

A STUDY ON KINETICS OF LEAD, ZINC, IRON, COPPER AND NICKEL SORPTION ONTO IMMOBILIZED HUMIC SUBSTANCES

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ABSTRACT

Kinetics of interaction between humic substances (HS) and metal ions are very significant in determining their reactivity in the nature, for instance, the size of humic substance may notably affect the kinetics of metal binding. Kinetics of complex formation is likely a significant process, that determines the transport of organic and inorganic pollutants in nature.

Present paper investigates the kinetics of zinc, lead, iron, nickel and copper sorption onto immobilized humic substances. Immobilized humic substances and their sorption capacity of metal ions were characterized using multi-proxy analysis, including elemental analysis, Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), atomic absorption spectroscopy (AAS).

A batch sorption was applied to study the sorption of Zn, Cu, Ni, Pb and Fe onto immobilized humic substances. Various parameters affecting the sorption capacity such as initial pH, agitation period, temperatures and different initial concentrations of metals, as well humic substances were studied.

The obtained results showed that sorption of studied metals is efficient, and affordable technology for simultaneous removal of trace elements from the contaminated territories, using immobilized humic substances.

Keywords: humic substances, metal ions, sorption, kinetics, atomic absorption spectroscopy

AGRICULTURAL LANDS BONITATION AND ESTIMATION OF CROP PRODUCTION IN ALMAJULUI VALLEY, CARAS-SEVERIN COUNTY

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ABSTRACT

The bonitation of the agricultural lands represents a complex action of quantitative research and assessment of the main conditions which determine the growth and fruiting of plants, of establishing the degree of favorability of these conditions for each use and crop. Because the capacity of production of lands modify under the influence of natural factors, but especially of human intervention, the bonitation must be permanently updated.

The biggest drawback of the Romanian agriculture is the excessive division of the land property, in small undertakings, in average of 2.2 ha. This is one of the consequences of the application of laws on agricultural real estate, which did not provide anything for the protection of great technical investments made before 1989 (organization of the territory, irrigation systems, etc.) and nor sanctions for those who destroy them.

The small agricultural undertakings, of subsistence, limit the possibility of investments in modern means of production. First of all, it is about the mechanization of agricultural works and of the restoration of the irrigation system.

The pedological mapping and soil cadastral bonitation works enable the making-up of the graphic and descriptive database necessary for the inventory, classification and evaluation of the soil resources from a geographical space that can be represented by an agricultural undertaking or by a cadastral - administrative territory. The topsoil is studied in relation to the natural and anthropogenic factors that determine its features and respectively, the natural fertility, with different favorability marks for the growth and development of agricultural or natural phytocenoses.

Keywords: soil bonitation, crop production, agroameliorative measures

AGRICULTURAL LANDS MANAGEMENT IN ROMANIA, AFTER 2007**Phd student Andreea Dimitriu****Master student Oana Tudorita Minea****Lecturer Dr. Radu Ionut Dimitriu**Alexandru Ioan Cuza University of Iasi, **Romania****ABSTRACT**

The year 2007 marked a historic moment in Romania joining the European Union, although at that time was the Member State with a GDP per capita well below the European average and the use of EU funds and own resources to stimulate investment was a necessity. Accession to the European Union does not necessarily guarantee improved economic performance in agriculture, and it was clear from that point, that an increasing share of services in GDP will occur with the relative decline in the share of agriculture and industry sectors affected by a long and difficult transition.

However, the main resource of Romania remains farmland, but growth performance in agriculture depends primarily on Romania's macroeconomic policies and not joining the European Union. One of the obligations that Romania has assumed in the Treaty of Accession to contribute to the achievement of a united Europe was fundamental restructuring of agriculture and stimulating rural development.

Developing the agricultural sector aim to overcome structural problems (weak endowment with machinery, excessive fragmentation of agricultural land) and increasing the competitiveness of Romanian products domestically.

Although this step was intended to lay the foundations of the European agricultural model, characterized by viable operating structures, agricultural progress in Romania in the period 2007 - 2013 has been elusive. The agricultural support measures were insufficient to reach the European agricultural objectives and, finally, the results were partial and unsatisfactory.

Keywords: resource, macroeconomic policies, agriculture progress, fragmentation of agricultural land, competitiveness.

ASSESSMENT OF SLOPE STABILITY OF EARTH DAMS

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ABSTRACT

The first and foremost requirement for the analysis and design of earthen dams is to guarantee their safety and reliability during their service life. Therefore, regular and thorough inspections and measurements of water constructions are carried out to track movement of slopes, which serve as data used in stability calculations. Earthquakes are random events, so their occurrence in the areas never hit before or hit but of different intensity cannot be precluded. Therefore, structures of greater significance must be analyzed and verified for the effects of seismic actions. The paper target is the appraisal of the slope stability of the water construction in four cross profiles and review of the consequential stability grade. The GEO 5 software for the slope stability is the essential component of the work. The critical factors of safety have been determined by Bishop and Sarma methods for Domaša dam.

Keywords: slope stability, heterogeneous earthen dam, methods of stability analysis, seismicity, factor of safety for the critical slip surface

BASIC PEDOLOGICAL CHARACTERISTICS OF SLOVAK PEATLANDS

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ABSTRACT

The consequences of climatic changes, the first of all raising of the temperature, may result in shifting the balance of humus formation from humification to mineralization. With increasing mineralization are particularly vulnerable natural soils with high content of organic carbon. In Slovak soil monitoring, part of natural soils (Alpine and forest soils) are included, however, peatlands are missing. Slovak peatlands were mapped in detail from fauna and flora point of view but without pedological characteristics. For this reason from 2008 gradually monitoring network of peatlands has been created. This network includes all types of peatlands in Slovakia and on all localities basic chemical (pH, nutrient and heavy metals contents) characteristics with an emphasis on detailed observation of soil organic matter in 10 years interval are monitored. In this work basic pedological characteristics of five different peatlands are presented. The highest concentration of organic carbon (OC) content (48%) on locality Klenovské Blatá was found. Localization of this peat is in deep forest and it is typical transitional mire. Klenovské Blatá is very strongly acidic peat with the highest content of nutrients (P,K) from all observed peatlands. The high concentration of OC (44%) also on bog Rudné was found. This locality is situated in the Upper Orava region near cadastral Suchá Hora village. This is also extremely acidic bog with considerable stocks of potassium and phosphorus. The lowest concentration of organic carbon content (29%) on Belianské Lúky locality was found. Belianské Lúky is Slovak last large unworked peatland in territory of Spiš region and at the same time the greatest fen in Slovakia. As this site is characterized as calcareous fen its pH is in slightly alkaline region with extremely low concentration of phosphorus. The highest concentration of nitrogen and the lowest concentration of available potassium from all observed localities on peat Šúr were determined. This inland fen is situated in the Little Carpatians mountains in the cadastral municipality Svätý Jur and Chorvátsky Grob. Medium concentration of organic carbon content, with low pH and quite low concentration of available nutrients on locality Abrod was determined. Abrod is fen meadow and it is situated in natural reserve Záhorie. On the basis the first preliminary results it can be concluded considerable differences in organic carbon content, pH and nutrients among observed localities due to different type of peatlands.

