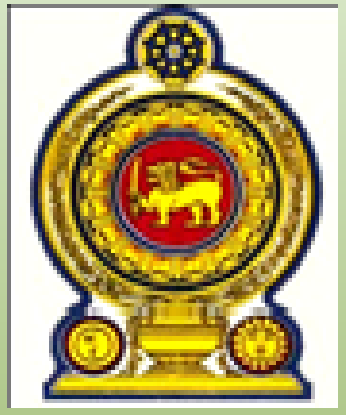

"Ornamental aquatic plants industry in Sri Lanka with special reference to constraints for booming"

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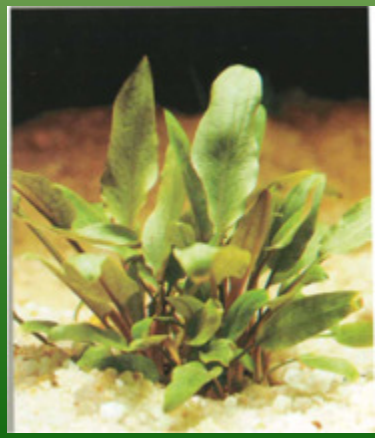


OUTLINE

- Introduction
- Objectives
- Methodology
- Results & Discussion
- Constraints
- Recommendations
- References
- Acknowledgements

INTRODCTION

What are **AQUATIC PLANTS** ?

- **Aquatic plants** are plants that have adapted to living in aquatic environments (saltwater or freshwater).
- Also referred to as **hydrophytes** or **macrophytes.**
- These plants require special adaptations for living submerged in water, or at the water surface.

- Aquatic plants are categorized into three groups:

Floating Plants

- **Floating Plants**

- These are the plants most frequently used as hiding places fro fish fry.
- *Ceratophylum demersum*, sold as a bunch plant is really a floating plant.
- It never develops roots.
- Not all floating plants floats at the surface.
- *Nitella gracils* float at the bottom.

Bunched Plants

Cabomba caroliniana

- **Bunched Plants**

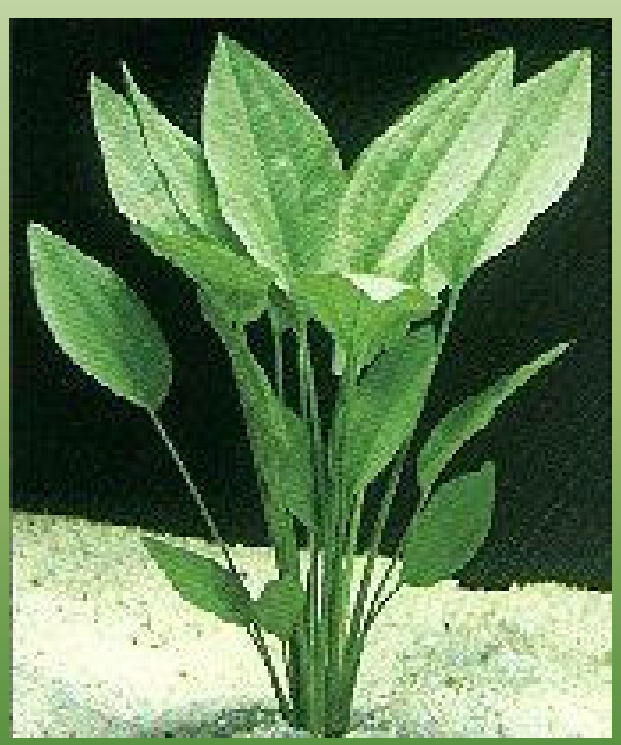
- In these plants , the roots serve primarily
- as anchors. Growth occurs at the tip.

- If the tip is broken off, a new one will form. When the stem is injured , a branch often develops

- Many bunched plants will grow even while floating freely in water.

- They show a tendency to root, sending down long, thin roots.

Rooted Plants



Echinodorus argentinensis

- **Rooted Plants**

- Plants with a complex root structure
- Growth of new leaves originates at the crown which is the juncture of roots & leaves.
- Some plants split at the crown to form two or more separate plants.

❖ **Aquatic plants are utilized for many purposes as;**

* **Medicines**
* **Food**
* **Ornamental fish industry**

- Of all above, **aquatic plants** play a major role in **Ornamental fish industry** giving an esthetic value to the observation units/aquaria

In an observation unit, aquatic plants serve as;

- a decor for the aquarium
- a conditioner & an oxygenator
- an inhibitor of the growth of algae
- a spawning medium for many types of egg laying fishes.

