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Rapid UV–Vis screening of phenolic compounds in surface waters and comparison with confirmatory hplc-pda analysis

ABSTRACT

The aim of this study was to investigate the occurrence of phenolic compounds in surface water samples from the main rivers in the Tirana area and to evaluate a rapid UV–Vis spectrophotometric approach as a screening technique. Phenolic compounds are recognized environmental pollutants originating from both natural and anthropogenic sources. The absorption spectrum of phenol was recorded and the wavelength of maximum absorbance (270.1 nm) was selected for spectrophotometric measurements. Method performance was evaluated in terms of linearity, repeatability, reproducibility and recovery following ISO 17025 recommendations. Because several organic substances present in natural waters may also absorb in the 250–280 nm region, the UV–Vis technique was applied as a rapid screening method for UV-absorbing aromatic compounds potentially related to phenolic substances. To evaluate selectivity, selected samples were additionally analyzed using a High-Performance Liquid Chromatography system with photodiode array detection (HPLC-PDA) after pressurized solvent extraction (PSE). Comparison between the two techniques showed that UV–Vis results were generally 1.5–2 times higher than HPLC values, indicating the contribution of other UV-absorbing organic compounds present in the river water matrix. The results show that the studied rivers are influenced by urban and anthropogenic activities and contain detectable levels of aromatic organic compounds. The UV–Vis method can be used as a rapid and inexpensive screening tool, while confirmatory analysis with more selective techniques such as HPLC is recommended for accurate phenol determination.

***Keywords**: Phenol, UV-VIS technique, Water analysis, Water quality, Method building/evaluation*

INTRODUCTION

Phenol and their derivatives are common pollutants of the environment and living organisms [1]. Their presence could be because of human activity, result of complicated bio-mechanism in plants/living things (including humans), fungi and decomposition of organic matter [2]. However, the industrialization of economy create new ways for high levels of phenol in the ecosystems [3]. Synthesis of dyes, polymers (especially resin) and different other organic substances, coal tar, activity of pharmaceutical and petrol industries, drainage of municipal and industrial sewages[4], as well as synthesis and degradation of several pesticides, like phenoxy herbicides, are some of the studied sources of phenol and its derivatives in environment (especially in water ecosystems). Phenols usually act as eco-toxins [5].Toxicity of phenols based on formation of free radicals and very reactive specieswith oxygen [6]. Also, their hemotoxic effect can be carcinoma andmutagenesis toward living organism, including humans [7]. The high levelsof phenol in the environment by natural/anthropogenic factors, as well as accidental pollution (pipeline leaks, transport accidents, etc.), is an important encouragement for the determination of the phenol concentrationsin soil and water [8, 9]. By knowing phenol levels in an ecosystem, this can help in reducing of possible intoxication risks, as well as enable to react more accordingly to the problem.

Phenol and its derivates are usually acquired on an industrial scale from coal tar and/or by transformation of cumene (isopropyl benzene),

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which is present in plants that are used for tar [10]. It can also be synthesized from chlorobenzene. It is often used in industry, mostly in chemical production, like pesticides, dyes and textile production, as well as explosives [1]. Considering its high toxicity, which even in small quantities can cause toxic effect and foul odor in water, it has been viewed as priority pollutant in EPA list of USAs. At the same time, most countries allow less than 1 mg/l of phenol in their effluent streams [10].Generally, natural waters are estimated to contain around 0.01 – 2.0 µg/l of phenol [1], and in unpolluted water their concentration is often fewer than 0.02 mg/l[4]. However, it is important to consider phenol degradation, and the fact that its concentrationcan differ slowly or rapidlyon water ecosystems depending on the sources (natural and/or anthropogenic sources). For example, Netherlands surface water has the concentration of phenol between 2.6-5.6 µg/l, but in the waterof the river, which is polluted by petrol processing plants sewage, has the concentration of phenol around 40 mg/l [1]. In China in 2006 Ministry of Public Health has declared in the standards for drinking water for maximum phenol concentration to be 2 ppm [7]. High concentration of phenol is also common near wood impregnated factories and can reach values of 9.7 µg/m3 [1].

At the same time, toxic effect aquatic organisms, such as fish, can be seen at concentrations of 0.01 mg/l and above [11]. Note that, the phenols concentration as low as 5 µg/l can change the taste of drinking water[12]. The presence of phenol in the environment also led to its occurrence in food. Around 5 µg/kg of phenol was found in honey and coffee, as well as 7 and 28.6 µg/kg in grilled sausage and pork, and alarming 37-70 mg/kg in outer layer of smoked meat. Exposure to 10-240 mg/day phenol per person may result in such symptoms as burning pain in mouth, mouth sores, dark urine, and diarrhea [1, 13 - 15]. Phenol can also further impact the CentralNervous System and damage kidney and liver functions [8]. At the same time the removal of phenol from different systems, such as drinking water, proved to be challenging. Even though some techniques, like biodegradation, with several suitable microorganisms discovered, seem promising, there is only a few data about cleaning drinking water from phenol by bio-filters [7]. They are also not always suitable for the environment, from which phenol needs to be removed. In high level, and the mechanism of phenols degradation at low concentration is still not completely understood. Enzymatic approach was also been tried for several years, with its own advantages compared to the conventional methods, however, large amounts of enzymes are needed, in order for it to work, which may often be too costly [15 – 18].

