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Cultivation of Aquatic plants for Sustainable Development

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ABSTRACT

Aquatic plants are the plants which spend at least a part of their life cycle in water. The majority of the aquatic plants are considered as weeds; the main reason is that the people are not aware about the great potential of these plants. During recent days these aquatic plants are proved as more productive than conventional terrestrial crops. This extremely productive crop does not require any tillage, fertilizers, seeds, or care. A study conducted during the year 1994- 2011 in parts of the Jharkhand revealed that these plants can be used for making bio-gas, bio- fertilizers, fodder, as fish feed, and several plant based industries. Beside these plants are the source of a number of chemicals, which has immense medicinal value. Several species of aquatic plants are used as food. Many of these plants are sold in the urban vegetable market for its important food values, as vegetable or as medicine.

Key Words : Aquatic Plants, Cultivation, weeds.

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INTRODUCTION

Aquatic plants are plants are great economic potential, some time these plants are proved to be more productive than the traditional terrestrial crops as these plants do not require any tillage or extra fertilizers for its cultivation. Hence these plants can be cultivated as the potential crop for various purposes. Gradually its cultivation is gaining momentum and farmers are earning out of it. The plants are cultivated in the water bodies, collected and sailing in the market. Cultivation of aquatic plant requires utmost care due to its high water content, as it spoils in short span of time. However it has huge potential and very less number of farmers or peoples is engaged in to this business India, where as country like China, Japan, Indonesia, Thailand, and Malaysia etc, this is very much in practice. The present paper is a small effort in this direction along with bringing awareness among the potential farmers. This paper this deals with the various uses of aquatic and semi aquatic plants found in the state of Jharkhand which can help in the sustainable development.

METHODOLOGY

For the purpose to make the accurate and intensive study and survey of various uses of aquatic and semi - aquatic plants of the study area the study area were visited in a regular intervals, twice or thrice in every seasons to encounter the plants at their flowering and fruiting stages . Utmost care were made during the field visits and while collecting the plant specimens; because the nature of the aquatic plants are quite different from the terrestrial ones. The plants are delicate, submerged and prone to lose their characters soon if extra precautions are not properly taken, while they are taken out of the water.

During the field work, several important characters like habit, habitat, colour of the plants , height of the plants , association of the plants with other plants ,field numbers, local name and the their uses were noted down. Plants after collecting from the field were pressed in the field herbarium press and old

magazines. Some plants were also kept in the dilute solution of formalin. Just after returning from the field work, the plants were studied in the laboratory on the very same day. The field numbers were verified and flowers were dissected. After completion of the specific study of the specimen, the plants were identified with the help of local Floras.

Same time, various uses of the plants were gathered by the people residing near by the plant bodies, nearby markets were also visited to see the availability of these plants in the local market and information were also gathered from the vendors. In order to know the medicinal uses of the plant the local herbal practitioners were also interviewed, the patients cure were also interviewed in order to know the degree of cure.

RESULT AND DISCUSSION

The survey revealed that the aquatic and semi aquatic plants are used in different way, and has a great potential for its cultivation. These Economically importance Aquatic and semi plants are used in different purposes like food, medicine, in pollution control, in pisciculture and several other uses and are discussed here in brief.

***Aquatic plant used as substitute food*.**

Some aquatic plants have a long tradition used as human food. Rice, (*Oryza sativa*) is emergent aquatic plant, is one of the world's main crop and forms the staple diet of over half of the world population. Water chest nut (*Trapa Sps*.), lotus (*Nelumbo nucifera*) are also used as food in small scale etc. *Ipomea aquatica* is one of the important aquatic plant grown as potherbs in our area .

1. *Oryza sativa*: A common cultivated aquatic cereal of this reason. It is mainly cultivated during rainy season on both high and low lands.
2. Water chestnut (*Trapa natans*): Popularly known as singhara or paniphal is also cultivated by farmers. It bears fruit in summer. Dry singhraras are used as flour which is highly nutritious. It contain starch, manganese, calcium, phosphorus and Iron etc.
3. Lotus (*Nelumbo nucifera*) commonly called Kamal Phool or Poddo Phool. The roots, flower, stem, young fruits and seed of lotus are used as food in different way. It is widely cultivated as crop and to other ornamental uses. *Nelumbo* honey is highly in demand in the market. It is a nutritious and palatable vegetable alone or in combinations with other.
4. *Colocasia esculenta* van-kachu. The rhizome and petiole are common vegetable in this area. It is cheap vegetable of poor villagers.
5. *Nymphaea Nouchali*- Saluk ,Rhizomes and seeds are commonly eaten by village people .It is considered as chief famine food to the villagers during scarcity .In rainy season it is very common in the rural market. The Rhizomes are consumed after boiling.
6. *Nymphaea Stellata*, Nilakamal The stems petioles and peduncles are used as vegetable .It is also available in local market during rainy season .It is considered as poor men's food during need.
7. *Polycarpon prostratum* vern name Gimasag leaves and soft branches are used as vegetable . It is consumed by the local poor people in rainy season, when prices of common vegetables are very high.
8. *Alocasia fornicate,* kannda kachu .Slender Rhizomes and petioles are also common in poor men kitchens .

