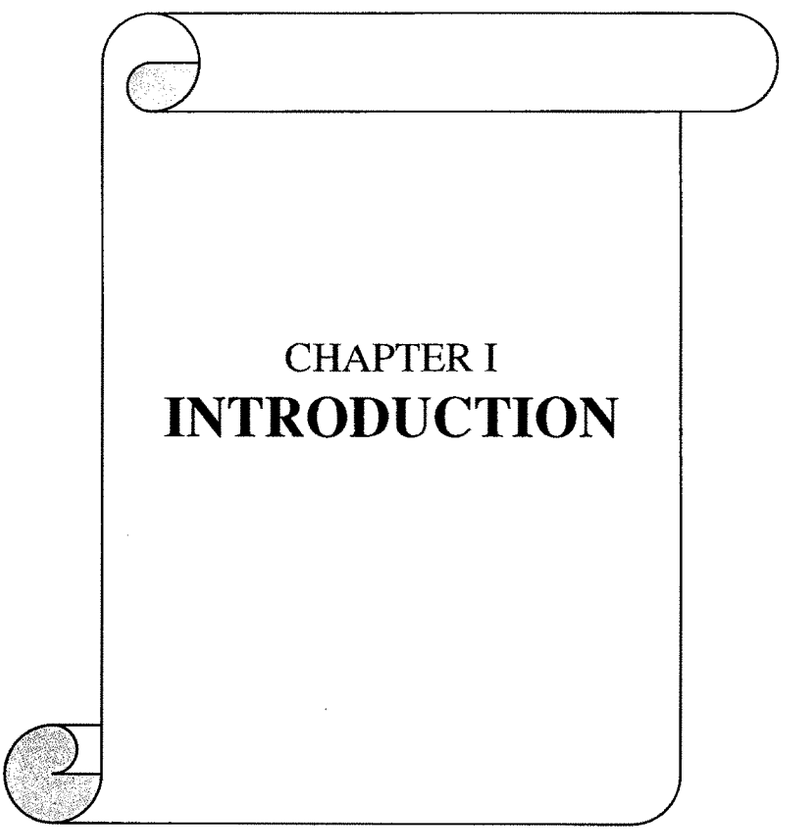

CHAPTER I
INTRODUCTION

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INTRODUCTION

Now a days, there is profound use of heavy metals, pesticides, herbicides and insecticides in day to day life, to control the pests and ultimately they find their way into aquatic bodies like ponds and rivers. Such a pollutants cause damage to the living organisms, like chronic changes in behaviour, low survival rates, morphological changes in different organ systems and also mass mortality. Thus the introduction of small amounts of many relative toxic materials in an aquatic environments cause multiple changes in the internal dynamics of aquatic organisms at sub-lethal level.

Among all these chemicals, pesticides are the best weapon used against pests to protect losses due to pest infestation. The pesticides along with blessings show harmful effects on aquatic fauna. Aquatic animals have to pass large quantities of water over their respiratory surface and body. The pesticides pollute the aquatic ecosystem thus aquatic animals are subjected to the relative risk of the toxic substance and exposure to the toxic substances. Their extremely low concentration immobilizes the aquatic fauna and even causes death of the animals.

1) A brief survey of literature on the use of pesticides in the control of aquatic pests :

A) Use of synthetic chemicals and heavy metals:

A survey of literature reveals that there are a lot of synthetic chemicals and heavey metals which were used as pesticides . Bryan and Uysal (1978) has showed the effect of heavy metals in burrowing bivalve ,*Serobicularia plana* from the Tamar estuary in relation to environment

