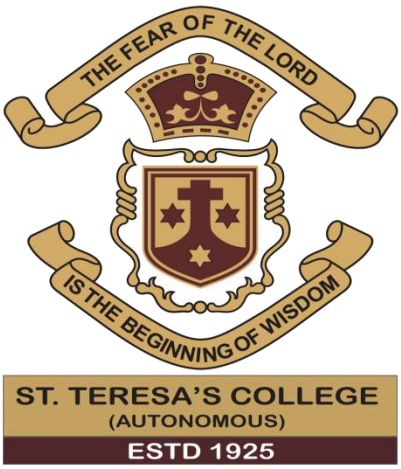
"A COMPARATIVE STUDY ON EFFECT OF SYNTHETIC AND ORGANIC PESTICIDES IN *Etroplus suratensis*"



Project work by,
MILEEN GUILD
AB21ZOO036

Under the guidance of
Ms.AKHILA ANILKUMAR , Assistant professor
Department of zoology,St Teresa's college (Autonomous), Ernakulam
Kochi-683011

Submitted to,St.Teresa's college (Autonomous), Affiliated to Mahatma Gandhi University, Kottayam in partial fulfilment of requirement for the Degree of Bachelor in Science in Zoology

2023-24

CERTIFICATE

This is to certify that the project entitled "**A COMPARATIVE STUDY ON EFFECT OF SYNTHETIC AND ORGANIC PESTICIDES IN *Etroplus suratensis*"** submitted by Ms.Mileen Guild, Reg no : AB21ZOO036 in partial fulfillment of the requirement of Bachelor of Science degree of Mahatma Gandhi, University, Kottayam in a bona fide work under my guidance and supervision and to my best knowledge,this is her original effort.

Akhila Anilkumar
Assistant Professor
Department of Zoology
St.Teresa's College (Autonomous)
Ernakulam.

Dr.Soja Louis
Head of Department
Department of zoology
St Teresa's College (Autonomous)
Ernakulam

EXAMINERS

1)

2)

DECLARATION

I, hereby declare that this project work entitled **"A COMPARATIVE STUDY ON EFFECT OF SYNTHETIC AND ORGANIC PESTICIDES IN *Etroplus suratensis"*** is submitted to St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam in partial fulfillment of the requirement of Bachelor of Science degree in Zoology. This work has not been undertaken or submitted elsewhere in connection with any other academic course and the opinions furnished in this report are entirely my own.

.

MILEEN GUILD SIGNATURE
REGISTER NO:AB21ZOO036

ACKNOWLEDGEMENT

I would like to express my gratitude and appreciation to all those who have contributed to this project. First and foremost, I would like to thank my project guide Ms.Akhila Anilkumar for the invaluable guidance, support, and encouragement. Thank you for guiding us along to build a good project work, by providing all the necessary information and the best available resources.

I thank all the teachers of the department of Zoology, St. Teresa's college, Ernakulam who were always willing to encourage and help us in all our efforts.I also thank fishermen for their whole-hearted support and help.

My project work would not have been a success without the constant encouragement from my parents and my friends. Their support has kept me motivated and focused on completing this project successfully.

Above all I would like to thank God Almighty for showering his blessings upon me abundantly and for giving me the strength, knowledge, ability, and opportunity to undertake and complete this project work.

ABSTRACT

Pesticides can be harmful to aquatic ecosystems, including fish. Runoff from agricultural fields or urban areas can introduce pesticides into waterways, impacting fish health and populations. It's crucial to manage pesticide use responsibly to minimize environmental damage.

Bordeaux and Indofil M-45 are the chemical pesticides and garlic spray is the organic pesticide used in the study.*Etroplus suratensis* is the fish used . Study was conducted by the continuous observation of the fish for a period of 12 hours per day.Breathing rate was noted on the beginning and at the end of the experiment. 1g,2g,3g,4g and 5g of Bordeaux and Indofil M-45 was added to 6L water in fish bowl.1ml,2ml,3ml,4ml and 5ml of garlic spray was added to 6L water in fish bowl. Aerator was provided throughout the experiment.No death were observed when I and 2 g of bordeaux was added to the water system later death of one fish each were observed by the addition of each g.1g of indofil doesn't resulted in the death of fishes,later one fish each were died on the addition of each g of indofil M-45. On comparing both chemical pesticides used indofil M-45 is more lethal.When organic pesticide, garlic spray was used change in breathing rate wasn't observed. On comparing the effect of chemical pesticides with organic pesticide, study clearly suggest to find alternatives like garlic spray

The impact of studies on the effects of pesticides is significant. They provide crucial insights into the potential risks to human health, wildlife, and the environment. Such studies influence regulatory decisions, farming practices, and public awareness regarding pesticide usage. They often lead to improved regulations, alternative pest management strategies, and greater emphasis on sustainability in agriculture.

TABLE OF CONTENTS

SL NO:	CONTENTS	PG NO:
1	INTRODUCTION	**7**
2	REVIEW OF LITERATURE	**11**
3	METHODOLOGY	**15**
4	RESULT	**16**
5	DISCUSSION	**24**
6	CONCLUSION	**25**
7	REFERENCE	**27**

INTRODUCTION

In recent years, increase in population and industrialization is one of the major problem that our world is facing. Population increase lead to the increase in the demand of crops, inorder to meet the demand of high yield, disease resistant crops pesticides came into use.Fishes are one of the main victims of pesticides, since these chemicals are washed out into water bodies.Taking a view of toxicity in fishes ,there are several other factors like ; untreated and partially treated industrial effluents,supplemented with pollutants like heavy metals, pesticides and many organic compounds, have greatly contributed to massive fish death of aquatic ecosystems. These toxic chemicals and metals have changed the quality of water that affect the fish and other aquatic organisms

The ubiquity of pesticides in modern agriculture raises concerns about their potential ecological consequences, particularly in aquatic ecosystems. This project aims to delve into the intricate relationship between pesticides and fishes, examining the effects of these chemical compounds on various aspects of fish physiology and behaviour. As pesticides play a pivotal role in enhancing crop yields, understanding their impact on aquatic organisms, such as fishes, is crucial for assessing environmental health. Through a multidimensional approach encompassing physiological, behavioural, and biochemical parameters, this study seeks to provide insights into the intricate dynamics between pesticides and fish populations.

