The effect of selection cutting to the soil in Pilis-hills

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Abstract: In our fieldworks we measured the habitat preconditions and effects to soil. We opened 10 soil profiles in the territory, in which we described the soil factors and collected soil samples. We measured organic matter accumulation in the upper layer of soil in two gaps and the in the surrounding material. The great part of the examined soil profiles are classified to rendzina and lessivated brown forest soil types. Even within small distance it is possible to find significant differences in the thickness of humus layer and water- and nutriment supplied ability. In accordance with climatic conditions the soil site difference appears not in wood composition, but firstly in growth. The dimension of gaps determine the vegetation and the processes in the soil. In extreme large gaps the covering of *Rubus fruticosus* increases and the growth appearing is problematical.

Keywords: selection cutting /soil / humus / *Fagus sylvatica* / forest site / soil moisture content

1. INTRODUCTION

In the last decades the natural forest management have been spreading. The selection cutting is the most symptomatic method of sylviculture, which ensure the continuous forest cover (REININGER 2010). In more part of the Pilisi Parkerdő Zrt. has been launched the selection forest management method. The Pilisi Örökerdő is situated in Pilis-hills, where the first selection cutting started back in 1998. The operate level of selection cutting has been applied in 2002 (CSÉPÁNYI 2007). Today about 2000 ha territory is managed by selection cutting in Pilis-hills. In this area a long term fieldwork experiment is going on, where the aim is to analyse the economics of management (ESZTÓ 2011) and present practical forestry methods, which are acceptable in the aspect of sylviculture, nature conservation and public welfare. Although the selection cutting method has become popular in Hungarian sylviculture (GÁLHIDY 2008, LETT et al., 2009, KAPÓCS-HORVÁTH 2011), the habitat preconditions and effects to soil have not been examined so far. In the course of fieldwork we examined in above-mentioned effects.

1.1 Study area

The territory belongs to Pilis-Budai-hills forestry region (HALÁSZ 2006). The land is low mountain of medium height, which is vertically strong orography. The peak of Pilis (757 m) is the highest part of Dunántúli-hills (DANSZKY 1963). The soil profiles are situated in 605-686 m above sea level. The dolomit (in therms of soil formation) has unfavourable characteristics,

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because primary decaying physically, and has very little silicate minerals, from which soil can form. The climate of the area is moderate cold and moderate warm, as well as moderate humid and moderate dry. The annual temperature mean is 9.9 °C, and in vegetation season is 16.5°C. The annual precipitation sum is less than 540 mm, and in vegetation season mean is 328 mm.

2. MATERALS AND METHODS

We opened 10 soil profiles in the territory, in which we described the soil factors and collected soil samples (STEFANOVITS 1992). On the basis of field description and laboratory analysis we determined the type of soil profile (BELLÉR 1997, SZODFRIDT 1993). We measured organic matter accumulation in the upper layer of soil in two gaps and the in the surrounding material. We designated two lines per gaps (E – W and N – S directions). Set out from middle point of gaps we pointed collecting points per 2 meters (*Figure 1 and 2*). In individual points we measured the weight of litter in a 30x30 cm quadrant. We were taken 3-3 soil samples (homogeneous 300 cm^3) from the soil layers 0-5, 5-10, 10-20 and 20-30 cm depth by cylinders of Vér-type. We determined the mass volume, the acidity (pH), the organic matter (humus) content of soils.