- **a shelter & hiding place for the smaller fishes & less aggressive species.**
- **a security factor as plants make the aquarium more like home to the fishes.**
- **an absorber and utilizer of dissolved carbon dioxide through photosynthesis in the presence of light**

RESEARCH BACKGROUND

- In the past, ornamental aquatic plants exported from Sri Lanka was limited to the wild collections
- With the continuous collection of aquatic plants for export purposes, especially the endemic plants were threatened
- Consequently, different acts and legislations were introduced by different governments to control the wild collection

- Following the enforcement of legislations, exporters established their own nurseries to produce the plants.

- Despite the above fact, the industry is still not in a position to cater the demand of the buyers due to various reasons

- At least, no records exist in the Central Bank regarding the contribution by the industry to the country's GDP

OBJECTIVES

- To study the current status of the ornamental aquatic plant industry in Sri Lanka

- To identify the prevailing constraints of the industry & make feasible recommendations

METHODOLOGY

- Ornamental Aquatic Plant propagation methods including " tissue culture labs" were observed at National Aquaculture Development Authority (NAQDA) at Rambodagalla & from Ruvini Aquarium Pvt Ltd, the leading private sector nursery

- Different types of ornamental aquatic plants were identified at the NARA, NAQDA & several private sector nurseries

- Packing, quarantine , green house processes & tissue culture operations were observed & learned at the visited plant nurseries.

- Exported aquatic plants, their prices and export data/statistics were obtained from Export Development Board & Sri Lanka customs.

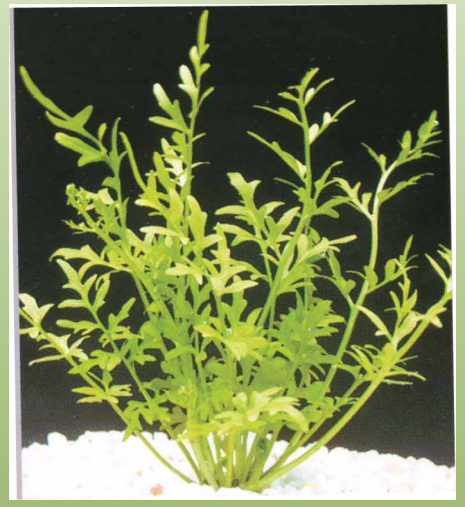
- The legislations pertaining to aquatic ornamental plants were obtained from the departments of Wildlife & Forestry /Baththaramulla, Colombo.
- Direct interviews were conducted with private sector exporters to learn about the prevailing constraints
- Literature was gathered from research papers, paper articles and internet sources.

RESULTS & DISCUSSIONS

NAQDA

Ruvini Aquarium Pvt Ltd

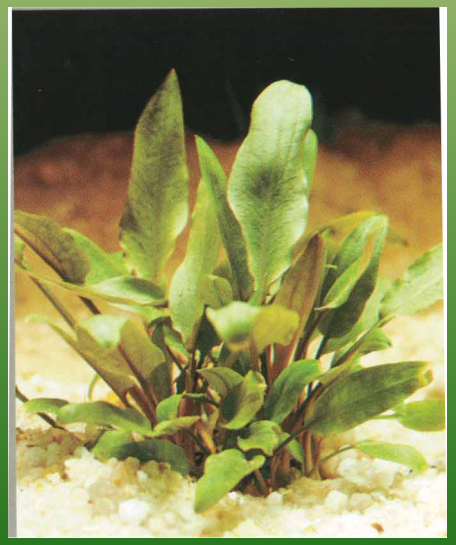
Attractive Aquatic Plants in the Industry