Unfortunately, in Albania there is a lack of data regarding the levels of phenol in the environment and also the discharge of urban waste into rivers and other aquatic ecosystems without treatment is a possibility for their high presence in water. The main part of industries (oil extraction and processing industry, mine, mechanical, etc.) discharge their waste continuously into water systems (mainly rivers, canals or small streams) that end up in the Adriatic Sea. This is the main goal that efforts us to develop arapid method (screening method) for the detection of phenol compounds in surface water samples from the Tirana area.For this study, the waters of Erzen, Lana, Tirana and Ishem rivers were considered because these rivers are affected by urban pollution and anthropogenic activity. Water samples were analyzed from different stations of these rivers in May (dry period) and October (rainy period) for two consecutive years (2023 and 2024) by using UV-Vis technique as a rapid method of phenol compounds determination.For accurate determination of phenolic compounds in environmental waters, chromatographic techniques coupled with sample pre-concentration procedures such as solid-phase extraction (SPE) are widely used. SPE followed by HPLC/PDA detection has been successfully applied for the determination of phenols and related compounds in surface and wastewater matrices due to its high sensitivity and selectivity [11-16]. SPE followed by HPLC/PDA technique were used in this study to evaluate the levels of phenols obtain by UV-Vis technique.

MATERIAL AND METHODS

Study area and water sampling

After method evaluation water samples from four rivers of Tirana area were analyzed. Samples were collected in different stations of Lana River (12 stations), Tirana River (10 stations), Erzen River (12 stations) and Ishem River (8 stations). The Lana River and the Tirana River pass through the city of Tirana. The Erzen River passes in the Southeast of the city of Tirana and flows into the Adriatic Sea. The Ishem River collects the waters of the Lana, Tirana, Zeze rivers and some other small streams and it also flows into the Adriatic Sea (in the North of Erzen River). For all these ecosystems there is a continuous discharge of urban waste from the residents/businesses of the Tirana city and the surroundings. The water sampling was realized on May and October for two years period (2023-2024). One liter of water sample was taken for each station in PTFE bottles. Water samples were taken according to the ISO 5667-14:2016 methodology. They were transported and kept at +4^{o}C before analysis in the laboratory. The sampling stations for each lake were shown in Figure 1. Water samples were filtered by using Whatman Qualitative 125 mm filter paper and then

were transferred to 100 ml balloon. Three parallel measurements were performed by using direct measurement for each water sample. Average value was selected as representative of phenol concentration for each analyzed sample. For samples of Erzen and Lana rivers collected at May 2023, direct measurement and the standard addition method was apply for the same samples. Similar results were observed for both analysis methods, concluding that the measurement of phenol directly in the water sample provides reliable and satisfactory levels.

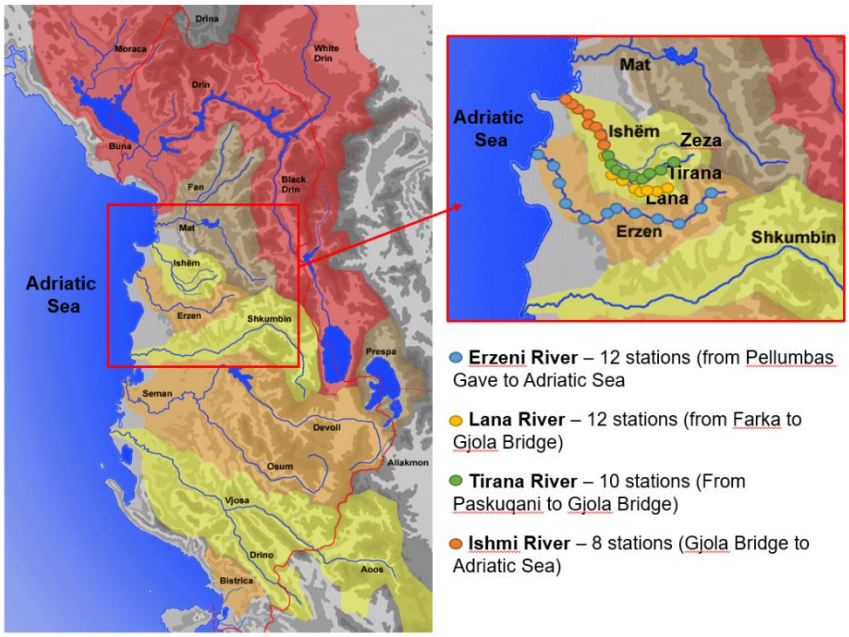


Figure 1. Water sampling map in the rivers of Tirana area

Standard and working solutions of phenol

Phenol with a purity of 99.5 % was purchased from Sigma Aldrich. Firstly, a phenol solution of 1000 mg/l (ppm) was prepared. For this, 1.002 g of, was measured using LAB-KITS Analytical Balance and diluted with 1000ml of bi-distilled water in a flask (volume of the flask 1000 ml). This was the standard solution of phenolwhich was used for preparing working solution of it with the following concentrations: 500 ppm, 250 ppm, 100 ppm, 50 ppm, 25 ppm, 10 ppm, 5 ppm, 2.5 ppm and 1 ppm. All working solutions were prepared in 100 ml flasks by using bi-distillated water as solvent. The bi-distillated water regularly was used for blank procedure.