Aquatic plant used as pisciculture

Aquatic plants are very important for fish farmers for promoting the growth of suitable variety of fish. They gave special stress in the management of aquatic plants so that they get desired fisheries production. They always have to face serious aquatic weeds infestation. Herbivorous fish controls some extent of the aquatic weeds by eating them. The common herbivorous fishes which are cultivated by fish farmers of our regions are grass carp (*Ctenopharyngodon idella*) siver carp (*Hypophthalmichthys molitrix*), kholisha (*Trichogaster pectoralis*), Jaal mach (Sps. of *Ophicephalus*), (magur) *Clarias* & Tilapia variety,

Puritius javanicus, *Carassius distichodus*, sp, Scarus sp, Labeo rohita etc. eat the *wolffia arrhiza* and *lemna perpusills* .

Grass carp is a voracious eater of *Naja foveolata*, *Chara* sps. *Vallisneria spiralis*, *Potomegaton nodosus*, *P. pectinatus* and *Hydrilla verticillata.* Fish weighing 60 – 70 gm. Preferred Chara sp. *N. foveolata* and small amounts of *Hydrilla, P. perfoliatus* & Typha sp. Grasscarp did not eat *Eicchornia crassipes*, *Pistia*, *Nymphoides* but *when only E. crassipes pistia and colocasia were available the fish lost condition, C*, *idella* can eat up to 7-10 times to its weight Silver carp (*H. molitrix*) feed mainly on phytoplankton but they can also take zooplankton. Chara spp are considered as useful aquatic plants because they provide excellent habitat for fishes small and tender plants such as *lemna* and *wolffia* are also excellent feed for certain kind of fishes.

Tilapia verity of fishes likes *potamogton pectinatus*, *Myriophyllum spectum*, *Naja sps*. and Chara sps. Besides eating aquatic weed tilapia play an important role in reducing mosquito also. *Cyprinids carpio,* a bottom feeds carp mostly prefer plankton as food. The large fishes eat higher plant, this fish dig out the root and rhizomes of soft aquatic weed for searching annelids and insects. It was observed that the fish taken out from heavily polluted ponds and kept in small tubes for few days for value addition and better taste. Water hyacinth provides food like mites and larvas for fishes. *Hydrilla verticilla* a serious aquatic weed is voraciously consumed by variety of grass

Aquatic plant used as traditionally medicinal system:

In the organic world man is the highest evolved organism. Enabled with the superior intelligent to a self sufficient and independent existence, He has made himself more dependent on other organism. All through a number of mineral and animal products contribute to his welfare but is the plant that has been considered to be the most essential part of human beings.

Human beings are using plants as a drug to cure disease and relieve from suffering for ancient days, in which aquatic plants played a very important role. Almost all the homeopathic, Ayurvedic and a large no of allopathic medicines are obtained from the plants.

The tribal and kabirajs of Jharkhand utilize a large variedly of locally available plant species as a herbal medicine in curing various disease. Some of the herbal plants they commonly used are aquatic plants. Following are some common potentially medicinal plants with their therapeutic and ethno medicinal properties.

1. *Ludwingia perennis* (Onagraceae) : It is used in treatment of parsauti fever. Fever after delivery, patient feel cold even in summer, headache pain in ear, in polar and sol. Lingual amount of roots of *Ludwigia perennis* and *Acyranthes aspera* is boiled in water. This water is taken thrice a day. Decoction of *L. perennis* is also taken in empty stomach.
2. *Nelumbo nucifera* (Nymphaceae) : The flower is used as cardiac medicine, liver trouble and in fever .seeds are used in skin related problem dried rhizome powder is very useful against piles.
3. *Polycarpon prostratum* (Caryophyllaceae) : This plant has numerous medicinal values. In fusion of roasted leaves is giver for cough, fever and is used in measles. It is also used as vegetable.
4. *Oxalis Corniculata* (Oxalidaceal) : It has huge medicinal properties, leaves contain vitamin and having antiseptic properties and astringent. Plants decoction is used to cure dyspepsia, piles, anemia, and tympanis.
5. *Ammannia s*pp (Lytharaceae) : Leaves are used against rheumatism, pain and fever. It is also used to reduce sexual libido of animals.
6. *Cenetella asiatica* (Apiaceae) : It has very high medicinal values. Decoction of *C. asiatica* is used as tonic in skin diseases, blood related disease and in nervousness, leaves juice is used in stomach trouble and amoebic dysentery, diarrhea, it also improve memory.
7. *Oldenlandia diffusa* (Rubiaceae) Juice of this plant is used in biliousness fever and gonorrhea.

8. *Eclipta alba* (Asteraceae) : It is used as tonic for treatment in haepatic, spleen enlargement .plant juice mixed with aromatics is used for treatment of jaundice , cough and cold of infants . Leaves are beneficial during scorpion bite.

9. *Enydra fluctuans* (Asteraceae) : The leaves of this plant is used as laxative. It has some medicinal values. It has rich source of minerals also.