levels . Gayanth and Sarojini *et al.* (1987) observed the effect of sodium pentachlorophenate on fresh water prawn, *Microbrachium lamerri.* Mane *et al.* (1984) has shown that effect of cythion – malathion on respiration in different fresh water bivalve molluscs from Godavari River near Paithan. Mane and Hiwale (1984) showed acute toxicity of nuvan to two edible estuarine lamellibranch molluscs from Ratnagiri Coast. Ram and Sathyanesan (1985) showed changes in the protein, lipids and cholesterol levels of the liver and ovary of the fish *Channa punctatus* after exposure to organophosphates Mane *et al.* (1986) also pointed out acute toxicity of fenthion to fresh water lamellibranch mollusc, *Indonaia caeruleus.* Muley and Mane (1987d) pointed out sublethal toxicity of mercuric chloride on tissue composition of bivalve mollusc, *Lamellidens marginalis.* Beena Somanath (1988). has reporated that effect of acute sublethal concentration of tannic acid on the protein, carbohydrate and lipid levels in the tissues of the fish, *Labeo rohita.* Choudhari *et al.* (1988) have studied the effect of Basaline (herbicide) on surrival and respiration of fresh water gastropod, *Bellamya bengalensis.* Akarte and Mane (1988)studied sublethal and lethal limits of folithion on behaviour of fresh water bivalve in different seasons. Lomate and Patil (1989) have given an elaborative account of the effect of some common pesticides on digestive enzymes of the army worm, *Mythimna (Pseudalatia) separata.* Nagbhushanam *et al.* (1991) showed remarkable toxicity of copper sulphate and zinc sulphate on the biochemical constituents of the testis of crab,*Barytelphusa guerini.* Kewal Jaiswal *et al.* (1991) revealed chronic effects of naphthalene on total protein free amino acid, RNA and DNA in certain tissues of fresh water prawn, *Macrobrachium kistnesis.* Respiratory impairment in crustaceans and molluscs due to

exposure to heavy metals Cu, Zn. Hg and Cd was showed by John and Roy (1991).

Aldrin toxicity was studied by Singh *et al.* (1993) giving sublethal doses to Indian catfish *Heteropneustes fossilis* and observed biochemical changes in it Gupta *et al.* (1994) fond out combined toxicity of chlordane, malathion and furadan to a test fish, *Notopterus notopterus.* Alterations in carbohydrate metabolism due to monocrotophos toxicity in terrestrial snail, *Cryptozona semirugata* showed by Kulkarni and Chodhari(1995). Sublethal effect of monocrotophos on food utilization of *Cyprinus carpio* was also shown by Poomani . *et al.* (1997). Heavey metal such as copper, mercury, cadbium and zinc toxicity to an intertidal gastropod, *Morual granulata* (Duclos) was studied by Uma devi, (1997). Gupta *et al.* (1998) showed stress induced by cypermethrin (10EC) and quinolphos (25EC) on the hepatic and renal phosphatases in *Notopterus notopterus.* Bhide (1998) showed the effect of nuvan methyl parathion and thimet on mortality, behaviour and reproductive performance of fresh water snail *Lymnea stagnalis.*Awati (2004) observed toxic effect of synthetic molluscicides thimet 10 G and sodium pentachlorophenate on respiratory and reproductive physiology of aquatic snail, *Viviparus bengalensis.*

B) Use of plant toxins (natural pesticides):

The synthetic chemicals are known to alter the physio-chemical properties of water and affect the aquatic enviroment. These in turn interfere and interact with various physiological and biochemical activities of organisms.

Now a days scientists had become more sensitive towards environment hence they have become more aware toards environmental and related potential health hazards of conventional insecticides which has stimulated to evolve alternative systems of pest control that confers, ensuring food safety and protection of environment (Hileman, 1990). An alternative system of pest control consists of the use of biodegradable natural products or phytotoxins such as plant compounds having various biological activities like specific toxicity, feeding inhibition, growth regulation and antifertility effects. More than 200 plant species have been identified during last five decades as biologically active. (Arnason *etal.*, 1989). These plant species shows some of the properties like specific toxicity, feeding inhibition, growth regulation, and anti-fertility effects as above. (Grainge and Ahmed; 1985 and Parmer and Devkumar, 1993).

Beside the synthetic chemicals, as a pesticide, many plant products are used as natural pesticides. Now a days many researchers turned their attention on natural pesticides (Phytotoxins) to avoid the environmental pollution. The plants having pesticidal properties especially contain the active principals like Tigliane (Hecker, 1978)), Daphane (Gunsekera *et al;* 1981), rotenone (Geoffrey, 1985), Saponin (Chakraborthy *et al.* 1972, Patil, 2000, Awati, 2004), etc. Other plant toxins such as zugulone and pyrethrin, pyrethroides, alkaloides, glycosides and essential oils are also used as pesticides (Mauck and Ol son, 1976).