The selection of wavelength for the phenol analyze

To obtain the absorption curve of phenol, a solution of it with a concentration of 25 ppm was used. The measurement was performed on a Varian Cary 50 Conc UV-VIS Photometer and Cary WinUV program. The measurement was performed from 190 – 1100 ppm with a scanning speed of 10 nm/sec. The wavelength selected for quantitative analysis of phenol was λmax = 270.1 nm (Figure 2). At this wavelength, it was observed that there was absorption of phenol even for solutions with a concentration lower than 1 ppm, therefore it was chosen as appropriate to perform quantitative analyses of phenol determination.

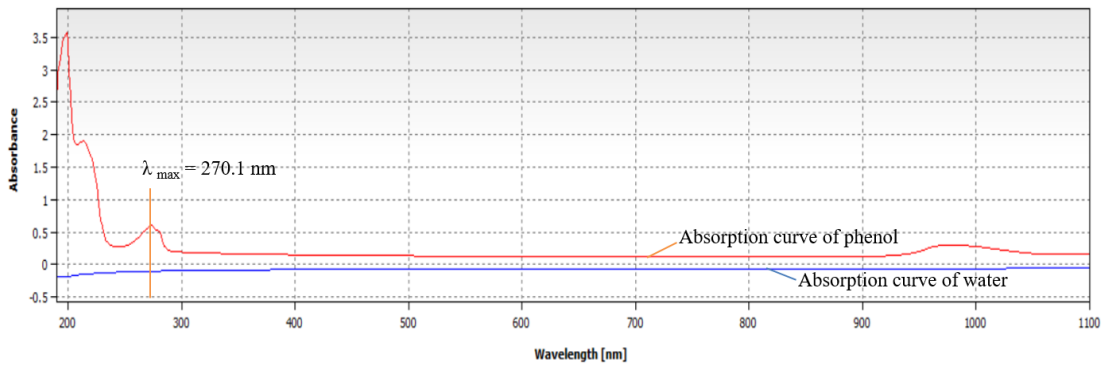


Figure 2. Absorption curve of phenol

Quantitative analyze of phenol in water samples using UV-Vis technique

Quantitation of phenols in water samples was based on absorption value on λ_{max} = 270.1 nm and comparing it with the calibration curve equation. For building calibration curve, primarily, were done measurements of phenol standard solutions from 0 to 1000 ppm (0; 1; 2.5; 5; 10; 25; 50; 100; 250; 500 and 1000 ppm). Measurements (a total of 36 parallel measures) were performed in the Varian Cary 50 Conc UV-VIS Photometer in the same day, in different day and from the different analysts (Figure 3). From these data was noted that the linear zone of calibration curve for the phenol in water was between 0 to 200 ppm but for the determination of it in water samples 0 – 100 ppm range were used. It was assumed that phenol concentrations in surface waters should be lower than 100 ppm. To construct the phenol calibration curve, solutions with concentrations of 0; 1; 2.5; 5; 10; 25; 50 and 100 ppm were used (Figure 4) which has a satisfactory R^2 value of 0.9991 (linearity).

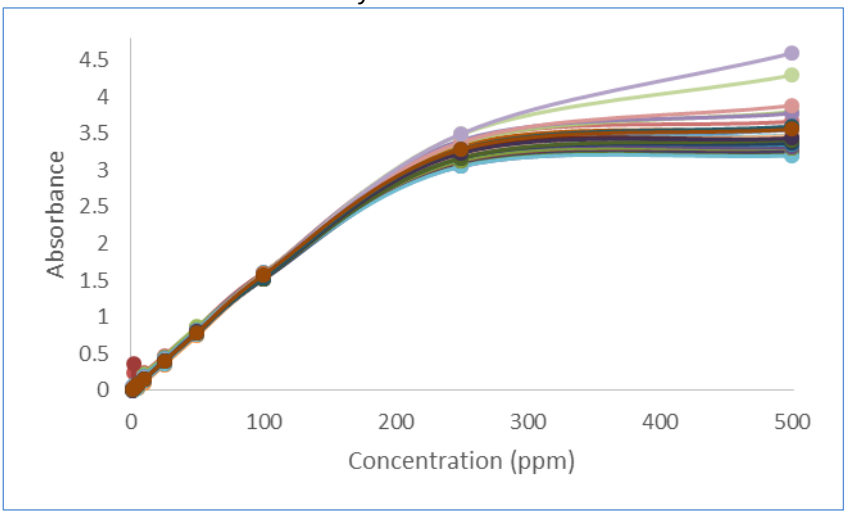
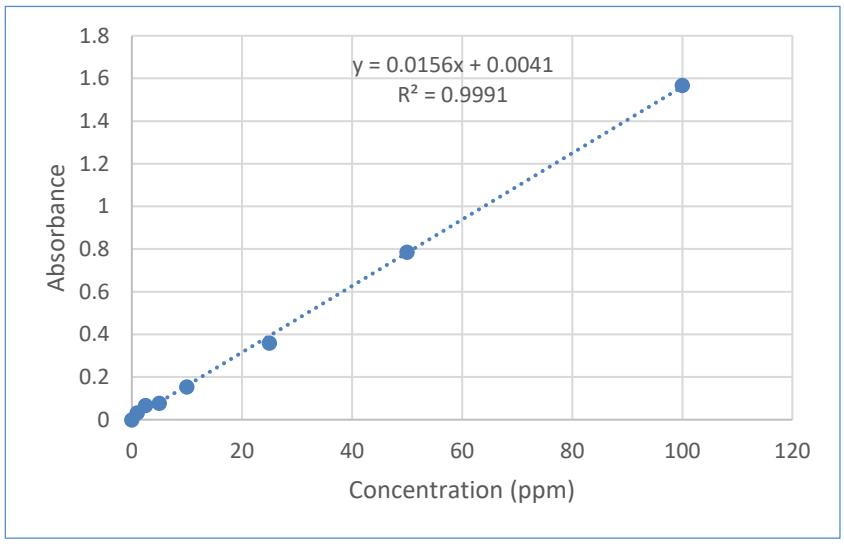