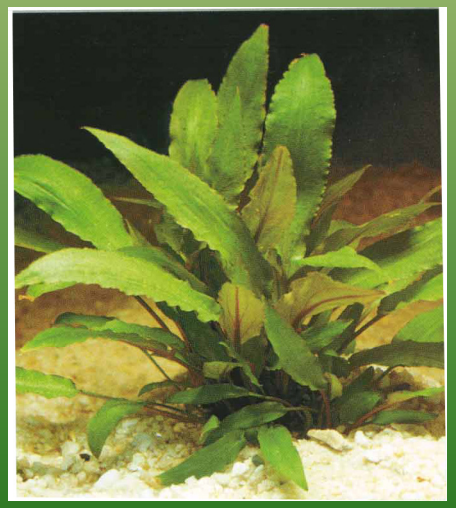


Ceratopteris

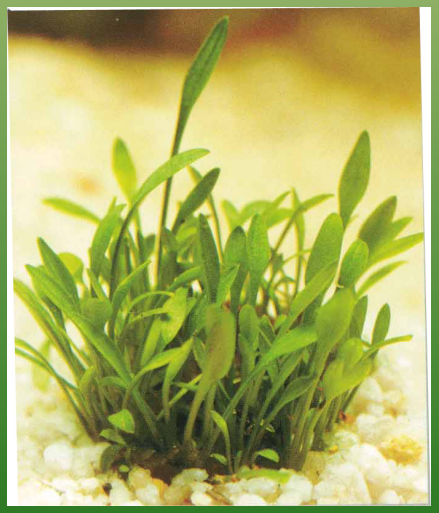
Cardamine

Crinum





***Cryptocoryne* sp.**



_____

***Alternanthera* sp.**

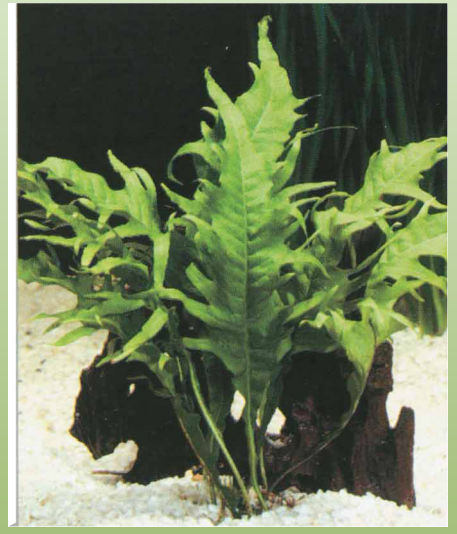
_____

_____

***Anubias* sp.**

_____

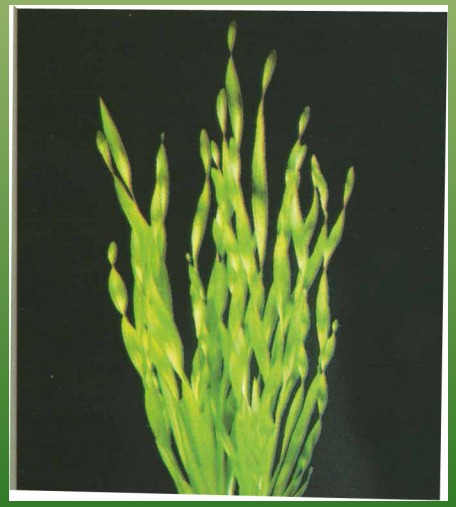
Ludwigia



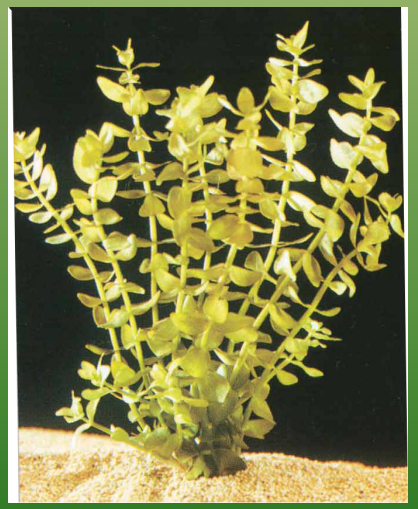
Microsorium

Myriophyllum

Rotala



Vallisneria



Bacopa

***Aponogeton* sp.**

Bolbtis

Cabomba

Ceratophyllum

Culture Methods

- Ornamental aquatic plant nursery owners use different types of culture methods to grow aquatic plants

