

# Investigation of the cultivation value of old grapevine cultivars in Tokaj in 2004–2006

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**Summary:** Most of the cultivars grown before the disaster of phylloxera in Tokaj can be found only in grapevine collections. The aim of our study was to determinate the cultivation values of six old grapevine cultivars of the wine-region, namely 'Balafánt', 'Budai gohér', 'Purcsin', 'Török gohér', 'Piros (red) furmint' and 'Változó (altering) furmint'. Based on the results of the investigations from 2004 to 2006 it can be concluded that among from the examined cultivars of Tokaj 'Budai gohér', 'Purcsin' and 'Változó furmint' match the best with the technological and consumer requirements of recent days. However the yield of 'Budai gohér' in certain vintages is not acceptable and red wine cultivars are not permitted at this time in the wine-region, but in qualitative responses these presented steadily good data. On the other hand the lowest sugar content was measured and development of noble rot was not registered at all in case of 'Piros furmint' and 'Balafánt'. Their spread in Tokaj is not probable.

**Key words:** old grapevine cultivars, Tokaj, cultivation value

## Introduction

In Tokaj the assortment of grapevine cultivars based on 'Furmint', 'Hárslevelű' and 'Sárga muskotály' (synonym of 'Muscat lunel') has fixed after the disaster of phylloxera. In the 19th Century contemporary viticultural literature still referred to more than 100 names regarding this wine-region. According to *Balassa* (1991) several proper and less valuable cultivars disappeared at the turn of the century. Recently the assortment of cultivars, steadied during the vineyard-reconstruction after the disaster of phylloxera, has expanded a bit. Currently beyond the above-mentioned three 'Zéta', as recommended cultivar besides 'Gohér', 'Kövérzöld' and 'Tarcal 10', as permitted cultivars, can be planted in the Tokaj wine-region (*Harsányi-Mádi*, 2005).

Nowadays most old cultivars of Tokaj can be found only in grapevine collections.

'Balafánt' (belonging to the convar. *pontica*) is of unknown origin (*Németh*, 1970). According to certain opinions it originates from Tokaj (*Molnár*, 1897). Besides its Hungarian synonyms its Austrian, Italian and French names are also known. In Tokaj it was present already in the 18th Century, but it was completely supplanted after the disaster of phylloxera (*Németh*, 1970).

The cultivar can be easily identified from the parted, round leaves and the main veins bordering the petiolar sinus (*Németh*, 1970). Dent can be often found in the lateral sinus (*Csepregi & Zilai*, 1955). It has shouldered, compact, medium-sized clusters. Its greenish, yellowish white berries are strongly bloomy (*Hegedűs et al.*, 1966).

It is long-seasoned, it ripens late. It has medium-strong vines. It yields steadily much, but its ripening sugar content is

extremely low (*Hegedűs et al.*, 1966). Because of its susceptibility to rotting 'Balafánt' requires breezy sites, though it is not demanding on soil. It is equally susceptible to frost, drought and fungal diseases, but not to noble rot (*Németh*, 1970).

According to former introductions 'Balafánt' produces valuable, racy, fiery wines, though later descriptions don't consider it as a qualitative cultivar (*Csepregi & Zilai*, 1955). Its wine is characterless, harsh-flavoured with remarkably rough acidity (*Németh*, 1970).

The detailed description of 'Budai gohér', as an individual cultivar, can not be found in the accessible ampelographies. *Balassa* (1991) claims, that the attribute „budai” indicated cultivars with high must yield but lower quality in Tokaj. *Németh* (1970) refers it as the synonym of 'Juhfark', 'Fehér gohér' and 'Demjén'. In author's Ampelography the above-mentioned 'Demjén' can be found among collected cultivars, according to its short description it is equal with the 'Budai gohér' investigated by us. According to *Balassa* (1991) 'Demjén's' name occurs in writing first in 1632, though author also declares, it couldn't be a very widespread cultivar, because after the disaster of phylloxera it could not be found anymore. In the Ampelography by *Németh* (1970) 'Demjén' also appears amongst the synonyms of 'Fehér gohér' and 'Királyszőlő'. The origin of the name probably can be attached to the patron saint of pharmacists and the supposed medicative effect of the cultivar (*Lőrincz et al.*, 2004).