Figure 3. Calibration curve of phenol (0 – 1000 ppm)



Concentration of Phenol (ppm)	Absorbance
0	0
1	0.0331
2.5	0.0665
5	0.0782
10	0.1546
25	0.3597
50	0.7854
100	1.5678

Figure 4. Calibration curve of phenol (0 – 100 ppm)

UV-Vis method evaluation (screening method)

The building of the calibration curve makes the method applicable to obtain quantitative data on phenol levels in surface waters but before analyses of the samples, the method evaluation was performed. Measurements of the calibration solutions were made on the same day, on different days and by different analysts (a total of 96 parallel measurements of the calibration solutions and control samples). The calibration curve data were used to calculate: slope, SE intercept, SD intercept, LOD, LOQ and linearity (for the measurements in

the range 0 – 100 ppm). The recovery of phenol was carried out in a 1000milliliter solution with a concentration of 10 ppm. 10 samples were analyzed within one day and on different days to calculate the reproducibility (<2%) and repeatability (<2%) of the measurements. Measurements of the standard solutions and the 10 ppm control solution were analyzed on two other devices by other analysts. Also from these data the value of the measurement errors was calculated. Blank measurements were regularly performed during the measurement validation procedure. A control chart was used to monitor the performance of the method for the entire two-year period of analyzes by using the 10 ppm phenol solution as a control sample. The validation of the method was done according to ISO 17025 recommendations.

Confirmatory analysis by HPLC-PDA technique

To evaluate the selectivity of the spectrophotometric measurements, in selected phenol standards (1, 5 and 50 ppm) and water samples (February 2026) were additionally analyzed using High-Performance Liquid Chromatography with photodiode array detection (HPLC-PDA). Prior to chromatographic analysis, phenols(the phenol standards for method evaluation and/or methods comparison and phenolic compounds for the surface water samples) were extracted from water samples using solid phase extraction technique (SPE) which was performed using C18 cartridges (200 mg, 6 ml). 200 ml of water sample was loaded and eluted with 10 ml of methanol and acetone (1:1) mixture. After concentration to 2 ml the extracts were filtered through a 0.45 µm membrane filter and injected into the HPLC/PAD model Agilent 1260. Separation was performed on a reversed-phase C18 column using a water–acetonitrile mobile phase under gradient conditions. Detection was carried out with a PDA detector at 270.1 nm. Quantification was performed using an external calibration curve. The linearity for phenolin the range of 1 - 100 mg/L where good (regression coefficient R2 was 0.9986). Limit of detections (LOD) and quantifications (LOQ) for the phenol were calculated at LOD = 0.36 ppm and LOQ = 1.1 ppm, respectively. The recovery percentages obtained for three levels concentrations (1, 5 and 50 ppm) were ranged from 55.3 to 118.4%. Repeatability has shown good performance with low relative standard deviation (< 2%) [19-23].