  ***Plant directly in the mud or soil**

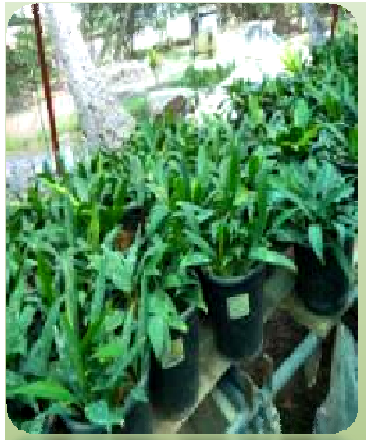
  ***Plant submerged in water**

  ***Plant in Green Houses**

Grown in Mud

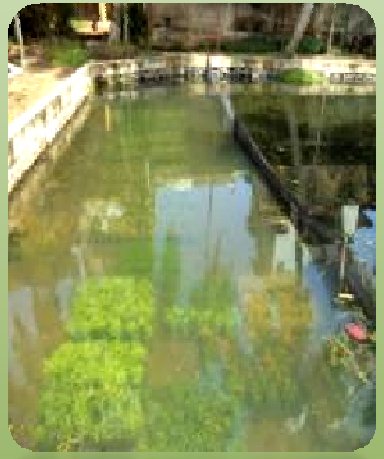
Submerged in water

Grown in Green Houses



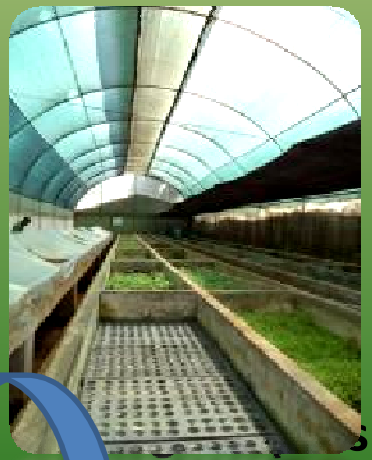
Mother plants

Mother plant → Green house



Grow out ponds

Washing tank



Tanks with nutrient soluti

- **Propagation techniques**

Plant propagation

Sexual propagation

- Seeds

Asexual propagation

- Cuttings
- Running roots
- Rhizomes
- Tissue culture

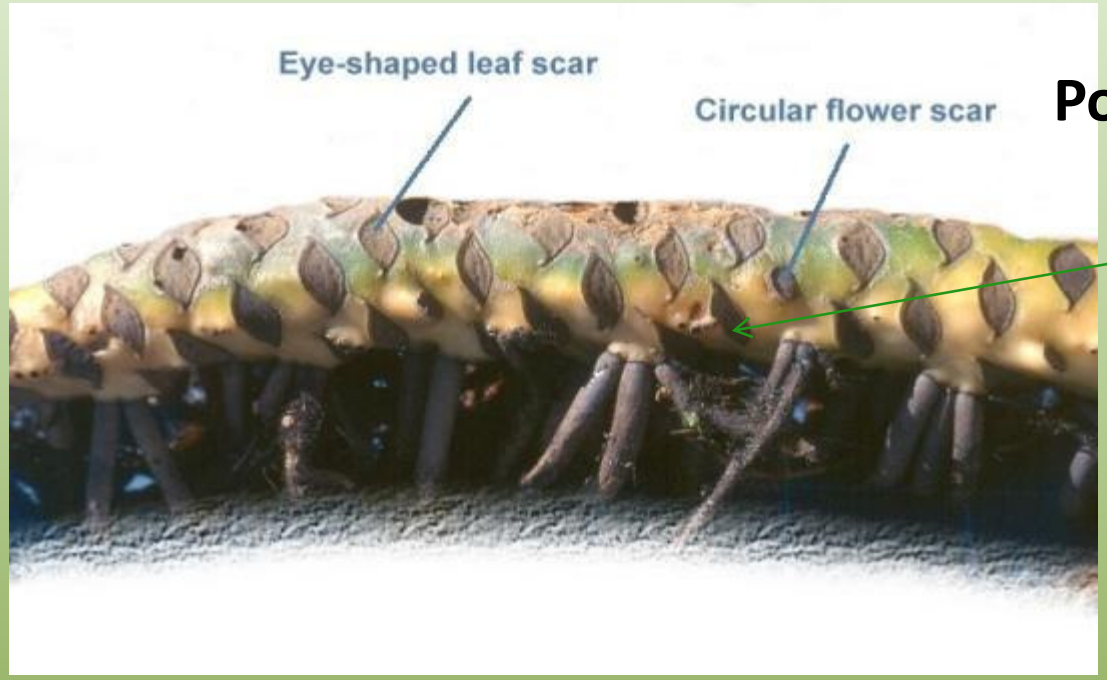
Cuttings for propagation

Vallisneria americana

Hydrocotyle maritima

Runners

Cryptocoryne wendti var.



