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Aquascaping: A Review

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ABSTRACT

Aquascaping is the method of arranging aquatic plants, rocks, stones, cave work, driftwood *etc*. in an aesthetically pleasing manner within an aquarium. The new aquascaping style was pioneered by Mr. Takashiamano in 1900. Proper placement of various elements in an aquascape makes it more attractive to eyes. Some important elements for aquascaping are imagination, substrate, hardscape materials, water filters, fishes *etc*. Proper plant selection makes aquascapes more attractive. Aquascaping styles like dutch style, jungle style, iwagumi style, nature aquarium style, biotope style, paludariums *etc*. are widely used today. Proper maintenance of aquascape is very important as failure of appropriate lighting, carbon dioxide supplements, temperature *etc*. can totally destroy the system. There is a need to boost aquascaping industry and related industries in India as there is a growing demand in the domestic as well as international market.

Key words: Aquascaping styles, Aquascaping, Elemental rules, Elements.

Aquascaping is a creative endeavour that turns aquariums into enchanting underwater vistas. It is the method of arranging aquatic plants, rocks, stones, cave work, driftwood *etc*. in an aesthetically pleasing manner within an aquarium or gardening under water (Mukherjee and Pradeep, 2012). Aquascapinhg is clearly an ecosystem in which the chemical and biological balance of the system is equally maintained by living and non-living organisms. The first ever stable aquarium in the world was made by Robert warington. He had put eelgrass, goldfish and snails in a 13-gallon glass container. The new aquascaping style was pioneered by Mr. Takashiamano in 1900. He created various styles by adding nutrient rich substrates, high levels of carbon dioxide and perfect lighting inside the aquascape. Incorporating riverscapes, zen gardens, lush jungle paradises, mystical fairy gardens, majestic mountain ranges and underwater cityscapes into aquascaping styles is a newer trend in this field. Minimalistic aquariums, fantasy diorama, creative use of lighting, black water biotopes and vertical aquascapes are gaining importance recently (Haridas *et al.*, 2019).

Elements of aquascaping

Proper placement of various elements in an aquascape makes it more attractive to eyes. Some important elements for aquascaping are imagination, substrate, hardscape materials, water filters, fishes *etc*.

Imagination

It is the key to aquascaping. Imagination begins with copying a specific design or style of an aquascape.

Plants

There are about 116 genera of aquarium plants comprising 425 species useful for aquascaping (Cohen *et al*., 2007). Aquatic plants with different size and form are planted in aquascapes.

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Substrate

It is essential for planting inside an aquascape tank. It helps to get the desired nutrients and fulfil their demand inside the system. Judicious selection of substrate will help in development of proper size, shape and color of plants (Khairnar and Kaur, 2018). Gravel, sand, crushed coral, limestone, marble, peat, laterite, flourate, aqua soil, crushed coral, onyx sand and soil are some substrates used. The substrate should be of high quality. It will not only supplement the essential nutrients to the plants for their proper growth and development but also last longer. Superior quality substrates last throughout the life of an aquarium (Love, 2019).

Hardscape materials

Rocks, wood, gravel *etc*. are generally used as hardscape materials inside an aquascape. These elements provide attractive design and layout of the entire aquascaping process. Various plants can be used to enhance the effect of aquascaping wood inside the aquarium without leaching any tannins or colour into water. Major point to consider is that the woods must be soaked to get saturated before

placing in aquarium (Schwartz, 2012). Rocks are generally used for creating 'Iwagumi' style layouts.

Water filters

Excess food, fish's waste, dangerous chemicals and decaying organic matter can be removed from the aquarium with the use of water filters. Mechanical, biological and chemical filtrations are generally used. Now a days most of the filters in market are the combination of any of these (Walstad, 2014). Types of filters used in aquascaping include hanging filters/ power filters (*eg*: eheim liberty filter and fluval c2 power filter), canister filters (*eg:* eheim classic 2213, sunsun multi-stage canister filter), internal filters/ corner filters (*eg*: eheim aquaball internal filter 2210), trickle filters/ wet/dry filters (*eg*: eshopps aeo13015 and wood 125) and under gravel filters (*eg*: lee's 13156 20l/29, premium under gravel filter) (Edmond, 2017).