Pereira and Pereira de Souza (1975) reportd that hexane extracts of the shell of the cashew nut *Anancardium accidentale* is toxic to the snail, *B. glabrata.* Nanaware and Harold (1987a) showed effect of *Lasiosiphon eriocephalus* leaves on dissolved O_2 and physiology of *Tilapia mossambicas.* Patil (2000) Studied effects of plant toxins from *Acacia*

sinuata, Lasiosiphon eriocephalus and *Sapindus laurifolius* on economically important fresh water fishes *Cyprinus carpio, Catla catla, Cirrhinus mrigala* and *Labeo rohita* and observed effect on mortality, behaviour, oxygen consumption, haematological parameters and nutrient value of these fishes. Nanaware *et al.* (2003) observed effect of natural molluscicides *Acacia sinuata* and *Sapindus laurifolius* induced changes in the nutrients of gills of snail, *Bellamya bengalensis.* Singh and Biajrani (2003) showed effect of neem oil *(Azadirachta indica)* on luminal protein pattern in mice during pre and post implantational stages.

Awati (2004) showed effect of *Sapindus laurifolius* on respiratory and reproductive physiology of aquatic snail, *Viviparus bengalensis.* Nanaware and Mane (2004) studied mortality after effect of leaf extract of *Eupatorium triplinere* on snail, *Viviparus bengalensis.*

Brief survey of plant toxins used as biopesticides :

Number of the plant species have been used in the control of the pests in the form of crude powder or in the form of alcoholic extract. From the survey of literature some of the plant species are listed below --

Croton tiglium (Babu, 1965 and Bhuyan, 1967), *Bassia latifolia* (Barrackpore, 1968 and Bhatia, 1970) *Barringtonia acutangula* (Babrrackpore, 1968), *Bassia latifolia* (Chowdhury, 1968 and Chakrborthy *et al.* 1972) *Randia dumetorum* (Barrackpore, 1968) *Walsura piscidia* (Chakraborthy, *et al.* 1972), *Camdia sipensis* (Chowdhary 1968), *Nicotina tabacum* (Konar, 1969) *Millettia pachycarpa* (Bhuyan, 1968), *Madhuca indica*, Syr., *Rassia latifolia* (Chowdhury, 1968), *Millctia piscidia* (Das, 1969), *Justica hayatai* (Ohta et al., 1969) *Marchantia polymorpha* (Kanasaki and Ohta, 1976) contain considerable toxin which affect the fish life. In recent years certain other plants *Eupatorum odoraturm* L., *Myrica ceculenta,*

Buch., *Polygonum hydropiper* L. Vor., *Pottentia fulgens* wal, ex Lenn., *Taxus buccata, Xeronpnis spinosa* (Thunb) Keay, *Zanthoxylum armatum* DC., (Ramanujam and Ratha, 1980a, 1980b, 1983) *Acorus calamus* Linn., *Sapindus mukrossi* Benth., *Xerophis spinosa* kreg. (Virdi, 1982). *Lasiosiphon eriocephalus* DC. (Harold, 1987) are reported as effective piscicides. Jhingran (1983) enlisted plants like safed siris. *(Alibizzia procera),* Nogdona tithwan *(Artemisia vulgaris),* Dar hald *(Berberis aristata),* Banalu *(Dioscorea spp.)* Chaulmugra *(Hydnocarpus hurzee),* akhort *(Jaglans regia),* Millettia spp., hazarmani *(Phyllanthus urinaria),* Rhododendren spp., Kuchla *(Strychnos nuxvomica),* Sarphonka *(Thephrosia purpurea)* and ban tambaku or giddar tambakhu *(Verbascum thapsus),* which contained fish toxins. Reports on the piscicidal properties are also available on the plants *P. linofolia* and *P. ligustrina* (Tyler *et al.* 1985). *Myrica esculenta* Buch-Ham, *Polygonum hydropiper* L. var. *Potentilla fulgens* Wal ex. Lehm, *Xeromphis spinosa* (Randia dumetorum), *Zanthxylum armatum* (Ramanujam and Ratha, 1980a, 1980b) *Acorus calamus, Sapindus mukorussi,* (Lal and Virdi, 1972 Virdi 1982), *Pimelea ligastrina, P. linifolia* (Tyler et al., 1985), *Calotropis procera* (Sharma, 1980) *Derris trifoliata* (Das, 1969), *Butea monosperma* (Joshi 1986), *Butea monosperma* (Joshi 1986), *sinuat, S. laurifolius, L. eriocephalus* (Patil,2000), *A. indica* (Singh and Biahrani.2003) and *Eupatorium triplinere* (Nanaware and Mane, 2004).

