

## ORIGINAL PAPER

**SOIL CHARACTERISTICS OF PROTECTED AREA “CHINAR DERE”**  
**ПОЧВЕНА ХАРАКТЕРИСТИКА НА ЗАЩИТЕНАТА МЕСТНОСТ “ ЧИНАР ДЕРЕ “****RADA POPOVA, EKATERINA VALCHEVA\***

\* Agricultural University, Plovdiv, Bulgaria, Tel. ++359 32 654 389, E-mail – radapopova@au-plovdiv.bg

Manuscript received: October 20, 2006; Reviewed: November 7, 2006; Accepted for publication: December 11, 2006

**ABSTRACT**

The soil types in the protected area “Chinar dere”, village of Topolovo, municipality of Assenovgrad, were studied. For this purpose, 4 soil samples from depth of 0-20cm and from different locations in the area – under cereal plants, sunflower, vineyard, and natural meadows, were collected. The soil samples were analyzed with respect to humus content, mechanical characteristics, sorption capacity, pH in water and in KCL, and exchangeable acidity /H<sup>+</sup> and AL<sup>3+</sup>/. On the basis of the conducted analyses the soil types were defined as koluvium soils suitable for growing various vineyard cultivars, and among the fruit cultivars they are suitable for growing plums, cherries, sour cherries, walnuts, apricots, and peaches.

These soil types are also suitable mainly for growing small-leaved tobacco, and in the higher regions – raspberries. In the case when the subterranean waters are closer to the surface, the soils are suitable for growing forage crops or can be used as meadows.

**Key words:** koluvium, chemical and physical characteristics of soils, meadows, cereal plants, sunflower, vineyard.

**РЕЗЮМЕ**

Бяха изследвани почвите в защитената местност “ Чинар –дере”, с.Тополово, община Асеновград. За целта бяха взети 4 почвени образци на дълбочина 0-20см от различни територии в местността – под житни, под слънчоглед, под лозе и под естествени ливади. Почвите бяха анализирани по отношение на хумус, механичен състав, сорбционен капацитет, рН във вода и в KCL, обменна киселинност / H<sup>+</sup> и AL<sup>3+</sup>/. Въз основа на извършените анализи почвите бяха охарактеризирани като делувиални почви / koluvium/ на които успешно могат да се отглеждат много сортове лози, от овощните видове добре се развиват сливи, череши, вишни, орехи, кайсии, праскови.

Подходящи са също за отглеждане главно на дребнолистен тютюн, а в по-високите части – и малини. В случаите, когато подпочвените води са по-близко до повърхността, на тези почви могат да се отглеждат редица фуражни култури или да бъдат използвани като ливади.

**Ключови думи:** делувиални почви, физико-химична характеристика, естествени ливади, житни, слънчоглед, лозе

## **INTRODUCTION**

For the purpose of preserving one of the last habitats of eastern plane tree (*Platanus orientalis*) in Bulgaria, according to act No RD-48, dated 14.11.1995, issued by the Ministry of Nature and Waters, the area "Chinar dere" was declared "protected area [3,4]. It is situated along the river Topolovska at about 500 m north-east of the village of Topolovo and comprises an area of 27,7 hca, 3 km in length, from 30 to 100 m in width, and altitude of 555 m.

The natural plane tree forest is of sprout type, with tree age 50-70 years, with some samples over 100 years of age, reaching height of 20-25 m, and being the only one in the country with a real forest-like outlook [3].

The protected area "Chinar dere" is managed and guarded by the Assenovgrad state forestry board, under the control of the Regional Inspection of Nature and Waters in Plovdiv, which is a regional structure of the Ministry of Nature and Waters [3].

The main goal of the present research was to characterize and determine the soil types in the protected area "Chinar dere", and to evaluate the degree of their fertility.

