

CHAPTER 27

Use of Plastic in Aquaculture Development

S. V. Poul,*^a and V. F. Dabhade^b

a,b Department of Zoology, Madhavrao Patil ACS College Palam Dist. Parbhani 431720 Maharashtra, India

Corresponding author Email: dabhadevarsha@gmail.com

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Introduction

Potentiality of the use of plastic in all part of world is extreme large. After US and China, India is third largest consumer of plastics in the world and it is about about 6 kg/capita (Sarkar, 2011, APME, 2000) Plastic has found very important various facets and use in aquaculture. Some of the significant applications of plastic like nylon in aquaculture include fishnets, net cages, pen culture, plastic pipe. Extensive research has been conducted on the utilization of plastic in aquaculture, involving multiple phases of experimentation and yielding diverse results. For research in future findings of such studies should be accessible. Consequently, newly developed devices in the field of aquaculture are mention in this chapter. The oldest Indian epics “Kautilya’s Arthasastra” found evidence of fish culture activity in 300 BC. Aquaculture is developing day by days by inventing many technologies. From onwards 1950’s India started breeding and cultivation research into the of fish but in the early 1970s significant technological advancements commenced with the development of fish seed production and aquaculture, in

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short plastic contributing greatly to the increased production of aquaculture products and showed its potential application in aquaculture proven positive results in aquaculture.

The light weighted plastic are commonly used everywhere. Plastic is commonly used and high in demand because it is light weighted material and available in clear transparent to any colours opaque. It can be recycled to improve physically and mechanically. It needs minimum energy to become final product. It can be blended and compounded, easily reuse and recycle. Waste plastics can be easily destroy to produce energy. Plastic may accompanying finished spatial tolerances from the first piece to suggest the millionth piece. Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), Polyvinyl Chloride (PVC), Polypropylene (PP), Polystyrene (PS), Polyamide (nylon), Polycarbonet (PC), Acrylic and Fibre Reinforced Plastics (FRP) etc are most used plastic in everywhere. Choosing the plastics for use in aquaculture is decided on the basis of examination of material and cutting capacity, it can determine the types of plastic. Hence these above plastics scientifically divide into two types thermoplastic and thermosetting. Thermoplastics can possible to shave for pare off with help of knife and rigid plastic don't pare, it is propably thermosetting. The identification of thermoplastic is easily sinks after red hot press of iron. The plastics like phenol, silicon, furans, polybutadiene and unsaturated polyesters are the thermosetting plastic. Thermosetting plastic is melted and shaped only once, after a second heating, it tends to crack or disintegrate. Thermosetting plastic is better suited to high-temperature applications up to the decomposition temperature, hence don't sinks on red hot press of an electric soldering iron. A thermoplastic is melted and shaped number of times, original shape may get back after cooling at room temperature. Polyethylene, polyacetal, polycarbonate, polystyrene, nylon, acrylic, Fluoroplastics, Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE) cellulose acetate and vinyl are the examples of thermoplastic. Among these plastics listed above, commonly used plastic in aquaculture are PVC, HDPE, nylon, PP, LDPE, FRP or Composite and Acrylic.

At beginning of aquaculture, using bundles or breeding pools has advantages and disadvantages. Nowadays, cages used in aquaculture are varies in different dimensions which based on requirement of like type of species, water depth, total area of water body, speed of wind, flow of water, financial resources, other factors. In aquaculture, areas like breeding pool, spawning pool, hatching pool, incubation pool, spawn collection unit, storage tank and all over the water supply system made by plastic. Such plastic system suitable for Rohu, Catla, Mrigal and common carps for their effective breeding in plastic tank. In aquaculture, making gears and crafts and packaging are most important sectors where the plastic is being rapidly substituted for materials such as wood, glass, metals, and paper. The products in aquaculture are made by plastics are pipe and fittings, boats, twines and rope, fish nets and hapas, pipe and valves of aeration, storage tanks, tubs, buckets, transportation carry bags for fish seed, live fish transportation tank, floats for cages, green house canopy cover cage structure, pipes and valves of culture units and many more components of aquaculture implements, laboratory wares. Over all packaging is the most used sector of plastic. At beginning when world started to use plastic in aquaculture, in Indian Aquaculture sector shows limited utilisation of plastic but from last two decades plasticware has been found using large.