Position of buds in Rhizomes

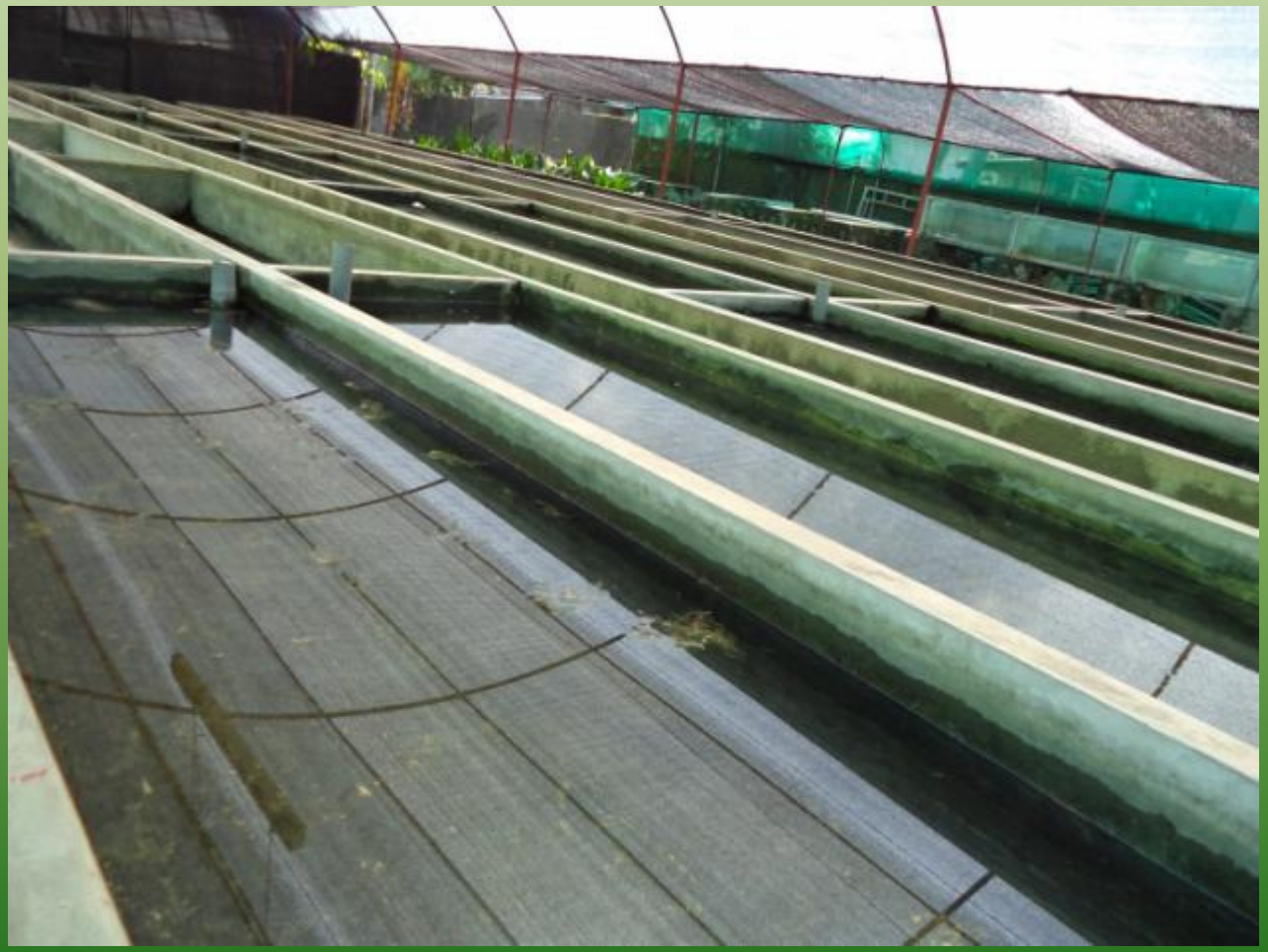
Eg. *Cryptocoryne* spp*,*
Sagittaria spp.*, Lagenandra* sp.

