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ECOLOGICAL CONTROL EQUIPMENT AND TECHNOLOGY OF UNDERWATER VEGETATION DEVELOPMENT

TEHNOLOGIE ŞI ECHIPAMENT DE CONTROL ECOLOGIC A DEZVOLTĂRII VEGETAȚIEI SUBMERSE

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The excess of aquatic submerse vegetation development carries to the reduction of the real rearing area for the piscicultural material from the production farms and allow nestling of the ichthyophages bird species that decrease the fish production. Aquatic submerse vegetation stumble the utilization of aquatic zones for recreation and also wright function of basins utilized for the electric energy production, of micro electricity works through obstruction of the dams grid. The control of the aquatic submerse vegetation development, for Myriophyllum verticillatum, Ceratophyllum submersum, Urticularia vulgaris, Potamogeton natans, Nimphoides peltata species it is accomplish through the removing of some parts of these, preferably with all the stump system. Usually, these its accomplish with the floating equipments fit up with the thermic engines and the propulsion and governating elements who have harm over the fish and some others aquatic organisms through the noise, the displacing a large quality of water caused of propulsion systems and through the noxes elimination (flue, carburant trails, etc.). These technologies reside from the evacuation of the aquatic submerse vegetation and the stump systems of these with the help of an adjustable rake, hang up from the coast by a rope, wrapped to a drummer, who is trained by a motto-propeller group with a small installed power.

Key words: aquatic submerse vegetation, aquaculture, aquatic ecology

Introduction

The piscicultural productivity from an aquatic basin is in the directly dependence with the exploitation type of these. An optimal exploitation of un aquatic basin suppose the accomplishment of some maintenance works of these, having as goal the obtaining of some superior bio-productive value.

One of the most important maintenance works, through the aquaculture farms it is represented by the struggle against the aquatic submerse vegetation.

The aquatic submerse plants formed an association of which the components, in their majority, through a fairly development, are productive elements in case of un aquatic basin, bringing more advantages. These are major oxygen producers because of the photosynthesis process who it take place aquatic submerse; is a shelter for the fish in the warm and storm periods; is a support for laid down of the roe of some fish and aquatic invertebrates; are consumed by some fish species and aquatic invertebrates. Through a quickly decompose of the plants, which fall under the bottom, water it's wealthy in biogenic elements.

However, some aquatic submerse plants, like *Elodea canadensis, Ceratophyllum submersum,* are harmful to the fish development through the influence which they have on the pH variation form un aquatic basins, and through the participation to the celluloses unproductive mud formation.

The excessive development of the aquatic submerse plants have a negative influence in the piscicultural economy. This fact require the removing of overflow plants from aquatic basins, in the aim of maintaining the productive factors to a favorable level, formation of some nutritive fish fauna, which is superior in point of quality and quantity, ensuring the access of fish to the rich food areas as in the aim of limiting the process of biological colmatation.

The importance development of this technology and this equipment dedicated to the aquatic submerse vegetation control is determined by the aspects regarding:

- Releasing of aquatic areas, over covered by the vegetation which stumble the rearing of economic valuable fish species;
- Accomplishment of an optimal control over the fish population;
- Increasing the useful areas of aquatic basins dedicated to the aquaculture and the rearing of fish through large density;
- Warning of aquatic basins colmatations;
- Hygiene of aquatic basins areas designated to the sporting fishing and recreative activities;
- Utilization of aquatic basins in the aim of recreation, because in these condition the swimming and the removing of recreation boat it is difficult, almost impossible;
- Vegetation removal, from aquatic basins which cater the micro electric power works, who stumble these to reach the grid zones.

The equipment will allow the increasing of production active areas in the piscicultural basins and also, the proper utilization of other aquatic areas with excess vegetation, in the reach of the goal for which are dedicated.

Materials and Methods

The aquatic submerse vegetation it is fixed through the radicular system by the alluvial substrate, and the essentially elements are: *Myriophyllum verticillatum*, *Ceratophyllum submersum*, *Utricularia vulgaris*, *Elodea canadensis*, *Potamogeton natans*, *Nymphoides peltata*, etc.

By the manner in which it is developed and distributed the aquatic submerse vegetation trough the aquatic basins, could be realize the appreciations over the piscicultural productivity value of those. In this way, then when *Myriophyllum* and *Potamogeton* appear in form of some medium populations, the piscultural productivity might be appreciated like good, if they are small bunches of *Elodea*, the piscultural productivity have a medium value, and where it is an adundance of *Elodea* and *Ceratophyllum,* the piscultural productivity is low.

Myriophyllum and *Potamogeton* cover sometimes the aquatic basins until 80% from aquatic areas, reducing very much the fish production and bringing the appearance of high human and material resource consumption for mowing and evacuating them from the basins surface.

For obtaining good fish production from the overgrowing vegetation basins this must be mowed (if it is possible) and in conformity with the situation will be effectuated a number until 4 mowing per year. The number of mowing may be reduced like in case of the eradicated to a single mowing per year and a substantial reducing of the affected surface by the aquatic submerses vegetation.

