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LETTER TO THE EDITOR

Control Methods of Ecological Environment Pollutants Based on Mangrove Wetland

Chen Zhang*, Yaning Li, Wei Liu, Guodong Li
Department of Environmental Science and Engineering, Nankai University Binhai College, Tianjin 300270, China
*Email: greatlake2019@163.com

The wetland ecological environment is in the interaction zone between fresh water and sea water, and has the function of purifying water bodies. As a large amount of sewage and waste are continuously discharged into the sea, the water purification function of the wetland is receiving increasing attention. Based on the relevant research results of domestic and foreign scholars, the research status of pollutant control methods and purification effects of wetland systems is reviewed. At present, the research on pollution ecosystem of wetland system mainly focuses on the impact of different pollutants on mangroves and ecological environment, including the growth and physiological ecology of mangrove plants, the accumulation and pollution of pollutants in mangrove plants. The effects on the sediments, algae, and benthic animals in the mangrove area. The research results shows that mangroves have strong tolerance to heavy metals, petroleum and sewage pollutants, and mangrove plants and soil under the forest have the ability to absorb a variety of pollutants, and have a strong purification effect on pollutants. The research on wetland systems needs to be further deepened. Wetland resources are in an endangered state, and management and protection need to be strengthened. All experimental projects should be carried out in non-protected areas.
Wetland ecology; Environmental pollutant; Control Method

I INTRODUCTION

Since the wetland system is in the interaction zone between fresh water and seawater, pollutants and toxic substances remain in the mudflats. The mangrove forest wetland system can absorb various pollutants through physical, chemical and biological effects. It accumulates and purifies, so the purification effect of wetland on sewage can not be ignored. With the development of urbanization in coastal areas and the rise of various industries, a large amount of sewage and waste are continuously discharged into the sea. The purification function of water bodies in wetlands is receiving more and more attention. Some scholars believe that the ecological effects of mangroves should be fully utilized to expand their applications scope, after domestication by fresh water, artificially create wetlands as a treatment site for domestic sewage and industrial wastewater (Ji and He 2019).

Gokhan Ekrem Ustun published an article in the journal Ekoloji's 2011 Issue 81， The title is: "The Assessment of Heavy Metal Contamination in the Waters of the Nilufer Stream in Bursa". The article evaluated eight metal contaminants (As (total), Cd, Cr (total), Cu, Mn, Ni, Pb and Zn) of Nilufer Stream, which are intensive industrialization, urbanization and agricultural activities. The results are then compared to national and international water quality guidelines (Ustun 2011). The impact of wastewater treatment facilities established during the measurement on water quality was also considered. It has been determined that the water quality of Nilüfer Stream along the basin has declined rapidly year by year. Enhanced wastewater discharge leads to a dominant flow of waste in the river and leads to a steady decline in water quality over time. The surface water quality was classified according to national standards, and the total chromium (Cr) and lead (Pb) levels in the effluent of the Nilufer Stream basin were rated as “highly polluted water”. The average metal concentration in the Nilüfer river water is usually higher than the international guidelines. It was found that the pollution of metal pollutants in the Nilüfer stream is related to human activities in the catchment area. The article has effectively treated pollutants. This paper will study the control methods of wetland ecological environment pollutants based on mangroves.

Scholars at home and abroad have started research work, and many studies have been carried out on the application of mangroves to wastewater treatment. The literature starts from the pollution ecology of wetland systems, and mainly studies the effects of different pollutants on the physiological and ecological aspects of wetland systems (Ochoa-Hueso et al. 2017). To provide a theoretical basis for the purification of wetland systems to study the anti-fouling tolerance of mangroves; the literature focuses on the decontamination effect of mangroves, the purification of different pollutants in natural wetlands and simulated wetlands (Zhang et al. 2017). The effects have been verified. The two methods are the same, and their research results provide a scientific basis for the protection of mangroves. This paper discusses the control methods of wetland ecological environment pollutants from the aspects of the pollution ecology of wetland system and its purification effect.