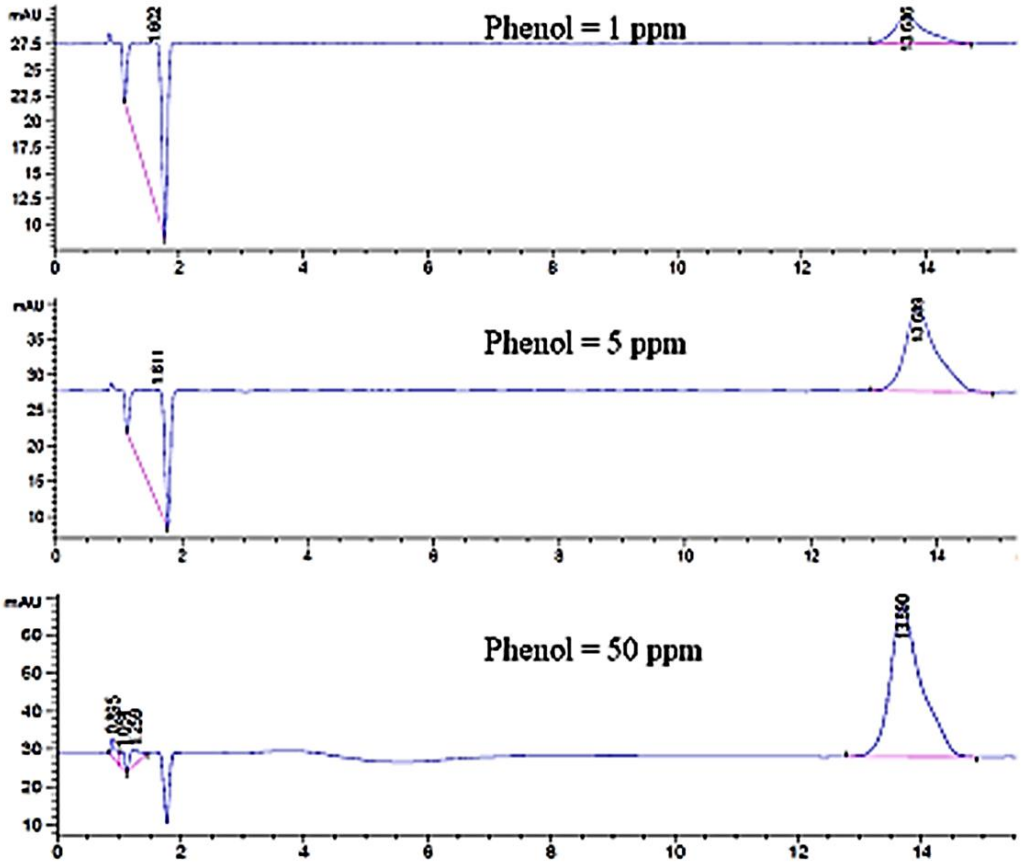


Figure 5. HPLC-PAD chromatograms of phenol standards (1, 5 and 50 ppm)

Comparison between UV-Vis and HPLC techniques

To assess the reliability of the spectrophotometric screening method, in addition to standard solutions (3 levels: 1, 5 and 50 ppm), selected samples from the studied rivers were analyzed using both UV–Vis spectrophotometry and HPLC-PDA (water samples of February 2026). The comparison revealed that UV–Vis results were systematically higher than those obtained by HPLC-PDA. In most cases, the difference ranged from approximately 1.5 to 2 times higher for UV-Vis method. This difference can be explained by the presence of other UV-absorbing organic compounds in the water matrix, such as humic substances, fulvic acids and other aromatic molecules naturally present in surface waters. These compounds absorb in the same spectral region (250–280 nm) and may contribute to the overall absorbance measured by the spectrophotometric technique [19-23].

Making an evaluation of the two methods, it can be concluded that UV-Vis is a screening method, rapid, low cost and that provides preliminary data on the presence of phenols in waters (and other organic substances of a similar nature) providing preliminary data of importance for water pollution mainly due to anthropogenic impact. Also, this method has low selectivity compared to HPLC-PDA, therefore, to take into account the data obtained with the UV-Vis technique, a coefficient of 0.56 (or divided by 1.8) was taken into account to correct the data obtained.

RESULTS AND DISCUSSION

Phenol and its derivatives belong to the group of aromatic organic compounds that absorb in the ultraviolet region. For this reason, UV–Vis spectrophotometry represents a rapid and cost-effective analytical approach for the preliminary detection of phenolic substances in water samples. In the present study, the maximum absorption wavelength for phenol was determined at λmax = 270.1 nm, which was selected for all quantitative measurements due to the clear absorbance signal even at concentrations below 1 ppm. The calibration curve for the range 0–100 ppm showed good linearity (R^2 = 0.9991), indicating that the method is suitable for quantitative screening within this concentration interval. The calculated analytical parameters demonstrated satisfactory performance of the method, with LOD = 0.263 ppm and LOQ = 0.797 ppm. Recovery experiments performed using a 10 ppm control solution showed values between 98.5% and 103.8%, confirming good analytical accuracy. The repeatability and reproducibility of the method were also satisfactory, with RSD values below 3%, which is consistent with the requirements for screening analytical methods (ISO 17025).

Although UV–Vis spectrophotometry is widely applied for the determination of phenolic compounds, it is known that natural organic matter, such as humic and fulvic substances, may absorb in the same spectral region (250–280 nm). These compounds may therefore contribute to the total absorbance measured by the spectrophotometric technique (Michałowicz & Duda, 2007). For this reason, selected samples and phenol standards were additionally analyzed using HPLC-PDA, which provides higher selectivity and specificity for phenolic compounds. The comparison between the two analytical approaches showed that the concentrations obtained by UV–Vis were generally 1.5–2 times higher than those obtained by HPLC-PDA. Similar observations have been reported in previous environmental studies where spectro photometric techniques tend to overestimate phenol concentrations due to matrix interferences from other aromatic compounds present in natural waters (Mahapatra et al., 2009; Otitoju et al., 2023). Based on this comparison, a correction factor of 0.56 (equivalent to dividing by 1.8) was applied to the UV–Vis results in order to obtain values more consistent with chromatographic measurements. After applying the correction factor, the spatial distribution of phenolic compounds along the studied rivers clearly reflects the influence of anthropogenic activities.

Erzen River showed the lowest values of phenol for all analyzedsamples. Phenol levels for 12 stations of Erzeni River were the following average values: 1.09 ppm in May 2023 (Min = 0.014 ppm and Max = 2.91 ppm), 1.05ppm in October 2023 (Min = 0.008 ppm and Max = 2.03 ppm), 1.32 ppm in May 2024 (Min = 0 ppm and Max = 2.96 ppm) and 1.26ppm in October 2024 (Min = 0.015 ppm and Max = 2.94 ppm). The profile of phenol level for Erzen River stations was given in Figure 6. The clean stations of Erzeni River were in the mountainous part of the river, from Pellumbas Gave (WER1) to Arbana (WER7). The higher slope and water flow velocity as well as the smaller number of homes/businesses located in this area are the main reasons for the lower level of phenol. Phenol levels increaseup to 2.5 times from the Beshiri Bridge (WER8) to Adriatic Sea (WER12) stations because the anthropogenic impact in this part of the river is greater. The number of residents, housing and businesses increases significantly, adding to the increase in

agricultural areas/activity. Also, the river in this part has a lower slope (plain area), which increase the concentration of pollutants.Fortunately, for all samples, concentrations do not exceeded the limit of 3.4 ppm recommended by the US Environmental Protection Agency (EPA) for the protection of aquatic life (NSCEP, 1978), classifying Erzeni River as clean in terms of phenol concentrations.

