International Journal of
Biological Engineering and Agriculture

ISSN: 2833-5376
Volume 2 | No 11 | Nov -2023

Prospects for Using Azolla Caroliniana

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Annotation: The article presents the results of laboratory experiments to determine the optimal conditions for growing the aquatic plant Azolla caroliniana in different concentrations of cow dung (5-, 10-, 15 g-m2) + KNO3 (2 g/l). The results of the formation of plant biomass depending on the concentration of the nutrient medium and the density of plants before and after cultivation are highlighted.

The quality and feature of flowing water leads to the growth and development of water organisms (gidrobions)here. Water organisms accelerate the purification of flowing waters. The good development of micro organism and high water plants is largely due to the chemical composition of wastewater.

Keywords: Azolla Caroliniana, higher aquatic plants; biomass; cow dung; nutrient medium.

The interest and need for natural food in the world have always been distinguished by the high importance of artificial products, which today increasingly cover many areas. Scientific substantiation of the biological potential of water basins, its correct orientation and distribution of resources, or accurate prediction of the future basin always requires reasonable implementation.

Improving the quality of daily feed rations is becoming an urgent task for increasing the production of livestock and poultry products in Uzbekistan, in particular, the composition of feed rations for livestock and poultry does not meet modern requirements.

In the future, the use of A. Caroliniana in various sectors of the economy is a matter of time, so it is necessary to study the bioecological properties of this plant, and this plant is being introduced in Uzbekistan for rational use. It has been distributed for several years in several reservoirs of its regions, mainly due to its good growth in stagnant or slow-flowing waters (Shoyakubov, Dosmetov, 2001).

Azolla is mainly found in the freshwater basins of tropical countries and is native to Vietnam. However, A.N. Krishtofovich testified that azole was also common in Central Asia in ancient times, and its remains were also found in Ustyurt (Oligocene).

Azolla-Anabaena is a symbiotic organism consisting of two plants according to its structure: the crustacean - Azolla and the blue-green algae Anabaena in its body (Lumpkin, Rlucknett, 1982).

Azolla was first used in practice by a peasant woman named Ba Xen, who lived in the Thai province of Vietnam (Mishustin, Shilnikova, 1968). He achieved very high results using azole in practice.

After the woman's death, Thai-Bin peasants erected a statue of the woman under the name "Queen of Azolla." Every autumn, on the day of his death, farmers held ceremonies to worship the statue. There was no information about Azolla in Vietnam other than this province. Azolla is known only to Thai-Bin farmers and is kept a secret. During this time, the study of the development and distribution of azole propagation was banned, which lasted until August 1945, after which the secrets of azole reproduction, distribution and importance in the national economy were revealed.

Azolla caroliniana is a small, 0.7-1.8 cm long floating plant. It also grows and reproduces in water bodies in Uzbekistan. As a result, it covers the surface of the water and prevents light from entering the ponds. Under favourable environmental conditions, azole is rapidly and rapidly transitioning to vegetative reproduction. Carolina azole sporophyte consists of a branched floating 25 mm long root. At the top of it are two rows of small (0.5–1mm) leaves, as if covered with a tile-like twig. From some joints of the branches can be seen long roots hanging in the water (Dosmetov, 2002).

The structure of the azole leaf indicates a high degree of specialization. Each leaf consists of two segments. The upper segment is green and is located on the surface of the water table. The lower segment is at the bottom of the water and we think it serves to suck up the water. Sometimes the development of courses on the lower segment side is also observed.

Azolla can reproduce several times continuously vegetatively without forming reproductive organs and produces large amounts of green biomass.

In Uzbekistan, Azolla caroliniana is propagated mainly vegetatively. Once the lateral branches of the mother plant have matured, they can easily begin to separate from the mother body. Separated side branches begin to grow independently, dispersing using a stream of water. If the mother plant initially had a single main root, then new roots (rhizoids) begin to form during the growth of the side branches. Another characteristic of the vegetative reproduction of azoles is that the mother body (plant) completely divides into a young body (plant). Then, when the lateral branches form roots, the mother root loses its properties, separates from the body and sinks to the bottom of the water, rots and becomes an organo-mineral substance (Dosmetov, 2002).