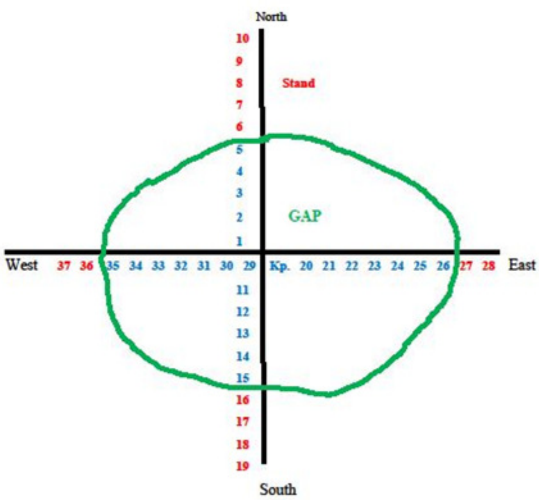


Figure 1. Points in smaller gap

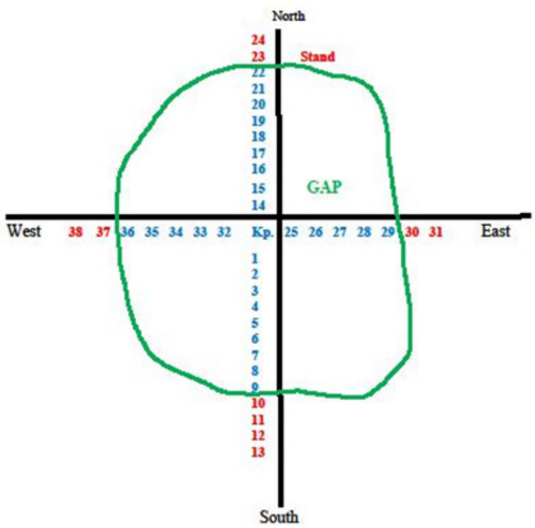


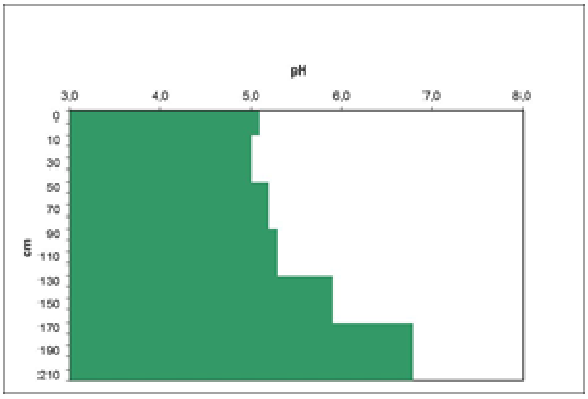
Figure 2. Points in larger gap

3. RESULTS

3.1 Results of soil measurements

The watery acidity of soil samples was between 4.3 and 8.2. (*Figure 3*). There are every type in the soil profiles, from strongly acidic to moderate alkaline pH (STEFANOVITS 1992). In some soil profiles the growing pH from above to deep is well noticeable. The KCl acidity was between 3.5 and 7.3, and well followed the watery pH values. We have found calcium-carbonate in 11 soil profiles. In compliance with acidity the calcium-carbonate appeared in deeper layers, the value was between 4.1 and 18.4%. Although some of soil samples contained significant quantity of dolomit, this only has been less presented in calcium-carbonate content of soils.

The quarter of measured samples contained concretion, this value changed between 15 to 84 %. In accordance with pH measurement we discovered hydrolytic acidity in 34 soil samples, which values were between 5.4 and 43.7. The higher acidity values were found not in the topsoil, which is may traceable to litter. We detected in 20 samples the exchange acidity which amounts are between 2.0 and 35.5.



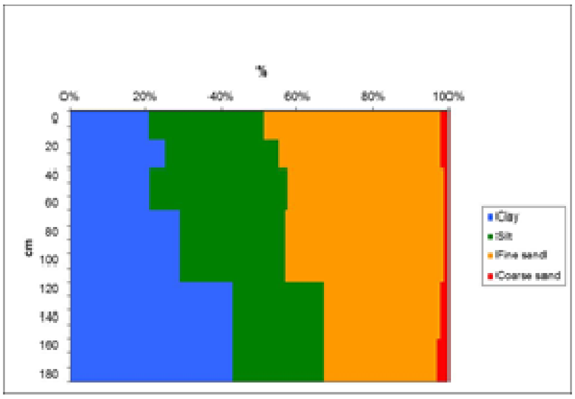


Figure 3. The watery pH in the soil profile 7. Figure 4. The particle size distribution in soil profile 3.