Pesticides is a chemical compound (such as carbamate) or a biological agent (such as a virus, bacteria, or fungus) that incapacitate, kill, or otherwise prevent pests. Target pests can include insects, plant parasites, weeds, molluscs, birds, mammals, fish, nematodes (roundworms) and microbes that damage property, cause or transmit disease, or are vectors of disease. In addition to these benefits, pesticides often have disadvantages, such as potentially toxic to humans and other species.

Pesticides are mainly classified into three categories : insecticides, fungicides and herbicides .Insecticides are the substance or mixture of substances used for killing insects like DDT(Dicholoro Diphenyl Trichloroethane),BHC(BenzeneHexachloride) Chlordane, TEPP(Tetra Ethyl Pyro Phosphate),Dithion,Parathion,Malathion.Fungicides are the chemical that destroy fungus,they are classified according to the chemical nature into two main groups ; inorganic and organic fungicides examples are Bordeaux mixture,copper oxychloride , sulphur,Dithiocarbamates.Herbicides are the chemicals that are widely used in the agricultural field for controlling the growth of herbs ,weeds and bushes which are considered unwanted due to

their growth of the crops.Examples are 2,4-dichlorophenoxy acetic acid, 3,5-dinitro-4-dipropyl -amino trifluorophenoxu benzene, arsenic acid,Bis-chloro isobutyrate.

The toxicity of a substance depends on three factors: its chemical structure, the extent to which the substance is absorbed by the body, and the body's ability to detoxify the substances and eliminate it from the body.Fish absorb contaminants such as PCBs, PBDEs, dioxins, and chlorinated pesticides from water, sediments, and the food they eat. In contaminated areas, bottom-dwelling fish are especially likely to have high levels of these chemicals because these substances settle to the bottom where the fish feed.
Etroplus suratensis is commonly chosen for experiments due to several advantageous characteristics. It is a freshwater fish with traits that make it suitable for various types of research:

1. Hardiness and Adaptability:Pearl spot is known for their resilience and adaptability to varying environmental conditions. This makes them well-suited for experiments in controlled settings, allowing researchers to manipulate specific variables while maintaining the health and stability of the experimental population.

2. Availability and Ease of Breeding: These fish species are readily available and relatively easy to breed in captivity. This availability ensures a consistent supply of experimental subjects, facilitating long-term studies and repeated trials.

3.Rapid Growth and Reproduction: Pearl spot exhibit rapid growth rates and high reproductive capacities. This enables researchers to observe multiple generations within a relatively short period, facilitating the study of generational effects of pesticides or other experimental factors.

4.Representativeness for Aquatic Ecosystems : Pearl spot are integral parts of freshwater ecosystems, and their responses to pesticides may reflect broader trends in aquatic environments. Studying these species can provide insights into the potential impacts of pesticides on fish populations and the ecosystems they inhabit.

Bordeaux mixture and indofil are the chemical pesticides used in this experiment. Bordeaux mixture is a traditional fungicide used in agriculture, primarily to control fungal diseases in crops like grapes, potatoes, and tomatoes. It's made from a mixture of copper sulfate, lime, and water. Bordeaux mixture has been used for over a century and is known for its effectiveness against diseases like downy mildew and powdery mildew. However, its use is declining due to concerns about copper accumulation in soil and potential environmental impacts.
Indofil is a well-known brand in the agricultural sector, particularly in the field of crop protection. Indofil's products contain various chemical compounds specifically formulated to target and control pests, diseases, and weeds in crops. These chemical contents may include active

ingredients such as insecticides, fungicides, and herbicides, along with inert ingredients to enhance efficacy and safety. The specific chemical compositions of their products vary depending on their intended use and target crop. Indofil adheres to regulatory standards and safety protocols to ensure the responsible use of chemicals in agriculture.Home-made garlic spray is the organic pesticide used in this experiment.It is an effective pesticide for repelling certain pests like aphids, mosquitoes, and some types of beetles. The strong odour of garlic can deter pests from plants and garden areas.

OBJECTIVES OF THE STUDY

- Analysis the impact of organic and chemical pesticides on *Etroplus suratensis*
- Investigating how pesticides affect fish behavior as a whole was studied.
- Comparative study between organic and chemical pesticide have been studied in this project.

REVIEW OF LITERATURE

The study conducted by Carla Bacchetta *et.al.*, (2014) aimed on the combined effect of pesticides in fishes .Fish was exposed to sublethal concentrations of endosulfan (ED), lambda-cyhalothrin (LC), and the combination of both pesticides, antioxidant enzymes activities and oxidative damage biomarkers measured in gills, liver, kidney, brain and muscle. were observed while the pesticides was used alone. The most significant effects were produced by the ED–LC combination. So, the mixture of both insecticides produced an increase in white blood cells count, and alterations in the differential leukocytes count.