Among from the morphological characteristics of the cultivar the shape, the size and the colour of berry should be emphasized. With its larger, ellipsoidal berries, which are greenish even at maturity, 'Budai gohér' can be easily separated from Gohér *conculata*, such as 'Török gohér'.



In the 18th Century there was still significant qualitative red wine making in Tokaj (Balassa, 1991). It is well demonstrated by the contemporary lists with numerous names regarding cultivars with „blue” berries. 'Purcsin' is an excellent representative of this sorts of cultivars. Probably it is of French origin, its name is referred in Tokaj first in 1726 (Balassa, 1991). According to Csepregi & Zilai (1955) it is an old Hungarian cultivar. Conforming to certain sources the first aszú-wine, which was gifted by Lackó Máté Szepsy to Zsuzsanna Lórántffy in 1608, was made of this cultivar (Németh, 1970). According to Rácz (1997) it is already mentioned as „precious species of Tokaj” in 1655, which is inconsistent with the opinion of Németh (1970) that it arrived at Hungary at the time of the French revolution. Since Italian synonyms of the cultivar are 'Tokaj Barleana' and 'Tokaj di Barlessano', it has presumably got from Tokaj to Italy. Earlier it was widespread also in the Érmelléke and in the Mátraalja, though by now it has already supplanted.

According to the natural system it is classed to convar. occidentalis.

Its leaves are varied-shaped and lobed-cloven. Stem of the main veins are red, the lower side of the blade is velvety and cobwebby. Autumn colouring of leaves is red-spotted yellow. Its clusters are medium-sized, shouldered and very compact, with weakly bloomy berries (Németh, 1970). According to Csepregi & Zilai (1955) 'Purcsin' has high colour intensity.

It is medium-seasoned, it ripens late. It is vigorous, well-setting, medium-productive. It is not demanding on soil, unpretentious, weather-hardened. It is relatively resistant to frost, it also tolerates drought. 'Purcsin' resists rotting, but it is susceptible to peronospora and downy mildew. It is demanding on phytotechnical practices, but it is less sensitive to load (Németh, 1970).

Formerly aszú-wines used to be made of 'Purcsin' in good vintages (Csepregi & Zilai, 1955). Németh (1970) claims it has rather tannic, harmonic, ruby red, fine table wine.

'Török gohér' is a synonym of the white-berried member of the Gohér conculta (group of cultivars). Probably it is of Hungarian origin, according to the natural system it belongs to convar. pontica subconvar. balcanica provar. mesocarpa subprovar. hungarica (Németh, 1970). Two subcultivars of 'Török gohér' is known: Sárga (yellow) and Zöld (green) gohér (Hajdu, 2003). High number of its synonyms refers that it may be one of our oldest-grown cultivars (Hegedűs et al., 1966). It is consumed as both wine grape and fresh grape (Molnár, 1897), it also occurs in the book about table grapes by Kozma (1961). It used to have significant role primarily in the wine-regions of Tokaj, Pécs and the Balaton Highland. Because of its female flowers it needs allogamy, consequently spread of pure plantations, respectively the low yield derived from it, caused its supplanting (Lőrincz et al., 2004). Currently it can be planted for experimental growing in Tokaj again (Harsányi & Mádi, 2005).

According to Csepregi & Zilai (1955) the leaves are most similar to 'Furmint', though the ones of 'Török gohér' are larger, and their lower sides are strongly downy. Texture of

the blade is thick, leathery; leaves are dark green. Petiole and shoot are both green. It has very loose clusters (because of its setting problems) with oval, weakly bloomy, dotted berries (Németh, 1970).

It demands short growing season, it ripens early. It is medium-vigorous, the yield is irregular and very low. It is susceptible to noble rot, mostly gives quality wines. Its pure plantation needs supplemental pollination (Hegedűs et al., 1966). 'Török gohér' requires few phytotechnical practices, and it is less sensitive to load. Its frost resistance is of low-degree, it tolerates drought. It is susceptible to rotting, peronospora and has a moderate-resistance to downy mildew. Vasp, turdus, badger and even fox damage it considerably (Németh, 1970).

It is susceptible to shrivelling and noble-rotting, in prosperous vintages it is suitable for making wine-specialities (Bényei & Lőrincz, 2005).

