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Retraction

Retracted: Comprehensive Treatment of Urban Landscape Water Environment Based on Aquatic Plants Purification and Restoration

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] K. Li, "Comprehensive Treatment of Urban Landscape Water Environment Based on Aquatic Plants Purification and Restoration," *Security and Communication Networks*, vol. 2022, Article ID 8771933, 9 pages, 2022.

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Research Article

Comprehensive Treatment of Urban Landscape Water Environment Based on Aquatic Plants Purification and Restoration

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Water is the source of life and the foundation for the growth of all things. Water is also an important part of the urban ecological structure. A healthy water environment is the basis for human survival and development, and it is also one of the important conditions for the harmonious development of cities. With the rapid development of the economy and the improvement of the level of urbanization, the water environment pollution in the urban landscape has become more and more serious, such as serious water eutrophication and rapid algae reproduction in the water environment. As plants that can survive in water, aquatic plants have always been an important main body of the water ecological environment. It plays an unparalleled role in water environment purification and comprehensive treatment of water pollution. This paper aims to study the comprehensive management of urban landscape water environment based on the purification and restoration of aquatic plants. It combines the purification and restoration ability of aquatic plants and genetic algorithm to carry out the comprehensive management experiment of urban landscape water environment. The conclusion shows that after the purification and restoration of aquatic plants and comprehensive pollution control, the comprehensive eutrophic substance content of the urban landscape pond water body decreased by 21.7 mg, and the water body transparency increased by 20 cm.

1. Introduction

Water is the basis for all things to survive and develop. The protection of water resources and the control of water pollution are the basic conditions for the harmonious coexistence between man and nature. With the development of urbanization, various landscape water bodies such as artificial lakes, fountains and moats have appeared in the city. Urban landscape water bodies refer to water bodies, lakes, rivers, and other water bodies that can regulate the microclimate of the water environment and beautify the environment to form landscapes. It is one of the basic elements of garden landscape and an important part of urban landscape. Urban landscape water bodies are also vulnerable to serious pollution. Urban landscape water pollution is mainly reflected in the following aspects: The first is the problem of replenishment water. When the replenishment water of the urban landscape water body is insufficient, the content of nitrogen, phosphorus, and other nutrients in the water is too high, which will cause the urban landscape water body to be seriously polluted. The second is that the fluidity of the water body is poor, and the water quality cannot be exchanged. This leads to the problem of weak self-purification ability of urban landscape water and serious eutrophication of water. The third is the issue of water pollution discharge in urban life and industry. A large number of sewage generated by urban residents' living and industrial production are poured into urban landscape water bodies, which aggravates the pollution degree of urban landscape water bodies. Therefore, urban landscape water environment governance is of great significance to ensure the coordination of urban water environment with urban production and life and is also an important measure to improve urban water pollution. Aquatic plants refer to plants that can survive in water bodies and have certain ecological purification functions. Aquatic plants have important functions such as absorbing heavy metals, removing pollutants, and purifying and repairing water bodies. Therefore, aquatic plants play an important role in the management of urban landscape water pollution.

The innovations of this paper are as follows: (1) It studies the comprehensive management method of urban landscape water environment based on the purification and restoration of aquatic plants. (2) This paper combines the ability of aquatic plants to purify and restore and genetic algorithm to carry out the comprehensive management experiment of urban landscape water environment and draw effective conclusions. It draws valid conclusions in two aspects: the change of eutrophic substances in water body and the change of water body transparency.

