Statistical and Hydrogeochemical Comparison of Groundwater Quality of Western and Eastern Plains of Kurdistan Province

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Abstract

This study aims to compare the water quality of Ghorveh plain (one of the main centers of potato production) and Marivan plain (one of the main centers of tobacco production) in the east and west of Kurdistan province, respectively. Total anions, total cations, chlorine, sulfate, bicarbonate, potassium, calcium, magnesium, sodium ions and sodium absorption ratio, alkalinity, total hardness, total dissolved solids and electrical conductivity data of groundwater in both plains were compared in between 1998 to 2016 by drawing water quality diagrams, calculation of indices, determination of different ionic ratios and groundwater quality mapping using GIS. To illustrate the distribution of data, chi-square test at 95% confidence and to compare the variables, independent t-test at the confidence level of 99% were used. The results showed that in both Ghorveh and Marivan plains, the order of concentrations of cations (from high to low) was calcium, magnesium, sodium and potassium, and the order of anions concentrations (from high to low) was bicarbonate, sulfate and chlorine. Based on the results, there is not any significant difference between the mean values of bicarbonate, potassium, calcium, alkalinity, total hardness and CO_2 saturation index in groundwater of Marivan and Qorveh plains. The mean values of other studied variables, ion ratios and indices were significantly different at the 99% confidence level.

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Removal of Copper and Zinc from Aqueous Solution by using Nanostructured Absorber *Phragmites australis*

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Abstract

The aim of this study was to determine the effectiveness of *Phragmites australis* nanostructured for removal of zinc and copper ions from aqueous solutions. Nanostructured *Phragmites australis* was prepared for this purpose and the effects of factors such as pH, contact time, initial concentration and adsorbent dosage on the removal of copper and zinc were studied in a batch system. To determine the absorption characteristics of the experiments SEM, PSA and FTIR were used. The SEM of nano-adsorbents showed that %18.5 of the product was nanoparticle and the rest was in the range of nanostructured particles. The results showed that the optimum pH value for both metals was 6, the best contact time was 90 min, and the favorable initial concentration and adsorbent dosage were 10 ppm and 0.5 g, respectively. The Langmuir isotherm model for both zinc and copper ions with maximum R^2 (0.98 and 0.99, respectively) and lowest RMSE (0.11 and 0.04, respectively) correlated with the data. The kinetic model fitted the model Hoo for both zinc and copper ions with maximum R^2 (0.99 and 0.98, respectively) and lowest RMSE (0.04 and 0.07, respectively). Zinc and copper desorption during 3 cycles showed that the highest desorption efficiency occurred in the first cycle (%72 and %75, respectively).

Key words: Nanotechnology, Kinetic, Isotherm, Zinc, Copper, Aqua solution.

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Phylogeny and Genetic Diversity of Wild Goat, *Capraaegagrus* (Erxleben, 1777) in Mazandaran Province based on D-loop Region of mt-DNA

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Abstract

Wild goat (*Capra aegagrus*), as an important and indicator species of mountainous regions of Iran has been confronted population decline in recent years. As a result, its conservation status was classified as "Vulnerable" species. In present study, the phylogenetics relationships and genetic diversity of bezoar, based on polymorphism of D-loop region of mt-DNA, have been investigated in three different habitats of Mazandaran Province; Kamarbon, Bandbon and Baladeh protected areas. The obtained phylogenetics trees showed seven discrete clades and studied individuals of the present study have the common ancestor and minimum two different origins for Mazandaran's Wild goats. Using Fst/1-Fst distance genetics matrix, the obtained NJ phylogeographic tree showed the relationships between genetics and geography in three studied habitats and also with neighbor geographic areas. The results of genetic indicators such as Fu's Fs and Tajima's D showed the mutation-genetic drift equilibrium in studied populations. On the other hand, regarding SSD and r factors in Mismatch distribution analysis, the match of expected and observed amounts showed the normality and expansion of the studied populations. The Analysis of Molecular Variation (AMOVA), regarding each haplogroup as one population showed significant genetic differences between different clades of different haplogroups. Also, the high value of F_{st} indicator represents the significant genetic differentiation of different clades of wild goats.