The importance of azole in the national economy is not limited to its assimilation of atmospheric nitrogen, it also serves as a nutritious supplement in animal husbandry. In several countries, fish, pigs, ducks and black cattle are fed with azole biomass.

We carried out research work to propagate A. filiculoides in the reservoirs of the Samarkand region, to study its bioecological properties, to use it in poultry farming and wastewater treatment.

Research materials and methods. The object of study is Azolla caroliniana Willd (Azolla caroliniana of the sea urchin) is a plant of the class Polypodiopsida, Salviniales family and family Azollaceae.

Various, organic and organometal nutrient media were prepared for the cultivation of azole, crystallizers, glass-plastic were used. Growth and vegetative propagation of azole were observed in the above devices.

To determine the yield of azoles per 1 m^2, a method of weighing its wet biomass was used.

Research results and their discussion. For aquatic plants, water is not only an important environmental factor necessary for life but also a direct habitat in which the whole set of factors is formed in contrast to terrestrial plants.

Although Azolla is a tropical plant, it usually lives well in stagnant or slow-flowing cool waters. Taking into account these features, we also used special devices to propagate this plant in Uzbekistan. We also dealt with the selection of the necessary nutrient media and the determination of the density of the initial seedlings to accelerate the mass reproduction and increase its efficiency.

Azolla gets the nutrients it needs from water. Its nutrient environment is almost the same as that of other aquatic plants, but the nitrogen demand of azoles is not derived from water, which is fully satisfied by the nitrogen accumulated by the blue-green algae Anabaena Azolla, which is its symbiosis.

To study the effect of Azolla nutrient content on the dynamics of biomass formation, we conducted experiments in duralumin containers, outdoors (water depth 15-25 cm, water surface area 1 m^2). In this case, the nutrient medium was used in 3 different variants (5, 10 and 15 g / l) prepared from the decomposed manure of cattle. KNO3 (2 g / l) was added to all food options. Wet biomass of 1 m^2 of azole was injected into the device at a rate of 800 g. The temperature of the nutrient medium was 15-280S, pH 6.5-7.5, light 400-450 W / m^2 FAR. Harvesting additional biomass every day also hurts productivity and plant growth. Therefore, additionally, grown biomass was obtained every 3 days (Table 1).

According to the analysis, the average daily increase in biomass density in 5 g / l + KNO3 (2 g / l) cow manure nutrient medium was 25.1 (3.3%) and the monthly biomass growth was 753 (94.1%) for Azolla caroliniana cultivation. found to be acceptable.

The 1st table. Dynamics of biomass formation in different nutrient media by Azolla caroliniana Willd

№	Type of nutrient medium	The amount of biomass is g / m^2		Daily growth of biomass		30-day growth of biomass	
		First	At the end of the experiment	G	%	g	%
1	5 g / l	800	1553 ± 55	25,1 ± 3	3,3	753 ± 42	94,1
2	10 g / l	800	1340 ± 60	18,7 ± 4	2,3	540 ± 45	67,5
3	15 g / l	800	1130 ± 77	11,7 ± 2	1,4	330 ± 50	42,3

The rapid growth of plants growing on the surface of the water depends not only on the composition of the nutrient medium but also on the density of the seedlings in which the plant is first planted.

To study the effect of azole on the density of the initial seedlings, we conducted experiments in duralumin containers, in the open air (water depth 15-25 cm, water surface area 1 m^2). In this case, a nutrient medium prepared from the decomposed manure of cattle (5 g / l) was used. Wet biomass of 1 m^2 of azole was planted on the device at the rate of 200, 400, 600, 800, 1000 and 1200 g. The temperature of the nutrient medium was 15–28^{0}C, pH 6.5–7.5. Harvesting additional biomass every day also hurts productivity and plant growth. Therefore, additionally, grown biomass was obtained every 3 days (Table 2).

Experiments have shown that azole grows relatively well and has a high yield (22815 g / m^2) when the density of the first planted seedlings is 400 g / m^2. When the density of the first planted seedlings was low (200 g / m^2), the daily yield was only 32.0 g / m^2. This means an average daily increase of 10.7%. The optimum density of the seedlings is 400 g / m^2, and from 600 g / m^2, the density begins to negatively affect the yield. As the density of seedlings increases (800-1200 g / m^2), the growth of azole becomes more difficult and in turn, the formation of biomass decreases. The main reason for this is that, as mentioned above, the plants condense and climb on top of each other. As a result, due to the lack of light to the plants exposed to sunlight, there are no conditions for the process of photosynthesis to take place and for the plant to reproduce. As a result, the process of photosynthesis and metabolism in these plants is disrupted, the production of azole biomass is reduced, the lower layers of the plant sink to the bottom and die.

