CONSIDERATIONS ON THE STRUCTURAL RELIEF IN COTNARI VINEYARD AREA

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Abstract: In this paper we will try firstly to emphasize the differences of elevation existing in the territory of Cotnari Vineyard, the differences being well outlined on the hypsometric map realised in this respect, and secondly to describe the forms of the structural relief in this region (the structural plateaus, the coasts, the structural valleys). A series of suggestive images accompany these descriptions.

Keywords: *hypsometric, structural plateaus, coasts, structural valleys*

Introduction

The altitude plays an important role in the distribution of the vineyards in this wine growing area, as the most favourable altitude from the viticultural view point is between 110 m (on the southwest slope of Baban Hill, then near the confluence of the Sărat Brook with Măgura Brook) and 305 m (in La Nuci area, from Osoi-Stroeşti Hill).

From the economic exploitation point of view, the coasts and the structural plateaus are used differentially in viticultural purpose. In general, the coast area shelters the most of the vineyards from this area (Vlădeni-Rădeni, Deleni-Hârlău, Zagavia-Scobinți, Buhalnița-Cotnari, Măgurii-Băiceni, Cucuteni-Costeşti sectors). Instead, the viticulture is practiced especially in the central part (Lupăria-Horodiştea sectors) and in the south part (Stroeşti-Cucuteni Giurgeşti-Costeşti and Săcăreşti-Dădeşti sectors) within the structural plateaus.

The hypsometric characteristics of Cotnari Vineyard region

For emphasizing the altitudinal differences existing in this area, we tried to group the hypsometric values in 15 classes: from 450 to 426.3 m; from 426.3 to 402.6 m; from 402.6 to 379 m; from 379 to 355, 3 m; from 355.3 to 331.6 m; from 331.6 to 308 m; from 308 to 284.3 m; from 284.3 to 260.6 m; from 260.6 to 237 m; from 237 to 213.3 m; from 213.3 to 189, 6 m; from 189.6 to 166 m; from 166 to 142.3 m; from 142.3 to 118.6 m; from 118.6 to 95 m (Fig. 1).

After we analyze the hypsometric map we can observe an unequal distribution of the altitudes in the longitudinal plane, in the sense that they decrease from west to east, starting with the the western marginal Plateau and until the depression corridor. To east of this depression corridor, the altitudes increase again within the eastern marginal Hills. As a result of the resistance to the erosion of the sandstone-limestone deposits, the western part, proper to the plateau, is justifying its height.

The intervals range from 450 to 426.3 m, from 426.3 to 402.6 m and from 402.6 to 379 m correspond to the high hilly slopes from the western marginal Plateau (Frunzarului-Storeşti Hill, Holm-Vlădeni Hill, Muchia Holmului-Boscoteni Hill, Belea

Hill, Deleni Hill, Stroeşti Hill, Laiu Hill) and from the upper segment of the transition Coast (Cătălina Hill).

The classes of values between 379 and 355.3 m, between 355.3 and 331.6 m, between 331.6 and 308 m are specific to the lower parts of the high hills from the West Marginal Plateau (Frunzarul Hill-Flămânzi, Frunzarul Hill-Storeşti, Holm Hill-Vlădeni, Muchia Holmului Hill-Boscoteni, Belea Hill, Deleni Hill, Florean Hill-Maxut, Velnița Lăgăria Hill, Basaraba Hill, Stînca Hill, Stroeşti Hill, Laiu Hill, Tinosu Hill, Viteazu Hill, Băiceni Hill, Cucuteni Hill, Ulmişului Hill) and to the high hills from the upper segment of the transition Coast (Liteanca Hill, Cătălina Hill).

The scales of values between 308 and 284.3 m, between 284.3 and 260.6 m, between 260.6 and 237 m are characteristic to the lower parts of the high hills from the upper segment of the transition Coast (Liteanca Hill, Cătălina Hill) and to the hills with medium altitudes from the middle segment of the transition Coast (Flămânzi-Şendreni-Vlădeni-Rădeni-Boscoteni-Slobozia-Deleni hilly alignment, Zagavia Hill, Velnița Lăgăria Hill, Dealul lui Vodă Hill, Plaiul Nou Hill, Țiglaiele lui Baltă Hill, Mândrului Hill, Naslău Hill, Osoi Hill, Lupului Hill, Halmu Hill, Băiceni Hill, Cucuteni Hill).