2. Related Work

There are many studies related to the purification and restoration of aquatic plants in academia. Among them, Li et al. studied the ability of an aquatic plant called *Nepenthes* to absorb uranium pollution in the aquatic environment. He also proved through experiments that *Nepenthes* has a good absorption capacity for uranium and can play a certain role in the purification and restoration of water environment [1]. Bauthiyal and Sharma mainly studied the ability of aquatic plants to remove fluorinated pollutants from the water environment. Their research shows that aquatic plants have a good effect on the removal of fluorinated pollutants in the water environment [2]. Lu et al. mainly studied the absorption capacity of eight aquatic plants including water hyacinth and spruce to heavy metals in the water environment. They found that aquatic plants in different places have different adsorption capacities for heavy metals. However, the uptake capacity of copper by root and stem tissues of all aquatic plants is consistent [3]. Haghnazar et al. studied the absorption capacity of aquatic plants to various pollutants in the urban water environment. Their research found that aquatic plants have better ability to absorb and purify toxic pollutants in urban water environment [4]. Saleh et al.'s research focuses on the ability of aquatic plants in the Egyptian environment to purify and remediate wastewater from human activities and urban development. They found that the purification ability of aquatic plants will be restricted by the different activity content of radionuclides in the water environment, the multiplying mass of plants, and the illumination and other factors [5]. Auchterlonie et al. mainly studied the ability of water hyacinth, an aquatic plant, to purify and restore the water environment in South Africa. They found that water hyacinth has a better treatment effect on water eutrophication in South Africa [6]. Although these studies are related to the purification and restoration of aquatic plants, the process of these studies is complex and requires a lot of time and effort. And its practicability for the comprehensive management of urban landscape water environment research is not strong enough.

3. Urban Landscape Water Environment Management Methods

3.1. Aquatic Plant Purification and Restoration. Aquatic plant purification and restoration is one of the ecological restoration methods. It specifically refers to the use of tissues such as roots and stems of aquatic plants to precipitate organic matter and nutrient salts in the water environment and absorb them by aquatic plants. At the same time, it has various functions such as precipitation, filtration, adsorption, adsorption, and decomposition of nutrients such as nitrogen and phosphorus. This thus achieves a phytoremediation technique for water purification [7]. Aquatic plant purification and restoration is one of the important methods to comprehensively control water pollution. Its advantages are low cost, wide adaptability, and no secondary pollutants. However, there are also some shortcomings. It takes a long time for aquatic plants to purify and restore the water environment, and it is difficult to restore deep pollution [8, 9]. Commonly used aquatic plants are floating plants, emergent plants, and submerged plants. The water quality range of water treatment for aquatic plants is shown in Table 1 [10].

The mechanism of the removal of nutrients in water by aquatic plants is shown in Figure 1 [11].

3.2. Genetic Algorithms. Genetic algorithm is a method of global search and optimization. It does not make any demands on the problem domain. Its essence is an efficient, parallel processing, global search method [12]. The operation of genetic algorithm follows the principle of survival of the fittest and successively generates an approximate optimal solution among many solutions [13]. Genetic algorithms are widely used in biology, computer science, engineering, economics, and other fields [14–17]. Genetic evolution starts with a population of completely random individuals and then occurs from generation to generation. In each generation, the fitness of the entire population will be reevaluated. It randomly selects multiple individuals (based on their fitness) from the current population and generates a new population of life through the theory of natural selection and mutation. This population becomes the current population in the next iteration of the algorithm [18]. The basic flow of the genetic algorithm is shown in Figure 2.

It assumes that there are n sample input data in total, and there are relative m sample output data. The one-to-one correspondence between the input and output data is called the interpolation condition, and the following formula can be established:

$$m = f(x_n). \tag{1}$$

Before applying the genetic algorithm, some parameters of the hidden nodes in the network need to be clarified, such as the number, size, expansion constant, and weight of the data center. If all sample data are selected as input data, then the number of data centers is the number of samples, and all basis functions have the same expansion constant [19]. The

Table 1: Scope of water quality for water treatment of aquatic plants.