## **MATERIAL AND METHODS**

The protected area "Chinar dere" belongs to the territory of the Assenovgrad municipality which is situated in the transitory-continental and mountain climatic part of the Thracian Plain. Winter here is comparatively mild. Spells of warm weather occur often due to the influence of the Mediterranean cyclones. The snow cover stays averagely for 30 days annually, and in higher locations /300-1000 m/ - from 40 to 70 days. The average temperature in January is from 0°C to 2°C. The lowest temperatures reach between -14°C and -15°C. Spring begins early, the average twenty-four-hour temperature reaches above 5°C as early as the beginning of March, and in the beginning of April it is at about 10°C. The amount of rainfalls in spring is from 120 to 300mm. Summer is short and cool. The average temperature in the warmest summer month varies from 17,5°C for locations at about 1000m above sea level to 22,5°C for those at about 300m above sea level. The amount of the monthly rainfalls is between 190 and 320mm. Autumn is comparatively warmer than spring. The average temperature in October is with 2-2,5°C higher than that in April. Compared to spring, autumn is warmer, drier and sunnier. The amount of rainfalls is from 180 to 250 mm.

4 soil types were used for the purpose of the research. They were collected from the region of the protected area "Chinar dere" which comprises the protected area and the contiguous arable farmland belonging to the lands

of the village of Topolovo, characterized with koluvium soil type. The samples were extracted from soil planted with vineyards, cereal plants, sunflower, and natural meadows.

The soil types were studied and analyzed with respect to the following indexes [5]:

- total humus content by Turin's method
- mechanical composition using FRITSCH photosedimentograph
- pH potentiometrically in H<sub>2</sub>O and KCL
- exchangeable H<sup>+</sup> and Al<sup>3+</sup>
- using Sokolov's methodology
- sorption capacity using the method of carbon-free soils with 1n BaCl<sub>2</sub>
- determination of the hygroscopic moisture using the weight method

## **RESULTS AND DISCUSSION**

The results from the study are shown in Table 1. The soil types in the region of the village of Topolovo refer to the diluvium-proluvium soils – Koluvium, and in some countries are usually called koluvium soils. They are also spread at the foot of all higher mountains, forming series of torrential cones along the border between the mountains and the valleys. The basic factor in this case is the water erosion. The soil-constituting materials are the diluvium deposits, which are mixture of soil and erosive material, eroded by the soils in higher locations and carried over by the torrents [1].

These soil types are in initial phase of soil-formation. As undeveloped soils they are characterized only with initial humus outline, which passes gradually into soil-forming materials. The studied soil types belong to the carbonate-free acid /unsaturated/ koluvium soils. They are characterized with average to weak pH in water and potassium chloride. The exchangeable acidity /H<sup>+</sup> + Al<sup>3+</sup>/ varied from 0,15 meq to 2,21 meq /100 g soil. In the soils under cereal plants and sunflower, the Al exchangeable acidity was higher than that of H, while in the soils under vineyard and in the protected area, the H exchangeable acidity was higher than that of Al. The humus content, according to the indexes developed by D. S. Orlov and L. A. Grrishina, and in conformity with our conditions and that of N. Artinova, varied from low – 1,89 and 2,06% /under cereal plants and sunflower/ - to average – 2,32 and 3,36% /under vineyard and natural meadows/. The sorption capacity value varied depending on the clay content – in the variants with higher clay content /under cereal plants and sunflower/ it was 12,5-12 meq/100g soil, while in the variants with lower clay content /under

Tabl.1 Physicochemical characteristics of soil types from the region of the village of Topolovo – protected area "Chinar dere"

Табл.1. Физико-химични свойства на почви от района на с. Тополово – защитената местност "Чинар дере".

Дълб. см. Depth	pH <sub>(H2O)</sub>	pH <sub>(KCL)</sub>	H <sup>+</sup> +AL <sup>3+</sup> meq	AL <sup>3+</sup> meq	H <sup>+</sup> meq	T meq	Хумус % Humus	Мех. състав % (<0,01мм) Mechanical characteristics	Хигроск. влага % Hygroscopic moisture
0-20 житни cereal plants	5,94	4,12	2,21	2,06	0,15	12,5	1,89	18 ГП clay-sandy	2,77
0-20 слънч. sunflower	6,24	4,24	1,14	1,06	0,08	13,0	2,06	36 СПГ middle sandy-clay	1,93
0-20 лозе vineyard	5,92	5,30	0,20	0,08	0,12	7,0	2,32	6 свързан пясък combined sand	4,7
0-20 ест.лив. nat.meadows	6,15	6,10	0,15	0,02	0,13	5,0	3,36	6 свързан пясък combined sand	5,93