10. *Sphaeranthus indicus* (Asteraceae) : The plants are highly aromatics and a range of medicinal uses has been ascribed to the plants for tooth ache, diuretic, laxative, fish poison. The decoction of plants is used as diuretic urinal discharges and stomach troubles.

11. *Nymphoides hydrophyla* (Menyanthaceae) : The stalk and leaves juice are mixed with oil and applied to ulcers and bites . The decoction is used as antiseptic lotion to wash parasitic skin infection.

12. *Nymphoides indicum* (Menyanthaceae) : The plant is used as a substitute for chiraita and used in treatment of fever and jaundice.

13. *Hydrolea zeylanica* (Hydrophyllaceas) : The leaves pest is used as an antiseptic cream. The plant is used in treatment of ulcer and constipation.

14. *Limnophilo indica* (Scrophulariaceae) : It is used as a antiseptic . When made into ointment with coconut oil it is used in encephalitis . Juice of the plants is rubbed over body in persistent fever.

15. *Eichhornia crassipes* (Pontederiaceae) : Scientist all over searching to utilize this plant as diet supplement because of its high nutritive value.

16. *Cyperus rotundus* (Cyperaceae): The root of this plant is useful in treatment of diarrhea, leprosy, fever, blood diseases, pain, and Vomiting disorder of stomach and in expelling worms.

Aquatic plant in controlling water pollution :

It is well recognized that certain aquatic plants particularly water hyacinth, to extract compounds and elements from water efficiently. They not only reduce the pollutants, but also clean the water resources. The national space technology and laboratory have few years back published a series of papers on the usefulness of water hyacinth (*Eichhornia crassipes*) and also alligator weed (*Alternanthera philoxeroides*) in removing pollutants from sewage and industrial water. Four plants are considered suitable i) *E. Crassipes*) *A. philoxeroider* iii) *Justicia Sps* iv) *Typha angustata v)Phramtis karaka* for reducing pollution and thus puriifying water. Scientists are in a view to harvest aquatic plants to withdraw nutrient from water.

Out of five plants water hyacinth would be ideally suited for nutrient removal. As it floats on the surface and is not rooted, harvesting is facilitate. By continuous harvesting the population could be kept in a rapidly expanding phase during which uptake rates of nutrients are at their highest. Waters beneath dense stands are anaerobic so additional N would be lost by denitrification. Again beneath hyacinths there were considerable microbial activities. So nutrients would be absorbed by the microorganisms also. In addition there is considerable organic matter would reach in the water by loss of leave and root fragments. *Altenanthera philoxeroides* probably the best harvesting plants in draining the pond and then using modified forge harvesting equipment.

Table 1. Quantities of elements that could be removed by continual culture of some aquatic plants (Kg\Ha\year)

Elements	E. Crassipes	A. Philoxeroides
N	1980	1780
P	320	200
S	250	180
Ca	750	320
K	3190	3220
Mg	790	320
Na	260	230
Fe	19	45
Mn	300	27
Zn	4	6
Cu	1	1

It is found that duck weed (*lemna* sp.) can be used as a supplemental filtration system to water hyacinth. When surface quantities of hyacinth diminished in cold weather the amount of duck weed increase and continued to absorb nutrient from the water. But when temperature raises (summer) hyacinths increased again thus reduces the no. of duck weed.

The release of heavy metals like cadmium and nickel to water by industrial effluents is very common. The root of hyacinths is about 18% of total weight of which absorbs about a 7% of the heavy metals absorbed by the whole plants. Again phenol and its derivatives are common organic pollutants in domestic and industrial waste but no phenols could be detected in any part of Hyacinth which absorbed this extraction. It is concluded that the phenol is rapidly metabolized to other components by this plant.

Aquatic plants used as compost and fertilizers :

The use of decay tissue of unwanted plants for providing useful nutrients for crop is a very effective way of exploiting weeds. Aquatic weeds dragged from their habitat to rot on dry land have the advantage that their seeds or vegetative parts do not present any risk of competing with the crop. In area where aquatic weeds are serious problem and labor cost is cheap this simple technique is quite effective the best use of aquatic weeds would be apply them as a thick layer on the soil to suppress weeds and conserver moisture. When decay had eventually reduced the effectiveness of the mulch then the residues could be incorporated into the soil to add organic matter and nutrients. When the paddy field is distant then it is wise able to dry weeds on the bank in order to minimize the labor and transport cost. A further alternative ways is to burn the dried weeds and use the ash residue, in this case ash contain most of the minerals except Basak, 1948 rejects the view of burning of water hyacinth to ash for fertilizer in Bengal because of the valuable loss of nitrogen and organic matter in this process, He advocates to use water hyacinth as compost. According to him it is four times richer than farmyard mature as is less than the usual price of the later. He considered, that where labor is cheap mechanical harvesting is unnecessary and that of value of the compost will more than the pay for the cost of making it.

CONCLUSION

Knowing the facts and varied uses of the aquatic plants it is concluded that the aquatic and semi aquatic plants are the crop of great potential and is easy to cultivate with proper care, besides using extra fertilizers**.**

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