Keywords: peatlands, organic carbon content, pH, nutrients

CO₂ EMISSION FROM EROSION AFFECTED SOILS

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ABSTRACT

The aim of this work was to describe an impact of erosion and deposition processes on soil properties and consequently on a microbial activity and CO₂ emission. Study was performed on morphologically diverse study site in loess region of Southern Moravia, Czech Republic. The original soil type was Haplic Chernozem, which was due to erosion changed into Regosol (steep parts) and Colluvial soil (base slope and the tributary valley). The grab soil samples were taken from topsoil at 5 locations of the selected elevation transect and also from the parent material (loess). The basic soil properties were measured in the laboratory: pH_{KCl}, pH_{H₂O} particle size distribution, oxidable organic carbon content, carbonates content and electric conductivity. Bulk density, porosity and soil particle density were also determined. Colony-forming units per gram of dry soil (CFU) were analyzed. Wet and also dry soil samples were measured 24 hours in the laboratory using the LCi-SD portable photosynthesis system with soil respiration chamber. The maximal net CO₂ exchange rate (NCER), average NCER between 11:00 to 16:00 o'clock and NCER at 19:00 o'clock were evaluated. The net H₂O exchange rates were also assessed. In general, the microbial activity and soil respiration increased with increasing organic matter content, salinity and particle density. The largest values of CFU were measured on topsoil at the upper part of the transect, which was only slightly impacted by erosion. The lowest values of the microbial activity and soil respiration characteristics were obtained on topsoil at the steepest and heavily eroded parts of the transect and on the parent material. Results showed close correlation between the CFU and following soil properties: salinity (R=0.90), pH_{KCl} (R=-0.97), pH_{H₂O} (R=-0.95), oxidable organic carbon content (R=0.96), carbonates (R=-0,89), clay content (R=-0,91) soil particle density (R=-0.90), bulk density (R=-0.94) and porosity (R=0.94). Similar correlations were found between soil respiration's characteristics on wet soil samples and soil characteristics. Close correlations were found also between CFU and maximal NCER (R=0,84) or average NCER (R=0,94) measured on wet soil samples. Results show that microbial potential expressed using colony forming units (CFU) and soil respiration characteristics could be used as an indicators of soil degradation due to erosion.

Key words: soil respiration, microbial activity, soil erosion

**CONSIDERATIONS CONCERNING THE ORGANIC MATTER FROM OAȘ
MOUNTAINS REPRESENTATIVE SOILS (EASTERN CARPHATIANS,
ROMANIA)**

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ABSTRACT

The humus fractionation analysis was conducted for five soil subtypes, which are representative for the lower altitudinal range of the Oaș Mountains (Eastern Carpathians, Romania). There were analyzed, as follows: one andi-Eutric Cambisol (EC an) (400m alt.), one typical Eutric Cambisol (EC ti) (410m alt.), one andi-meso-skeletal Dystric Cambisol (DC an-qq) (474m alt.), one andi-skeletal-Eutric Cambisol (EC an-qq) (490m alt.) and one typical Eutric Cambisol (EC ti) (650m alt.). The analysed soils lay under a vegetation cover of grasslands in alternation with beech or fir-beech mixed forest, in an environment with moderate rainfall. The chemical reaction varies from strongly acid to moderate and weakly acid. Organic accumulation (highest in the andi-meso-skeletal Dystric Cambisol), humification degree (highest in the typical Eutric Cambisol and andi-skeletal-Eutric Cambisol) rank these soils as moderate humic, and the extractable organic material, through the ratio between fulvic and humic acids ranks the quality of humification.

Keywords: humic fractions, soil subtypes, Oaș Mountains

CONTRIBUTIONS TO THE STUDY OF REGOSOL PHYTOREMEDIATION FROM TĂTĂRANI - DAMBOVIȚA AREA

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ABSTRACT

In the critical areas that need to be restored ecologically, are mentioned the areas affected by chemical pollution and also high tensile surfaces, such as those suffering from drought, excess water, erosion and landslides, which tend to expand under climate change.

In the ecological reconstruction of soils affected by different degradation processes, should be considered general measures and specific measures of agricultural soils.

The purpose of this paper is to highlight the efficiency of phytoremediation methods of soils degraded by erosion of the left slope of Dâmbovița valley, Tătărani- Bărbulețu area, by grassing degraded areas with a complex mixture of perennial grasses and improving soil quality indicators due to organic fertilization with compost.

The general term of *phytoremediation* includes those processes that use plants to remove, transfer, stabilize, and destroy contaminants in soil, water and sediments. Phytoremediation methods offers significant potential for certain applications and allow remediation of sites much higher than would be possible when using traditional remediation technologies. The objectives of this work were to establish the best mixed perennial grasses while settling the benefits of using organic fertilizer in the form of compost or well fermented manure aiming to actually improve soil quality on Dâmbovița left side of the pond, in the Tătărani-White River (Raul Alb) area. The efficiency goals outlined methods of phytoremediation of soils degraded by erosion from the area Tătărani - White River by grassing areas degraded by a complex mixture of perennial grasses and improving soil quality indicators due to organic fertilization with compost.

Keywords: soil, phytoremediation, erosion, perennial grasses, texture, slope

CREATION OF HUMUS HORIZON OF ANTHROPOGENIC SOILS UNDER FORESTRY RECLAMATION

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ABSTRACT

The work attempts to determine, in the case of forestry reclamation at the North Bohemian Brown Coal Basin (Czech Republic), if a humus layer is formed naturally and if the volume thereof is influenced by the type and age of the forest stands. Soil data were obtained in a field research in the form of shallow dug probes when thickness of humus horizon was detected. The soil profile was determined according to the taxonomic soil classification system. The measured humus thickness was compared to the forest stand and age thereof using the T-test. In all experimental sites, disregard to the age and type of vegetation the formation of humic layer was observed. Differences in A0 horizon thickness for deciduous, mixed and coniferous forests at different ages were proved, which confirms the presumption that the thickness and formation of the humus layer is affected by age and type of vegetation.

Keywords: forestry reclamation, humus horizon, post mining locations

DEVELOPMENT OF BIOPHYSICAL INDICATORS IN CONDITIONS OF SUSTAINABLE LAND USE

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ABSTRACT

Biological element of the soil plays a key role in the soil ecosystem and its activity significantly contributes to improvement of the soil quality and health. Its activity is the result of a combination of the biotic, chemical and physical processes in the soil. The aim of this work is to monitor and to evaluate the development of physical and biological properties of soils within the time and spatial scales in conditions of sustainable land use. The study was carried out in model area in the marginal areas of the northeastern Slovakia during 2010 - 2013 (48° 57'N, 20° 05'E). Physical (bulk density, porosity, maximum capillary capacity) and biological (soil enzyme activity – urease, alkaline and acid phosphatase) soil properties were monitored and statistically evaluated. Via statistical testing we found that agroecosystems had a significant impact on the observed biophysical parameter. This study underscores the importance of long-term, quantitative soil monitoring for determining the changes in agricultural land and ecosystem processes over time.

Keywords: ecosystem of soil, physical properties, soil enzymes

DIFFERENT INDICES AND CHARACTERIZING OF AGROMETEOROLOGICAL DROUGHT CONDITIONS

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ABSTRACT

In present investigation the hydro-thermal conditions in Bulgaria during the period 2000 – 2013 are analyzed with a few agrometeorological indices. The aim is to compare received results and make recommendations for their practical use. The hydro-thermal coefficient of Selyaninov, and indices of De Martonne, Thorntwaite potential evapotranspiration and Soil moisture index (SMI) are calculated. Data from 29 agrometeorological stations are processed.