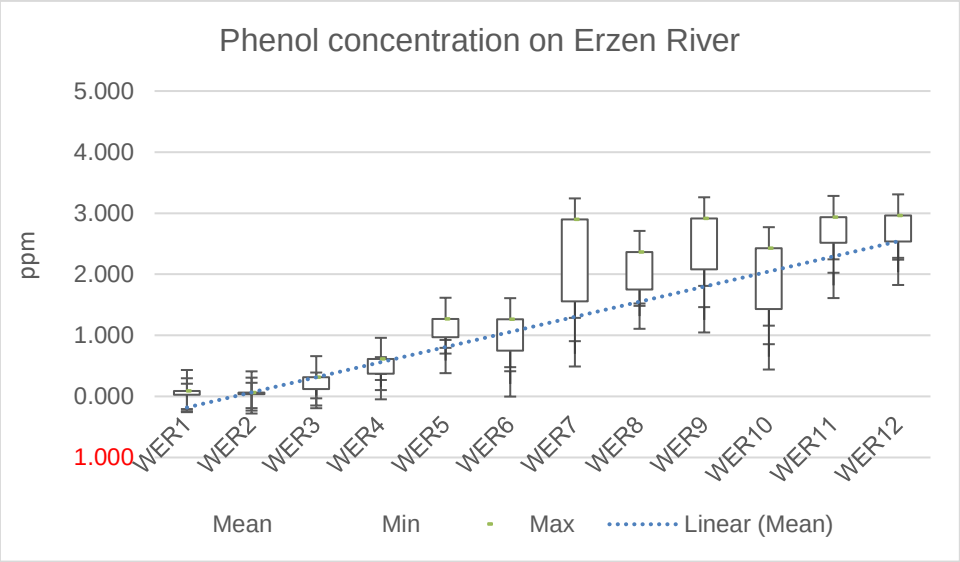


Figure 6. The profile of phenol levels in stations of Erzen River for 2023-2024 period

The samples of Lana River showed to have high phenol concentration, which increased towards downstream (Figure 7). The average phenol values for the four sampling periods were as follows: 9.50 ppm in May 2023 (Min = 0.70 ppm and the Max = 19.56 ppm), 9.93 ppm in October 2023 (Min = 1.31ppm and the Max = 17.35 ppm), 9.51 ppm in May 2024 (Min = 1.32 ppm and the Max = 19.54 ppm) and it was 6.78 ppm in October 2024 (Min = 0.29 ppm and the Max = 15.14 ppm). In three river stations, from Farka (WLR1) to Shkoze (WLR3) the phenol values were lower than the EPA allowed limit of 3.4 ppm while for the rest of stations the phenol levels were 2 - 5 times higher than this value. Lana River passes through the city of Tirana, which results in its pollution through urban waste, coming not only from families, but also from different businesses. This is very noticeable from the New Maternity station (WLR4) to the Gjola Bridge (WLR 12). In the laststations of the river (from Astir station – WLR8), phenol levels were increased noticeably because the numerous of businesses that directly discharge their waste into the river by affecting the water quality of this ecosystem.Also, this part of the river can impact agricultural activity. Lana River can be considered polluted based on phenol levels.

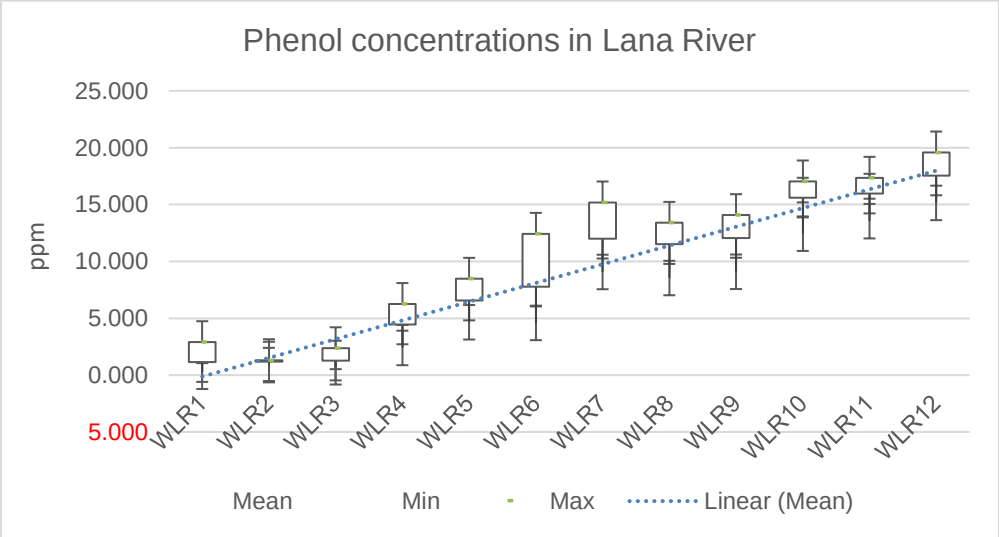


Figure 7. The profile of phenol levels in stations of Lana River for 2023-2024 period