In the study conducted by Johnson Stanley *et.al.*,(2016) aimed on the pesticides toxicity to fishes: exposure, toxicity and risk assessment methodology .They had given a wide detail about the different methods to access the sublethal effects along with the genotoxicity of pesticides disrupting in genes , chromosomes, DNAs and RNAs.

In study conducted by Shefali *et.al.*,(2021) aimed n the impact of pesticide toxicity in aquatic environment.deals with the effects of rapid growth in the human population on
the aquatic ecosystem, which may be noticed in the form of climate change, nutrient enrichment of aquatic bodies, and pollution by the different types of toxic substances, including pesticides in both regional and global scale. These man-made disturbances within the environment are responsible for adversely affecting the normal functioning of living organisms, which includes developmental abnormalities from invertebrates to higher organisms that are mammals. It is being noticed that in past years the use of pesticides is increasing, and it affects non-target organisms at different biological scales.

In the study conducted by K.Shankar Murthy *et.al.*,(2017)aimed on the toxicity of pesticides in fish. Study says about the long-term exposure to pesticides poses a continuous health hazard for both aquatic organisms and humans. Molecular biology techniques offer promising avenues for toxicological applications, potentially revolutionizing detection methods. Pesticide toxicity in fish can lead to various harmful effects, necessitating stringent regulations against indiscriminate pesticide use. Regular monitoring of pesticide residues in food and humans is essential for assessing population exposure. Further experimental research is needed to establish safe levels of exposure that avoid significant sub-lethal effects on fish.

In the study conducted by K .A.Al-Ghanim *et.al.*,(2020) aimed on the sub-lethal effect of synthetic pyrethroid pesticide on metabolic enzymes and protein profile of non-target Zebra fish

.Investigated the effects of sublethal fenvalerate concentrations on marker enzymes in freshwater Zebra fish. After 28 days of exposure, enzyme activities were assessed, showing reductions in superoxide dismutase and catalase activity in the liver and gills. Increases in aspartate and alanine amino transferase activity in the gills were observed, along with alterations in acid and alkaline phosphatase activity. Fenvalerate also induced changes in stress protein expression. The findings suggest that enzyme assays and protein analysis are valuable tools for monitoring fenvalerate toxicity in freshwater ecosystems.

In the study conducted by K.J.G.Diaz-Resendiz *et.al.,(*2019) aimed on the effect of diazinon, an organophosphate pesticide, on signal transduction and death induction in mononuclear cells of Nile tilapia fish .This study examines how diazinon affects immune responses in Nile tilapia by analyzing its impact on various cellular processes in spleen mononuclear cells. Results indicate significant damage to these cells, suggesting potential immunotoxicity mechanisms of the pesticide.

In the study conducted by Rafael J.G.Rubira *et.al.,*(2023) aimed on the biological responses to imazapic and methyl parathion pesticides in bioinspired lipid membranes and Tilapia fish . Investigates the effects of widely used sugarcane crop pesticides, Imazapic (IMZ) and Methyl Parathion (MP), on Nile tilapia gill tissues and lipid membranes. By using bioinspired cell membrane models, it reveals electrostatic interactions between the pesticides and lipid bilayers, leading to morphological changes. Gill tissues exposed to the pesticides show hypertrophic alterations, potentially compromising oxygen absorption and leading to fish mortality. This underscores the importance of water quality in ecosystem health and the need for informed management practices to protect aquatic organisms and preserve ecosystem balance in pesticide-affected environments.

In the study conducted by Abhijit Kar *et.al.,*(2024) aimed on the distribution and risk assessment of pesticide pollution in small streams adjoining paddy field.Investigated pesticide pollution in small streams near paddy fields, detecting 55 pesticides with fenobucarb and thiamethoxam showing the highest concentrations. Attabira stream had the most pesticides detected, and October had the highest pesticide presence. Risk assessment indicated high toxicity to aquatic life, urging for policy interventions to reduce pesticide pollution in these ecosystems.

In the study conducted by Sylvain Slaby *et.al.,*(2022) aimed on the distribution of pesticides and some of their transformation products in a small lentic waterbody: Fish, water, and sediment contamination in an agricultural watershed.Focuses on pesticide contamination in small waterbodies, particularly fishponds, highlighting the presence of both pesticides and their transformation products. High concentrations were found, especially for metazachlor-OXA in water and benzamide in sediment. Transformation products of certain pesticides were more

concentrated than their parent compounds. Few contaminants were detected in fish, but prosulfocarb accumulation raises concerns. The study underscores the need for ongoing monitoring and the establishment of toxicity thresholds.

In the study conducted by K Sukumaran *et.al.*,(2017) aimed on the enhancement of breeding frequency and reproductive performance of pearlspot Etroplus suratensis by curtailing parental care.It highlights the impact of parental care manipulation and salinity on the breeding frequency and reproductive performance of pearlspot in small tank systems. Larval separation increased breeding frequency, while lower salinity levels reduced the inter-spawning interval and enhanced breeding frequency. This suggests the potential for optimizing breeding conditions in captivity, particularly in smaller tank setups.

In the study conducted by N.D.Don Xavier *et.al.*,(2019) aimes on the marine Environmental Research Chronic effects of copper and zinc on the fish, Etroplus suratensis (Bloch, 1790) by continuous flow through (CFT) bioassay. Investigated the tolerance limits of copper (Cu) and zinc (Zn) on pearl spot fish, revealing their impact on survival and health. Through Continuous Flow Through (CFT) bioassay, the research derived LC50 and chronic toxicity values, indicating moderate to heavy pollution in the Cochin estuarine system. Histological, biochemical, hematological, and behavioral parameters showed significant variations at sublethal concentrations, emphasizing the importance of CFT-based studies in understanding toxicity changes and guiding water quality guidelines.