Usually the boats with knifes with alternative movement and preponderated in utilization designate to mowing aquatic vegetation do not have good results in the check and control of the aquatic submerse vegetation of *Myriophyllum verticillatum* type which is coil to the active organs and from the meaning that they have a reduced floatability.

From this reason it has been elaborated a proper technology and equipment to control the aquatic submerse vegetation which allow the eradicating and clearing of the aquatic vegetation.

An important role in establishing the check and control of the aquatic submerse vegetation technology is the soil ability where growing the vegetation. In the aquatic basins the types of soils are: alluvial or fluvial-lake deposits with high, average or slow ability and the types of technologies and equipments which could be applied.

This technology is mainly designate to some aquatic basins with surfaces approximately 3 ha, or canals with more destinations (refill, evacuation, drainage).

Usually the ecologically control mode for the development of the aquatic submerse vegetation consists in the traction from the coast of a rake trough the vegetation (fig.1), realizing the wires and roots grabbing (depending on the soil ability) with the help of a rope from a reel handled of an engine.

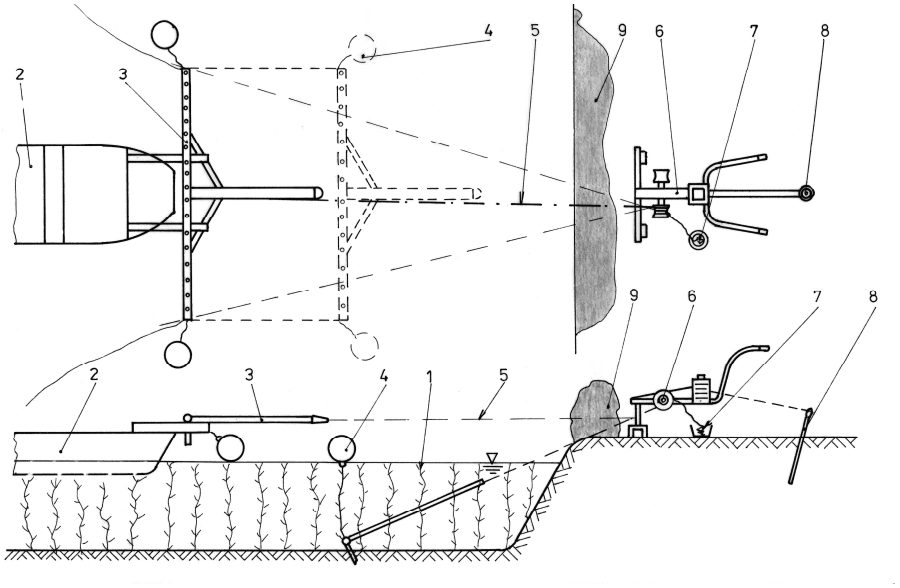

Fig.1 Action modality of combating equipment for aquatic submerse vegetation

Legend
1. Aquatic basin;
2. Boat for the movement of the tool used in aquatic vegetation removal;
3. Tool for aquatic vegetation removal (rake);
4. Floats;
5. Rope;
6. Rope handle unit;
7. Container for rope storage;
8. Picket for handle unit anchor;
9. Evacuated vegetation from the aquatic basin.

The crew in this activity is composed from 2 persons, one of them in a boat equipped at bow, with a holder used in vegetation removing tool fixation (rake), and the other one for the handle unit acting the tool for removing the aquatic vegetation (the rake) with the help of a rope above the trolley wheel and remove it in a storage container.

The engine tool it is made from the engine of a Carpatina MB MAS type AL75 motto mower with 6HP power, and a gearbox placed above a prop behind and forward. The unit it is anchored from a picket with the help of a chain and a

ring. The position of the unit is accomplishing trough his movement in an angle according to a new passing of the rake trough the aquatic basin with vegetation.

The deepness work adjustment of the tool for removing aquatic vegetation (rake) it is made with two floats fixed above his ends and one ax which has the role to avoid the tool to ram in soil much then necessary, avoiding his stack.

Traction of the rope on the wheel it is made without to be coiled and his storage in container. It is recommended to use a rope from propylene which it is easy and floats.

After the removal tool for aquatic vegetation gets to the coast his arm is climbed together with the vegetation and the roots on the coast where, with a knife or another cutting tool the vegetation is cut and the free rake is rising to the fixed arms on the boat and the operation begins again.