Fishes

Always better to choose schools of small fishes inside aquascapes (*eg.* Tetras, Rasboras *etc.*). Fishes should not be too huge and it should not disturb the aquascape. Fishes with high growth rate are strictly avoided in using inside aquascape.

Elemental rules of aquascaping

The rule of thirds

It clearly depicts how imaginary guidelines can be used in such a way that certain elements can be placed inside so that we are able to control, what the eye of the viewer sees. Imagine the aquascape is divided into nine equal parts by two equally spaced horizontal lines and two equally spaced vertical lines. Locate the intersection points of the grid where the focal point can be established. Placing the focal point in the middle of the tank is not as advisable as it would take away from what is happening around (Love, 2019).

The golden ratio

Creation of focal point is strictly connected to the estimation of golden ratio. It is the number obtained by dividing a line into two parts (Morgan, 2021). Best ratio is 1:1.618. If the short side of the rectangle is 1 foot wide, the long side needs to be 1.1618 feet long. If the short side is 2 feet, the long side would be 3.326 and so on. Creation of more than one focal point is not so advisable (Sanaye and Tibile, 2009).

The focal point

Fixing a focal point in aquascaping decides where to look at first and in what direction our eyes should move. There are different set of rules existing for small and large aquariums. Only one focal point and several secondary points of interest are created for small aquariums. More than one focal point can be created in case of larger aquariums but out of which one focal point should remain as the major point of attraction (Sanaye and Tibile, 2009).

Foreground, midground and background

Shortest plants, rocks, small stones and low growing carpet plants are used to create foregrounds. Mid ground is created by using middle height plants and hardscape materials. Tallest plants and hardscape materials are used to create background (Mazzotti, 2002).

Foreground plants (Nguyen, 2019)

- Java moss *(Taxiphyllum barbieri)*
- Micro Sword (*Lilaeopsis brasiliensis)*
- Dwarf Baby Tears (*Hemianthus callitrichoides)*
- Hair Grass (*Eleochalis acicularis)*
- Water pennywort (*Hydrocotyle verticillata)*
- Marimo Moss Ball (*Cladophora aegagropila)*
- Banana Plant (*Nymphoides aquatica)*
- Dwarf Cardinal Plant (*Lobelia cardinalis)*
- Small mud-mat (*Glossostigma elatinoides)*
- Red Dwarf Hygrophila (*Hygrophila araguaia)*
- Chain Sword (*Echinodorus aquadricostatus)*
- Bruce plant (*Staurogyne repens)*
- Downoi (*Pogostemon helferi)*
- River Buttercup *(Ranunculus inundates)*
- Crystalwort *(Riccia fluitans)*
- *Alternanthera reineckii* 'Mini
- Ashy pipewort (*Eriocaulon cinereum)*
- American Shoreweed (*Littorella uniflora)*
- Pearlweed (*Hemianthus micranthemoides)*

Mid ground plants (Nguyen, 2019)

- Water wisteria (*Hygrophila difformis)*
- Amazon Sword (*Echinodorus grisebachii)*
- Water trumpet *(Cryptocoryne sp.)*
- Bruce plant (*Alternanthera Reineckii)*
- *Anubias sp.*
- African water fern -*Bolbitis heudelotii*
- Narrow leaf java fern- *Microsorum pteropus "Narrow"*
- Trident java fern- *Microsorum pteropus 'Trident'*
- Windelov java fern- *Microsorum pteropus var windelov*
- Lace plant-*Aponogeton ulvaceus*
- Red Dwarf Hygrophila - *Hygrophila araguaia*
- Blyxa Short Leaf- *Blyxa Novoguineensis*
- Orchid Lily- *Barclaya Longifolia*
- *River Buttercup- Ranunculus Inundatus*
- Pearlweed- *Hemianthus Micranthemoides*
- Basil Leaf- *Limnophila Rugosa*
- *Rotala Indica 'Bonsai'*
- Water Hyssop- *Bacopa Caroliniana*
- Creeping Jenny- *Lysimachia Nummularia*
- Large Pearl Grass- *Micranthemum Umbrosum*