II IDEA DESCRIPTION

Survey of research on pollution ecosystem of wetland system

In the study of the pollution ecology of wetland systems, domestic and foreign scholars have studied the effects of various environmental pollutants on wetland systems, among which the research on heavy metal pollution, petroleum pollution and various types of wastewater rich in nutrient elements is widely studied (Enrica 2017).

1.1 Impact of heavy metals on wetland systems

Heavy metals are a class of pollutants with cumulative effects and strong toxicity. Except for a few species that can adapt to higher concentrations of heavy metals, most species show obvious damage symptoms under low-concentration heavy metal stress (Liu 2017). In addition, heavy metals have cumulative effects. With the extension of the food chain, it gradually accumulates and enlarges in the living body, which increases the degree of pollution. Based on the research of various scholars, the heavy metal pollution ecology of wetlands can be classified into the following points (Zhang et al. 2018, Bind et al. 2018).

(1) Mangrove plants can absorb a large amount of heavy metal ions and store them in parts of the body that are not easily foraged by animals, such as stems and roots, thus avoiding the diffusion of heavy metal ions in the environment. The study found that in natural habitats, the accumulation coefficient of heavy metals in soil sediments in mangroves is mostly below 0.1 except for Cd. At the same time, the accumulation of heavy metals absorbed by mangrove plants in roots, harder trunks and perennial branches accounted for 80% to 85% of the total plant body. The results of the literature show that the content of heavy metals in mangrove sediments is high, and there is a significant positive correlation with the content of organic matter (Enrica 2017). The literature found that the content of heavy metals in the rhizosphere sediments of mangrove plants was higher than that in Guangtan, and the content of heavy metals in mangrove plant tissues was lower (Zhang et al. 2018). The contents of Pb and Zn in the bodies were lower than those in rhizosphere sediments, but there were A certain enrichment. Research on the effects of heavy metals on mangrove wetlands has been carried out (Shi et al. 2018).

(2) High concentration of heavy metal pollution has a certain influence on mangroves. Shi et al. (2016) found that the plant growth and biomass in sewage were lower than those in the control group. The high concentration of heavy metals in the wastewater had toxic effects on mangrove plants and soil microbial environment. However, the

K. candel seedlings were treated with different concentrations of Cd, and it was found that the growth of seedlings at a certain concentration was not significantly affected. This shows that mangroves have a certain tolerance to heavy metals.

(3) There are differences in the absorption of heavy metals by different mangrove plants. Khim et al. (2018) compared the absorption capacity of heavy metals in the leaves of Tonghua, K. candelensis and A. chinensis, and found that Tonghua tree > Kandelia > white bone soil; and the absorption of four elements in mangrove forest soil was Zn>Cu>Pb>Cd. The study found that Zn was higher in the leaves of Osborniaoctodonta, Excoecaria agallocha and Aegialitisannulata than Ceriopstagal and Avicenniamarina. The above studies show that mangroves have certain tolerance to heavy metals, but high concentrations of heavy metal pollution can also have certain toxic effects on mangrove plants. However, it can also be seen that the current impacts of heavy metals on mangrove ecosystems are mainly focused on the distribution and morphological indicators of heavy metals in mangrove ecosystems, while morphological observations are used to judge the pollution of heavy metals by mangrove plants. The tolerance of the material is not enough, and some research on physiological, biochemical and structural changes in the body should be strengthened (Khim et al. 2018).

1.2 Impact of oil pollution on wetlands

With the exploration and large-scale development and production of submarine oil and natural gas, the oily sewage discharged from ships, especially the oil spill accidents of large oil tankers, caused a large amount of oil and oily wastewater to enter the ocean, causing the marine oil pollution to become increasingly serious. Oil pollution has deteriorated water quality, affecting the composition of flora and fauna in the coastal zone, and even endangering marine life. Mangroves growing in the intertidal zone are directly affected by it. For the time being, most of the research on oil pollution comes from abroad. The research results are as follows.