The groups of values that are placed between 237 and 213.3 m, between 213.3 and 189.6 m, between 189.6 and 166 m cover the lower parts of the hills with medium altitudes from the middle segment of the transition Coast (Stahnei Hill, Ponoarelor Hill, Flămânzi-Şendreni-Vlădeni-Rădeni-Boscoteni-Slobozia-Deleni hilly alignment, Zagavia Hill, Velnița Lăgăria Hill, Dealul lui Vodă Hill, Camnița Hill, Bisericii Hill, Plaiul Nou Hill, Țiglaiele lui Baltă Hill, Baban Hill, Mândrului Hill, Drăgănița Hill, Naslău Hill, Axinte Hill, Juleştii Mari Hill, Măgura Coast Hill, Osoi Hill, Lupului Hill, Tomar Hill, Halmu Hill, Băiceni Hill, Cucuteni Hill, Movila Jora Hill).

The hypsometric values located between 166 and 142.3 m, between 142.3 and 118.6 m, between 118.6 and 95 m are found in the hills from the lower segment of the transition Coast (Baban Hill, Luncii Hill, Furcilor Hill, Juleştii Mici Hill, Țărna Hill).

The forms of the structural relief in Cotnari Vineyard area

As the forms of the structural relief, generated by the general inclination of the layers on the NW-SE, in Cotnari vineyard territory we meet the structural plateaus, the coasts and the structural (consequent, subconsequent, reconsequent and obsequent) valleys.

The structural plateaus from this area are part of an extensive structural plateau, respectively of Dealul Mare Plateau. This structural plateau was deeply fragmented cross-regressive by some rivers as Foculeni Valley, Varnița, Boscoteni, Cerbătoarea, Bahlui (the Upper course) and its tributaries on the right (Cârjoaia/Măgura, Buhalnița), Pârâul Rece/Băiceni, Cucuteni. As a result of this fragmentation, three segments were contoured, called by V. Tufescu: *Broscăria-Laiu Platform* - between Ruginoasa Saddle and Cârjoaia Valley, *Sticlăria-Sângeap Platform* - between Cârjoaia Valley and the Upper Bahlui and *Dealul Mare-Holm Platform* in the North (*V.D. Cotea - coord., N. Barbu, 2006*).