Background plants (Nguyen, 2019)

- Indian toothcup (*Rotala Indica)*
- Water Primrose *(Ludwigia repens)*
- Temple Plant *(Hygrophila Corymbosa)*
- Short Myriophyllum *(Myriophyllum Mattogrossense)*
- *Pogostemon Erectus*
- *Rotala Macrandra*- Giant Red Rotala
- *Rotala Wallichii*
- *Ludwigia Repens 'Rubin' (Super Red)*
- *Ludwigia Arcuala*- Needle Leaf Ludwigia

- *Hygrophila pinnatifida*
- *Hygrophila difformis*- Water Wisteria
- *Myriophyllum tuberculatum*- Red Millfoi
- *Limnophila aquatica*- Giant Ambulia
- *Limnophila sessiliflora*- Dwarf Ambulia
- *Limnophila aromatica*
- *Ambulia conferta*
- *Ammannia gracilis*
- *Cabomba caroliniana*- Green Cabomba
- *Eleocharis montevidensis*- Giant Hairgrass
- *Vallisneria spiralis*- Jungle Val
- *Heteranthera zosterifolia*- Stargrass
- *Mayaca fluviatilis*- Bog Moss

Floating aquatic plants

These types of plants grow and float on the surface of water and provide shades to ornamental fishes. Some of the commonly used floating aquatic plants are Duckweed (*Lemna sp*.), Water Lettuce (*Pistia stratiotes*), Aldrovanda (*Adrovanda vesiculosa*), Azolla(*Azalia filiculoides*), Floating Watermoss(*Salvinia natans*), Eared Watermos(*Salvinia auriculata*), Asian Watermoss (*Salvinia cueujlata*) *etc* (O'Hare *et al.,* 2018).

Aquascaping styles

The dutch style

Height, colour and texture of a wide variety of plants are the main focuses of dutch style of aquascapes. This style focuses on the culture and arrangement of aquatic plants. Generally 70% of the aquarium should be planted resulting in high density of plants inside the aquascape. Basic technique of construction of this design is the terracing approach along with contrast as main element of design layout. It can be compared to underwater gardens but it does not resemble a specific biotope (Haridas *et al.*, 2019). *Saurus cernuus, Lobelia cardinalis, Hygrofilia corymbosa, Limnophila aquatic, Cryptocoryne spp. (lucens, lutea, walkeri, wendtii* and *becketii), Alternanthera reineckii, Ammania, Rotala, Tiger Lotus or Aponogetons etc.* are some of the important plants used in dutch style.

Jungle style

This style resembles appearance of a jungle. It can become very attractive and functional over time when the plant grows. This is one of the finest style last longer even without less maintenance (Haridas *et al.*, 2019). *Microsorum pteropus, Bolbitis heudelotii, Vallasneria americana, Crinum natans, Crinum calimistratum*, *Aponogeton boevinianus, Aponogeton crispus 'Red'*, *Echinodorus 'Ozelot'*, *Echinodorus 'Rubin'*, *Echinodorus quadricostatus*, *Sagittaria subulata*, *Hygrophila pinnatifida*, *Anubias barteria var. barteri*, *Limnobium laevigatum etc* are some important plants used in jungle style.

Iwagumi style

This style is based on the arrangement of rocks. The term Iwagumi was originated from Japanese 'rock formation' and it refers to a layout where stones play the leading role. Use stones having the same colour and texture for unity and harmony inside the aquascape. Low growing plants are important feature in this style. Generally there are three stones used in iwagumi style. One large stone (big Buddha) and two attenuating stones. The iwagumi style is all about collecting number of stones and placing them in a very natural and spacious manner (Kumari *et al.,* 2021). Dwarf hairgrass (*Eleocharis acicularis*), *Glossostigma elatinoides, Hemianthus callitrichoides '*Cuba', *Pogostemon helferi, Riccia fluitans, Vallisneria nana, Eleocharis vivipari* and *Rotala sp.* are some of the recommended plants for iwagumi style.