(1) According to the research reports of various scholars, oil pollution will cause a certain amount of impact on mangroves, but it should be seen that this effect will be greatly different due to different types of mangrove plants, as found in the literature. Treatment increased the enrichment of most nutrients in red sea urchin and red egg winter, but it had the opposite effect on white bone soil, while dipwood had two effects. And with the increase of treatment concentration, the enrichment of hydrocarbons in the leaves of mangrove plants also increased, of which B. sylvestris was the highest (Butkovskyi et al. 2017).

(2) The degree of pollution of oil is different, and the impact on mangrove plants is different. Ramdani et al. (2018) found that the viscous oil of A. glabra leaves can grow normally up to 0.451 mg/cm^2. Studies have shown that when the concentration of oily wastewater is greater than 400 mg/L, some physiological indexes of K. candelensis leaves change. When the concentration of oil is too high, its impact should be fatal. It is found that the Rhizophoramangle seedlings on the shallow reefs of Florida are covered with more than 50% of the oil area, and the water is covered by more than 50% of the respiratory roots (Ramdani et al. 2018).

1.3 The impact of various sewage on wetland systems

Most of the sewage is rich in N and P. In the mangrove ecosystem, nutrients (especially N and P) are the limiting factors for plant growth. Therefore, theoretically, the proper amount of sewage discharged into mangroves can promote plant growth. Research on the impact of sewage on wetland systems is more systematic.

First, the discharge of general domestic sewage can increase the productivity of mangroves. The mangrove plants such as Kandelia, Tunghua, Avicennia, and Bruguieragymnorhiza were studied. The results showed that, in addition to reducing the root growth and rhizome ratio of P. sylvestris, the discharge of sewage was generally The growth indicators of mangrove plants, such as plant height, stem diameter, base diameter, leaf yield and annual growth of biomass, and annual net productivity, all contribute to the growth.

Second, different sewage concentrations have different effects on mangroves. Many researchers have used artificial sewage to determine the content of each substance and prepared the sewage, and conducted a comparative study. Although different researchers conducted different mangrove plants, the results were similar for the study of Kandelia, Tung flower or A. chinensis, i.e. the growth of mangrove plants, plant stem height and organisms at normal concentrations of sewage. The increase in volume has a promoting effect. Under the five-fold concentration of sewage, the growth, flowering and fruiting of mangrove seedlings, as well as its chlorophyll a, chlorophyll b, proline concentration and root activity, are not significantly different from the control group. The ten-fold concentration of sewage will inhibit the growth and flowering of mangrove roots, the content of heavy metals is high, and the conductivity is also high, but the stem height, base diameter and biomass are similar to the control group.

Finally, in addition to the study of the ecological characteristics of mangrove plants themselves, there are also studies on the effects of sewage on litter, sediments, benthos, algae in forests, etc. in the mangrove system. The study found that the addition of sewage increased the annual litter amount of Kandelia and Tung tree. Sewage discharge did not cause significant changes in the amount of litter in mangrove plant communities, but the total litter amount had a significant seasonal variation model, and the peak of litter fell in the rainy summer. The discharge of sewage causes a great change in the environment around the leaves decomposed on the mangrove sediments, especially the deposition of suspended solids, which leaves the leaves in a more closed, anoxic environment, thus making the leaves normal. The decomposition process is hindered. The study found that although some sewage organisms appeared in the mangroves after sewage treatment, the total biomass of mangrove benthic animals was basically the same as that before the pollution, and the community structure remained unchanged. When the sewage is discharged into the mangroves, most of the algae die because they cannot adapt to the drastic changes in habitats. Only a few adaptable species can survive. Sewage discharge can promote the growth of algae in the near sea, but the sewage discharge must be strictly controlled.

In general, mangrove plants have a strong adaptability to domestic sewage, and sewage discharge has less impact on mangroves and the entire mangrove system. If it is better controlled, it will have a promoting effect. However, it should be noted that the discharge of sewage and the concentration of sewage should be strictly controlled.