Keywords: hydro-thermal indices, climate change, Soil moisture index, Bulgaria

EFFECT OF BIOFERTILIZERS ON MICROBIAL COMMUNITY OF ARABLE SOIL

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ABSTRACT

Three different organic substrates (compost, bottom sediment and biosludge) were applied to the arable soil in the laboratory conditions (incubation time 105 days at 25°C) in doses of 20 t.ha⁻¹ and 80 t.ha⁻¹. The main objective of the present study was to observe the changes in numbers of bacterial and fungal colonies using classic plate dilution method, changes in genetic microbial biodiversity using Polymerase Chain Reaction - Denaturing Gradient Gel Electrophoresis (PCR-DGGE) and changes in the microbial enzymatic activity (dehydrogenase, FDA - hydrolase and phosphatase activity) at the beginning (1st day) and at the end (105th day) of the experiment. The statistically significant differences in amount of bacteria (ANOVA, Tukey test, $P \leq 0.05$) were mostly demonstrated on the 1st day of the experiment. All three tested substrate inputs rapidly increased percentage representation of the monitored bacteria. In case of microscopic fungi, the most significant changes were determined after the addition of bottom sediment, which in both used doses increased number of fungal colonies, particularly the number representation of microscopic fungus *Penicillium simplicissimum* at the end of the experiment. According to the results of the cluster analysis of PCR-DGGE, the diversity of bacteria from enriched soil was at least influenced by the addition 20 as well as 80 t.ha⁻¹ of compost (similarity from 48 to 62 %). On the other hand, the addition of biosludge (both doses) influenced bacterial diversity at the most (similarity 33 %). In case of microscopic fungi, all three tested substrates affected fungal diversity approximately equally (similarity from 30 to 50 %). According to the results of regression analysis, $P < 0.05$, high relative abundance of bacteria as well as fungi determined by classic plate dilution method positively correlated with microbial diversity determined by PCR-DGGE and also with dehydrogenase activity.

Keywords: biofertilizers, microbial community, PCR-DGGE, enzymatic activity

EFFECT OF SOIL PARAMETERS ON THE PROFITABILITY OF CROP PRODUCTION

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ABSTRACT

This paper presents particular potential rates of solids production and profitability of the production for the most occurring soil types, categories of steepness, skeletal, soil depth and granularity. The calculation confirms the high correlation of profitability and natural yield of the crop production. Sustainable positive profitability in the crop production is expectable only in the regions with Mollic Fluvisols, Chernozems, Haplic Luvisols, Fluvisols, Albic Luvisols and Planosols contribution. The other regions depend on the subsidiary economic impulses. The analysis of the chosen soil parameters has generally shown that under recent economic conditions is the crop production without subsidiary impulse profitable only in lowlands and slopes to 7°, in deep soils, without skeleton, as to granularity medium heavy soils. This finding does not have to refer to a particular crop. Heterogeneity of the Slovak soils and their characteristics implicitly brings different productive and economic potentials of individual regions. According to the classification of the regions into the agricultural productive areas profitability potential is positive only in maize and beet production region. According to the dividing of the Slovak territory into so called LFA (less favoured areas) profitable regions are not included into this system or the regions with specific disadvantages as well. This report analyses in detail both the text and the graphic form above mentioned differences in potentials of producing the biomass as well as profitability of its production regarding the soil characteristics and agricultural relevant regions.

Keywords: profitability of the crop production, solids biomass production, soils parameters, Slovak regions

ENGINEERING REUSE OF DREDGED MATERIALS AS 'GOOD' SOILS: ENHANCED STRENGTH AND STIFFNESS PERFORMANCE

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ABSTRACT

Dredging is a necessary maintenance measure to keep the operational depths of ports and waterways adequate for navigation of waterborne transport. Due to natural sedimentation mechanism, as well as re-routing of the natural course of near-shore water pathways as a result of manmade shoreline alterations, dredging has seen a marked increase in terms of frequency and amount of sediments displaced. The materials dredged are generally considered wastes to be disposed of either at designated locations in open waters or contained landfills inland. Both disposal methods incur costs, labour, time and more importantly, the risks of depositing contaminants along the transportation route. It is therefore favourable for the conveyance and disposal of the dredged materials to be minimized or eliminated, if possible. One potential solution towards that is by reusing the material, with sufficient pre-treatment nonetheless, as any other good geomaterials in construction, particularly along the coastline to avoid long distance hauling. The present work involved examination of a typical dredged marine sample retrieved from a local port area, and the identification of its fundamental physico-chemical properties. Pre-treatment was achieved via solidification, where known dosages of hydraulic binders, i.e. cement and fly ash, were admixed with the dredged soil at a certain mixing water content. Cement is arguably the most common hydraulic binder used in the civil engineering world, while fly ash, a byproduct of coal combustion in power plants, was added to explore the possibility of cement substitution. A relatively small binder dosage was used in this study, i.e. 10 %, with various combinations of cement : fly ash ratios in the attempt to establish the solidification pattern and effects. The test specimens were left to cure up to a month, with measurements taken at intervals of 3, 7, and 28 days in the current study for an understanding of the time effect for maturity of the solidification process. A non-destructive bender element test was conducted together with the conventional unconfined compression test on the specimens to monitor the modified strength and stiffness with time and different binder ratios. The findings were interesting: while prolonged curing contributed to the maturity and improved performance of the solidified dredged soil, excessive cement addition seemed to impede the strength and stiffness gain despite the longer curing period. In conclusion, the study sheds some light on the potential of reviving dredged soil, otherwise destined for disposal as a waste, to a useful second life by solidification. Of course, this is but a preliminary exploratory work, which requires further test programmes to ascertain the long term performance, both in terms of engineering properties and environmental impact. Yet, this could very likely be the right step forward for a more sustainable handling of the increasing dredged materials worldwide.

Keywords: dredged materials, strength, stiffness, reuse, solidification, cement, fly ash

ENZYME ACTIVITIES AS A COMPONENT OF NUTRIENT CYCLING PROCESSES IN SOIL AMENDED WITH PESTICIDES

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ABSTRACT

The aim of our study was to describe the effect of two different insecticides with active substances chlorpyrifos and bifenthrin (Dursban, Talstar) and two herbicides with active substances linuron and dimetachlor (Linurex, Teridox) on the soil enzyme activities tested in laboratory conditions. The pesticides were applied to the arable soil in recommended doses of manufacturer and in dose one hundred times higher than recommended amount. Dehydrogenase activity and FDA hydrolase activity were detected on the day of the establishment of the experiment and on the 1st, 3rd, 7th, 14th, 28th, 56th and 112th day of incubation. Decrease of dehydrogenase activity occurred after application of all pesticides except bifenthrin from the beginning of the experiment to the 112th day, even when recommended doses of pesticides were used, but most significant changes were observed in higher doses. The activity of FDA hydrolase was negatively affected only by insecticide chlorpyrifos. In both doses used in our experiment, herbicides did not have remarkable changes to FDA hydrolase activity. According to results of regression analysis, dehydrogenase activity positively correlated with FDA hydrolase activity ($r=0.55$) in all treatments and negatively correlated with C_{mic} ($r=0.50$) only in treatments with herbicides. Negative correlations were found between FDA hydrolase activity and C_{ox} ($r=0.59$) and C_{mic} ($r=0.57$) in soil amended with herbicides.