Nature aquarium style

This style was introduced from Japanese gardening concept Wabi Sabi by Takashi Amano in the 1990's. The style is characterized by natural look and feel. The main aim of creating nature aquarium style is that it resembles a landscape or image from the natural world. It includes miniature versions of rainforests, mountains, hillsides or valleys *etc*. (Nizam *et al.*, 2020). *Riccia, Glossostigma elatinoides, Echinodorus tenellus, Staurogyne repens, Cryotocoryne sp* and *Eleocharis parvula etc.* are recommended for nature aquarium style.

Biotope style

This design does not provide a gardenlike display but it replicates a particular aquatic habitat at a particular geographic location. If plants and fishes are present, it should match with the habitat being represented. Biotopes are generally used to study ecological interactions in a relatively natural setting (Akshitha and Girwani, 2020).

Paludariums/German open style

Paludariums are a combination of immersed and sub - immersed set up which combines water and land inside the same environment. Tropical rainforests, jungles, riverbanks, beach *etc*. can be represented in paludariums. Paludariums are well-suited to keep amphibians unlike other aquarium setups (Salim *et al.,* 2013).

Derived styles of aquascaping

Taiwanese style

Dutch, Japanese and Nature style aquascapes are forerunners of this style. Taiwanese style is characterized with high terraces and depth. Creation of a living aquascape is the main objective of this style (Sanaye and Tibile, 2009).

Wabi-kusa style

Wabi-Kusa style is a submerged garden style derived from Japanese style. Plants are grown in a container and centered on a ball of soil. This style creates an island ball of plants surrounded by open water (Sanaye and Tibile, 2009).

Maintenance of aquascaped tanks

Light management is considered to be the functional heart of aquascaping (Febrian and Wardhana, 2018). LED lighting was found to be superior to fluorescent and incandescent

lights as it have superior light penetration up to 24 inches. Also LED lighting is characterized by its less cost (10% less than incandescent 30% less than fluorescent lights) (Reich, 2019). T5- Fluorescents is a newer technology which will aid in improving the overall healthiness and growth of plants in all areas of the aquarium without rippling effect (Clements, 2019). Carbon dioxide systems are essential for plants and it is closely related to water acidity and carbonate hardness. Ways to deliver CO, are pressurized CO, DIY CO, CO, liquids, CO, tabs and electronic CO, (Dugler and Hussner, 2017). Plants cannot thrive at ambient temperatures below 25°C or above 27°C inside aquascapes. Water cooler or chiller, small fans *etc*. can be used to lower the temperature of aquascapes (Zhang *et al.*, 2020).

Problems faced in aquascaping

Algal growth is one of the major bottlenecks. Providing too bright light for a long period, high nutrient content in the water *etc*. caused excessive algal growth (Love, 2019). Over-population of fish will limit their growth and degrade water quality. One biological control method is to stock one sunfish. Invasive plant introductions were happened through aquascaping. *Hydrilla verticillata, Egeria densa and Myriophyllum spicatum* became notorious weeds in many parts of world (Richard and White, 2021).

CONCLUSION

Aquascaping is a new entrant in ornamental gardening and it is gaining more importance in the present world. Adopting various aquascape designs with proper maintenance can attract any one's eye. There is a need to boost aquascaping industry and related industries in India as there is a growing demand in the internal market.

Conflict of interest

All authors declared that there is no conflict of interest.

REFERENCES

Akshitha, S. and Girwani, A. (2020). Aquascaping: An incredible art under water. Vigyan Vartha. 1(8): 59-62.

Clements, H., Valentin, S., Jenkins, N., Rankin, J., Baker, J.S., Gee, N., Snellgrove, D., Sloman, K. (2019). The effects of interacting with fish in aquariums on human health and well-being: A systematic review. Plos One. 14(7): DOI: 10.1371/journal.pone.0220524.

Cohen, J. Mirotchnick, N. and Leung, B. (2007). Thousands introduced annually: The aquarium pathway for non-indigenous plants to the St Lawrence Seaway. Frontiers in Ecology and the Environment. 5(10): 528-532.