For establishing of physical assortment of soil we done the international Atterberg-type separate measuring (STEFANOVITS et al. 1999, SZODFRIDT 1993), which showed that the clay content of soils was between 15 and 45 %, and the silt content was between 20 and 36% (*Figure 4*). The greater part of the examined soils were of loam physical assortment, near to border of clayey loam category. The humus content of soil was between 0.5 and 9.98%. The higher values were found naturally in the upper layers. The humus content in the upper layers is generally between 5-6% and in one soil profile approaches to 10%. On the basis of humus content, the soil profiles are well nutriment supplied. In the investigated area we described two type soils, which belong to different genetic soil types.

The half of the examined soil profiles are classified to rendzina type, which belong to rock-origin soils. These were established on compact calcareous bed-silt. The characteristic of their form are the strong humification and the slight leaching.

The other part of soils in area is the lessivated brown forest soil type, which belong to Cental and South-east European brown type. In the creation of brown forest type play an important role in the origin of woody vegetation microclimate, the soil climate, the organic substance (produced by means of trees, which fall down to surface in every year) and mainly the fungal microflora. In case of lessivated brown forest soil type the process of humification, leaching and claying are following the clay migration and medium acidification. The one subtype in the area is the typical lessivated brown forest soil type, which has molecular relative number between 1.0–1.2. In other soil profiles we found pseudogley brown forest type, in which were well recognizable the iron precipitation.

3.2 Results of measurements of gaps

On the basis of examination made in two gaps we have found that in case of smaller gap the quantity of litter was much larger, than in the bigger gap (*Figure 5*). At the greater gap in below the stand measured mass of litter did not come near to determined mean of mass of litter in smaller gap. Probably the difference is rather follow from absence of litter in larger gap, that traceable to more occurrence. The exaggerated size of gap inducing larger displacement of air, which transport farther on the litter. Because of the much higher moisture content data and the more incoming sunshine the degradation process much faster in the greater gap, as in case of smaller gap. In the larger gap the soil surface is moist microclimate in under *Rubus fruticosus*, which verify that theory, that the cover of dense *Rubus fruticosus* greatly decrease to the possibility of evaporation of soil. The moisture content of litter in case of smaller gap showed generally equal dispersion. In direction of medium of gap the values glowed continuously and in the middle point approached 70%, in contradiction to smaller gap, where the maximum value is 29%. This can be explained by the canopy density of smaller gap, where the foliage drain off the significant part of precipitation.

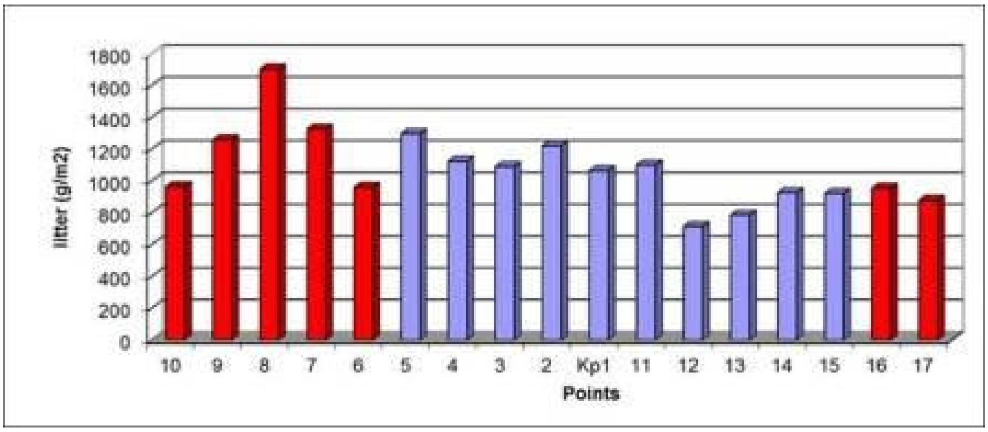


Figure 5. The distribution of litter volume in smaller gap

The soil moisture content was low in the complete territory of smaller gap. In the larger gap the soil moisture content increased towards the centre of gap (*Figure 6*). The rooted state of soil has an effect on the soil moisture. In the larger gap the rooted state was obviously smaller because the dimension of gap is bigger. In case of both gaps the soil moisture content has been higher in the uppermost layers.