The technical characteristics of the control equipment of the aquatic submerse vegetation are:

- The maximum distance of traction 100m from coast;
- The rake width 3m;
- The maximum traction distance and the work speed depends of the vegetation thickness, the substrate structure, the vegetation type, the water deepness;
- The rope thickness approximately 12mm;
- The fuel consumption 0,6 – 1,9 l/h;
- The crew – 2 persons, one of them mechanic;

The technological process for aquatic submerses vegetation control regard the following technological phases:

- ✓ Assembling of the engine unit with winch in an area of the coast what has visibility to the basin;
- ✓ Bond of the tool for removing vegetation above the prop of the boat;
- ✓ Displacement of the boat together with the removal tool for aquatic vegetation in the vegetation area;
- ✓ Measurement of the water deepness and the establishing of the floats position;
- ✓ Rake lunch in vegetation;
- ✓ Traction of the vegetation removal tool to the engine unit trough the rope handled on the pulley wheel and the rope storage on an open container;
- ✓ Climbing of the rake on coast and its remove of the evacuated vegetation from the cutting wires of plants;
- ✓ Bringing the rake above the prop on the boat and the resumption of the activity trough the movement of the boat in the vegetation area;
- ✓ Regarding the resumption of the traction in a new vegetation area the engine unit is shift radial in the fixing spindle.

Results and Discussions

The tests effectuated with the equipment for struggle against the aquatic submerse vegetation has been realized in more ponds that belongs to different fish farms, and to different aquatic basins that are used in recreative scope.

Thus, have been realized tests in Neptun II Lake, which present a 40 ha area and a depth of 2-2,5m, from who the area full with *Myriophyllum verticillatum*, represent 3 ha. The substratum is compound from black – grey flood lake deposit with reduced lift.

It was utilized a fixed spindle with the same characteristics like the rotative ones, adjustable on water depth with floats. The hang up has been realized with a mechanic winch from the coast. There were realized 3 passing through the same area and was obtained the vegetation removing in a percent of 90%. In the end of the activity, during 20 days, have been removed approximately 40 tones of dry and wet plants.

Another set of tests were executes to the Brates fish farm from ICDEAPA Galati, in a 20 ha fish pond and 1,5 m water depth, invaded by *Nymphoides peltata*. Substratum is compound from black – grey flood lake deposit with big lift.

The tests have been done with uncutted vegetation; at three times passes, on the same area, and discovered that the vegetation struggle was effectuated in a 60-70% percent, by reason of the roots type, the stool one.

The tests performed at Malina fish farm, on a fish pond with 30 ha area and 1,5 m water depth, partial covered with *Nymphoides peltata*, with the substratum represented by flood lake deposit with average lift.

It's been utilized a horizontally spindle with fingers and seaplane floats for adjusting the water level. The spindle has a 3 m length and a 20 cm distance between the fingers.

The ensemble it was displaced with a boat in the inside of the vegetation area and released to different depths, established with the help of adjustable seaplane floats, so that the spindle position arrive to the pond nearby bottom.

The hang up was realized from the coast with a mechanic winch adapted on Carpatina MB motto-bloc, through the textile cable with 12 mm diameter and 100 m length. After three passage, on the same area, with a depth of the rake of: 0,8; 1,2 and 1,5 m, the struggle of the vegetation its done by 70 – 80%.

The technology of vegetation control consist on utilization of the realized equipment, depending on the vegetation type, by the area engaged of these, by the zone in that vegetation sit, by the earth type where the vegetation developed.

In the test period of the technology and equipment for ecological control of aquatic submerse vegetation, has been following the exploitation value regarding:

- the time production structure;
- the determination of the work volume, in the time of a shift;
- fuel consume;
- coefficients of the time work;
- average productivity during the tests.

After the tests were accomplished the equipment is proper for the goal, assuring so the displacing in the field as to the control activities of aquatic submerse development. The size work front of the boat its optimum, assuring a suitable control of the movements and managements, as to the power consume of the train engine.

Conclusions

The technology presented eliminate the perturbation reveal in the ecosystem by reason of the movements of a floating equipment which disturbing through the noise, through the elimination of the pollutants, assuring and the transport of the vegetation cut on the coast without the utilization of an other equipment, eliminating in this way the degradation of the cut vegetation in the aquatic basins through the temperature influence.

A disadvantage could be the productivity relatively poor in comparison with another reap methods using knifes with alternative movements but which have the disadvantage of a frequently obstructions which decrease its productivity.

Bibliography

1. **Antonescu, C.S.,** (1963)- *Biologia apelor*, Editura Didactică şi Pedagogică, Bucureşti
2. **Berca,M,** (1998)- *Teoria gestiunii mediului şi a resurselor naturale*, Editura Grand, Bucureşti
3. **Botnariuc, N., Vădineanu, A.,** (1982)- *Ecologie*, Editura didactică şi Pedagogică, Bucureşti
4. **Ciolac, A.,** (1997)- *Elemente de ecologie acvatică*, Editura Pax Aura Mundi, Galați
5. **Ciolac, A.,** (2002)- *Ecologie*, Editura Didactică şi Pedagogică, Bucureşti.
6. **Stăncioiu, S.,** (1976)- *Ihtiologie generală*, Universitatea de Galați
7. **Vasilescu, G.,** (1986)- *Hidrobilogie*, curs.