Type	Applicable places	Processing scope	Contaminant removal mechanisms	Common types	Application
Floating plant	Strong oxidation pond	Urban sewage, industrial wastewater, storm runoff, polluted natural water	Plant uptake, microbial metabolism	Water hyacinth, float ping, algae, big peanuts Jiang Hong	Easy design, but industrial optimization less research
Emergent plants	Artificial or natural wetlands	Urban secondary sewage, industrial wastewater, storm runoff	Plant uptake, microbial metabolism	Reed, incense Po, wick grass, mushroom	Research application vs. many, process design meter is mature
Submerged plants	Natural body of water	Submerged vegetation restoration, polluted water restoration	For nitrogen and phosphorus short-term storage, control eutrophication form of expression	Original type of water	Difficult to operate degree, research and application, few

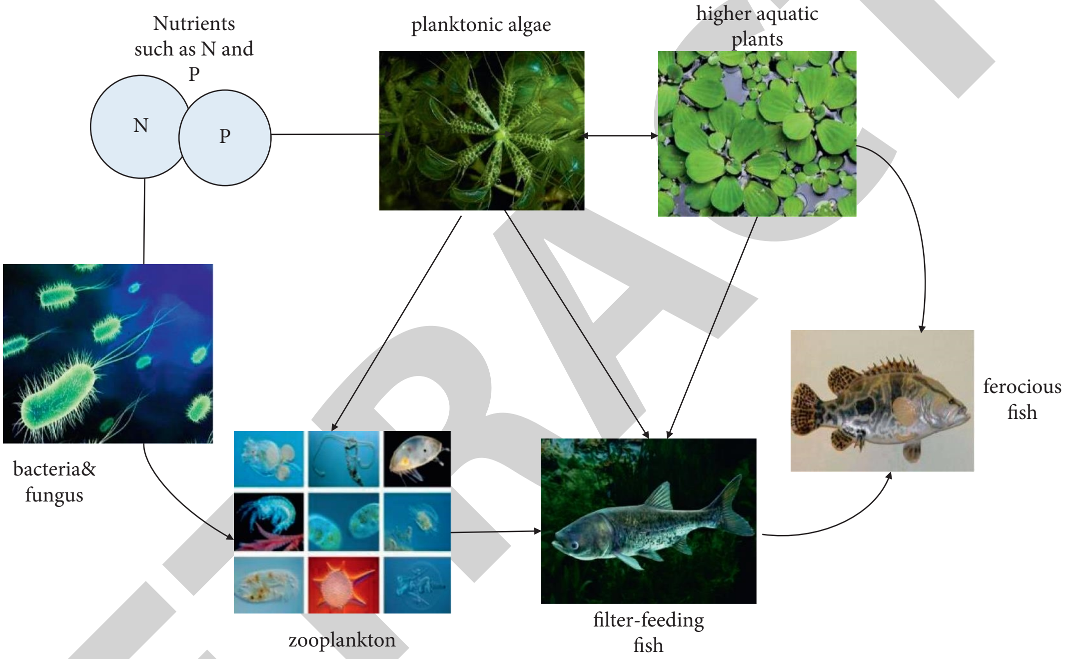


Figure 1: Removal mechanism and process of nutrients in water by aquatic plants.

size of the weights in the network can be calculated from the values of all the sample data. Therefore, the formula for passing the kth node in the hidden layer to the next layer is

$$h_k = \varnothing kz\|x_n - h_k\|. \quad (2)$$

If $H = h_k$ is the output of the hidden layer of the genetic network, then the output of the network can be obtained as

$$f(x_n) = \sum_{k=1}^{n} h_k. \quad (3)$$

For the input vector X, if the matrix H is invertible, the weight can be obtained at this time:

$$L = H^{-1}X. \quad (4)$$

This method is a complete interpolation method, that is, the output data obtained by the network is the output of all samples. Although this method can achieve zero error, in practical applications, full interpolation is unattainable [20]. In addition, when there are too many sample data, the H matrix of the hidden layer will change, which will cause instability during the inversion. For instability, a regularized network can be used to solve it.