2) A brief survey of literature on the effect of synthetic and natural pesticides on Mortality, oxygen consumption and biochemical parameters :-

The parameters Mortality, Oxygen consumption and Biochemical study are taken for this study the brief survey of literature is summarisd below.

a) Mortality;-

Effect of malathion on the mortality and behaiour of fresh water teleosts have been studied by Singh and Sahai (1984). Poonmani *etal.* (1997) revealed sublethal effect of monocrotophos on food utilization of *Cyprinus carpio.* Bhide (1998) studied mortality in fresh water molluscs, *Lymnea stagnalis* after exposure to nuvan, methyl parathion and thimet Awati (2004) showed comparison on toxic effect of synthetic and natural molluscides on mortality of aquatic snail, *Viviparus bengalensis.* Nanaware and Mane (2004) observed effect of *Eupatorium triplinere* on the mortality of snail, *Viviparus bengalensis.*

Mortality effect in *T. mossambica* was studid by Harold (1987), Bhosale (1988) and Patil (1988) by exposing it to the phytotoxins from *L. eriocphalus, S. laurifolius* and *A. concina* respectively. Similary effect of phytotoxins from *D. trifoliata,* Mahua oil cake and *T. indica* has observed respechtively by Das (1969), Bhatia (1970) and Jena (1979) to study mortality respectively in fishes *C. punctatus, C.mrigala* and *C. carpio.*

b) Oxygen consumption –

Oxygen consumption in relation to environmental oxygen concentrations in the ampullarid snail, *Malisa cornuarietis* have been reported by Akerlund (1974). Buckingham *etal.* (1976) observed effect of temperature and pH. on the oxygen consumption in the prosobranch snail, *Viviparus contectoides.* Bayne and Sarlard (1978) observed rate of oxygen consumption in *Thias lapillus.* Singh and Singh (1979) observed changes in

oxygen consumption of siluroid fish, *Mystus vittatus* puttting them to different concentration of some heavy metal salts. Amabile *et al.* (1981) reported Influence of weight, sex and environment on oxygen consumption in amphibious snail, *Pamacea lineata.* Alam and Lomate (1984) showed effect of zinc sulphate on oxygen consumption of fresh water gastropod, *Bellamya bengalensis.* Balavenkatasubhaiah *et al.* (1984) observed effect of mercury on oxygen consumption in fresh water mussel, *Lamellidens marginalis.* Muley and Mane (1987c) studied induced changes after effect of endosulfan in oxygen consumption in two species of freshwater lamillibranch molluscs. Kapoor and Lomate (1987) studied the effect of toxic compounds ($HgCl_2$ and $CuSo_4$) on oxygen consumption of fresh water mussel, *Indonaia caeruleus.* Sarkar (1999) observed the effect of heavy metals (copper sulpate and cadmium sulphate) on oxygen consumption of fish *Cyprinus carpio.*

Impact of heavy metals on fresh water fish, *Cyprinus carpio* in relation to oxygen consumption was studied by Bhilave *et al.* (2003). Bharati *et al.* (2002) studied effect of monocrotophus on oxygen consumption of fresh water edible crab, *Paratelphus hydrodomas.*

c) Biochemical Parameters –

i) Glycogen -

The literature survey revealed that Kulkarni *et al.* (1984) studied impact of endosulfan toxicity on carbohydrate metabolism of fresh water snail, *Pila globosa.* Kulkarni and Choudhari (1995) showed alteration in carbohydrate metabolism due to monocrotophos toxicity in terrestrial snail, *Cryptozona semirugata.* Alteration in the carbohydrate metabolism due to monocrotophos toxicity on the terrestrial snail, *Zootecus insularis.* Khan, *et*

al. (2001,2002) observed cadmium toxicity in glycogen level from body parts and whole body of marine edible gastropod, *Bodylonia spirata* and aslo studied tissue glycogen level in different body parts of the green mussel, *Perna vividis* exposed to zinc chloride. Nanaware *et al.* (2003) observed heavy metals induced changes in hepatopancreas of fresh water snail, *Bellamya bengalensis.*