Also, the Tirana River shows high levels of phenol almost in the same range as Lana River (Figure 8). Stations of Tirana River starting from Paskuqan (WTR1) to Gjola Bridge (WTR10). Phenol levels for river stations had the following average values: 8.00 ppm in May 2023 (Min = 0.15ppm and Max = 18.96 ppm), 6.66 ppm in October 2023 (Min = 0.32 ppm and Max = 14.27 ppm), 7.27 ppm in May 2024 (Min = 0.19ppm and Max = 22.92 ppm) and 7.20 ppm in October 2024 (Min = 0.39 ppm and Max = 14.31 ppm). Again, for the mountainous part of the river (first stations), phenol levels were lower than 3.4 ppm, since in the upper part of the river the number of residents and housing is lower and the slope of the river is greater, affecting thus in the low values of this pollutant. From the Allias (WTR4) to Gjola Bridge (WTR10) station the number of families and businesses near the river is much higher and therefore the levels of phenol increase significantly. At these stations again the levels of phenol wereup to 5 times higher than the limit value of 3.4 ppm recommended by the US Environmental Protection Agency (EPA) for the protection of aquatic life (NSCEP, 1978), classifying Tirana River as polluted in terms of phenol concentrations.

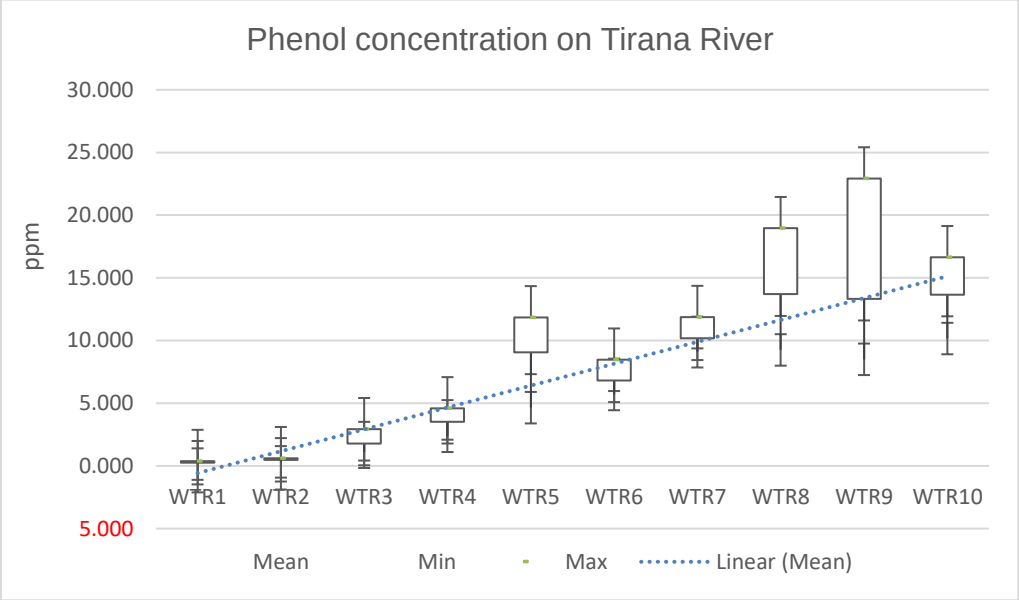


Figure 8. The profile of phenol levels in stations of Tirana River for 2023-2024 period

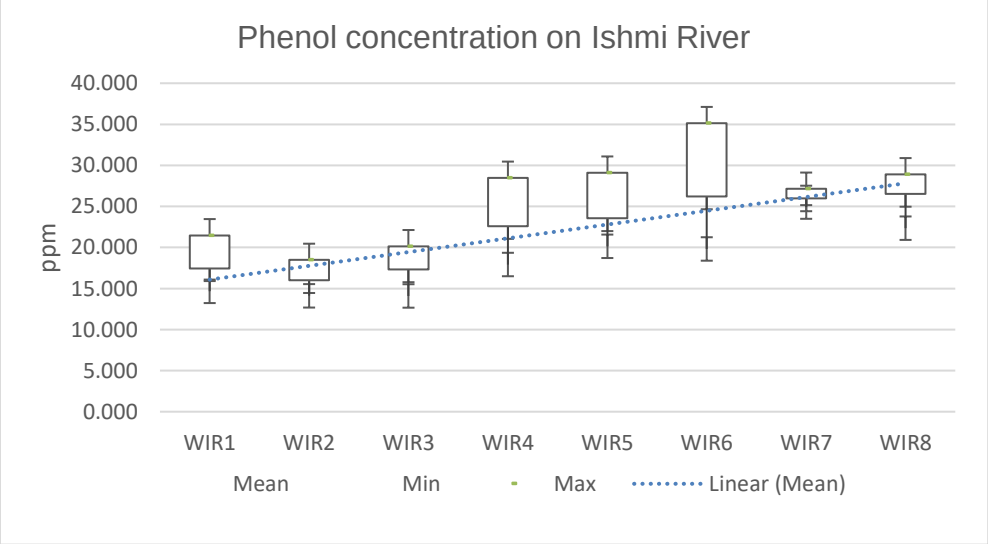


Figure 9. The profile of phenol levels in stations of Ishem River for 2023-2024 period