Keywords: insecticides, herbicides, dehydrogenase activity, fluorescein diacetate hydrolase activity, arable soil

EVALUATION OF SELECTED LOCALITY OF EAST-SLOVAKIAN LOWLAND BY SOIL POTENTIAL FOR VOLUME CHANGES

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ABSTRACT

Soil volume changes during water saturation are caused by clay minerals in soil, especially of illite and montmorillonite group. The knowledge of these changes is important for engineering works as well as basic hydrological research. Soil volume potential can be quantified by means of COLE potential (Potential of Linear Extensibility). COLE values are determined in laboratory on intact soil samples. It is a time-demanding and arduous process. This paper presents spacial distribution of selected part of East-Slovakian lowland on the basis of COLE potential. COLE values were determined by indirect method. For this purpose, a pedotransfer function which illustrates relation between COLE and content of colloidal and physical clay (particles < 0.002mm) was created. During field measurements, 106 samples were taken in order to perform grain-size analysis. The results of spacial evaluation of soil volume changes potential are presented by means of GIS.

Keywords: Clay, Volume changes, Potential of Linear Extensibility

EVALUATION OF THERMAL TREATMENT IN DECONTAMINATING SOILS POLLUTED WITH CRUDE OIL

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ABSTRACT

The effectiveness of thermal decontamination of a soil sample polluted with crude oil was assessed using optical methods (absorbance and fluorescence spectroscopy) and the standard high performance liquid chromatography method (HPLC). The sample was divided in aliquots and subjected to pyrolysis for 1 h, at three operating temperatures: 300, 400 and 500°C. Ten common PAHs were found in all samples: anthracene, naphthalene, phenanthrene, pyrene, chrysene, fluoranthene, benzo(a)anthracene, benzo(k)fluoranthene, benzo(b)fluoranthene and benzo(ghi)perylene. Fluorescence spectroscopy proved to be suitable for evidencing the low and high molecular weight PAHs and their evolution after exposure to the various treatment temperatures. It showed similar decontamination degrees as compared with the high performance liquid chromatography, for the low molecular weight hydrocarbons, but overestimated the decontamination efficiency for the heavier ones. The most satisfactory decontamination rate was evidenced for 400°C. The further increase of the temperature did not improve the treatment outcome, due to the formation of by-products, such as benzo(alfa)pyrene and indeno(1,2,3-c,d)pyrene. Results showed that fluorescence measurements were useful in evaluating the efficiency of the pyrolysis process.

Keywords: fluorescence spectroscopy, polycyclic aromatic hydrocarbons, contaminated soil, thermal decontamination, crude oil

EXPERIMENTAL RESEARCH OF SOIL EROSION PROCESSES IN THE CZECH REPUBLIC

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ABSTRACT

Soil erosion by water is one of the main degradation processes on agricultural lands in the Czech Republic. The team on Department of Irrigation, Drainage and Landscape Engineering at the Czech Technical University in Prague have been involved in experimental measuring of surface runoff, soil erosion and soil transport processes for several decades. Based on the experiments, a physically based simulation model of runoff and soil erosion processes, SMODERP, was developed and USLE based models have been applied and calibrated.

Experimental erosion plots were installed at Bykovice catchments (central Bohemia, Czech Republic) in 2009. The natural rainfall-runoff events and corresponding soil loss have been continuously measured there since 2010.

Nowadays there are six experimental plots, three “Wischmeier’s” type (22 meters in length – vegetation, cultivated fallow and non-cultivated fallow), one plot with length of 4 meters (to be comparable with laboratory rainfall simulator data), and two plots of 8 meters (to compare with field rainfall simulator data). The outflow from each plot and precipitation intensity is automatically continuously measured during each natural rainfall event. The sediment samples are taken manually after the event. The soil concentration in outflow and total amount of transported soil is determined.

Data from the experimental plots about rainfall intensity and duration, sediment fluxes and sediment concentration are presented in the paper.

20 rainstorms producing surface runoff have been recorded during four seasons. In total 1086 mm of rainfall has been measured during recorded surface runoff - erosion effective storm events, what represent 40 % of average annual rainfall. Results shows different responses of surface with vegetation and cultivated fallow characterized by runoff coefficient and particularly by sediment yield.

Keywords: Soil loss, Wischmeier’s plots, Experimental measurement, Erosion

FERTILITY AND PLANT PRODUCTION ON THE ERODED SOILS IN THE FOREST-STEPPE ZONE OF WEST SIBERIA

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ABSTRACT

Snowmelt erosion is one of the widespread processes leading to decrease of soil fertility the most valuable agricultural lands in the West Siberia. The aim of the present study is to evaluate the fertility, transformation of soil organic matter and biogenic elements in eroded soils. Set of field and laboratory experiments were carried out on the Chernozem and the Phaeozem (7th years - layland, non-eroded and moderate eroded) in condition of forest-steppe zone in the Western Siberia, Russia. Results have indicated the reduction in the content of carbon and nitrogen (stock and amount) and rate of nitrate accumulation, intensification of the process ammonification, increase the content of available form of potassium on eroded soils. Decrease into 1.5-2.0 times of the crop yield and growth of aboveground biomass of meadow grass were obtained on sloping soils. It is shown that erosive processes lead to decrease of fertility, alteration of a ratio between different forms of main plant nutrition elements and without using of the additional techniques of soils conservation will lead to degradation of soil cover at whole.

Keywords: fertility, nutrition elements, eroded soil, Chernozem, West Siberia

FRACTION DISTRIBUTION AND BIOAVAILABILITY OF METALS AND METALLOIDS IN SOIL OF DIFFERENT TYPES

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ABSTRACT

Bioavailability is the amount of a nutrient that is potentially available for absorption from a matrix (e.g., from soil to crops or from food to humans) and when absorbed, utilizable for metabolic processes in the organism. Bioavailability is dependent not only on chemical properties of compounds but also on soil composition and properties, among them pH, granulometric composition or soil texture and organic matter content can be mentioned. The aim of this study was to investigate fraction distribution of elements in soil samples of different types to assess prospective bioavailability of metals and metalloids. Five soil samples were collected in Latvia, considering their representativeness for soils in Latvia. Soil type and texture were identified as follows: fen peat soil (S1); sod-podzolic soil / sandy loam (S2); sod-podzolic soil / sand (S3); sod-podzolic soil / loamy sand (S4); sod-podzolic soil / sandy clay loam (S5). Such parameters as soil pH, soil organic matter expressed as content of humic substances, cation base saturation were determined as well as speciation analysis of soil samples was performed. Consequent extraction was done to obtain element distribution in five fractions: 1) fraction of water soluble compounds; 2) fraction of acid soluble compounds; 3) fraction of reduced forms of compounds; 4) fraction of organic compounds; 5) fraction of sulphide compounds. Ten elements (As, Cd, Co, Cu, Ni, Pb, Rb, Sr, V and Zn) were quantitatively detected in fractions. Fraction distribution of elements revealed differences among soil samples and behaviour of individual elements in soil.