Dugler, E. and Hussner, A. (2017). Differences in the growth and physiological response of eight *Myriophyllum* species to carbon dioxide depletion. Aquatic Botany. 139: 25-31.

Edmond, A. (2017). The Five Filter Types and their use in Water Tanks. The Aquarium Guide. 312 W. 2nd St #4103, Casper, WY 82601, United States.

Febrian, A. and Wardhana, A. (2018). IOS based aquascape component selection application uses a genetic algorithm. Int. J. Comput. Sci. Mobile Computing. 7(6): 37-48.

Haridas, H. Saravan, K., Praveenraj, J., Sontakke, R., Gladson, Y., Ajina, S.M., Deepitha, R., prakashan, S., Sankar, R.K., Roy, S.D. (2019). Training manual on fresh water ornamental fish breeding and aquascaping techniques. ICAR- Central island agricultural research institute. Port Blair. 45p.

Khairnar, S.O. and Kaur, V.I. (2018). Quantitative and qualitative differences in morphological traits of freshwater ornamental aquatic plant water wisteria, *Hygrophila difformis* under different organic substrate. Journal of Entomology and Zoology Studies. 6(1): 1664-1667.

Kumari, K. M., Kumar, N. V., Thaneshwari., Kumari, C. (2021). Art and science of aquascaping. The Pharma Innovation International Journal. 10(6): 240-245.

Love, A. (2019). Getting Started with Aquascaping. aquascapinglove.com.

Mazzotti, F.J. (2002). An Introduction to Aquascaping [Lecture notes]. University of Florida. Institute of Food and Agricultural Sciences. 12p.

Morgan, K. (2021). Aquascaping guide: How to create an underwater paradise. Modestfish.com.

Mukherjee, M. and Pradeep, H.D. (2012). Abstracts of Aquascaping and Trade in India, 5-7, march, 2012, New Delhi. Congress on Urban Green Spaces, New Delhi, p. 184-187. Abstract No. 1.

Nguyen, S. (2019). 15+ aquarium plants for foreground and guidelines. https://lovefishtank.com.

Nizam, N.U.M., Hanafiah, M.M., Noor, I.M., Karim, H.I.A. (2020). Effciency of five selected aquatic plants in phytoremediation of aquaculture waste water. Applied Sciences. 10(8): 27120. DOI: 10.3390/app10082712.

O'Hare, M.T., Aguiar, F.C., Asaeda, T., Bakker, E.S. Chambers, P.A., Clayton, J.S., Elger, A., Gunn, I.D.M., Wood, K.A. (2018). Plants in aquatic ecosystems: Current trends and future directions. Hydrobiologia. 812: 1-11. DOI: 10.1007/s10750-017-3190-7.

Reich, T. (2019). Lighting Requirements for Live Plants in Community Aquariums [online]. Available: https://www.thesprucepets.com/live-plants-lighting-requirements-4092855 [13 Nov. 2021].

Richard, S.H. and White, P. (2021). Horticulture as a pathway of invasive plant introductions in the United States. Bio Science. 51(2): 103-113. DOI: 10.1641/0006-3568(2001)051[0103:HAAPOI]2.0.CO;2.

Salim, S.S., Sirajudheen, T.K., Biju, K.A., Kiran, P., Premdev, K.V. (2013). diversity of marine ornamental fishes associated with trawl by-catch landings in neendakara fishing harbour, Kerala. Journal of Aquatic Biology and Fisheries. 2(1): 256-259.

Sanaye, S.V. and Tibile, R.M. (2009). The fine art of aquascaping. Fishing Chimes. 29(7): 44-47.

Schwartz, J. (2012). Biological approach to aquascaping. Currents Journals. 1(1): 9-13.

Walstad, D. (2014). Plants versus filters. Ecology of Planted Aquarium. 56: 105-117.

Zhang, P., Kuramae, A., Van-Leeuwen, C.H.A., Velthuis, M., Donk, E.V., Xu, J., Bakker, E.S. (2020). Interactive effects of rising temperature and nutrient enrichment on aquatic plant growth, stoichiometry and palatability. Frontiers in Plant Science. 11(58): 2-15.