The values of acidity measurement were almost similar in the two gaps and in different stands. We made a comparison between two pH value of gaps. The data of smaller gap indicated to somewhat acidic pH. We also observed that values of the smaller gap were more stable than the results of the larger gap. The size of gap essentially determined the vegetation of gaps and the pass off process in the soil.

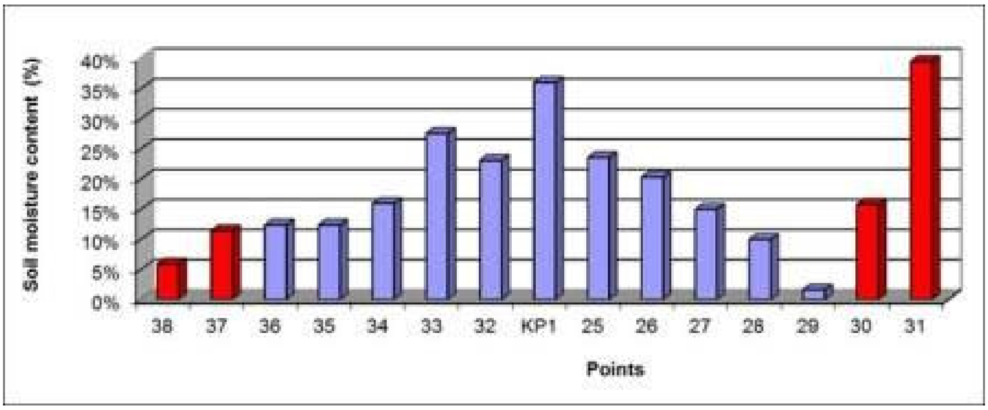


Figure 6. The distribution of soil moisture content in larger gap

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REFERENCES

BELLÉR P. (1997): Talajvizsgálati módszerek. Egyetemi jegyzet, Soproni Egyetem, Erdőmérnöki Kar, Termőhelyismerettani Tanszék, Sopron.

CSÉPÁNYI P. (2007): A természetközeli erdőgazdálkodás és a szálalóerdő. Erdészeti Lapok 142, 9, p. 281-284.

DANSZKY I. (ed., 1963): IV. Dunántúli Középhegység erdőgazdasági tájcsoport. Országos Erdészeti Főigazgatóság, Budapest.

ESZTÓ K. (2011): Megalapozó faállomány-szerkezeti vizsgálatok előkészítése a Pilisi Parkerdő Zrt. Pilisszentkereszti Erdészetének területén tervezett szállaló erdőtömben. MTA Veszprémi Területi Bizottság, Mező-és Erdőgazdálkodási Munkabizottság,, Mészáros Károly Emlékülés kiadvány, Sopron, 21-36 p.

GÁLHIDY L. (2008): Örökerdők Magyarországon. – WWF Magyarország, Budapest.

HALÁSZ G. (ed., 2006): Magyarország erdészeti tájai. Állami Erdészeti Szolgálat. Budapest.

KAPÓCS-HORVÁTH ZS. (2011): A szálaló és átalakító üzemmódok alkalmazásának aktuális kérdései. MTA Veszprémi Területi Bizottság, Mező-és Erdőgazdálkodási Munkabizottság, Mészáros Károly Emlékülés kiadvány, Sopron, 113-118 p.

LETT B. – NAGY I. – PUSKÁS L. – STARK M. – HORVÁTH S. – HORVÁTH T. (ed., 2009): Múlt és jövő II. „Tarvágásból szálalásba”. A folyamatos erdőborítás üzemmódjainak bevezetése, gyakorlata. Nyugat-magyarországi Egyetem, Sopron.

REININGER H. (2010): A szálalás elvei, avagy a korosztályos erdők átalakítása. HM Budapesti erdőgazdaság Zrt, Budapest.

STEFANOVITS P. (1992): Talajtan. Mezőgazda Kiadó, Budapest.

STEFANOVITS P. – FILEP GY. – FÜLEKY GY. (1999): Talajtan. Mezőgazda Kiadó, Budapest.

SZODFRIDT I. (1993): Erdészeti termőhelyismerettan. Mezőgazda Kiadó, Budapest.