*Furmint conculta* contains three cultivars: 'Fehér (white)', 'Piros (red)' and 'Változó (altering) furmint'. Currently only the white-berried member of the group can be found in pure plantations. The other two cultivars occur in a couple of wine regions and grapevine collections (Németh, 1967).

There are different ideas about the origin of the conculta: Molnár (1897) claims Hungarian origin; Kozma (1953) and Csepregi & Zilai (1960) write about possible Italian ancestors; while Németh (1967) and Balassa (1991) mentions it may be a native of Transylvania. It is a cultivar of superior quality (Prohászka, 1954).

Since investigation is about special local cultivars, their description can be hardly found in foreign references. Viala & Vermorel (1905) and Constantinescu (1958) present 'Furmint'. Recently its name also occurs in studies about synonyms and homonyms beside ones checking parent-offspring connections (Vouillamoz et al., 2004).

Members of the group of cultivar can be easily distinguished based on four main morphological characteristics.

Main veins of 'Fehér furmint' are green, colour of the berry is not changing, white; autumn colouring of leaves is yellow. 9 subcultivars of 'Fehér furmint' are known (Németh, 1967). Its plantable clones are the following: Kt. 4, P. 51, T. 85 and T. 92. The clones signed P. 14, P. 26 and P.27 are tradable with distinctive markings (Harsányi & Mádi, 2005).

'Piros furmint' has green main veins; the colour of the berry is not changing, red; autumn colouring of leaves is red-spotted yellow. Two subcultivars of 'Piros furmint' are known (Németh, 1967). There are not selected clones of the cultivar yet.

Main veins of 'Változó furmint' are red; colour of the berry is changing (from green through red to white) and white at maturity; autumn colouring of leaves is yellow. Two subcultivars of 'Változó furmint' are known (Németh, 1967). There are not selected clones of the cultivar yet.

## Materials and methods

The investigation was carried out from 2004 to 2006 in the vineyard of Tokaj – Oremus Kft. in Mandolás-dűlő (plot of land), west from the village Tolcsva, Hungary. The



investigated plot can be found at 210 meters above sea level on south-southwestern steep gradients, in the middle of hillside (*Dálnoki Kovács*, 2004). The investigated vines were planted in 1997 in slope way north-south row direction. Examined cultivars were on the rootstock Teleki 5 C (*Vitis berlandieri* x *Vitis riparia*). The vines were spaced 0.8 m (between vines) x 2.2 m (between rows) and trained to royat cordon.

In advance it is necessary to state that the examined vines had the same treatments (for example identical load, cluster thinning) as the surrounding operating plantation. The identical cultivation technology partly makes the comparing easier, on the other hand it results that certain cultivars cannot produce in their optimum conditions.

Based on the measurements of the Research Station of FVM Research Institute for Viticulture and Oenology in Tarcsló the main meteorological data of the years of investigation are the following: in 2004 mean annual temperature was 11.0 °C, and yearly total rainfall was 579.4 mm. In 2005 mean annual temperature was 10.6 °C, and yearly total rainfall was 710.0 mm. In 2006 mean annual temperature was 11.3 °C, and yearly total rainfall was 330.1 mm. In comparison with the centenarian mean 2004 and 2005 were moist, while 2006 was arid. Observing the autumn weather of the years of investigation, it has been found that Octobers of all three years were more arid and warmer than the centenarian mean.

In our study – because of dimensional reasons – only the more significant ones among from the characteristics determining the cultivation value are considered.

The dates of phenological stages were registered, and the changes of shoot-length were observed until the first topping.

The weight of berries, the sugar content, titrable acidity and pH of the juice were measured weekly during the ripening period, having used the general methods of viticultural examinations, such as titration, determination of reductive sugar content etc.

The same methods amplified with the registration of certain morphological characteristics prescribed by the O.I.V. were used in case of harvests, in addition we also measured some quantitative data (number of clusters per vines, mean weight of clusters, mean weight of berries and distribution of berries regarding their size), ratio of rotten and noble-rotted berries were also recorded.