Keywords: bioavailability, element speciation, soil analysis, metals and metalloids

HEAVY METALS IN THE LANDS OF EASTERN PART OF DRENASI REGION-REPUBLIC OF KOSOVO

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ABSTRACT

A study of soil composition is performed in an area of 10 km² in the southeastern part of Drenasi ranging region from Ferronickel Complex in the distance of 10 Km. The area is known for silicate minerals of nickel, therefore established the aforementioned Complex. Agricultural lands are the main source of food production for humans and animals, so land conservation from poisoning is necessity of time. Kosovo and as many developing countries have environmental problems. During this study we analyzed 20 soil samples taken at depths up to 30 cm of arable land and 20 samples of soil profile. Results indicate the concentrations of some heavy metals (Ni, Cr, Zn, Pb). The largest concentrations were observed near the Ferronickel Complex. Values are as follows: Ni (43.35 – 591.75 ppm), Pb (8.92 – 49.95 ppm) and Zn (28.26 – 62.73 ppm). All soil samples for the determination of heavy metals in Aqua Regia ICP are measured in the Laboratory "Agrovet" in Fushë Kosovë. The purpose of this paper is to determine the contents of heavy metals in soil.

Keywords: Heavy metals, Samples, Pollution, Drenas, Kosovo.

IMMOBILIZED HUMIC SUBSTANCES AS SORBENTS FOR TRACE ELEMENT REMOVAL

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ABSTRACT

Intensive studies have been made in the research of humic substances (HS), particularly owing to the diverse application capacity. While different commercial sorbents are available, there is still need for research to obtain products with a specific selectivity. Due to unique properties of humic substances, they are the main sorbent in soil for organic and inorganic chemicals, whereas HS appear to have the greatest capacity for sorption of trace elements in cationic form and sorption and complexation processes are the main binding mechanisms.

A main focus of this work is on the characterization of metal ion sorption onto humic substances immobilized onto differing polymeric matrixes. The potential of immobilized humic substances as sorbents for removal of trace elements, such as Zn, Cu, Ni, Pb, Fe, was studied. Four differing polymeric matrixes were selected for immobilization of humic substances. The results of sorption study demonstrated that humic substances have strong affinity for several chemical elements, e.g., Cu, Zn, Ni, Fe, Pb, forming relatively stable complexes.

Keywords: humic substances, immobilization, atomic absorption spectroscopy, trace and major elements, sorption

IMPACT OF SLUDGE ORIGINATED PCDDs/PCDFs ON SOIL CONTAMINATION AND *SALIX* SP. METABOLISM

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ABSTRACT

The use of sewage sludge as a fertilizer for energetic plants is a method for sludge utilization, which could generate double benefits: enhancement of bioenergy production and reduction of CO₂ emission, as compared to combustion methods. This kind of sewage sludge utilization enables also reduction of toxic substances concentrations by using natural soil-plant interactions (phytotechnology, rhizodegradation).

Despite many years of sewage sludge analyses which have proved that their contain a number of organic pollutants such as polychlorinated dibenzo-*p*-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs), there is no law regulation in Poland concerning their concentrations in soil after sludge application or there is no guideline for limits of the aforementioned compounds in sludge. Although, sewage sludge is commonly used as soil fertilizer for agricultural purpose, green energy production (usually as willow plantations) or for soil recultivation, and thus there is a need to identify the pathways of PCDDs/PCDFs transfer and translocation between the sewage sludge, soil and a plant. Our focus is to recognize the impact which these contaminants may exert on soil as well as on metabolism of willow (*Salix* sp.) as typical energy plant.

Keywords: PCDD/PCDF, sewage sludge, plant metabolism, *Salix* sp.

INFLUENCE OF SAPROPEL (GYTTJA) ON *TRIFOLIUM PRATENSE* SEEDS GERMINATION IN PRESENCE OF COPPER

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ABSTRACT

The terms “sapropel” or “gyttja” are used to describe bottom deposits of freshwater bodies rich in the organic matter (organic matter content exceed 15%) which are formed from the remains of water animals and vegetation mixed with mineral components. Sapropel has a fine disperse and plastic structure and it can be used in various fields such as agriculture, livestock farming, balneology, cosmetology etc.

Germination tests are used for determination of germination potential and quality of a selected seed lot. Several factors such as diseases, age of seeds, mechanical damage of seeds, excessive moisture or drought during storage can affect the behaviour of seeds germination. The rate of germination is very significant as it indicates field planting value of seeds. Detection of influencing factors and their intensity on seed germination is especially significant research due to its practical importance in agriculture and gardening. The aim of this study was to determine the influence of sapropel (gyttja) on the germination of *Trifolium pratense* (red clover) seeds in the presence of copper contamination.

Methodology of the study involved selection and preparation of *Trifolium pratense* seeds, selection of peaty sapropel obtained from Lake Pilvelis (Latvia) and preparation of germination tests. To assess the influence of sapropel on seeds germination half of seeds were germinated in water, while another part – in sapropel. In addition, to estimate the interaction of sapropel with metallic elements the study was done by adding copper in various Cu^{2+} target concentration (i.e., 0, 40, 70, 100, 130, 200, 400, 600, 800, 1000 mg/L) into water or sapropel. Seed germination was done by using “Phytotestkit” plates. Seeds were germinated in thermostat at the temperature 22°C for 7 days. Developed radicles, hypocotyls and shoots were measured.

Obtained results showed positive influence of sapropel on *Trifolium pratense* seeds germination and development as well as sapropel addition reduced negative effects caused by metal contamination on seeds endurance affirming potential use of sapropel as effective soil amendment.

Keywords: copper, germination, gyttja, sapropel, *Trifolium pratense*

INFLUENCE OF VEGETAL WASTE/PIG SLURRY RATIO ON THE QUALITY OF COMPOST

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ABSTRACT

Composting is a traditional and inexpensive method to convert organic waste into useful material (compost) that can be used as soil conditioner and organic fertilizer. The carbon/nitrogen ratio is an important quality parameter that is used to assess the rate of decomposition of compost mixture. Compost may be used as a soil amendment, when the values measured of C/N ratio varied between 5 and 17, depending on the type of raw material. During composting processes, the waste that contained the carbon and nitrogen are transformed through the activities of successive microbial populations into more stable complex organic forms namely humic substances and mineral compounds as salts of nitrogen (nitrate, nitrite, ammonia) and phosphorus (phosphates). Metabolic activity evolution is affected by the chemical composition of starting material, carbon/nitrogen ratio, moisture, temperature, pH, the turning frequency, the oxygen input and the particle size.

In this paper the influence of vegetal waste/pig slurry weight ratio on the quality of compost has been studied. Like vegetal waste were used the marc from fermented fruits (plum, apples and peaches) and sawdust from fir and beech wood. Moisture, temperature, pH values, volatile organic carbon, total organic carbon, Kjeldalh nitrogen and ash content were monitored for 63 days for characterization of the compost quality. The weight increase of either pig slurry or sawdust in the composting system involves the decrease of C/N ratio and the increase in the quality of mature compost.

Keywords: aerobic process, biodegradation, composting, vegetable waste

MITIGATION METHODS OF SOIL NUTRIENT LOSSES

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ABSTRACT

Soil nutrient losses are close related to the erosion phenomenon because large nutrient quantities are lost along with the solid material that is transported by erosion agents. These nutrient losses have a strong impact on soils and environment by: decreasing soils productivity because of soil humus depletion and nutrient pool of eroded soils, the warping of water accumulations, plant roots disruption or their covering by sediments that determine the decreasing of crops yields, surface waters and running waters pollution by eutrophication. In order to reduce the nutrient losses of farming origin, at European level there was initiated the COST Program, Action 86, entitled: „Mitigation options for nutrient reduction in surface waters and ground water”. For implementing this program in Romania we have performed researches at the Research Centre for Pastures Preajba, District Gorj that belongs to the University of Craiova, Romania; the main goal of these researches has been the identification of the best methods to mitigate the nutrient losses from farming land into surface waters and ground waters. The experimented methods for reducing nutrient losses have been:

- The using of organic-mineral fertilizers of L120 type;
- The using of buffer strips at the base of the slope;
- The using of some filtering material for runoff water.