The 2nd table. Effect of seedling density on Azolla caroliniana Willd yield

№	The initial density of biomass, g / m^2	After the experiment (after 30 days)			Increase in raw biomass at the end of the experiment	
		Crude biomass, g/м^2	Daily gain			
			g/m^2	%	g/m^2	%
1	200	1260 ± 79	32 ± 4	10,7	960 ± 40	320

2	400	22815 ± 70	77,2 ± 5	15,4	2315 ± 46	463
3	600	1890 ± 59	39,7 ± 6	5,7	1190 ± 60	170
4	800	1780 ± 66	26 ± 4	2,6	780 ± 35	78
5	1000	1720 ± 80	17,3 ± 5	1,4	520 ± 50	43,3
6	1200	1950 ± 70	15 ± 2	1	450 ± 44	30

Thus, determining the optimal level of seedling density is of practical importance for azoles, as well as other algae and aquatic plants.

Water is an environmental factor of primary importance for all living organisms and people's hospitality. Over the following years, pollution of open water bodies due to the influence of industrial and agricultural wastewater has been causing profound negative changes in the structure of their flora and fauna. In Uzbekistan, contaminated water coming out of poultry and swine production and agro-industrial enterprises is added directly to the open water basins through reservoirs. In the composition of such waters, the disease provoking salmonella, shigella, enterovirus and vibrions are added to the waters of open reservoirs, which leads to their contamination, which leads to the fact that humans suffer from various diseases, poisoning.

The quality and feature of flowing water leads to the growth and development of water organisms (gidrobions)here. Water organisms accelerate the purification of flowing waters. The good development of micro organism and high water plants is largely due to the chemical composition of wastewater (Dosmetov, 2001; Raimbekov, 2017).

Another important aspect of high water plants is that they grow well mainly in polluted waters and make a high level of biomass dressing, enrich the water with oxygen. As a result, it microbiologically oxidizes organic substances, and water is purified. Purified water can be used freely for different purposes. A biomass with a high degree of dressing can be used in the feeding of rural animals and poultry.

The results of our studies show that, like other higher plants, A.Saroliniana is also important in the purification of whitewash and collector-sizing waters and improves the physical properties and chemical composition of water.

A.10 days after the cultivation of Saroliniana, the physical properties and chemical composition of water radically changed. The water in the stream became clear and odorless. Oxygen dissolved in water increased to 10,7 mg O2 /l, there was a slight decrease in the amount of nitrate, nitrite and ammonia (Table 3).

The 3nd table. Wastewater physical and chemical composition A.the effect of caroliniana

Indicators	Before experience	After experience
pH	5-5,5	7
Colour	Brown	Colorless
Smell	Scented	Scentless
The amount of dissolved oxygen in water, mgO_2 / l	4,7	10,7
Oxygenation, mg O_2/l	45,0	12,0
Ammonia, mg/l	1,5	0,01
Nitrates, mg/l	7,0	0,08
Nitrites, mg/l	0,065	0,003
Dry residue, mg/l	740,0	54,0

One of the most urgent problems in Central Asia, in particular in Uzbekistan, is the water deficit and the fact that it becomes a limiting factor. Therefore, it is understandable in itself that the importance of attracting such wastewater, which can not be used in production activities, is incomparable. Continuing to deepen and deepen serious scientific work in this direction, it seems to us promising.

Conclusion. Thus, in the conditions of the Samarkand region, we consider it optimal to use 5 g / l + KNO3 (2 g / l) nutrient medium of rotten cattle manure in special devices for azole augmentation in laboratories and limited water basins and the optimum density of seedlings is 400 g / m^2.

For gross reproduction, organic and mineral substances contained in various wastewater, collector-sizot waters are sufficient, the water environment (rn), the temperature of light, water and air, is optimal for the development of nitrogen and obtaining biomass from it, and at the same time reduced the number of bacteria with saprophytes and intestinal sticks in azolla wastewater and collector-sizot Waters, lost pathogens,

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