In the study conducted by Banalata Mohanty (2024) aimes on the pesticides exposure and compromised fitness in wild birds: Focusing on the reproductive endocrine disruption.The study discusses the concerning impact of pesticides on wildlife, particularly regarding endocrine disruption. It highlights the vulnerability of wildlife species, especially those higher in the food chain, to the harmful effects of pesticides due to biomagnification. Focusing on birds, the review compiles literature on how pesticides affect reproductive functions and overall fitness by disrupting hormone regulation. It emphasizes the need for studies on realistic exposure doses, mixture exposures, and transgenerational effects to accurately predict pesticide-induced endocrine disruption. Furthermore, it calls for the development of screening methodologies and quantitative structure-activity relationships to assess and validate the endocrine disruption potential of contemporary pesticides.

In the study conducted by Lea Tison *et.al.*,(2024) aimes on the transfer and bioaccumulation of pesticides in terrestrial arthropods and food webs. Focuses on pesticide transfers mediated by terrestrial arthropods in food webs and the resulting bioaccumulation and biomagnification effects. It highlights the importance of understanding the chemical properties, detoxification abilities of organisms, and their effects on life history traits. The review identifies four critical areas for future

research: studying co-formulants and pesticide mixtures, improving analytical methods for detecting low pesticide concentrations, quantifying pesticide levels across different trophic levels, and investigating the influence of trophic structure on pesticide transfer. Overall, the review aims to inspire future studies to better understand and quantify pesticide impacts on terrestrial food webs in both natural and cultivated landscapes.

In the study conducted by Md.Ariful Islam *et.al.*,(2022) aimes on chronic effects of organic pesticides on the aquatic environment and human health .It highlights the substantial deterioration of aquatic environments due to the accumulation of toxic pollutants, with pesticides being among the most concerning compounds. Organochlorine pesticides (OCPs) like DDT and PCBs are particularly detrimental, persisting for decades in the environment and threatening both environmental integrity and human health. The extensive use of pesticides in South Asia exacerbates the issue, with millions of cases of pesticide toxicity occurring annually worldwide. In aquatic environments, pesticide toxicity leads to mortality, reproductive failure, and various health complications in fish. Similarly, humans experience short-term and chronic health impacts from pesticide exposure, including skin irritation, nausea, and even diseases like cancer. The review provides an overview of pesticide levels and distribution in the Asian region and globally, as well as chronic effects on human health.

METHODOLOGY

Setting up of aquarium: The fish-bowl was thoroughly cleaned with water and dried under sunlight. Following this, it was filled with 6 litres of dechlorinated water with a pH level of 7 and the temperature set to 25°C.

Addition of fishes: the fish was introduced into the bowl. Throughout the study, an aerator was consistently used to support the bowl. The fish was fed its regular floating diet during the course of the study.
In order to prevent the contamination of fish with bacteria fish was introduced into the fish bowl with fish net.

Pesticides used:

- ✧ Chemical pesticide-Bordeaux and Indofil M-45
- ✧ Organic pesticide-Garlic spray

Application of pesticide : 1g,2g,3g,4g and 5g is the quantity of Bordeaux and Indofil M -45 was used in 5 fishes of the same species.1ml,2ml,3ml,4ml and 5ml of garlic spray was used in 5 fishes.The procedure was conducted on 6L water in fish bowl.15 pearl spot fishes was used in this experiment.

.

RESULT AND OBSERVATION

Duration of the experiment:12 hrs
Pesticides used in the experiment are Bordeaux, Indofil M-45 and garlic spray

Five fishes were taken on five separate bowl in 6L water to study the effect of Bordeaux .On treatment with 1g of Bordeaux five fishes all were alive .On treatment with 2g of Bordeaux on the same five fishes all were alive ,but on treatment with 3 g of Bordeaux on the same five fishes, four were alive and one had died.On treatment with 4g of Bordeaux on same four fishes ,three were alive and one had died again.On treatment with 5g of Bordeaux on same all fishes were died.

EFFECT OF BORDEAUX ON *Etroplus suratinesis*

sl no	concentration of bordeaux	average breathing rate in the beginning	average breathing rate in the end	fish alive or died
1	1g	89/min	84/min	All alive
2	2g	84/min	82/min	All alive
3	3g	78/min	57/min	Four alive and one dead
4	4g	56/min	53/min	Three alive and one dead
5	5g	52/min	48/min	All dead

Table.1,shows the effect of Bordeaux on breathing rate

fig .1 ***fig.2***

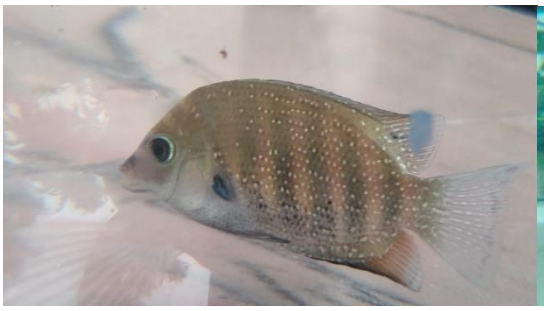


fig.3 ***fig.4***

fig.

Figure.1:shows the Pearlspot on contamination with 1 g of Bordeaux .
Figure.2:, shows the Pearlspot on contamination with 2 g of Bordeaux .
Figure.3 : shows the Pearlspot on contamination with 3 g Bordeaux.
Figure.4 : shows the Pearlspot on contamination with 4 g of Bordeaux.
Figure.5,:shows the Pearlspot on contamination with 5g of Bordeaux.

.