In aquaculture the plastics are selected on the basis of what purpose of tools are made for. For shaving purpose thermoplastics are used most. For trim or pare thermosetting plastic is preferable instead of polystyrene thermoplastics. Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), Polypropylene, Ethylene vinyl acetate copolymer like thermoplastics are mostly used for floats on the water instead of nylon, polycarbonate, PF, Polystyrene, UF, Polyethylene oxide etc are sinks easily in the water. Faint coloured plastics are always used for the observation of colours in water parameters such as UF or MF instead of PF.

In aquaculture if targeted high production potential hence plastic demands high in aquaculture and can convincely used in area like stocking, harvesting, feeding, monitoring of biological parameters. The availability of plastics in aquaculture in the India has contributing greatly, it has been increasing fast, and obtain importance to the increased production of agriculture. Central Institute of Freshwater Aquaculture (CIFA) has made considerable effort to increase the scope and application of plastics in aquaculture. The institute in collaboration with All India Coordinated Project on Application of Plastics in Agriculture (AICRP-APA) of Indian Council of Agricultural Research (ICAR) is working since 1989-90 on the application of plastics in aquaculture (www.cifa.nic.in). CIFA, Bhubaneswar has designed and developed the complete set of hatchery system in FRP for carp fish breeding and hatchery rearing of seed (Mohapatra *et al.*, 2003).

In catfish hatchery, HDPE plastic is used for the egg incubation unit, which is circular in structure connected with inlet PVC pipe. The post-larval rearing unit which receiving water through PVC pipes. Interconnection of larval and post-larval rearing unit are made of plastic valves. The translucent plastic sheets is used for seed rearing tanks. Now days floating plastic cages are designed and fabricated using rigid PVC pipes. The circular cages are made OD HDPE pipes and floating plastic cages are made of rigid PVC pipes. The connected nuts and bolts are made of plastics. The non sinking property of HDPE, the drums floats on water made of HDPE. Also, in Pens culture (HDPE) materials is used for plastic netting. The cage is kept in floating condition in the water body hence used HDPE plastic. By using plastic pipe covered with UV stabilized LDPE, water temperature maintained at up to 4 -6 °C in ponds (Mohapatra *et al.*, 2002). Water temperature-maintained experiments using plastic pipe covered with UV stabilized LDPE in freshwater fish, *Labeo rohita* done by Bandyopadhyay *et al.*, 2000. For transportation of fishes a plastic tank is more suitable than oxygen filled polyethylene bags. For those who maintain aquariums, cleaning and changing the water takes hours on a regular basis, the reason is frequently accumulation due to fish excreta it disturbs the water quality. CIFA Bhubneswar Odisha, designed plastic made cylindrical in shape with conical bottom connected with an out let with different filter media (Aravindakshan *et al.*, 2000). Fish feeder is also made of plastic to serve the fish manually.

Other section or tools in aquaculture, where plastics has remarkable attention are like ropes, nets, different pipes, nuts, bolts, units of aeration, different capacity's storage units, tubs, buckets, transportation bags, packaging material, poly house pond. Besides, there are numerable other applications which often goes unnoticed but contribute significantly to the fisheries and aquaculture (Mohapatra *et al.*, 2011).

Conclusion

To use plastic tools and gadgets in aquaculture need more research and development to enhance productivity from aquaculture. It has numerous uses in aquaculture, these products dimensions, design, and materials are tested in research stations and real-world settings to determine their suitability, adoptability and productivity. The use of plastics has been found to be positively and directly correlated with growth of aquaculture. The dark side of using plastic nowadays is the increase in plastic waste and its efficient and the Government, environmentalist and common people big concern about safe disposal used plastic. Many countries of world are making policies about dumping of plastic waste and NGOs are contributing the creating awareness about use of plastics. Use of plastic causes secondary problems such as clogged drains, also found in health issues in terrestrial and aquatic animals.

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