## Results and Discussion

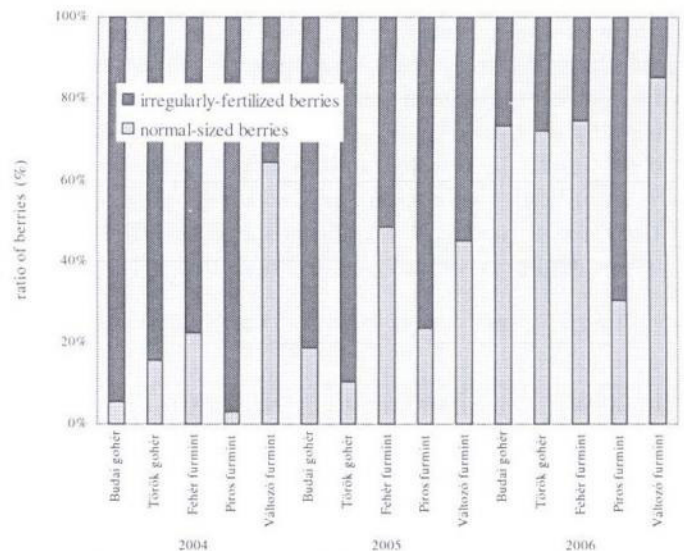
Based on the investigations in Tolcsva it has been found that the vigour of 'Balafánt' was the weakest among the examined cultivars. Its productivity was satisfying even in case of short pruning. Summarizing three years the mean weight of clusters was higher than 200 g, it has no setting problems. On the contrary to the references sugar content of its juice was greater than 20 Brix° in every year, and the titrable acidity was about 8-9 g/l (*Table 1*). According to our observations harsh flavour mentioned about its wine by Németh (1970) could be already felt in berries. In 2006,

'Balafánt' was damaged by mites, in addition bunch stem necrosis was recorded in case of most clusters. However the greatest problem is its susceptibility to rotting (ratio of rotten berries reached 95% in 2004 and it was higher than 30% even in 2005). Development of noble rot wasn't recorded at all in any years. It should be emphasized that its juicy berries were very sensitive to browning.

**Table 1** The main qualitative data of vintage of 'Balafánt' (Tolcsva, 2004–2006)

vintage	date of harvest	sugar content (Brix °)	titrable acidity (g/l)
2004	11.03.	26.3	9.0
2005	10.25.	22.1	8.2
2006	10.18.	20.6	8.2

Regarding its late bud-burst, early ripening and female flowers 'Budai gohér' corresponds to 'Török gohér'. Besides the small size of clusters caused by the berry-set problems in 2004 (ratio of berries originated from normal double fertilization was 6%) and in 2005 (ratio of normal-sized berries was 19%) it also raised a problem that several vines produced no bunches at all (*Figure 1*). However, in 2006, it had no setting problems, ratio of irregularly-fertilized berries was only about 25%. Density of its juice was higher than 23 Brix° in every year, and its titrable acidity was about 7–8 g/l (*Table 2*). In 2006 'Budai gohér' was significantly damaged by wasps, ratio of bunch stem necrosis was lower than that in case of 'Török gohér'. In 2004, 37% of its berries noble-rotted, in the other two years only rotting was registered (18–17%).



**Figure 1.** Distribution of different-sized berries (Tolcsva, 2004–2006)

**Table 2.** The main qualitative data of vintage of 'Budai gohér' (Tolcsva, 2004–2006)

vintage	date of harvest	sugar content (Brix °)	titrable acidity (g/l)
2004	10.22.	25.1	7.0
2005	10.25.	23.0	8.1
2006	10.18.	25.1	7.1



Based on the investigations in Tolcsva it has been found that the vigour of 'Purcsin' was one of the strongest among the examined cultivars, moreover in 2006 it even surpassed the Furmint conculata. It has no setting problems, in 2004–2006 mean weight of clusters was about 150 g. In 2004 it presented the lowest sugar content, however density was higher than 23 Brix ° even then (Table 3). Data of the other two vintages were approximately equal. In 2006 significant bunch stem necrosis was recorded. Ratio of Botrytis infection was lower than 10% in every year. Rotting (ratio of damaged berries was registered 50%) in 2004 was caused by the rain fallen the week before harvest. Vintage of 2005 was available to make racy red wine with high colour intensity.