Five fishes were taken on five separate bowl in 6L water to study the effect of Indofil M-45. On treatment with 1g of Indofil M-45 five fishes were alive.On treatment with 2g of Indofil M-45

four were alive and one had died.While treatment with 3g of Indofil on same four fishes ,three were found alive and one died.Whereas treatment with 4g of Indofil M-45 on the three fishes resulted in the death of one . Treatment with 5g of the same pesticide killed the fishes left.

EFFECT OF INDOFIL M- 45 ON *Etroplus suratensis*

sl no	concentration of indofil m-45	average breathing rate in the beginning	average breathing rate in the end	fish alive or died
1	1g	115/min	95/min	All fishes alive
2	2g	95/ min	85/min	Four alive one dead in three hour
3	3g	85/min	65/min	Three alive one dead in two hour
4	4g	65/min	45/min	Two alive one dead in one hour
5	5g	45/min	30/min	All dead in 15 minutes

Table.2,shows the effect of Indofil M-45 on breathing rate

fig.6. ***fig.7***

fig.8 ***fig.9***

Figure.6: shows the Pearlspot on contamination with 1g Indofil M-45.
Figure.7: shows the died Pearlspot after contamination with 1g Indofil M -45.
Figure.8: hows the Pearlspot on contamination with 2g Indofil M-45.
Figure.9: shows the died Pearlspot after contamination with 2 g Indofil M-45.

Garlaic spray was the organic pesticide used for the study. For the work five fishes were taken in separate bowls in 6L water. On treatment with 1ml of garlic spray no changes were observed in the breathing rate. The same effect was produce when the concentration of pesticide was increased to 2ml, 3ml, 4ml and 5ml.

sl no	concentration of garlic spray	Average breathing rate in the beginning	Average breathing rate in the end	Dead or alive
1	1ml	92/ min	92/min	All alive
2	2ml	92/ min	92/min	All alive
3	3ml	92/ min	92/min	All alive
4	4ml	92/min	92/min	All alive
5	5ml	92/min	92/min	All alive

Table.3,shows the effect of Garlic spray on breathing rate

fig.10

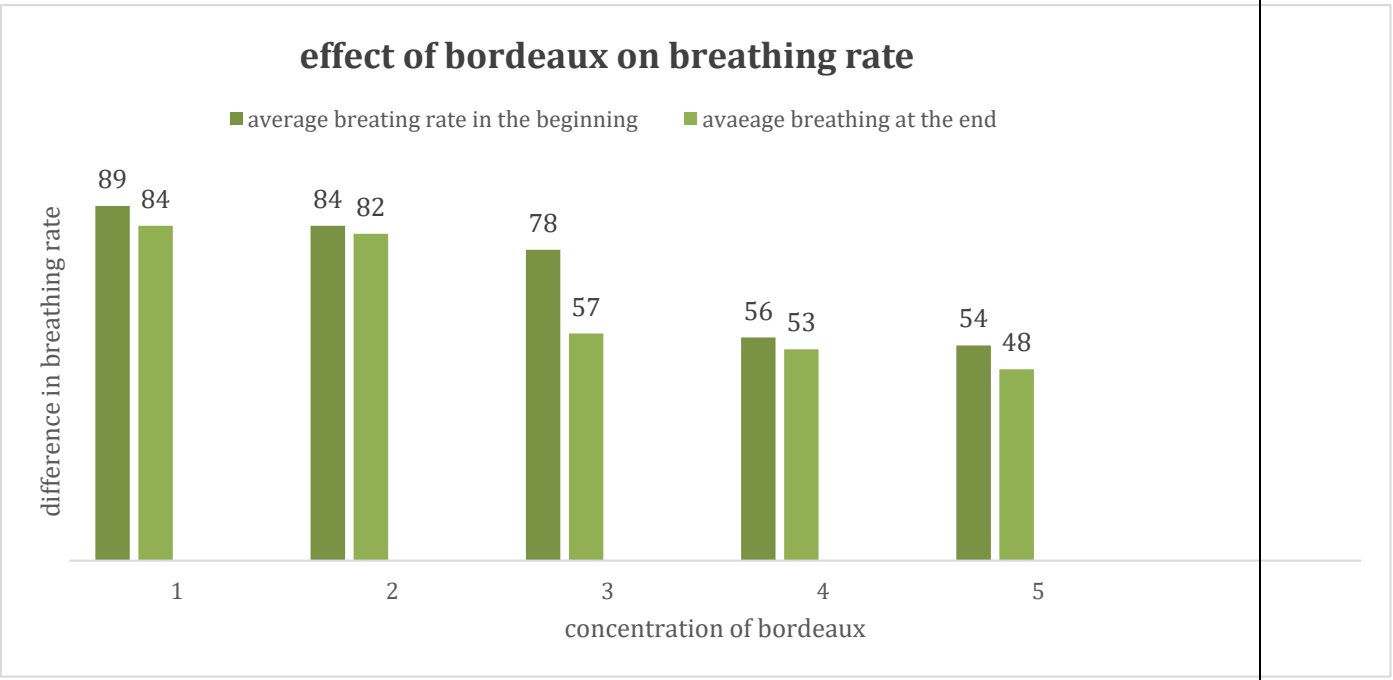
fig.11

fig. 12.