ii) Proteins -

Singh *et al.* (1979) studied bio-chemical changes in the fresh water Indian catfish, *Heteropneustes fossillis* after exposure to sublthal concentration of aldrin. Ram and Sathyanesan (1984) showed mercuric chloride induced changes in the protein, lipid and cholesterol levels of the liver and ovary of fish, *Channa punctatus.* Sarojini *et al.* (1987) observed naphthalene induced alteration in total proteins, free amino acids, AIAT, AAT and GDH in fresh water prawn, *Macrobrachium kistnesis.* Choudhary and Lomate (1991) showed pesticidal impact on protein metabolism in the digestive gland of snail, *Bellamya bengalensis.* Somanath Beena (1991) observed effect of acute sublethal concentration of tannic acid on the protein carbohydrate and lipid levels in the tissues of fish *Labeo rohita.* Moorthy and Subramanian (1997) studied copper induced protein profile variation in a fresh water prawn, *Macrobranchium lamarrel lamarrel.* Choudhary *et al.* (1998) observed effect of sodium pentachlorophenate on protein metabolism of the gastropod, *Indoplanorbis exustus.* The accumulation and metabolism of amino acids by *Biophalaria glabrata,* a fresh water pulmonate snail have been studied by Eaton and Thomau (1999). Nanaware *et al.* (2003) studied natural molluscicides induced changes in the nutrients of gill of snail, *Vivipanus bengalensis.*

iii) Lipids –

Nanaware and Patil (1998) observed influence of natural pesticide from *S, laurifolius* on the nutritive value of *C. catla.* Singh *et al.* (1993) studied effect of cypermethrin metacarbate and phorate on phospholipids and lipid peroxidation in snail, *Lymnea accuminata.* Choudhary *et al.* (1998) studied altered level of lipids and cholesterol in the gastropod, *Indoplanorbis exustus.* Nanaware *et al.* (2003) observed natural molluscicides induced changes in the nutrients of gill of snail, *Bellamya bengalensis.*

3) Analysis of the problem and plan of present work :

In aquatic toxicology the investigators concentrated their attention for last few decades in analyzing the effects of synthetic chemicals and pesticides on particular group of animals ie. Pisces. As in aquatic fauna besides fishes gastropods occur in major mumber and they are economically important. Some of the scientists had studied the effect of synthetic pesticids on the gastropods but very few investigators have paid their attention to study the effect of natural molluscides on these animals.

It is revealed form the review of literature on the use of synthetic chemicals and as well as plant origin toxicants that both are used in the control of molluscan pests. However although synthetic chemicals are more effective. They are not trustworthy due their bad effects on the aquatic and subaquatic animals and their environment. They also destroy the food of organisms such as zooplanktons and phytoplanktons, in addition due to the residual effects of the synthetic chemicals and heavy metals affect the food

chain and the water bodies get affected for prolonged period. They may even result in mutation and these changes become prominant after few generations. The chemical pesticides also kill friendly insects. Hence scientists had thought about the alternative way of using plant toxins which are easily degradable, comparatively less expensive and can not create prolonged hazards in the water.

Hence scientists have been engaged in screening the plant parts to find out plant toxins and their use it in the control of pests and other organisms.

But the use of these plant toxins may create a stressfull condition in the water. The problem remains that wheather such a toxic stress is injurious to the molluscs and their life activities. If so how much it affects the vital activities of these molluscs. This has stimulated us to work out the present investigation.

One of these problems of the effects of the phytotoxins on the vital activities of the molluscs is being undertaken for the detailed investigation. The present work is concerned with study of the one of the important vital activity i.e. respiratory activity of the gastropod, *Viviparus bengalensis* after its exposure to the phytotoxins from *Clerodendron inerme* , *Vitex negundo* and neem oil of *Azadichta indica.*

The present work is concerned with the study of effect on the respiratory activity of *Viviparus bengalensis* after its exposure to the phytotoxins from *Clerodendron inerme*, *Vitex negundo* and neem oil of *Azadirachta indica.*

In the present investigation it was decided to carry out detailed analysis of ;

1. Lethal concentrations of phytotoxins *Clerodendron inerme, Vitex negundo* and Neem oil of *Azadirachta indica* with respect to the snail, *Viviparus bengalensis.*
2. The Oxygen consumption of *Viviparus bengalensis* after its exposure to the phytotoxins from *Clerodendron inerme, Vitex negundo* and Neem oil of *Azadirachta indica.*
3. Alternations in glycogen, protein and lipids in the gills of *Viviparus bengalensis.*

The next part of this dissertation is divided into five chapters which will help for easy understanding. The second chapter deals with material and methods used in this investigation.

The third chapter accounts the observation in this investigation. The fourth chapter describes the discussion concerned with this work. Where as fifth chapter deals with the general summary and concluding remarks which is further followed by Bibliography.