III RESULTS

Survey of research on purification effect of wetland system

The wetland system has a unique and complex purification mechanism that utilizes the triple coordination of physical, chemical and biological interactions of the matrix-microbe-plant complex ecosystem through filtration, adsorption, co-precipitation, ion exchange, plant uptake and microbial decomposition. The high-efficiency purification of pollutants is realized, and at the same time, the biogeochemical cycle of nutrients and water promotes the growth of green plants and increases the yield, thereby realizing the resource utilization and harmlessness of wastewater. Due to the purification effect of mangroves, the water quality of the tidal flat planting-culture system meets the standards of seawater quality II-III. The purification effect of the integrated mangrove wetland system can be divided into the following aspects:

First, the purification of heavy metal pollution. Since mangrove plants are capable of depositing a large amount of metal contaminants in various ways, they have a purifying effect on heavy metal pollution. The results showed that the removal rate of Cd, Cr and Cu in the synthetic wastewater from the mangrove ecosystem in the greenhouse was 92%, and the removal rate of Ni and Zn was 88%.

Second, the purification of oily wastewater. Because the mangrove plant has a certain absorption of oil, it can purify the oily wastewater to a certain extent. With the increase of the concentration of oily wastewater treatment, the relative purification rate of K. candelensis oil is reduced, but the annual net oil absorption of the plant varies with the treatment concentration. Increases and increases.

Third, reduce organic pollution. The inflow of chemical wastewater has increased the organic pollution of the wetland water near the sewage outlet, and the organic pollution of the water in the remote sewage wetland has been significantly reduced. The study found that the organic logistics in urban sewage was greatly reduced after the wetland of Shenzhen Futian Mangrove Nature Reserve. Treatment of shrimp pond sewage with higher concentration of salt by mangrove constructed wetland can reduce its biochemical oxygen demand and total organic carbon.

At last, the purification of nitrogen and phosphorus. A number of studies have shown that mangrove wetlands have a good removal effect on total nitrogen and total phosphorus. The purification effect wetland system on sewage N increases with the increase of sewage treatment concentration. The purification effect candel wetland is better. The results showed that the treatment efficiency of K and K. chinensis system was higher under seawater conditions than under freshwater conditions, and the ability to absorb N nutrients in wastewater under any conditions was higher than that of reeds currently widely used. In addition, the mangrove constructed wetland was constructed and it was found that the removal rates of TSS, BOD, NO_3 -N, NH_4 -N, TN, PO_4 -P and TP in mangrove constructed wetlands were not significantly different from those in natural forests. The removal rate of sewage, the removal rate of TSS, PO_4 -P and TP will increase significantly.

IV DISCUSSION

All studies have shown that the wetland system has strong adaptability and tolerance purification effect on pollutant sewage, but the purification efficiency needs further quantitative research. Wetland has the potential to maintain the nutrients of sewage. It is because its soil and vegetation have a strong ability to absorb these nutrients. Therefore, it is feasible to use the mangrove wetland system to purify domestic sewage. However, different mangroves differ greatly in their physical, chemical and biological properties. Because of the different effects of different sewage discharges on mangroves, they are assessed as suitable for use as secondary or tertiary sewage treatment sites. At the time, further research is needed. Only when the wetland system of the unit time area is used to handle the pollutant load, can the wetland system be better able to purify the pollutants.

V CONCLUSION

The study of pollution ecology and purification effects of wetland systems has become one of the new important areas. Various studies have shown that mangroves have certain resistance and tolerance to a variety of pollutants, and mangrove plants and understory soils have the ability to absorb various pollutants, thus having a certain purification effect on water bodies. Therefore, some scholars have suggested that the nutrient enrichment caused by sewage discharge will not affect the mangrove itself. In fact, it is beneficial in a certain range. However, some researchers believe that the Chinese mangrove ecosystem is in an endangered state and should not be used as urban sewage treatment to avoid the decline of ecosystem diversity and further degradation. However, it should be noted that the current research is mainly focused on short-term, and the profound changes in the physiological and ecological characteristics of plants can sometimes be shown after a long time. With the extension of sewage discharge time and the increase of sewage discharge, the mangrove forest has a certain impact that remains to be seen.

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