Ishem River collects the waters of the Lana, Tirana and Zeze rivers near Gjola Bridge. The Lana and Tirana rivers have their catchment area in the Tirana area while the Zeze River has its catchment area mainly in the Kruja area, therefore it was not included in this study. However, all three of these rivers pass through inhabited areas and are directly affected by urban pollution and anthropogenic activity. Also, these rivers are impacted by agricultural activity. Unfortunately, the polluted waters of the Lana, Tirana and Zeze rivers flow into the Ishem River, which then flows into the Adriatic Sea. This is one of the main reasons why the Ishem River is one of the most polluted rivers in our country (Cullhaj et al 2015) adding that the river flow is slow because of the small slope (Figure 9). Phenol levels for the 8 stations of Ishem River had the following average values: 22.51 ppm in May 2023 (Min = 15.75 ppm and Max = 28.91 ppm), 24.29 ppm in October 2023 (Min = 14.64 ppm and Max = 35.13 ppm), 21.21 ppm in May 2024 (Min = 14.09 ppm and Max = 27.75 ppm) and 19.82 ppm in October 2024 (Min = 14.66 ppm and Max = 27.14 ppm). For all analyzed samples of Ishem River, phenol levels exceed the value set by the EPA (3.4 ppm) up to 10 times, making this the most polluted ecosystem in phenol concentrations. This was expected since the waters that the Ishem River collects polluted waters of Tirana, Lana and Zeza rivers. For allstations of Ishem River,intense agriculture activity can impact directly the high levels of phenol compounds in water samples.

CONCLUSIONS

The present study demonstrated that UV–Vis spectrophotometry at 270.1 nm can be successfully applied as a rapid screening method for detecting UV-absorbing aromatic compounds associated with phenolic substances in surface waters. The method showed satisfactory analytical performance in terms of linearity, repeatability, reproducibility and recovery, making it suitable for preliminary environmental monitoring. However, the comparison with HPLC-PDA analysis highlighted the limited selectivity of the spectrophotometric method when applied to complex environmental matrices. Natural organic matter and other aromatic compounds present in surface waters may contribute to the measured absorbance and lead to an overestimation of phenol concentrations. For this reason, a correction factor of 0.56 was applied to the spectrophotometric results to improve their comparability with chromatographic measurements.

The monitoring results revealed significant differences in phenol concentrations among the studied rivers in the Tirana region. The Erzen River showed the lowest levels of phenolic compounds, particularly in its upstream mountainous stations where anthropogenic influence is limited. In contrast, the Lana and Tirana rivers exhibited considerably higher concentrations due to the strong impact of urban activities, untreated wastewater discharges, industrial sources and agricultural impact. The Ishem River, which collects the waters of several tributaries flowing through densely populated areas, showed the highest levels of phenolic contamination. These findings confirm that urbanization and anthropogenic activities represent the main factors of phenolic pollution in the studied river systems of Tirana area.

The results obtained highlight the need for continuous environmental monitoring and improved wastewater management strategies in the Tirana region. While UV–Vis spectrophotometry can serve as an efficient screening tool for rapid assessment of aromatic organic pollution, more selective analytical techniques such as HPLC or GC-based methods are required for accurate identification and quantification of phenolic contaminants.

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Conflict of interest

Authors declare there is not conflict of interest.

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IZVOD

BRZA ANALIZA ZA ODREĐIVANJE FENOLA U UZORCIMA POVRŠINSKE VODE KORIŠĆENJEM UV-VIS TEHNIKE

Cilj ove studije bio je da se istraži pojava fenolnih jedinjenja u uzorcima površinskih voda iz glavnih reka u oblasti Tirane i da se proceni brzi UV-Vis spektrofotometrijski pristup kao tehnika skrininga. Fenolna jedinjenja su prepoznati zagađivači životne sredine koji potiču i iz prirodnih i iz antropogenih izvora. Zabeležen je apsorpcioni spektar fenola i odabrana je talasna dužina maksimalne apsorbancije (270,1 nm) za spektrofotometrijska merenja. Performanse metode su procenjene u smislu linearnosti, ponovljivosti, reproduktivnosti i oporavka, prateći preporuke ISO 17025. Pošto nekoliko organskih supstanci prisutnih u prirodnim vodama takođe mogu apsorbovati u oblasti 250–280 nm, UV-Vis tehnika je primenjena kao brza metoda skrininga za UV apsorbujuća aromatična jedinjenja potencijalno povezana sa fenolnim supstancama. Da bi se procenila selektivnost, odabrani uzorci su dodatno analizirani korišćenjem sistema visokoefikasne tečne hromatografije sa detekcijom nizom fotodioda (HPLC-PDA) nakon ekstrakcije rastvaračem pod pritiskom (PSE). Poređenje između dve tehnike pokazalo je da su rezultati UV-Vis spektroskopije generalno 1,5–2 puta veći od HPLC vrednosti, što ukazuje na doprinos drugih UV-apsorbujućih organskih jedinjenja prisutnih u matriksu rečne vode. Rezultati pokazuju da su proučavane reke pod uticajem urbanih i antropogenih aktivnosti i da sadrže detektabilne nivoe aromatičnih organskih jedinjenja. UV-Vis metoda se može koristiti kao brz i jeftin alat za skrining, dok se potvrdna analiza sa selektivnijim tehnikama kao što je HPLC preporučuje za precizno određivanje fenola.

Ključne reči: *Fenol, UV-VIS tehnika, analiza vode, kvalitet vode, izrada/evaluacija metode*

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