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Isotherm and Thermodynamic Studies of Phenol Removal by Molecular Sieve MCM-48

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Abstract

Some water and wastewater pollutants cannot be eliminated with traditional treatment methods. This has encouraged researchers to focus on high performance and environmentally friendly methods for their removal. The main objective of this study was to evaluate the performance of MCM-48 in phenol removal from water. MCM-48 was synthesized and the effects of effective parameters were evaluated. The results showed that maximum absorption of phenol in optimal conditions of 0.3g adsorbent, time equals 30 minutes, pH =6, initial concentration of 2.5 mg L^{-1} at a temperature of 298 K and constant engine speed of 300 rpm is at about 88 percent. The thermodynamic parameters showed that the adsorption process is spontaneous and exothermic. The Langmiur model fitted well the experimental data with a maximum adsorption capacity of 38.02.

Keywords: Molecular sieve MCM-48, Phenol, Water pollutants.

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Comparative Study of the Effects of Lignocellulose Nano-fibers (LCNFs) and Chitin Nano-fibers (CNFs) as Natural Biopolymers on Removal of Lead Ion from Aqueous Solutions

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Abstract

Adsorption to the biological polymers (LCNFs and CNFs) is a novel environmentally friendly technology for reducing and removing heavy metals from industrial wastewater. The goal of this study was to investigate and compare the performance of LCNFs and CNFs adsorbents in the removal of lead from aqueous solutions in a discontinuous system. The test conditions are considered completely identical for the two adsorbents. Infrared spectrometer (FT-IR) and transient electron microscopy (TEM) were used to identify the physical, chemical and structural characteristics of LCNFs and CNFs adsorbents. In the discontinuous system, pH (4-9), absorption dose (0.1-1 g L^{-1}), contact time (15-120 min)., lead initial concentration (10-50 mg L^{-1}) and temperature (15-40°C) were studied. The results were analyzed by one-way ANOVA and Duncan's tests for significant evaluation of changes in parameters. Results showed that the highest percentage of removal of lead (98.45%.) for LCNFs obtained at 25 °C, pH 6, 60 min., absorbent dose of 0.3 g L^{-1} and lead concentration of 10 mg L^{-1}. The LCNFs and CNFs adsorbents are considered as optimal absorbers for removal of lead from aqueous solutions.

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Ecological Factors Influencing Distribution of Endangered Species (*Anagyris foetida* L.) in Gilan-e-Gharb Region

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Abstract

In order to determine the most important ecological factors affecting distribution of *Anagyris foetida*, 12 research areas in the Gilan-e-Gharb of Kermanshah province were selected. Sampling of vegetation of each treatment was performed using random- systematic sampling in 20×20 square-meter plot. A plot of 1×1 m square was applied for understory sampling. Soil samples were collected at a depth of 50 cm in each plot at the foot of the plant and between the plants. Soil physical and chemical properties such as clay, silt, sand, gypsum, lime, electrical conductivity, pH, phosphorus, calcium, magnesium, percentage of stones and pebbles, nitrogen, carbon and potassium were measured. In order to determine the effect of environmental factors on the density and volume of *Anagyris foetida* covers, the multivariate regression was used. The analysis of variance demonstrated that the factors of slop, pH, magnesium, potasium, nitrogen, clay, sand, canopy, density and size of the habitat have significant differences at the level of 1% .Regression analysis also showed that 89 percent of the variation in *Anagyris foetida* could be justified by nitrogen and slope for the density of the canopy.

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Estimating the Ecotourism Value of Taq-e Bostan Kermanshah by Factors of Willingness to Pay

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Abstract

Development of economic activities, population growth, increased life business and higher levels of living standards have increased the demands for natural environment and the needs for cultural and tourism. Taq-e Bostan Complex is one of the unique monuments of Iran and the world. This historic complex of Kermanshah province is one of the attractions that host a large number of domestic and foreign tourists every year. Therefore, the study of eco-tourist values is necessary in predicting needs, eliminating deficiencies and developing tourism in the area. Data needed for calculation of willingness to pay and the value of the historical complex was collected in 2014, through questionnaires and interviews with 1047 visitors. The results showed that gender of visitors did not show significant relationship with the willingness to pay, while age, education, cost of transportation, household size, household income, number of visits, travel time and vehicle type (personal or public) are the factors affecting willingness to pay. The average willingness to pay for each visitor was 45850 Iranian Rials per visit.