Assuming that the function F needs to be approximated by another function, the approximation function can usually be found by solving the method of minimizing the objective function; that is, the standard error term can be found:

$$E(F) = \frac{1}{2}\sum_{k=1}^{n}(X - F(X)). \quad (5)$$

At this time, $E(F)$ is the required standard error term value. In order to solve the instability of the H matrix generated in the interpolation process of the genetic neural network, a regularization term can be added on the basis of the above formula. On the one hand, it reduces the complexity of the approximation function, and on the other

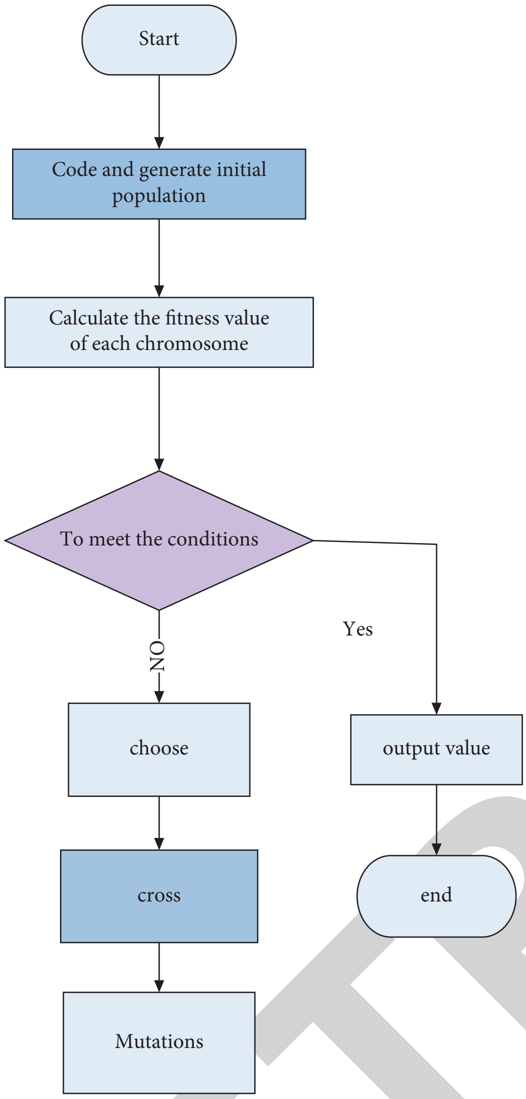


Figure 2: Genetic algorithm flowchart.

hand, it reflects the "geometric" characteristics of the approximation function [21–23]. The added regularization term is

$$E(F) = \frac{1}{2}\|\mathrm{DF}\|^2. \tag{6}$$

In the above formula, D is a linear differential operator. At this time, the total network error term [24]

$$E(F) = \gamma E_k(F). \tag{7}$$

In the formula, γ takes a positive value and is the coefficient of the regularization term. Then the Lagrange formula is

$$\mathrm{DF}_\gamma = \frac{1}{\gamma}\sum_{k=1}^{n} X\delta(F - X). \tag{8}$$

The solution of the above formula is

$$F_\gamma(x) = \frac{1}{\gamma}\sum_{k=1}^{n} G(X_n). \tag{9}$$

The regularization can be obtained by performing linear operations on n basis functions G under different weights [25]:

$$F(x) = \sum_{k=1}^{n} G(x, x_n). \tag{10}$$

Next, the predicted output data $y(n)$ can be calculated from the input data $x(n)$:

$$y(n) = \sum_{k=1}^{m} w_k \varnothing x(n). \tag{11}$$

It replaces the parameters in the original network:

$$W(n+1) = W(n) + \mu_w e(n) \varnothing F. \tag{12}$$

If the input information is x and $j = 1, 2, 3$, the output of the ith hidden node is

$$h_i = \varnothing_i \left\| x_j - c_i(k) \right\|. \tag{13}$$

Among them, $\varnothing_i$ is the activation function of the hidden node, that is, the Gaussian function. Finally, the final output weight of the genetic network can be obtained [26]:

$$\theta = \left\| y - y_n \right\|, \tag{14}$$

which is

$$\theta = \| y - \widehat{H} w \|. \tag{15}$$

4. Experiment of Comprehensive Treatment of Urban Landscape Water Environment

4.1. Experimental Materials and Methods. This experiment of comprehensive treatment of urban landscape water environment is mainly based on the purification and restoration ability of aquatic plants and genetic algorithm. The experiment selected a landscape pond A in Xi'an as the experimental object. The area of the pond is 200 m, the depth of the pond near the bank is about 1 m, and the water depth in the center of the pond is 1.8 m. The pond is surrounded by a landscaped garden with lush trees. Before the start of this experiment, the pond had not been dredged, and the lake bottom was heavily silted up. Moreover, the silt layer is relatively thick and is semifluid, which is easily affected by hydraulic pressure to form sediment floating. Before the ecological purification and restoration of aquatic plants, the hydraulic fluidity of the pond was poor, and the eutrophication of the water body was very serious. The details of the water quality of the pond are shown in Table 2.

It can be seen from Table 2 that the content of eutrophic substances contained in the water body of the pond before the comprehensive treatment of the water environment is significantly higher.

Table 2: Water quality of pond A.

	COD	TN	Ammonia nitrogen	TP	Phosphate
Background concentration	38	3.56	0.95	0.35	0.20
Reclaimed water quality	1.12	11.2	7.55	0.26	0.19
Turbidity	26	18	20	17	22

The aquatic plants selected in this experiment were iris, canna, and celandine, as shown in Figure 3.

The purification and restoration functions of these three aquatic plants on the water environment are as follows: Iris can effectively improve water quality. This makes it more conducive to plant growth, thus keeping the ecosystem in a virtuous cycle. Canna has strong adaptability and high removal efficiency of phosphorus. Celandine can effectively remove all kinds of nutrients in the promotion [27]. These three aquatic plants not only have beautiful landscape effects, but also have better water purification and restoration effects when combined together. Therefore, the cultivation of these three plants in pond A is in line with the experimental purpose.

This experiment combines the water purification and restoration capabilities of the above three aquatic plants and the optimal arrangement function of the genetic algorithm to purify and restore the water body of pond A. After the restoration is completed, the changes in the content of eutrophic substances in the water body and the changes in the transparency of the water body are observed. This then judges the effect of aquatic plants on the purification, restoration, and pollution control of the pond landscape water body. It judges the purification, restoration, and pollution control effects of aquatic plants on the pond landscape water body by analyzing the changes of eutrophic substances in the water body and the changes of water body transparency.

4.2. Changes in the Content of Eutrophic Substances in Water. TN, TP, nitrogen, phosphate, COD, ammonia nitrogen, nitrate nitrogen, and phosphorus are important indicators of water eutrophication. Therefore, the removal of eutrophic substances such as TN, TP, nitrogen, phosphate, COD, ammonia nitrogen, nitrate nitrogen, and phosphorus in the water body is an important measure to control the serious problems of water eutrophication and pollution. It grows three aquatic plants, iris, canna, and celandine, and combines the optimization function of genetic algorithm for water pollution control. The changes of eutrophic substances in the water body of pond A are shown in Figure 4 and Figure 5.

It can be seen from Figures 4 and 5 that 8 eutrophic substances are TN, TP, nitrogen, phosphate, COD, ammonia nitrogen, nitrate nitrogen, and phosphorus. Its content from 20 days before to 60 days after water purification and pollution treatment continued to decline as a whole. The average magnitude of its decrease is 2.1 mg/L. The smallest decrease was the change in TP content. It decreased from 2.8 mg/L before 20 days to 0.6 mg/L after 60 days, with a decreasing range of 2.2 mg/L. The biggest drop was in phosphorus changes. It decreased from 4.1 mg/L 20 days ago to 0.8 mg/L after 60 days, a decrease of 3.3 mg/L. This shows that aquatic plants have better adsorption and removal effects on eutrophic substances in the water body of pond A, and the adsorption and removal effects of phosphorus are the best.