There was experimented the organic-mineral fertilizer that has as a base the lignite coal and contains humic polymers, urea-aldehydic polymers and salt of sulphuric acid used for activate the coal. Within this fertilizer the nitrogen is linked as ions both as humates of ammonia or as amidic polymers as well as salt (sulphate or phosphate of ammonia), the phosphorus is present as phosphate of ammonia and the potassium, as ion form; therefore the nutrients are embedded, under different forms in an organic – mineral matrix that slows down and prolongs the hydrolysis, the ammonification and nitrification processes.

There were researched the quantity of lost phosphorus from L120 organic-fertilizer, in comparison with the superphosphate fertilizer at a rate of 81 kg P₂O₅/ha. This way, the quantity of lost phosphorus when superphosphate fertilizer has been added, has been of 0.31 kg/ha with sown pasture and of 0.51 kg/ha with sun flowers crop while after L120 organic-mineral fertilizer applying the lost phosphorus quantity has been of only 0.18 kg P₂O₅/ha with sown pasture and 0.32 kg P₂O₅/ha with sun flowers crop.

There have been set up buffer strips at the base of the slope along the creek Preajba, with the width of 10 m and composed of the following grasses species: *Agrostis capillaris*, *Festuca rubra*, *Cynosurus cristatus*, *Lolium perenne*, *Antoxanthum odoratum* and *Trifolium repens*. These buffer strips have contributed to the reduction of

humus and NPK losses from soil as follows: on the soil without buffer strips there was lost 684.5 m³/ha, 3.26 t/ha water and, within these quantities, 122.4 kg humus/ha, 3.25 kg nitrogen/ha, 0.44 kg P/ha and 0.69 kg K/ha; when buffer strips were put in place, with upward grasses plants, the losses are reduced by half, reaching 366.2 m³/ liquid runoffs, 1.14 t/ha eroded soil, 31.3 t/ha humus, 1.31 kg/ha nitrogen, 0.11 kg/ha P and 0.33 kg/ha K.

As filters for water from Balasan creek, there were tried, straw ballots, recording the concentration of nutrients of water before and after this kind of filter, after one hour, 6 hours, 24 hours and 48 hours. The decreasing of the concentration in nutrient of water was more obvious after 24 and 48 hours, when this concentration reached normal limits, of 2.77 mg N(NO₃) per liter, 0.016 mg N(NO₂) per liter, 1.2 mg total Nitrogen per liter, 0.04 P(PO₄) per liter and 3.7 mg K per liter.

Keywords: mitigation, soil, nutrient, minerals, losses

NITROGEN OPTIMIZATION FOR BLUEBERRY CULTIVATION

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ABSTRACT

Highbush blueberries (*Vaccinium corymbosum* L.) are becoming more and more popular in Latvia and area of commercial plantations is increasing annually accounting 220 hectares in 2012. One of the points of interest is balanced fertilisation to match the crops' need for development of good stand, as well as to secure the high yield potential with relevant quality characteristics and storage properties. Similar to other horticultural crops, nitrogen management is quite complicated due to its mobility, transformations, effect on plant winter resistance, vegetative growth, berry storage properties, taste etc. As blueberries prefer the acid growth medium, some differences might be relevant for choice of nitrogen form – ammonium or nitrate. The nitrogen management for blueberries was chosen as a main topic for experiment set up in Varmiera district in 2012 where plantation was established 4 years ago. Experimental plots with blueberry cultivar 'Chippewa' were arranged on gently slope. Original topsoil's reaction was pH KCl – 6.26, organic matter content 30 g kg⁻¹. Five experimental plots each of them consisting from 8 bushes was set up. Soil reaction was determined potentiometrically, organic matter in mineral soil according to the Tyurin's method, in organic materials – by dry combustion, total nitrogen using Kjeldahl method, but mineral nitrogen (N–NO₃ and N–NH₄) – spectrophotometrically. Samples of leaves from each experimental plot were taken during the vegetation for NPK nutrition diagnosis. Research showed that nitrogen fertiliser applications significantly affected ammonium and nitrate ion concentration in soil (0 – 60 cm). Sphagnum peat (pH KCl 3.0) as a soil modifier allowed efficiently reduce the soil reaction at the root zone and provided an optimal environment for blueberries as well as increased organic matter content in the soil. Interactions of nitrogen applications and peat mineralization also was studied as well as nitrogen immobilization in the root zone

Keywords: fertilisation, nitrogen forms, blueberry cultivation, soil properties.

**PEDOLOGICAL ASPECTS OF LARGE HYDROLOGICAL RESTORATION
OF FORMER OPEN PIT MINE LEZAKY/MOST – NEW RESULTS OF
RESEARCH**

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ABSTRACT

The article briefly summarises the evaluation of pedological situation of the Most Lake coast and slopes. The main attention is devoted to new results of the research achieved in 2013 – 2014. The main targets of the research were the finishing of geological and pedological mapping of the Most lake area, the realization of periodical sampling from nine research pits and determination of the content of risk trace elements in the small phytotoxic areas.

Keywords: hydrological restoration, soil properties, risk trace elements

**POLYCHLORINATED BIPHENYLSREMOVAL. EVALUATION
OF PYROLYSIS EFFECTS ON SOIL FERTILITY**

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ABSTRACT

Polychlorinated biphenyls (PCBs) have been produced for a wide array of applications for more than fifty years and have been exported as chemicals and in products to virtually every country in the world. Despite a ban on production since the 1970s, PCBs constitute a major class of persistent environmental contaminants. PCBs can be found in contaminated soils and the disposal is a global problem. The most frequent remediation solution adopted to PCBs contaminated soils are excavation for incineration or disposal to the landfill.

This study was aimed to evaluate the feasibility of the decontamination of the soils with PCBs using pyrolysis technology.

Soil samples subjected to this procedure showed that the concentration of total PCBs decreases with increasing temperature and pyrolysis time. Increasing the processing temperature with 100°C is revealed an increase in the efficiency of pyrolysis with 13% when exposed for 30 minutes and with 14% for an exposure of 60 minutes.

In the ash from the pyrolysis process was planted peas. Note that in the soil treated at 300°C for 60 minutes, the organic matter was not completely destroyed in the process, as evidenced by the emergence and favourable evolution of the peas. In the soil treated at 400°C for 60 minutes, a low amount of organic matter was found.

Keywords: PCBs, remediation, pyrolysis, soil

PREDICTION OF SOIL WATER RETENTION PROPERTIES BY USING ARYA-PARIS MODEL

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ABSTRACT

The soil water retention curve or the soil water content-matric potential relationship expresses the capacity of soils to store water for plant growth, which is a very important soil property for irrigation and hydrological modelling. Due to relatively long time involved in the determination of water retention curves, there is an increasing interest for models that estimate this property from simple taxonomic data (soil particle size distribution, bulk density, organic matter and other basic properties). Among these models is the Arya-Paris approach, which is based on the similarity between the shapes of particle size distribution and soil water retention curves. In this paper the model of Arya-Paris was used for assessing the water retention curve using soil texture and bulk density data. Arya-Paris model with α values calculated was applied to evaluate pairs of θ (soil water content) - ψ (matric potential). The van Genuchten equation was then used to estimate the water retention curve in the analyzed soils. Two soil types (Rendzic Leptosol and Calcaro-calcic Kastanozem) located in the Dobrogea area from SE of Romania were analyzed. Parameters of the van Genuchten equation, θ_r , θ_s , α , n were evaluated using the pairs of values θ - ψ calculated by Arya-Paris model. Van Genuchten equation was then used to assess some parameters that have agronomical significance. Optimum soil water content and soil matric potential for soil workability correspond to the inflection point of the soil water retention curve. Depending on the characteristics of the soil water retention curve at the inflection point the soil physical quality index, S was calculated.