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Air Pollution (PM$_{10}$) Estimation using Weather Data (Case Study: Ahvaz City)

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Abstract

The amount of dust and other air pollutants have increased during recent years. The PM$_{10}$ is one of the most important variables that is used for monitoring and assessment of dust pollution. To predict PM$_{10}$, different studies have used various statistical methods. In this study, two aims were pursuit: 1) Application of Spearman analysis to determine the relation between PM$_{10}$ and weather variables such as temperature (maximum, average, minimum), relative humidity (maximum, average, minimum), rainfall, wind (speed and direction), and visibility, and 2) Prediction of PM$_{10}$ by Random Forest model on daily data (2008 to 2011). The results of Spearman analysis showed that PM$_{10}$ had very high relationship with visibility and minimum temperature and lower relationships with rain, -0.376, +349, and -0.077, respectively. In addition, Random Forest analysis showed that for the prediction of PM$_{10}$, visibility and minimum temperature were very important. Fitting curve between observed and prediction data showed a medium correlation with Y=0.1686x +183.49 and R2=0.47, sig=0.99. Final sequence of trees of random forest illustrated that from all data, just maximum and minimum of relative humidity and minimum of temperature had high resolutions with 396 (<0.205 %), 389(<0.305 %), and 387 (<5.5 ^{o}C) data for each variable, respectively.

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The Study on the Level of Pollution and Spatial Distribution of Concentrations of Heavy Metals (Cr, Ni, Cu, Pb and Zn) in the Industrial City of Mah-Shahr

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Abstract

Due to their toxicity and persistence in the environment heavy metals are among the most significant soil contaminants. Therefore, it is essential to investigate the distribution of heavy metals for controlling contamination of soil and maintaining the quality of the environment. This study aimed to assess the level of contamination and mapping the spatial patterns of heavy metals i.e. chromium, nickel, copper, lead and zinc in topsoil of Mahshahr in 2016. For this purpose, 51 surface soil samples (0-20 cm) were systematically collected and their metal concentrations were measured by XRF. Also, soil EC, pH, lime and soil texture were determined. Pollution index (PI), and Nemerow integrated pollution index (NIPI) were used to determine the soil contamination level. Concentration Distribution maps of heavy metals were prepared using the interpolation method in geographic information system (GIS). Principal component analysis (PCA) was performed to investigate the relationship between metals. The results indicated the highest PI of chrome and nickel which are in high contamination level. Many urban soils in Mahshahr have been contaminated with a sort of low or moderate levels of lead, zinc and copper. NIPI showed that all parts are in high pollution levels. The results of principal component analysis indicated that copper, lead, and zinc were placed under the same category revealed to be of man-made and common origins. Chromium and nickel have been placed in a separate category and the quantity of pollution index of these metals with high variable coefficient was determined to be of anthropogenic origin.

Keywords: Spatial distribution, Heavy metal pollution index, Nemerow index, Mah-Shahr.

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Studying the Effects of Pb Contamination on ADHD Occurrence in Primary School Students in Tehran

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Abstract

Increasing human population growth along with the urbanization and industrialization of societies has caused disadvantages such as increasing environmental pollutants. Among these pollutants are heavy metals such as lead, which have numerous effects on humans, especially children and the elderly, which have been reported in numerous studies. Due to the fact that lead is one of the metals that affect the nervous system, numerous studies have been conducted on the psychological effects of this metal, especially in children. In this study, the concentration of this metal in the nails of normal children and children with ADHD syndrome was compared. After completing the questionnaires, 30 children with ADHD syndrome and 30 normal children regardless of gender were selected. Nail samples were prepared from these children and after acid digestion; the concentration of metals was measured by atomic absorption. The results showed that the mean concentration of lead in children's nails was 23.6±3.5 μg / g. According to the results, with an increase in the concentration of lead in the nail, ADHD syndrome was increased in children. Therefore, lead can be one of the factors involved in the occurrence of ADHD and the necessary measures in this regard must be taken.

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