\* ГП – глинесто-песъчливи ( clay-sandy ), СПГ – средно песъчливо-глинести ( middle sandy-clay )

 Tabl. 2 Agrochemical characteristics of soil types in the protected area "Chinar dere"  
 Табл. № 2. Агрохимични показатели на почви от защитената местност "Чинар дере"

Дълб. см. Depth	NH <sub>4</sub> +NO <sub>3</sub> mg/kg	P <sub>2</sub> O <sub>5</sub> mg/100g	K <sub>2</sub> O mg/100g
0-20 житни cereal plants	52,4	46,17	9,7
0-20 слънч. sunflower	50,5	13,86	14,5
0-20 лозе vineyard	107,1	64,76	53,3
0-20 ест.лив. nat.meadows	24,7	13,93	24,3

vineyard and natural meadows/ it was 5-7meq/100g soil. The mechanical composition was lighter – from combined sand /under vineyard and natural meadows/ to medium sandy-clay /under cereal plants and sunflower/. All chemical characteristics varied in accordance with the mechanical composition. There are no specialized studies in this respect, but on the basis of already known data, it can be concluded that these soil types are loose, drainable, permeable, well-aerated and warm, but they have low moisture absorption and low water retention,

as a result of which they often are characterized with dehydration. They do not have well-expressed structure – the macroaggregates are not watertight, but they have good physicochemical characteristics – low stickiness and plasticity, they do not become compressed, and are easy to cultivate.

The amount of absorbable forms from the basic nutritive elements was comparatively low and these soil types were characterized with small stores of nitrogen and phosphorus, and with greater amount of potassium /tabl. 2, under natural meadows/. As a result of this, irrespective of the good physicochemical characteristics, they were characterized with comparatively low degree of natural fertility.

## CONCLUSIONS

On the basis of the soil characteristics of the studied soil types in the protected area "Chinar dere" the following important conclusions can be made:

1. The soil types belong to the category of undeveloped soils with a /A/-C profile and initial humus outlook, which passes gradually into the soil-constituting materials – carbonate-free acid /unsaturated/ koluvium soils.
2. For the purpose of increasing their fertility, it is necessary that some limiting factors such as erosion, deteriorated structure, low humus content, insufficient nutritive elements and dehydration, should be removed.

3. In order to stop the erosion, all necessary measures with respect to its management should be taken.

4. To enrich the soils with organic substance and to improve their structure it is necessary to manure them with barnyard dung, composts, green manure and apply appropriate crop rotation. In summer the soils dry up and need irrigation. When possible, it should be done more frequently with special spraying machines, using short-furrow gravitation irrigation, with a greater rate of the water jet, in order to prevent the irrigation erosion.

5. All cereal crops can be grown without irrigation, while many earthed-up crops – maize, sunflower, etc.- only in the case of irrigation. The soils are suitable for growing many vineyard cultivars, in case that the subterranean waters are over 3 m deep. With respect to the fruit cultivars they are suitable for growing plums, cherries, sour cherries, walnuts, apricots, and peaches.

6. The soils are suitable for growing mainly small-leaved tobacco, and in higher locations – raspberries. In the case when the subterranean waters are closer to the surface, many forage crops can be grown on these soils, or they

can be used as meadows

#### **REFERENCES**

[1] Giurov G., N. Artinova, Soil Science, Plovdiv, 2001, 306-310.

[2] Ministry of Nature and Waters. Law of nature protection, 2002, State newspaper, Iss. No 91, 25.09.2002; Iss. No98 18.10.2002; book 10/2002 p. 244; Vol. 5, p. 4, № 420.

[3] Ministry of Nature and Waters. Law of protected areas, (State newspaper Iss. No133, 1998; State newspaper Iss. No98, 1999; State newspaper Iss. No 28, 48 and 78, 2000; State newspaper Iss. No23, 77 and 91/2002; State newspaper Iss. No 28/2005).

[4] Pilot Agro-environmental Schemes in Bulgaria, Information brochure, Plovdiv ,2000, 10-11.

[5] Trendafilov K., R. Popova, Manuel of Soil Science, Plovdiv – AU, 2006, 38-39.