Plantlets from flower stalks

Eg. *Echinodorous*

Tissue culture process

In house quarantine procedure before packaging



Packaging of Aquatic Plants for Export

Ready to Export Aquatic Plants by Tissue Culture

Currently implemented procedure during export

- HS code (Harmonized system code) 0602.90.20
- No objection letter

  At present, no permit is required for exotic species but export of endemic species requires

  a permit (Fee : 1500/=)

- Quarantine by officials from Department of Agriculture, Katunayake, Colombo

- Then, plants are transported to the cargo village at the airport for inspection by custom officials & give certification for export

- Mainly there are 180 aquatic plant species cultured in Sri Lanka

- Of the above;

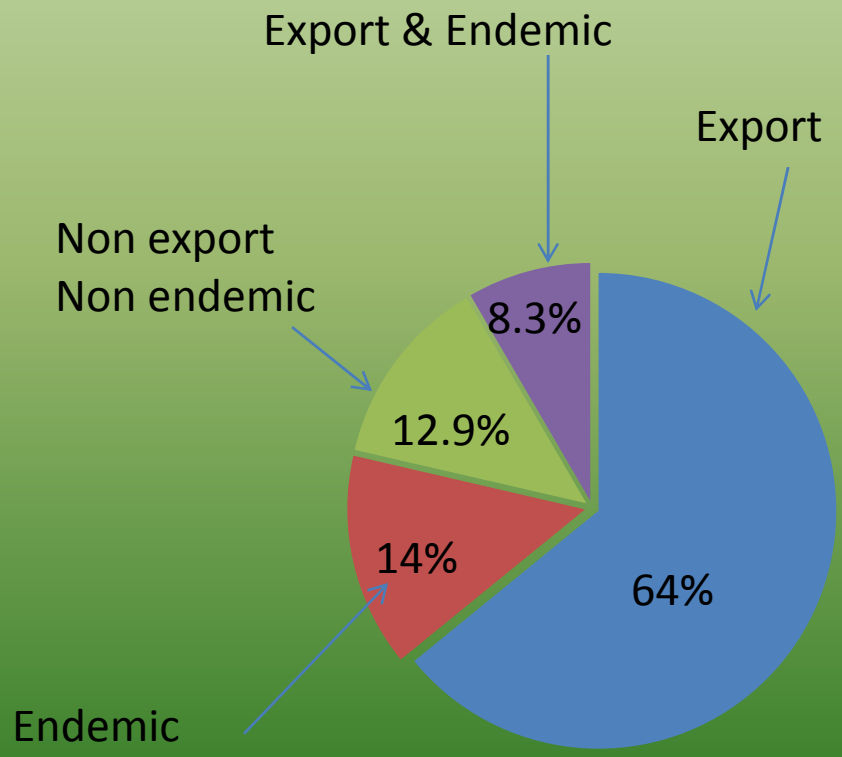
84 species – Export

19 species – Endemic

17 species - Non exported

- **Non endemic**

11 species – Exported & Endemic



Exported Aquatic Plants & Values

Species	Bundle 600/Box US$ / Plant	Loose 2000-3000 / Box US$ / Plant	Pot 200 / Box US$ / Plant	Mother plants 50 / Box US$ / Plant
Acorus	0.48	0.12	0.60	-
Alternanthera	0.48	0.07	0.60	-
Ammannia	0.48	0.07	0.60	-
Ammoricia	0.42	0.07	0.60	-
Anubias	-	0.85	1.85	5.50
Aponogeton	-	-	-	-
Bacopa	0.48	0.06	0.60	-
Barclaya	-	0.24	0.60	-
Blyxa	0.36	0.06	-	-
Cabomba	0.36	0.03	0.60	-
Cadamine	0.42	0.14	0.60	-
Ceratophyllum	0.42	0.04	0.60	-
Ceratopteris	0.42	0.07	0.60	-
Crinum	-	0.30	0.60	-
Cryptocoryne	0.54	0.42	0.96	-
Cyperus	0.36	0.24	0.60	-
Dracenae	0.48	0.30	0.72	-
Echinodorus	0.36	0.14	-	1.80
Hemigraphis	0.42	0.12	0.60	-
Hottonia	0.30	0.07	0.60	-
Hydrocotyle	0.42	0.04	0.60	-

