment of grape and fruit tree plantations took place in the southern lowland region of the country, mainly in the Bács-Kiskun county. The soil samples were taken from selected plantations, i.e. soil segments and topsoils, at different depths from 2009 to 2015. The size, place and type of plantations were the parameters observed throughout the period under consideration.

The analytical sample testing was also performed in the Soil and Plant Testing Laboratory of the Faculty of Horticulture and

Rural Development (Pallas Athena University). The Laboratory uses standard methods encompassed by the accreditation certificate (NAT-1-1548/2011 and NAT-1-1548/ 2015). The soil CaCO₃ content was measured using the gas volumetric method, whereas the water-soluble salt content was measured using a conductometer and expressed in m/m%. The soil texture was followed according to the Arany number (K_A) relative to the SP level. (K_A 25-30 for sand, 31-37 for sandy loam, 38-42 for loam, 43-50 for loam clay, and 51-60 for clay).

Statistical analysis and demonstration of the data were performed by the Microsoft Office Excel program. Consequently, the means, standard deviations and Pearson's correlation coefficients were estimated.

RESULTS AND DISCUSSION

The number of soil samples arriving to our laboratory has been significant since the end of 2008. The Laboratory has active collaboration with several soil protection experts who collect samples abiding by the rules of sample collection.

In the period 2009-2015, the number of tested plantations was 789 in total. The number of plantations according to each year under observation is shown in Figure 1.

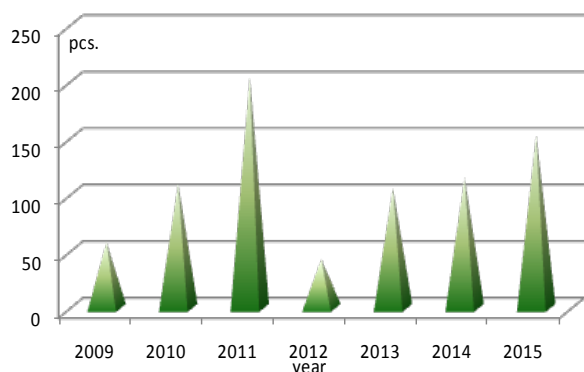


Fig.1. The number of tested plantations in our laboratory from 2009 to 2015

The most plantations in the period under consideration were tested in 2011 (204, i.e. 25 %), followed by 2015 and 2014 (153 (19.4 %) and 115 (14.6 %) respectively). The total area of new plantations is shown in Figure 2.

A significant correlation between the total size and the number of plantations was recorded ($r=0,836, p<0,025$).

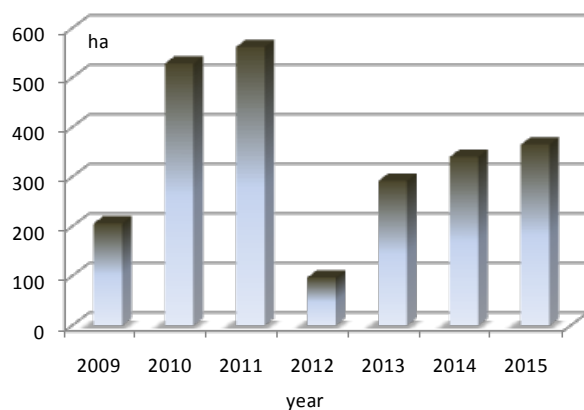


Fig. 2. The total area of new plantations in the period 2009-2015

The average size of plantations was also estimated every year in the period under consideration. The results obtained are illustrated in Table 1. The average size of land has showed a slightly decreasing trend since 2009. The average area was the smallest in 2012.

Table 1. The average area of plantations (ha) in the period under consideration

| Year | Average area of a plantation (ha) |
|------|-----------------------------------|
| 2009 | 3.55 |
| 2010 | 4.80 |
| 2011 | 2.75 |
| 2012 | 2.25 |
| 2013 | 2.75 |
| 2014 | 2.96 |
| 2015 | 2.39 |

The ratio of vineyards and fruit gardens in the total plantation structure is shown in Table 2. Admittedly, vineyards were much more predominant in the south-eastern part of Hungary compared to fruit plantations.

Table 2. The distribution of the plantations examined

| Type | Prevalence (%) |
|------------------|----------------|
| Vineyard | 80.4 |
| Fruit plantation | 19.6 |

The predominant plantations in our region in the period under consideration were vineyards, except in 2012. Moreover, the average size of a fruit orchard was about 33 % larger than that of a vineyard. Apricot, cherry and plum plantations were the most prevalent of all the fruit plantations included in the study. Buckthorn, currant, lavender and asparagus were also planted sporadically. The most favourite grape cultivars were green, especially 'Cserszegi fűszeres', 'Aletta', 'Arany sárfehér' and 'Zalagyöngye'.

The soil sampling was performed in eleven Hungarian counties, mainly in the Bács-Kiskun county (approximating to 90 %) and the Pest county (5 %).

The results of soil analysis confirmed that the soil texture was sandy with a low salt content and a moderate calcium carbonate concentration (Table 3).

Table 3. The distribution of the plantations examined

| | Mean | Standard deviation |
|----------------------------|-------|--------------------|
| K _A | 29.23 | 4.08 |
| Water-soluble salt (m/m %) | 0.023 | 0.011 |
| CaCO ₃ (m/m %) | 6.28 | 5.28 |

CONCLUSION

Latest plantation technologies are focused on the environment-friendly plant growing and efficient management of natural resources such as soil and water. Different methods and techniques are used in pruning, application of manure and fertilizers, and supplementary irrigation (especially drip irrigation), disease care and prevention, and harvesting. A wide variety of harvesting systems are utilized in plantations, ranging from manual to completely mechanized (Kanowski and Savill,

1992). Environment management programs support fruit planting and replanting under controlled conditions.

The soil samples in this study were taken in ten Hungarian counties, mainly the Bács-Kiskun county (about 90 %) and the Pest county (about 5 %). Our results suggest that the predominant plantations in the south-eastern region of Hungary in the period 2009-2015 were vineyards, except in 2012. Apricot, cherry and plum plantations were the most prevalent of all the fruit plantations included in the study. The most favourite grape cultivars were green, especially 'Cserszegi fűszeres', 'Aletta', 'Arany sárfehér' and 'Zalagyöngye'. The share of orchards in the plantation structure was the highest in 2013. The average area of the planned fruit garden was about 33 % larger than that of a vineyard. The number and composition of new plantations in our region were in accordance with the public regulations.

Physical and chemical properties of the soil are very important and should be determined before planting. Hungarian vineyards approximately account for 2.3 % of the EU vineyard areas. The results of soil analysis in this paper confirmed that the soil texture in the south-eastern region of Hungary was sandy with a low salt content and a moderate calcium carbonate concentration. These features are favourable for establishing planned plantations. Nevertheless, sandy soils tend to be less fertile and have a lower water-holding capacity, often requiring farmers to build irrigation systems in their plantations and use low water-consuming growing technologies.

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