Keywords: Arya-Paris model, water retention curve, van Genuchten equation

**PUBLIC RISK IN EXPLOITING AN AGRICULTURAL SOIL
CONTAMINATED WITH THE TETANIC BACILLUS**

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ABSTRACT

In the past few decades, environment support campaigns have become more and more frequent and significant. It is a paradox that the most coherent environmental policies have come from those states that through the centuries have ignored natural values to the benefit of economic development. These states have gradually learnt that economic power means nothing as long as people do not live in an adequate living environment, able to provide primary resources and harmonious social development.

In a nutshell, it means durable development, promoting the right balance between the economy, environment and society, making sure that the next generations will benefit from at least the same resources and living standard as developed societies.

Starting from this premise, environmental initiatives mainly focus on issues like soil pollution caused by farmyard manure infected with the *Clostridium tetani* bacterium. The bacterium causing tetanus, *Clostridium tetani*, is normally found in the animals' intestines and can pass into the manure. When the conditions are favourable, the bacterial culture grows and may survive indefinitely. The risks are high in rural areas, where poverty and the primitive agricultural methods play a major part.

Keywords: soil, risk, tetanus, agriculture

RESEARCH ON EFFECT OF VEGETATION USE ON SOIL EROSION AND CONSERVATION IN THE HILLY AGROECOSYSTEMS IN ROMANIA

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ABSTRACT

As it is known, a good status of land cover has an important role in reducing of runoffs and soil losses in the torrential agricultural watersheds. A good vegetation cover reduces the erosive power of impacting raindrops and thus splash erosion, furthermore it reduces the volume of water reaching the soil surface. The effectiveness of land cover in reducing soil erosion depends upon the plants' density, height and continuity of the canopy. In Romania, soil erosion represents a big problem for the hilly agricultural lands, especially in the last period of time and mainly after the finalization of land restitution process. The paper presents some of the results of a study carried out at the Agronomic University's Aldeni/Buzau Research Station on Soil Erosion, concerning soil losses under different crops and pedo-climate conditions. Based on the longtime field measurements conducted on the runoff plots, in the period 1992-2012, the role of the vegetation and crop factor were checked and some strong correlations were established between the soil loss on different slope steepness and the erosive factor.

Keywords: soil erosion, soil loss, runoff plots, vegetation, erosive factor

RESTORATION OF SOIL QUALITY AFTER OIL POLLUTION

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ABSTRACT

In this study, the self-restoration and remediation of oily polluted soil was investigated, Microbial parameters were used as indicators of the processes. The amount of oil that was used for artificial contamination of soil was 20 g kg⁻¹. We analyzed total petroleum hydrocarbon (TPH) content and dynamics of microbial activities in polluted soil, polluted dugged-up soil, control soil in the layers 0-20, 20-40, 40-60 cm after 3 and 36 months after pollution. It was shown that oil mainly remains in the upper layer and does not migrate significantly along soil profile. The digging-up permitted the intensify the natural process of oil destruction (up to 42%). Changes in TPH content influenced the concentrations of organic carbon in the soil - they increased in 3.3-3.9 times in the upper layer of soil after 3 months since contamination in comparison to control. The level of microbial biomass in the control samples ranged from 172 to 201 mg Cmic g⁻¹ in the upper soil layers, and decreased with depth. The maximum level of this parameter (807 mg Cmic g⁻¹) was observed in the upper layer of non-dugged polluted soil after 3 months of contamination. Soil respiration activity values ranged from 94 to 100 mg CO₂-C g⁻¹ 24h⁻¹. The positive correlation (R=0.86) between basal respiration and microbial biomass was found in control samples but not in polluted samples. Oil pollution did not influence significantly the cellulase activity of the soil which was more determined by depth but not TPH concentration or presence/absence of pollution. In opposite, urease activity was highly dependent on oil pollution - in all polluted samples it was 3-383 times lower than in the corresponding control.

Keywords: soil restoration, microbial biomass, microbial enzyme activity, microbial respiration, oil pollution

SOIL WATER CONSERVATION – A MEASURE AGAINST DESERTIFICATION

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ABSTRACT

Today in Romania about 7 mil. ha are affected by drought as a limiting factor for crops. A modern method possibly to be used at farm level in drought conditions is to incorporate superabsorbent materials in soils. These materials have the property to retain water, to further release it in conditions of water scarcity or precipitation lack over a longer interval, especially during the growing season of cultivated crops. The superabsorbent tested in this study is made of maize starch, is structurally made up of solid granules, is biodegradable and non-toxic and have the capacity to retain 500 times more water than their mass. The experimental sites were located in private farms in Pecica, Arad, in fields with oat, onion and water melon crops and consisted of variants in which two doses of superabsorbent were applied (6 Kg/ha and 12 Kg/ha) and a control variant. The volume of soil water at rooting depth that is readily available to plants has a very important role in increasing plant productivity and was measured by determining the soil water retention capacity. Water retention measurements were done on undisturbed soil samples at three depths (5-10 cm, 15-20 cm, 25-30 cm) using laboratory standardized equipments. Measured values of soil moisture are used for calculating the van Genuchten equation parameters and then soil water retention curves were estimated. Study results showed that mobility and availability of water are higher in treated variants than in the control one as a result of superabsorbent application in top-soil layers. Highest values of plant available water were recorded in variant where 12 kg of superabsorbent was applied in oat and onion fields at 15 – 20 cm depth, whereas in water melon field the highest value for available water was determined in variant with 12 kg of superabsorbent at 5 – 10 cm depth. Also it was noticed that in oat field in the variant with 12 kg of Zeba applied, at 15-20 cm depth, in onion field in variant with 12 kg of superabsorbent, at 5-10 cm and 15-20 cm depths and in water melon field in variant with 12 kg of superabsorbent, at 5-10 cm and 25-30 cm depths, the water is strongly retained in soil at lower levels of suction, whereas at pF values higher than 2.5 the water retained in soil starts to be slowly released during the drought periods, when there is no any water supply.

Keywords: superabsorbent material, soil water retention curve, plant available water

THE BIOLOGICAL ACTIVITY OF SOIL ECOSYSTEMS IN THE LOCALITY OF DRY POLDER BESA

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ABSTRACT

The activity of enzymes is necessary for the operation of all bio-transformation in the soil, and therefore the enzyme activity used as a sensitive indicator of biological activity of the soil. The quantity of factors influence the activity of soil enzymes therefore it is necessary measured values given in relation to the physical, chemical and biological characteristics of the soil. In the years 2012 - 2013 in the locality of the dry polder Besa the biological activity of soils were observed and evaluated by the selected biological and physical characteristics. Soil samples for determination the selected properties were taken from depth of 0.0 - 0.6 m at 0.2 m from four profiles. From the biological properties of the activity of urease, acid and alkaline phosphatase were investigated. Experimental data were evaluated by statistical methods. Values of activity urease ranged from 0.02 to 0.46 mg [NH₄ ± N g⁻¹ 24 h⁻¹]. Values of activity acid phosphatase from 26.32 to 115.19 [µg P g⁻¹ 3 h⁻¹], values activity of alkaline phosphatase ranged from 10.53 to 82.27 [µg P g⁻¹ 3 h⁻¹]. Statistical testing, we found the correlation dependence between phosphatases and physical properties and phosphatases each other, except for the content of grains I. cat., the soil urease we didn't find a statistically significant correlation in relation to the selected parameters.