Source: NAQDA Rambadagalla

Sri Lanka Export Statistic - Ornamental Aquatic Plants

code	description	2011		2012		2013		2014	
		quantity	value	quantity	value	quantity	value	quantity	value
H.06029020		Kg	LKR						
	Aquatic plants								
	Germany					35,250	36,029,352	15,600	17,480172
	Sweedan							1,960	1,295,705
	Maldives					1	2,442	95	696,999
	France					15	14,627	300	251,759
	United kingdom							190	182,725
	Japan							11	114,442
	Norway							5	87,001
	Qatar							52	40,947
	Saudi Arabia							30	30,279
	Lebanon					20	15,501	75	29,926
	Nambia							54	28,216
	Southafria					8	8,247	90	26,293
	Cyprus							15	17,883
	Baharain							3	14,852
	Czech republic							30	14,410
	Kuwait							1	8,688
	Pakistan							10	6,692
	Iran							15	5,865
	Total					35,294	36,070,196	18,536	20,332,854

Source: Information technology division/Sri Lanka Export Development Board/Colombo

- According to the statistics of year 2014 ,

  Major exported countries are

  Germany , Sweden & France

- Total revenue of the aquatic plant trade From 2013 January to 2014 August

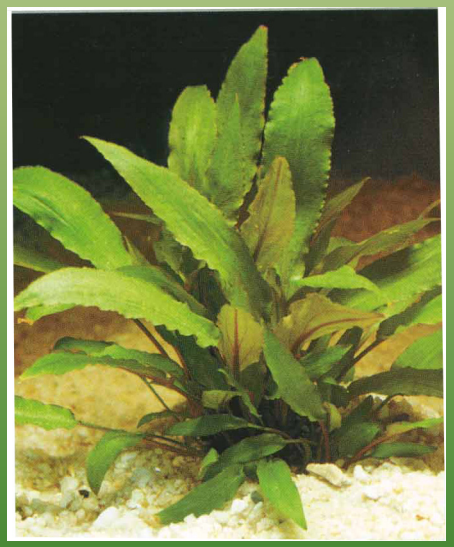
  56,403,023/= LKR

- Total quantity exported in the above period

  53830 Kg

- *Anabius* & *Cryptocorine* spp are the most expensive species.
- Individual plant rate of the exported plants ranges from **0.16** to **1.95 US$**

Anabius sp



Cryptocorine sp

CONSTRAINTS

- **Identification**
  - One of the major problems faced by the industry relates to the issue of identification of plants, as there are different species with similar morphological characteristics

- **Lengthy permit procedure**
  - The permit procedure at the Forest department is too lengthy (7 days) & consequently, the exporters lose the customers as they cant respond immediately.

- **Lack of Responsible Authority**
  - to address the issues of aquatic plant exporters

- **Lack of skilled personnel and new techniques**

  to further develop the industry where the State has a big role to play

- **Pest Problems**
  - If pest problems arise, it is a risk for the exporters as the country has already used very strong pesticide such as Carbofuran for agricultural purposes

- Lack of identification of technological & other related problems of the industry
  - This has become paramount importance considering the fact that the aquatic ornamental plant industry has vast potential as a foreign exchange earner

RECOMMENDATIONS

- Provision of foreign consultancy for the expertise to upgrade the knowledge of local exporters
- Streamline the government export procedure & expedite the permit process
- Introduction of new verities using genetic engineering
- Introduction of new packing methods/techniques
- Introduction of loan scheme by the government with low interest rates
- Reduction of production cost by providing subsidies for electricity and water bills

REFERENCES

- C.Dissanayaka , M.Hettiarachchi and M.C.M Iqbal, Sustainable use of *Cryptocorine wenditti* and *Echinodorus cordifolius* in the Aquaculture Industry of Sri Lanka
- C.Dissanayake ,NAQDA , Aquatic Ornamental Plants
- International Trade in Aquatic Ornamental Species , European commission , Director general E- Environment
- I.U.C.N. 2007. Red list of Threatened species. The World Conservation Union (IUCN) and Ministry of Environment and Natural Resources, Colombo, Sri Lanka
- Ryan M.Wersal , Ph.D and John D.Madsen,Ph.D aquatic plants their uses and risks
- Samuli Lehtonen and Luis Angel Rodriguez, Notes on aquarium plant production in Peruvian Amazonia
- WWW.Ruvini aqua plants .lk
- WWW.Lumbini aqua plants .lk
- WWW.Techwaters (Pvt)Limited.lk

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- Co-author & my student of Ocean University , Chathuri Jayarathne

THANK YOU !