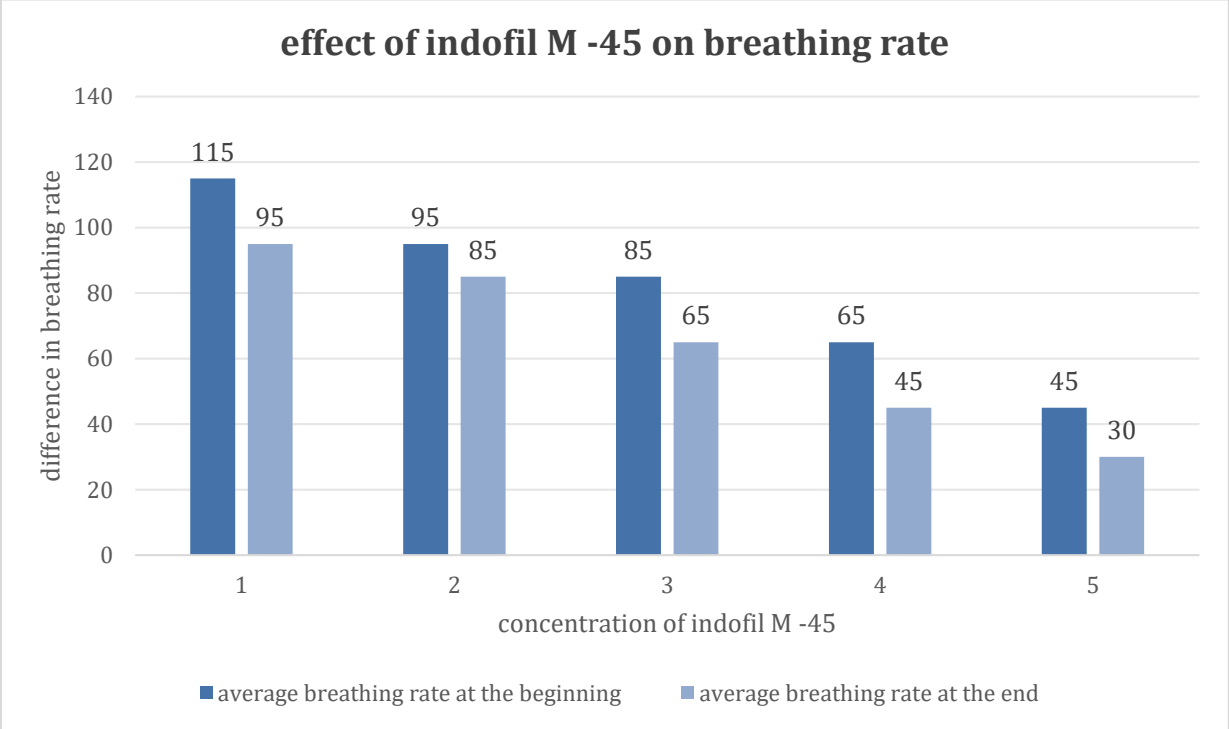
fig.13

fig.14

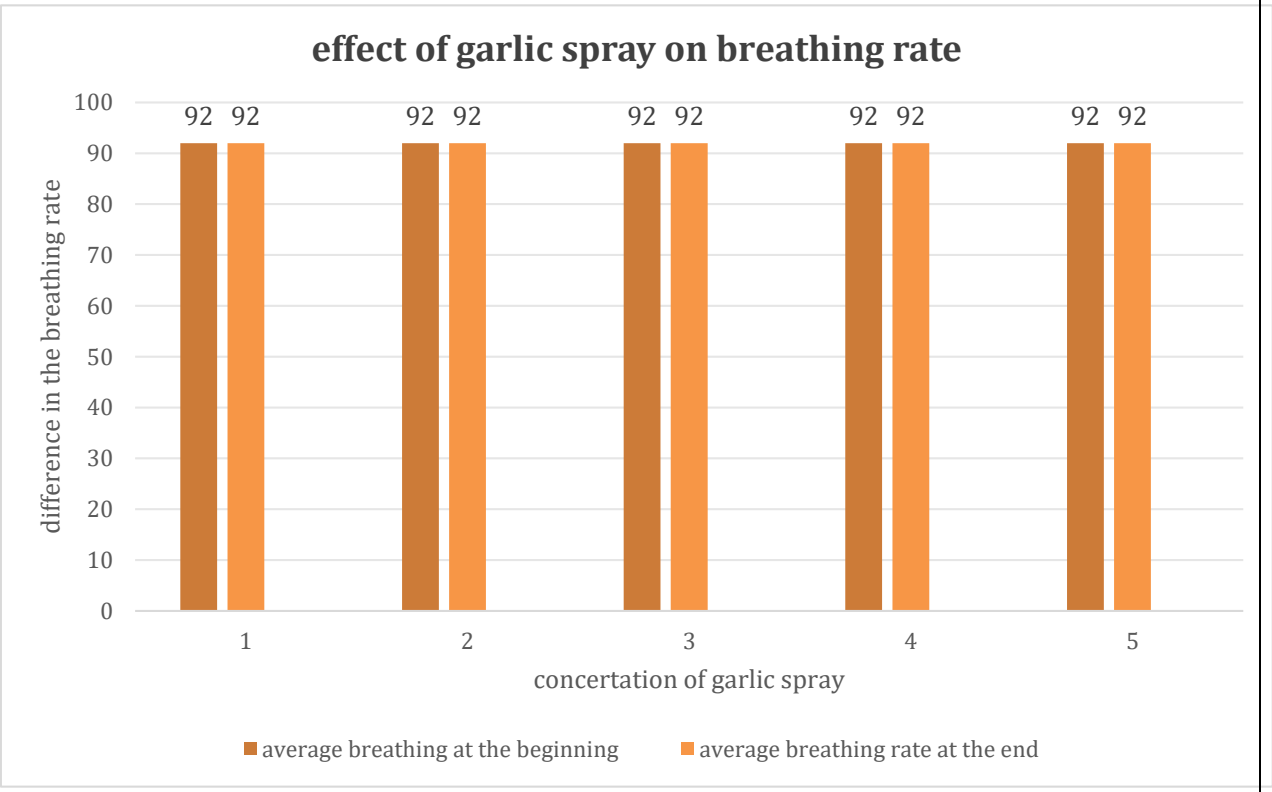
Figure 10-14 ,shows pearlspot on contamination with garlic spray .There didn't have any chance in the breathing rate. Breathing rate in the beginning was 92/min and at the end was also 92/min .Weight of the fish is 75g and length is 2 inch.