4.3. Changes in Water Transparency. Finally, it is necessary to observe the change of the water transparency of the water body. It is combined with the results of changes in the content of eutrophic substances in the water body analyzed in the previous step to judge the effect of comprehensive treatment of urban landscape water bodies. As far as urban landscape water is concerned, water transparency is a very important evaluation index. The human senses can intuitively feel the quality of the water body through the transparency of the water body. Therefore, to a certain extent, the transparency index of the urban landscape water body directly affects the public's acceptance of the landscape water body. Water transparency reflects the clarity and turbidity of water. Highly polluted waters have higher turbidity, whereas less polluted or unpolluted waters have higher clarity. The transparency of water body reflects the light scattering intensity of particles in the water body and the higher transparency of water body. It shows that the less particulate matter contained in the water body, the less eutrophic substances contained in the water body at this time, and the water body is less polluted. The turbidity of the water body directly reflects the content of impurities in the water body. The higher the turbidity, the higher the impurity content in the water body, that is, the more the pollutants in the water body. Figures 6 and 7 show the changes in the transparency of the water body in the pond after purification and restoration by aquatic plants.

It can be seen from Figures 6 and 7 that the water transparency of pond A after pollution control has increased from 20 cm 7 days ago to 40 cm after 63 days. In contrast, the turbidity of the water body decreased from 24 cm before 7 days of treatment to 2 cm after 63 days. This shows that after the purification and restoration of aquatic plants and pollution control, the water transparency of the landscape pond has increased significantly. It also means that the comprehensive treatment of water pollution has achieved good results.

In summary, after the purification and restoration of aquatic plants and comprehensive pollution control, the comprehensive eutrophic substance content of the landscape pond water body decreased by 21.7 mg, and the water body transparency increased by 20 cm. The effect of the landscape water body after pollution control is shown in Figure 8.

It can be seen that after the comprehensive pollution control based on the purification and restoration of aquatic plants and the optimal arrangement of genetic algorithm, the landscape water body has achieved a good landscape water body effect.

Figure 3: (From left to right) Iris, canna, celandine.

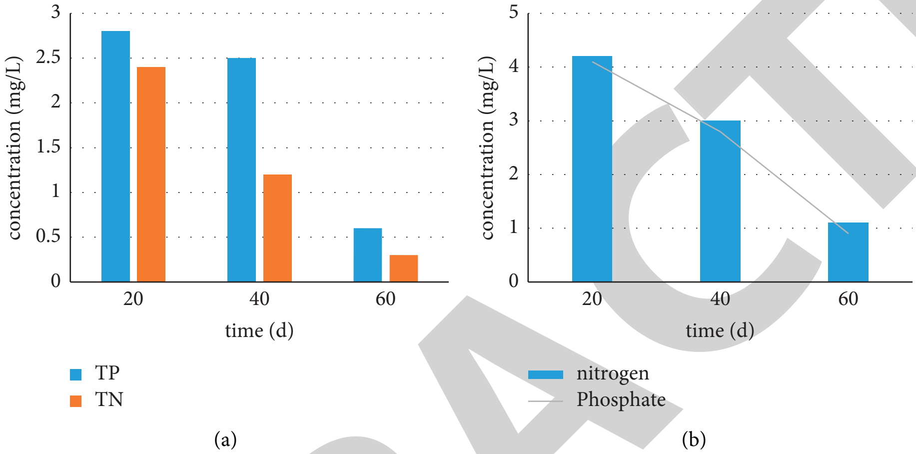


Figure 4: Changes in the content of TN, TP, nitrogen, and phosphate over time in water. (a) Changes in the content of TN and TP. (b) Changes in nitrogen and phosphate content.