Table 3 The main qualitative data of vintage of 'Purcsin' (Tolcsva, 2004–2006)

vintage	date of harvest	sugar content (Brix °)	titrable acidity (g/l)
2004	11.03.	23.5	8.9
2005	10.25.	25.9	7.3
2006	10.18.	25.1	7.1

'Török gohér', which was medium-vigorous, had late budburst. It has female flowers, similarly to 'Budai gohér' it also had berry-set problems in 2004–2005 (Figure 1). In 2004, parthenocarpic berries (67%), while in 2005, stenopericarpic berries (58%) meant majority. Its yield was acceptable only in 2006, this year the ratio of berries originated from normal double fertilization was measured 72%. Regarding the quality of juice vintage of 2005 differed from the other two years (Table 4), namely 'Török gohér' presented lower sugar content and higher titrable acidity. In 2006, high ratios of bunch stem necrosis were registered, while damage of vases, which is often mentioned in references, was not recorded at all, only in case of 'Budai gohér'. In 2004 development of noble rot could be detected at 40% of the berries, moreover 16% of the berries were rotted. In the other two years majority of the yield remained sound (ratio of sound berries: 88% and 77%). Normal-sized berries were neutral-tasted and very juicy.

Table 4 The main qualitative data of vintage of 'Török gohér' (Tolcsva, 2004–2006)

vintage	date of harvest	sugar content (Brix °)	titrable acidity (g/l)
2004	10.22.	23.0	7.1
2005	10.25.	20.6	9.7
2006	10.18.	23.2	6.9

Based on the investigations in Tolcsva it can be claimed that members of the Furmint conculata had more morphological differences beyond the characteristics stressed by Németh (1967). 'Változó furmint' (similarly to 'Fehér furmint') had a bit stronger vigour than the red-berried cultivar. 'Piros furmint' had the most significant setting problems (Figure 1), in 2004 ratio of irregularly-fertilized berries reached 95%, even in the other two years it was about 70%. The mean size of bunch of 'Piros furmint' was smaller than the other two cultivars'. 'Vál-

tozó furmint' had the largest clusters in every year. Sugar content of the altering-berried cultivar was the highest in every vintage, its titrable acidity was measured steadily high (Tables 5 and 6). In the comparison of the examined cultivars the 'Piros furmint's' juice presented the lowest sugar content, however the deviation between the vintages was the lowest. In case of every member of the conculata bunch stem necrosis was recorded in 2006. 'Piros furmint' was not infected by Botrytis at all, though in 2004 rotting started by the time of harvest. 'Változó furmint' rather rotted in 2004 (66%) and in 2006 (40%). Moderated development of noble rot was also detected. On the other hand 39% of its berries were infected by Botrytis in 2005.

We can conclude, that regarding both quantity and quality of the fruit 'Piros furmint' was the weakest compared to the other

Table 5 The main qualitative data of vintage of 'Piros furmint' (Tolcsva, 2004–2006)

vintage	date of harvest	sugar content (Brix °)	titrable acidity (g/l)
2004	11.03.	19.7	8.1
2005	10.25.	19.7	7.5
2006	10.18.	19.7	8.3

Table 6 The main qualitative data of vintage of 'Változó furmint' (Tolcsva, 2004–2006)

vintage	date of harvest	sugar content (Brix °)	titrable acidity (g/l)
2004	11.03.	23.8	9.6
2005	10.25.	22.5	9.5
2006	10.18.	24.2	9.7

two cultivars of the conculata. It is susceptible to neither rotting nor noble rot. 'Változó furmint' is similar to 'Fehér furmint' in both quantitative and qualitative responses. Susceptibility of 'Változó furmint' for rotting (and in some years even the development of noble rot) surpassed the other Furmint.

Based on the results of the investigations it can be concluded that among from the examined cultivars of Tokaj 'Budai gohér', 'Purcsin' and 'Változó furmint' match the best with the technological and consumer requirements of recent days. However the yield of 'Budai gohér' in certain vintages is not acceptable and red wine cultivars are not permitted at the moment, but in qualitative responses these presented steadily good data. On the other hand the lowest sugar content was measured and development of noble rot was not registered at all in case of 'Piros furmint' and 'Balafánt'. Their spread in Tokaj is not probable.

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