Graph 1 ,shows the effect of Bordeaux in breathing rate



Graph 2 ,shows the effect of Indofil M-45 on breathing rate



Graph 3: shows the effect of Garlic spray on breathing rate

DISCUSSION

Pesticides can significantly impact aquatic systems by contaminating water bodies through run-off from agricultural fields, urban areas, and industrial sites. These chemicals can disrupt the balance of aquatic ecosystems by harming various organisms, including fishes, algae, invertebrates, and aquatic species

the study by Carla Bacchetta ,Andrea Rossi , Analía Ale ,Mirta Campana , María Julieta Parma , Jimena Cazenave on the topic "Combined effect of pesticides in fishes" , explored the combined effects of pesticides, specifically endosulfan and lambda-cyhalothrin, on fish. It observed changes in antioxidant enzyme activities and oxidative damage biomarkers in various fish tissues when exposed to these pesticides alone or in combination. Meanwhile This project focused on comparing the effects of organic and chemical pesticides on *Etroplus suratenesis* . It highlights ,how chemical pesticides led to a decrease in breathing rate and mortality, with Indofil M-45 being particularly lethal compared to bordeaux,while garlic spray didn't cause any effect on breathing rate.thus it proves that pesticides that uses hazardous chemicals to produce better yield of crop have disastrous effects on aquatic life. It could be assumed that the combined effects of chemical pesticides are more lethal that individual ones. Both works emphasize the importance of reducing chemical pesticide and finding alternatives like garlic spray for the sustainability of the aquatic ecosystem.

The current research investigates the contrasting impacts of chemical and organic pesticides. It's evident that chemical pesticides affect breathing rates. Notably, Indofil M-45, a potent chemical pesticide, can cause fish mortality with just 2 gram. While current work focus on the breath rate and behaviour of *Etroplus suratenises.* The work on Biological responses to imazapic and methyl parathion pesticides in bioinspired lipid membranes and Tilapia fish" examines how diazinon affects immune responses in Nile tilapia by analysing its impact on various cellular processes in spleen mononuclear cells. Both the experiments focuses on the drastic effect that happens to fishes due to chemical pesticide. This provides sufficient evidence to prove that the impact of pesticide is different for different species.Moreover the concentration of pesticide plays an important role in the ill effects. Both the experiments could be used as evidences of harmful impact of chemical pesticides.

CONCLUSION

Pesticides are chemicals used to control pests, like insects, weeds, and fungi, to protect crops and public health. However, they can also have harmful effects on the environment and human health if not used properly or in excess. It's important to balance their benefits with potential risks and explore alternatives like integrated pest management.Pesticides can have various effects on fishes and aquatic ecosystems. Some pesticides can directly poison fish if they are washed into water bodies, leading to fish kills. Additionally, pesticides can accumulate in the tissues of fish and other aquatic organisms, potentially causing long-term health problems and disrupting the balance of the ecosystem. Pesticides can also harm aquatic plants, which can impact the habitat and food sources of fish.

Bordeaux and Indofil M-45 are the chemical pesticides and garlic spray is the organic pesticide used in the study.*Etroplus suratensis* is the fish used . Study was conducted by the continuous observation of the fish for a period of 12 hours.Breathing rate was noted on the beginning and at the end of the experiment. 1g,2g,3g,4g and 5g of Bordeaux and Indofil M-45 was added to 6L water in five separate fish bowl with five fishes.1ml,2ml,3ml,4ml and 5ml of garlic spray was added to 6L water in fish bowl. Aerator was provided throughout the experiment.When 1g,2g of Bordeaux was added all fishes was alive. Later on by the addition of each gram of Bordeaux resulted in the death of each fish and after the addition of 5g no fishes were alive , change in the breathing rate was observed . When 1 g Indofil M-45 was added to five separate fish bowl , all the fish fishes were alive but when 2 g was added it resulted in the death of one fish.Later to this four fishes 3g of indofil was added after this addition only three fishes were alive.later 4g of indofil was added which resulted in the death of one more fish ,finally 5g of indofil was added to the reaming one fish that fish too died within 15 minutes .On comparing both Bordeaux and Indofil M-45, latter is more lethal .When organic pesticide, garlic spray was used change in breathing rate wasn't observed. On comparing the effect of chemical pesticides with organic pesticide, study clearly suggest to find alternatives like garlic spray

Main objective of the project is to determine the toxicity levels of specific pesticides on fish species to understand their potential harm.Understand how pesticides introduced into aquatic environments affect fish populations, biodiversity, and ecosystem health.Determine if pesticide residues in fish pose risks to human consumers through bioaccumulation or direct exposure.Provide scientific evidence to support regulations and management practices aimed at minimizing pesticide contamination in aquatic ecosystems and safeguarding fish populations.Overall, the project would aim to provide valuable insights into the ecological consequences of pesticide exposure on fish populations and contribute to the development of more environmentally sustainable practices in agriculture and pest management.Investigate how

pesticides affect fish behavior, such as feeding, mating, and migration patterns,can be studied as an extent of this project.

Scope :Studying the effects of pesticides on fishes involves examining various aspects such as the impact on their physiology, behavior, reproduction, and overall ecosystem dynamics. Understanding these effects is crucial for assessing environmental risks and implementing appropriate management strategies.