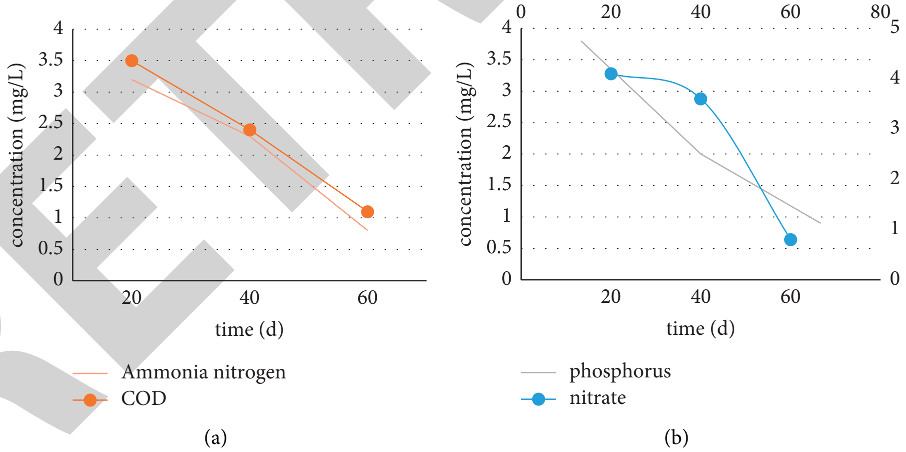
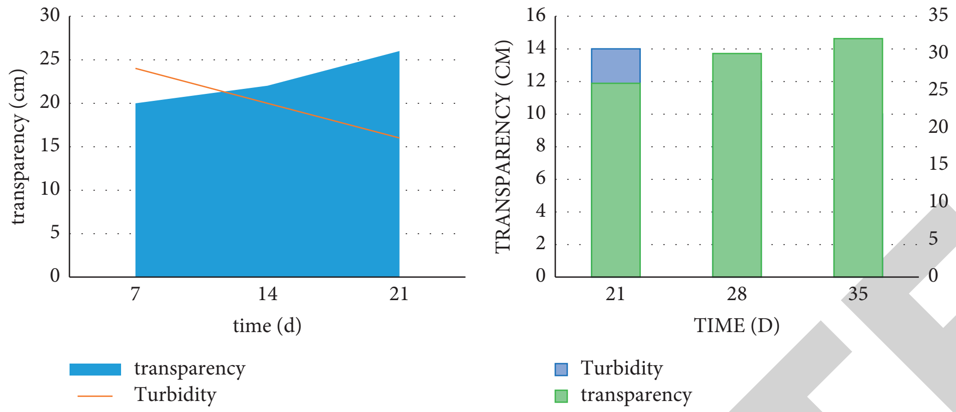


Figure 5: Changes in the content of COD, ammonia nitrogen, nitrate nitrogen, and phosphorus in water. (a) Changes in the content of COD and ammonia nitrogen. (b) Changes in the content of nitrate and phosphorus.

5. Discussion

Urban landscape water body is an important part of urban water environment. It not only has a certain ecological function, but also has a unique aesthetic function. Urban landscape water bodies have always played an important role in the urban water environment. The urban water environment has been polluted more and more, and the urban landscape water bodies have also been polluted and destroyed more and more. Therefore, the comprehensive treatment of urban water environment pollution and the treatment of urban landscape water pollution are of great significance for protecting the urban water environment and maintaining the harmonious development between the production and life of urban residents and nature [28].

