UDC: 628.832.12.32

EICHHORNIA (EICHHORNIA CRASSIPES SOLMS.): ADAPTATION CHARACTERISTICS OF THE AQUATIC PLANT TO WASTEWATER CONTAMINATED WITH PETROLEUM PRODUCTS

Normatov Abdurahim Eminovich
Basic doctoral student of FerSU abdurahim85normatov@gmail.com
Tel: (+998-99) 010-91-51 ORCID ID: 0009-0004-5617-3258

Annotation: *This article provides information on the growth and adaptation characteristics of the higher aquatic plant Eichhornia (Eichhornia crassipes Solms.) in wastewater contaminated with petroleum products. It discusses the plant's role in accumulating and purifying harmful substances, as well as its root system.*

Key words: *Eichhornia (Eichhornia crassipes Solms.), oil product, adapted, microorganism, natural equator, photosynthesis, development, growth, wastewater, aerenchyma.*

ENTRANCE

Today, in order to prevent pollution of natural and artificial reservoirs, the use of water resources in the world is increasingly turning wastewater from residential areas, industrial and agricultural enterprises into untreated wastewater.

Large innovative measures are being implemented to improve effective wastewater treatment methods, create a system for the reuse of wastewater, and implement it in practice.

Among organic water pollutants, one of the most dangerous substances is oil products, and their separation or purification from wastewater is one of the most complex tasks.

The biological method for purifying water contaminated with oil and petroleum products is considered an effective, cost-effective, and environmentally friendly method, differing from mechanical and chemical methods in that it requires time.

The main aquatic plants and bacteria used in biological wastewater treatment require time for adaptation, growth, reproduction, accumulation, breakdown of harmful substances, and other processes in harmful aquatic environments.

Eichornia is considered a fast-growing higher aquatic plant. It is found mainly in tropical and subtropical regions.

Eichornia often floats on the surface of the water, and a large number of spreading root systems move freely in the water.

The leaves are thick and large in diameter, and the roots are mostly black.

Figure 1. Eichhornia (Eichhornia crassipes Solms.) is a higher aquatic plant.

Eichornia absorbs impurities from water, including phosphates, nitrates, and organic substances, thereby making it useful in the biological water purification process. It can also accumulate various heavy metals, which has made it an effective plant in water treatment projects.

The root system of eichornia has a unique and very effective structure among aquatic plants. Eichornia's roots float freely in the water and are not attached to the outer surface or the bottom. Roots can extend from the water surface to the bottom by 50 cm or more.

hey absorb nitrates, phosphates, and organic compounds from water, as well as various heavy metals, allow eichornia to move like a natural filter. This process contributes to the biological purification of water. It can accumulate many harmful elements (such as sulfur, mercury, zinc, and other heavy metals) in water.

Eihornia roots also create a favorable environment for aquatic microorganisms. Interacting with internal microorganisms, it accelerates the breakdown of harmful substances in the water. This also provides additional help in the process of eichornia's water purification. The Eichhornia root system plays an important role in filtering pollutants in aquatic ecosystems. Eichornia accumulates nitrate and phosphate substances in the water, which in excess can form sediments and clay at the bottom. Having absorbed these substances, the roots of eichornia do not allow them to accumulate at the bottom, therefore a layer of clay is formed.

Because Eichhornia floats on the water's surface, it slows down the movement of sediments near the bottom and prevents them from turning into a solid clay layer. Therefore, instead of forming a layer of clay, it, on the contrary, contributes to the breakdown of substances in the water. These properties make eichornia an effective "natural excavator" for cleaning water bodies.

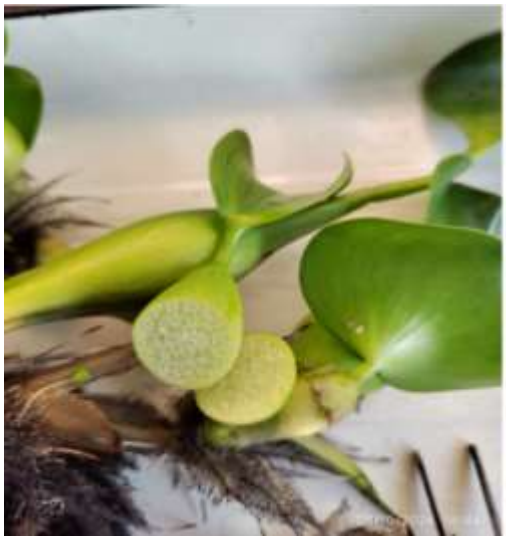
Eichornia roots have a unique anatomy, they swim freely in the water and play an important role in absorbing substances from the water.

Figures 2-3. Eichhornia (Eichhornia crassipes Solms.) roots of a higher aquatic plant.

The internal structure of Eichhornia's roots allows it to obtain nutrients from water, filter waste, and efficiently use oxygen in the water.

Epidermis (outer covering) The outer structure of Eichhornia roots consists of the epidermis, which helps to obtain nutrients and water directly from water. The epidermis performs the function of protecting the root in a favorable aquatic environment and controlling the absorption of nutrients in the water. The epidermis also protects the root from harmful substances and microorganisms in the water.

The tissue that forms the main part of the root after the epidermis (parchal cells) is called the cortex. Cells of the cortex are the ones that absorb the most water and nutrients. Their main function is to receive nutrients and minerals from the water and transport them above the root. Aerenchyma (air-conducting tissues) The aerenchyma tissue present in the roots of eichornia is one of the most important characteristics. Aerenchyma cavities are specialized organs for storing and transporting oxygen within the root, helping the root to breathe in a low-oxygen environment in the water. These tissues are present not only in the root but in the entire plant and help it survive in water.