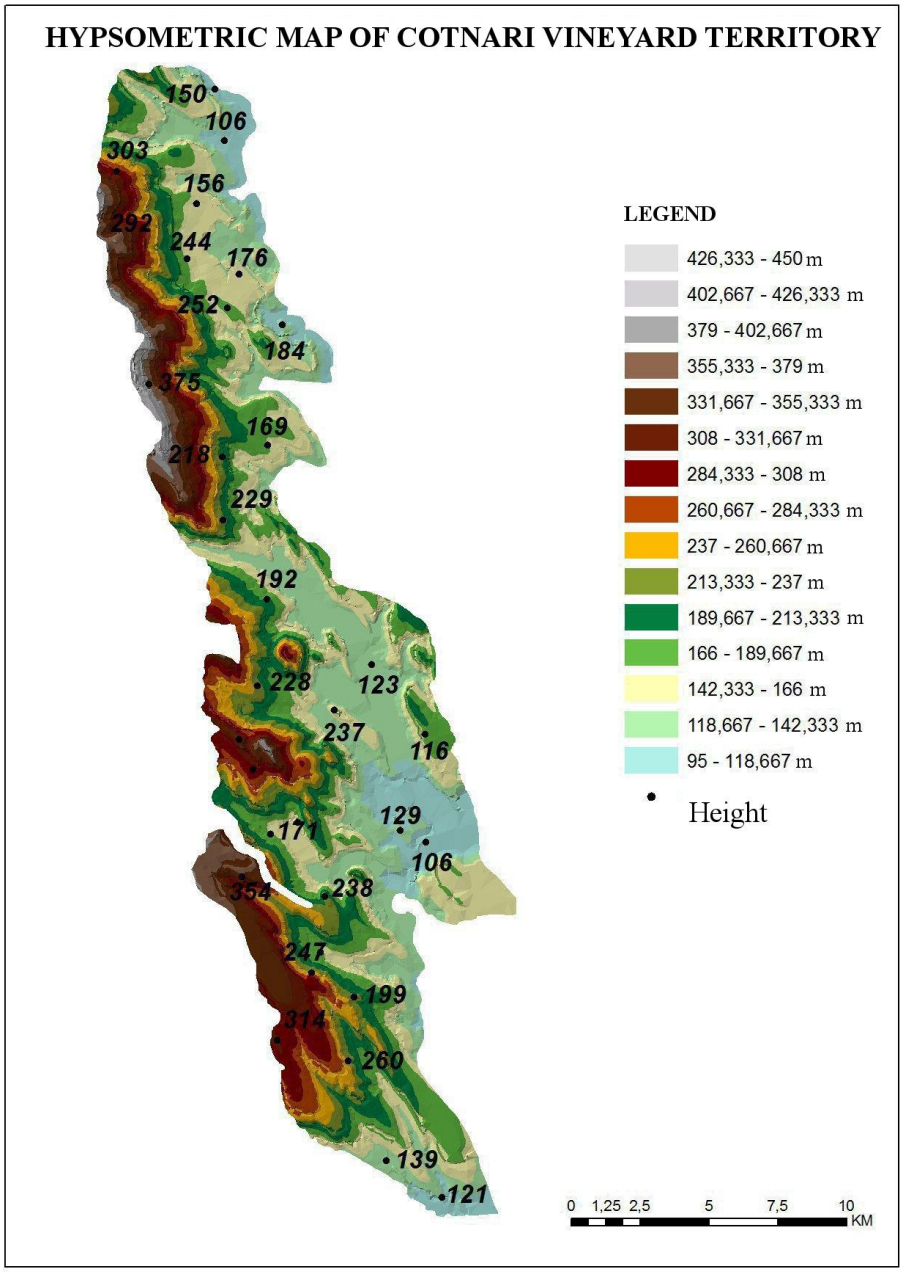

Figure 1 Hypsometric map of Cotnari Vineyard territory

The structural plateaus from Cotnari vineyard area, whose genesis was determined by the monoclinal structure and by the presence of the hard limestone-sandstone rocks (such as oolitic limestone of Hărmăneşti and oolitic limestone of Hârlău or oolitic sandstone of Criveşti), are generally fragmented by the shallow valleys (Valea Racului, Lupăria, Horodiştea). On the small areas, where the hard limestone-sandstone plate was

broken by the erosion, the valleys were widened more, getting a stepped longitudinal profile (Pârâul Rece-Băiceni and its tributaries from Băiceni Hill). Some plateaus have sharp edges under the form of cornice (Cătălina, Băiceni, Stroeşti). On the edge of the slopes, the groundwater layer that deteremine the landslides can be observed (*C. Martiniuc, V. Băcăuanu, 1962*). With higher altitudes and colder climate than the coast areas, these plateaus are not a favourable environment for the development of vineyards, excepting Cucuteni, Băiceni, Stroeşti and Liteanca (*V.D. Cotea - coord., N. Barbu, 2006*). Among the structural plateaus of the studied area we can mention (Fig. 2 - 6): Spinişul (311 m), Viteazu (340 m), Tinosu (342 m), Cucuteni (310 m), Laiu (383 m), Băiceni (353 m), Stroeşti (420 m), Piciorul Racului (306 m), Pietrosul (297 m), Cătălina (394 m) Liteanca (342 m), Sângeap (408 m), Basaraba (419 m), Pietrăriei (372 m), Deleni (461 m), Belea (481 m).

Figure 2 Băiceni Structural Plateau

Figure 3 Cucuteni Structural Plateau

Figure 4 Pietrosul Structural Plateau

Figure 5 Cătălina Structural Plateau

Figure 6 Laiu Structural Plateau

The coasts, alongside the structural plateaus, represent the keynote of this type of relief in this area, and partially used as a substrate for vine growing. Well individualized in Cotnari vineyard territory, *Dealul Mare-Hârlău Coast*, a section of *Dealul Mare-Hăpăi Coast* is a part from *Moldavian Coast*, alongside *Iaşi Coast* and *Ibăneşti Coast*, (by *I. Sârcu, 1956*). *Cotnari Coast* (by *C. Martiniuc, V. Băcăuanu, 1962*), unfolded on Târgu-Frumos-Cucuteni-Cotnari-Hârlău-Flămânzi alignment, is not a typical coast because it has not a contrary to the monoclin inclination, but is actually a steep coast (by *V. Băcăuanu, 1980*), because of its erosive-regressive origin. It is perpendicularly fragmented by several subsequent valleys (Bahlui between Zagavia and Hârlău, Zagavia, Scobinți, Buhalnița, Zlodica, Ungurilor, Graurul, Cârjoaia-Măgura, Cucuteni, Băiceni) that create a system of typical structural coasts: Bahlui Coast (between Zagavia and Hârlău), Buhalnița Coast, Ungurilor Coast, Graur Coast, Sărata Coast, Cârjoaia Coast (Fig. 11), Măgura Coast, Băiceni Coast, Cucuteni Coast (Fig. 8). Referring to the classification made by *I. Ioniță (2000*), the coasts from this area can be grouped in two types, in accordance with the general exhibition of the forehead coasts:

- ***Ist order Structural Asymmetry*** - includes structural valleys characterized by the northern exhibition forehead coasts. In this type of structural asymmetry can be distinguished:
  • *typical subsequent valleys* with a West-East direction: Măgura in Măgura Coast Hill (Fig. 10) and in Hodora Hill, Buhalnița in Cătălina Hill and in Liteanca Hill, Bahlui in Zagavia Hill, Zlodica in Țiglaiele lui Baltă Hill, Tomar (an effluent on the right side of Băiceni brook) in Tomar Hill.
  • *diagonal subsequent vall*eys that intersect geological strata in an acute angle: Bahlui River in Bisericii Hill, Buhalnița in Baban Hill, the upper and the middle Graur, Sărata - the upper and the lower, Cârjoaia in the village Cârjoaia, Băiceni in Tinosu Hill.
- ***IInd order Structural Asymmetry*** - includes the valleys with a North-South general direction of the drainage, whose foreheads coasts have a Western exhibition. In this type of asymmetry enters reconsequent valleys: Cucuteni in Halmu Hill (Fig. 7), Ungurilor in Țiglaiele lui Baltă Hill (Fig. 9), Cimpoierului Valley in Vlădeni Hill.

Dealul Mare-Hârlău Coast was divided into three segments in cross section (upper, middle and lower), based on their litho-geomorphological features that impose a different

behaviour to viticulture factor (*V.D. Cotea - coord., N. Barbu, 2006*). *The upper segment of the Coast*, with altitudes above 250-300 m, is represented by a sandstone-limestone steep portion (the cornice), and by a sandy gently slope (15-25 °). Due to the intense gravitational processes (earth falls, landslides), this segment cannot be turned to account only by the terracing works; these works were already accomplished in Cătălina Hill, Liteanca Hill, Stroeşti Hill, Băiceni Hill, Cucuteni Hill. Instead, the sandstone-limestone fragments from the upper coast supply the other two segments in the proximity, contributing in this way to the enrichment of their pedological cover. *The middle segment of the Coast*, with the altitudes between 150-300 m, mainly marly-sandy-clay one, is characterized by the moderate slopes (5-15 °), affected by the extensive landslides. The mixture of sandstone-limestone materials, from the top of the coast with the local marly-clayey-sandy ones, makes this segment to represent the most favoured vine growing area from the point of view of the litho-pedological conditions where the most of the vineyards are placed. *The lower end of the Coast*, with altitudes 130-150 m, has gently sloping (less than 3-4 °), which allowed the formation of the colluvial or proluvial-coluvial glacis on the base of the materials from the upper coast. The climatic risks, often produced in this segment of the coast, have made it cannot be turned to account from the viticol point of view of as good as the middle segment, although the litho-pedological conditions permit it (*V.D. Cotea - coord., N. Barbu, 2006*).

Figure 7 The forehead coast with West exhibition in Cucuteni Valley (Halmu Hill)

Figure 8 Cucuteni Coast in Dădeşti Hill

The only sector of ***consequent valley*** from Cotnari Vineyard area is Bahlui Valley between Bădeni and Cotnari (Fig. 12.).

The subsequent valleys, oriented to the West-East, are dominant in this vineyard: Bahlui (between Pârcovaci and Bădeni), Zagavia, Buhalnița, Zlodica, Sărata - the upper and the lower course, Graurul - the upper and the middle course, Cârjoaia-Măgura, Băiceni - the middle course, Tomar – an effluent on the right side of Băiceni brook, Cucuteni – the lower course.

The reconsequent valleys are represented in this area by the next valleys: Lupăria, Horodiştea, Mitoc, Ungurilor, Cucuteni – the middle course.

The tributary valleys of Măgura that cross the forehead coast with North exhibition of Măgura Hill and Hodora Hill can be considered ***the obsequent valleys***.

Figure 9 The North exhibition coast front on UngurilorValley (Țiglaiele lui Baltă Hill)

Figure 10 West exhibition coast front (Măgura Hill)

Figure 11 Cârjoaia Coast

Figure 12 A sector of consecquent valley -Bahlui Valley in Cotnari (near railway station)

Conclusions

In this area some important altitudinal differences (between 450 m to 95 m) exist, that is why we tried to group the hypsometric values in 15 classes and to identify the subunits corresponding to them.

In Cotnari vineyard territory we meet as forms of the structural relief *the structural plateaus* (fragmented by the shallow valleys and covered by the hard limestone-sandstone rocks), *the coasts* (represented by the structural valleys with a northern exhibition forehead coasts and by the valleys with a Western exhibition foreheads coasts) and *the structural valleys* (consequent valleys, represented only by Bahlui Valley between Bădeni and Cotnari; subconsequent - dominant in this area; reconsequent - Lupăria, Horodiştea, Mitoc, Ungurilor, Cucuteni – the middle course; obsequent - the tributary valleys of Măgura that cross Măgura Hill and Hodora Hill).

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