Keywords: enzyme of soil, physical properties, arable land, permanent grassland

THE MEASUREMENT OF SOIL-STRUCTURE INTERACTION OF BURIED STRUCTURE DURING CONSTRUCTION

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ABSTRACT

This paper presents arrangement and results of continuous monitoring of soil-structure interaction of a reinforced concrete (RC) buried arch bridge near Tábor, Czech Republic. The bridge was equipped by earth pressure measurement gauges and deflection measurement strings. The measurements were performed continuously for 8 days in fall 2013 during the entire construction process. The deflections were recorded during the entire fill placement and compaction process from the level of the foot drainage up to the level of the rail including compaction of the ballast. After the compacting of the fill was finished, the structure was loaded by static probe vehicle loading. For this purpose, a 74 ton locomotive was placed in several positions. The experimental showed interesting results in means of impact of the real site compaction conditions on the deflections and earth pressures a buried arch structure. Especially the compaction of the ballast, as the final stage of construction showed its decisive role for design of the structure.

Keywords: Buried structure, earth pressure, construction stages.

THE POTENTIAL WATER EROSION HAZARD ANALYSIS: THE KIELCE CASE STUDY

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ABSTRACT

The environment of the contemporary, fast-growing, cities is exposed to numerous risks related to progressive urban development, extension of engineering infrastructure and transportation, growth of services and industry as a result of which the greater and greater anthropogenic impact upon the environment takes place. A frequent phenomenon accompanying the spontaneously implemented changes is degradation of cities' spatial structure that leads to irreversible changes in their functioning. The research on cities' natural threats, including potential water erosion have been conducted for many years. In case of superficial extension of built-up areas in the cities, including their outskirts, more and more often they happen to invade onto the areas being at risk of water erosion. Water erosion of soil is a natural process and its intensity is determined, among other things, by some anthropogenic factors such as the uncontrolled urban development, inappropriate implementation of infrastructure.

The City of Kielce, due to its location within the Świętokrzyskie Mountains and its dynamic growth, is exposed to water erosion risk to a large extent. Having used the data gathered in the Spatial Information System for the City of Kielce, a soil and gradient map within the City was elaborated and further compared to a area coverage map as a result of which a potential water erosion risk map was generated. The analysis was performed with the use of the ArcGis software. The final part of this paper deals with the analysis of City's urban development documents in respect of the arrangements related to erosion risks and methods of its prevention, land development trends for areas at risk by efficient development of urbanized land as well as protection of open ground.

Keywords: Kielce, water erosion, hazard of soils with erosion, land development

THEORETICAL MODEL OF DESERTIFICATION PROCESS

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ABSTRACT

In the given article the attempt of desertification process' particular theoretical model design is considered, in which main physical mechanism – soil' active layer drying off and its step by step structural changes, is presented.

The abovementioned process is reflected in soil physical parameters (density, specific heat capacity, transfer soil heat conductivity coefficient) which in case of desertification become dependent upon the temperature, however heat transfer mechanism in the soil gets a non-linear nature, as a result of which strong heat accumulation and growth of temperature in time are observed in the active soil layer. Indicated process, representing the "Greenhouse Effect", continues until arid soil structure gets quite a new appearance, with new physical parameters. By this way it is possible to get the analytical solution of non-linear heat conductivity' equation, characterizing the desertification process.

Keywords: “Greenhouse Effect”, desertification, soil conductivity.

USE OF NEW AMENDMENTS IN AGRICULTURE FOR SOIL ACIDITY NEUTRALIZATION

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ABSTRACT

Research was carried out in order to exploit new materials for improving agricultural soil acidity and the effect of slag from steel refinery on some chromic luvisol chemical properties.

In Romania annually are produced from 0.18 to 0.2 million tones ladle slag (LF slag) from steel refinery, classified as a dangerous waste due to its alkalinity. It contains high percents of calcium oxide and from this reason we think to be appropriate to be used instead of lime in treatment of acid soils. For improving the reaction of chromic luvisol from the experimental field located at Moara Domnească a metallurgical waste from the Galați steel refinery was used as amendment. The experimental field consisted of five variants, in three replicates V₁ (control), V₂ (1 t/ha), V₃ (2 t/ha), V₄ (3 t/ha) and V₅ (5 t/ha). The biological material used was maize hybrid LG 30.489.

Keywords: slag, soil acidity, amendment

USING VNIR-DRS TO ASSESS SOIL DEGRADATION DUE TO EROSION

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ABSTRACT

Large numbers of soil samples must be collected and analyzed when mapping soil degradation due to erosion. The reflective spectroscopy in the visible and near infrared part of electromagnetic spectrum (VNIR DRS spectroscopy) is a low-cost indirect method, which may be used to gain information about soil properties more effectively. The method for assessing soil degradation using soil spectra proposed and tested in this study was based on estimating oxidable organic carbon content, carbonate content, and contents of different forms of iron and manganese (Mehlich III extract, ammonium oxalate extract and dithionite–citrate extract). Study was performed in Brumovice. Tested soil types were Haplic Chernozem, Colluvic Chernozem, Colluvial soils and Regosol. Samples were taken from the topsoil within the regular grid covering the studied area. The soil spectra curves (of air dry soil and sieved using 0.2 mm sieve) were measured in the laboratory using the spectrometer FieldSpec®3 (350 – 2 500 nm). Partial least squares regression (PLSR) was used for modeling of the relationships between spectra and measured soil properties.

The results showed the best prediction for carbonate content ($R^2 = 0.87$). The worse predictions were obtained for oxidable organic carbon content ($R^2 = 0.78$), and contents of Mn in ammonium oxalate extract ($R^2 = 0.78$), Mn in dithionite–citrate extract ($R^2 = 0.72$), Fe in ammonium oxalate extract ($R^2 = 0.70$), Fe in dithionite–citrate extract ($R^2 = 0.57$), Mn in Mehlich III extract ($R^2 = 0.31$) and content of Fe in Mehlich III extract ($R^2 = 0.20$). In general, the results confirmed that the measurement of soil spectral characteristics is a promising technology for digital soil mapping and predicting soil degradation due to erosion processes.

Keywords: VNIR diffuse reflectance spectroscopy, iron and manganese forms, soil organic carbon, partial least squares regression, digital soil mapping

**VERTICAL AND HORIZONTAL STRESSES DUE TO COMPACTION OF
BACKFILL AND ITS INFLUENCE ON BEHAVIOR OF BURIED
STRUCTURES**

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ABSTRACT

Together with development of bridge structures interacting with backfill material (integrated and buried bridges), the importance of determining the actual behavior of compacted backfill of the bridge structure gains importance. The properties of the backfill material and its compaction play a critical role. This article deals with the experimental determination of the maximum vertical/horizontal stress due to compaction and its influence on the behavior of backfill of the buried structure, or its horizontal stiffness.

Keywords: Backfill of structure, compaction, horizontal stiffness, behavior of buried structure, earth pressure.