Figures 4-5. Eichhornia (Eichhornia crassipes Solms.) - aerenchyma tissues of the higher aquatic plant.

Aerenchyma tissues have small air chambers that ensure oxygen exchange in the aquatic environment and help maintain the necessary air reserve for plant life in cases of oxygen deficiency in the water.

Xylem and phloem (transport tissues) The xylem and phloem tissues are responsible for transporting water and nutrients inside the roots. The xylem carries water and minerals upward from the root to other parts of the plant, while the phloem distributes sugars and nutrients produced during photosynthesis to all the cells.

The root node (apical meristem) is the growing part of the root called the apical meristem. This node produces new cells, ensuring root growth and its continued activity in water. The apical meristem grows rapidly, forming new cells and helping the root adapt to the external environment. The root anatomy of Eichornia is adapted to its ability to live productively in aquatic environments and absorb necessary substances from water. Aerenchyma tissues, cortex cells, and transport tissues play a key role in respiration, nutrient uptake, and plant life support in aquatic environments. From the outside, its most noticeable features are its free-floating roots in water, while its internal structure indicates its development in accordance with the requirements of a specific ecosystem.

Eichhornia (Eichhornia crassipes) is effective in treating water contaminated with oil and petroleum products, but it does not decompose oil, but rather purifies it by accumulating.

The cells located in the roots and leaves of eichornia are capable of absorbing oil and oil products. These plants help remove toxic substances and organic matter from the water by accumulating them.

These properties are effective in the extraction of petroleum products from wastewater contaminated with petroleum products, and their concentration decreases. Eichornia roots contain arbitrary microorganisms, providing them with a source of nutrients. These microorganisms can also be active in the process of oil decomposition, but the main function of eichornia is their collection and purification.

Eichornia helps to work together with local microflora (mainly bacteria) to increase its effectiveness. These microorganisms play an important role in the process of oil decomposition.

Eichhornia has a mechanism based on accumulation rather than decomposition when treating water contaminated with oil and petroleum products. It plays an important role in the process of absorbing toxic substances from water, interaction with microorganisms, and subsequent purification.

In the process of accumulating oil and petroleum products, Eichhornia stores them mainly in its roots, leaves, and aerenchyma tissues. Eihornia roots perform the function of absorbing and storing substances from water. These roots are very effective for the accumulation of oil and oil products.

Aerenchyma tissue in leaves not only provides oxygen but also has the function of accumulating oil and organic substances. Leaves also participate in the absorption and accumulation of oil substances. Eichornia's aerenchyma tissue, i.e., internal air cavities, serves not only for storing oxygen but also for accumulating petroleum substances. In these cavities, the concentration of petroleum substances can decrease or accumulate.

Treating wastewater contaminated with oil and oil products using the Eichhornia plant is considered the most effective biological method and plays a fundamental and important role in reducing the negative impact of contaminated wastewater on nature.

LIST OF LITERATURE:

1. Буриев С., Рашидов Н., Ҳайитов Ё., Джалолов Е. Биотехнологические основы очистки сточных вод животноводческих комплексов. IV Международная научная экологическая конференция // Проблемы рекультивации отходов быта, промышленного и селькохозяйственного производства. – Краснадар, 2015. – С. 239-240.

2. Гула К.Е. Использование ряски малой (Lemna minor L) в процессе очистки промышленных стоков золоторудных предприятий в бассейне р. Амур // Научный журнал НИУ ИТМО. Серия Экономика и экологический менеджмент. – 2012. № 2 (11). – С. 13-19.

3. Davronov Q. Biotexnologiya: Ilmiy, amaliy va uslubiy asoslari. “Patent - Press”. – Toshkent, 2008. – B. 504.

4. Jo‘rayev O.J., Eshqobilov Sh.A., Urolov F.A., Qayumova L.SH. Sut mahsulotlari ishlab chiquvchi korxonalar oqava suvlarini mahalliy tozalash uslublari tahlili // Mintaqada yuzaga kelgan ekologik muammolarni yumshatish omillari. – Buxoro, 2019. –S. 73-74.

5. Jo‘rayev U.A. Kollektor-zovur suvlarining mineralizatsiyasini biologik usulda pasaytirish va undan sug‘orma dehqonchilikda foydalanish // Dis. ... q/x. fan. nom. – Toshkent: TIQXMMI. Buxoro filiali, 2017. – B. 120.

6. Jo‘rayev O.J., Eshqobilov Sh.A., Qayumova L.SH. Yengil sanoat oqava suvlarini mahalliy sharoitda tozalashda qo‘llaniladigan uslublar tahlili // Mintaqada yuzaga kelgan ekologik muammolarni yumshatish omillari. – Buxoro, 2019. – B. 78-79.

7. Заядан Б.К., Садвакасова А.К., Кирбаева Д.К., Болатхан К., Салех М., Бауенова М. Безотходная технология биологической очистки сточных вод с помощью микроводорослей // Вестник серия экологическая. № 2/2 (38). 2013. – С. 159-163.

8. Загоскина Н.В., Назаренко Л.В., Калашникова Е.А., Живухина Е.А. Биотехнология: Теория и практика. – М.: Оникс, 2009. – С. 496.

9. Yuldoshov L.T., Bo‘riyev S.B. Oqava suvlarda yuksak suv o‘simliklarini ko‘paytirish biotexnologiyasi // Oqava suvlarni biologik uslubda tozalashning biotexnologiyasi.- Respublika ilmiy-amaliy anjuman materiallari. – Buxoro, 2018. – B. 112-124.

10. Buriev S. B., Yuldoshov L.T. Ecological biotechnology of sewage cleaning.//Asian Journal of Multidimensional Research. Vol 8, Issue 5, May 2019.