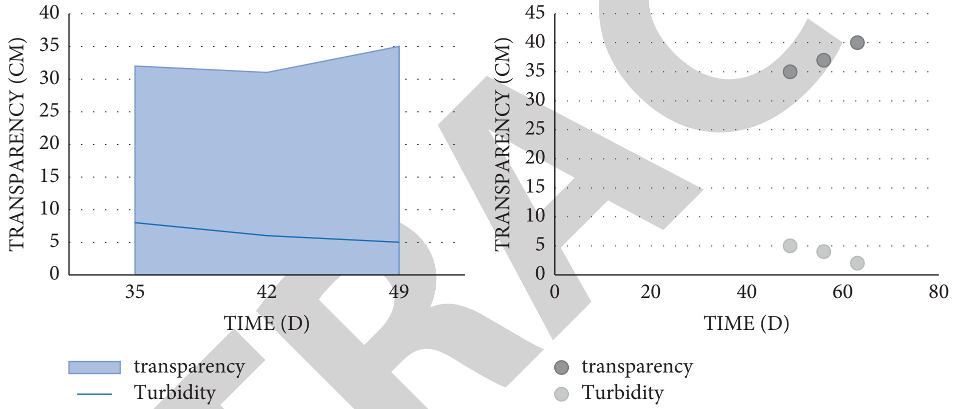
As plants that can survive and reproduce in water, aquatic plants have certain ecological functions. It also has a certain purification and repair effect on water pollution. Therefore,



(a)

(b)

Figure 6: Changes in water transparency from day 7 to 35. (a) 7–21 days' water transparency changes. (b) 21–35 days' water transparency changes.



(a)

(b)

Figure 7: Changes in water clarity from 35 to 63 days. (a) Changes in water transparency in 35–49 days. (b) Changes in water transparency in 49–63 days.

(a)

(b)

Figure 8: Pond A water body effect after pollution control. (a) 30 days after pollution control. (b) 60 days after pollution control.

aquatic plants are often used in the comprehensive management of water environment pollution. As a global search optimization algorithm, genetic algorithm plays a certain role in the construction of pollution control system. In this paper, the comprehensive management of urban landscape water environment is carried out based on the purification and restoration ability of aquatic plants and genetic algorithm.

The urban landscape water environment comprehensive treatment experiment designed in this paper first selected a landscape pond A in Xi'an as the experimental object and conducted a basic investigation on its water quality. It then selected three aquatic plants, iris, canna, and celandine, as raw materials for the purification and restoration of aquatic plants and combined genetic algorithms to conduct experiments. It planted these three aquatic plants in the pond water body. The experiment judged the effect of the comprehensive urban water environment management experiment based on the purification and restoration ability of aquatic plants and genetic algorithm by observing the changes in the content of various eutrophic substances in the pond water within 60 days and the changes in water transparency within 7–63 days. After the experiment, it was found that the content of eutrophic substances in the landscape water body decreased significantly, and the water body transparency increased. This shows that the experiment has achieved a good effect of comprehensive treatment of urban water environment. After the experiment, it was found that the comprehensive eutrophic content of the landscape pond water after the purification and restoration of aquatic plants and comprehensive pollution control decreased by 21.7 mg, and the transparency of the water body increased by 20 cm. This shows that the content of eutrophic substances in the landscape water body has decreased significantly, and the transparency of the water body has increased. It also means that the experiment has achieved a good effect of comprehensive treatment of urban water environment.

6. Conclusion

In view of the economic significance of comprehensive management of urban landscape water bodies for protecting urban water environment, this paper mainly studies the comprehensive management of urban water environment based on aquatic plant purification and restoration and genetic algorithm. This paper mainly studies the comprehensive management of urban water environment based on aquatic plant purification and restoration and genetic algorithm. The experimental research in this paper shows that the comprehensive treatment of urban water environment based on the purification and restoration of aquatic plants and genetic algorithm can achieve good results. The conclusions drawn in this paper have certain significance for promoting the progress of comprehensive treatment technology of urban water environment. The research of this paper also has limitations, for example, the research angle is still a little narrow, and the research method is not innovative enough. It is believed that there will be more excellent researches related to the comprehensive management of urban water environment in the future.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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