REFERENCE

1.Abhijit Kar , Sonali Deole , Rakesh Ranjan Nayak , Akhilesh Kumar Gupta , Basana Gowda Gadratagi , Naveenkumar Patil , Govindharaj Guru-Pirasanna-Pandi , Bibhab Mahapatra , Arabinda Mahanty , Totan Adak ,"Distribution and risk assessment of pesticide pollution in small streams adjoining paddy fields"Journal of Hazardous Materials Volume 469, 5 May 2024.

2.Banalata Mohanty,"Pesticides exposure and compromised fitness in wild birds: Focusing on the reproductive endocrine disruption"Pesticide Biochemistry and Physiology Volume 199, February 2024.

3.Carla Bacchetta , Andrea Rossi , Analía Ale , Mirta Campana ,María Julieta Parma , Jimena Cazenave ,"Combined toxicological effects of pesticides: A fish multi-biomarker approach"Ecological Indicators Volume 36, January 2014, Pages 532-538.

4.Esmirna Cantu , Michelle Rivera , Brittney Lacy ,, Md Saydur Rahman ,"Effects of short-term exposure to a pesticide mixture on free-swimming behavior in goldfish, Carassius auratus"Journal of Hazardous Materials Advances Volume 11, August 2023.

5.lPrem Rajak , Sumedha Roy , Abhratanu Ganguly , Moutushi Mandi , Anik Dutta Kanchana Das , Sayantani Nanda , Siddhartha Ghanty , Gopal Biswas,"Agricultural pesticides – friends or foes to biosphere?"Journal of Hazardous Materials Advances Volume 10, May 2023

6.K.A. Al-Ghanim ,Shahid Mahboob , P. Vijayaraghavan , F.A. Al-Misned ,Young Ock Kim , Hak-Jae Kim,"Sub-lethal effect of synthetic pyrethroid pesticide on metabolic enzymes and protein profile of non-target Zebra fish, Danio rerio"Saudi Journal of Biological Sciences Volume 27, Issue 1, January 2020, Pages 441-447.

7.K.J.G. Díaz-Resendiz , P.C. Ortiz-Lazareno , C.E. Covantes-Rosales , A.M. Trujillo-Lepe , G.A. Toledo-Ibarra , G.H. Ventura-Ramón , M.I. Girón-Pérez ,"Effect of diazinon, an organophosphate pesticide, on signal transduction and death induction in mononuclear cells of Nile tilapia fish"Fish & Shellfish Immunology Volume 89, June 2019, Pages 12-17.

8.K. Shankar Murthy , B.R.Kiran , M.Venkateshwarlu ,"A review on toxicity of pesticides in Fish"International Journal of Open Scientific Research, Volume 1 ,May 2013.

9.K. Sukumaran, M. Kailasam, K. Vasagam, R. Subburaj, G. Thiagarajan, K.K. Vijayan,"Enhancement of breeding frequency and reproductive performance of pearlspot Etroplus suratensis by curtailing parental care"Aquaculture Volume 479, 1 October 2017.

10.Léa Tison , Léa Beaumelle ,Karine Monceau , Denis Thiery ,"Transfer and bioaccumulation of pesticides in terrestrial arthropods and food webs: State of knowledge and perspectives for research"Chemosphere Volume 357, June 2024.

11.Md. Ariful Islam , S.M. Nurul Amin , M. Aminur Rahman ,Abdul Shukor Juraimi , Md. Kamal Uddin , Christopher L. Brown , Aziz Arshad ,"Chronic effects of organic pesticides on the aquatic environment and human health: A review",Environmental Nanotechnology, Monitoring & Management Volume 18, December 2022.

12.Md Fazle Rohani,"Pesticides toxicity in fish: Histopathological and hemato- biochemical aspects – A review ,Emerging Contaminants Volume 9, Issue 3, September 2023.

13.Naheed Bano , Amir Nadeem , Sadia Maalik , Sajida Mushtaq , Naeem Iqbal , Ahmad Kamran Khan ,Asghar Shabbir ,Muhammad Imran ,Safia Niaz , Muhammad Yasin ,Mirza Abdul Qayyum , Bashir Ahmad , Milan Skalicky , Sulaiman Ali Alharbil, Saleh Alfarraj ,"Effect of pesticides on erythrocytes of indigenous fish Labeo rohita"Journal of King Saud University - Science Volume 33, Issue 7, October 2021.

14.N.D. Don Xavier , S. Bijoy Nandan , P.R. Jayachandran , P.R. Anu , A.M. Midhun , D. Mohan ,"Chronic effects of copper and zinc on the fish, Etroplus suratensis (Bloch, 1790) by continuous flow through (CFT) bioassay" Marine Environmental Research Volume 143, January 2019, Pages 141-157.

15.Rafael J.G. Rubira ,Victor R.G. Batista ,Rafael R. Correia , Wallance M. Pazin , Mateus D. Maximino , Gilia C.M. Ruiz , Giovana R. Teixeira , Aldo E. Job,"Biological responses to imazapic and methyl parathion pesticides in bioinspired lipid membranes and Tilapia fish"Journal of Hazardous Materials Volume 458, 15 September 2023

16.Samara Silva de Souza , Kerem Hapuque Rodrigues Bruce , Jaqueline Custódio da Costa , Desyree Pereira , Grazyelle Sebrenski da Silva , Adalberto Luis Val ,"Effects of climate change and mixtures of pesticides on the Amazonian fish Colossoma macropomum"Science of The Total Environment Volume 922, 20 April 2024

17.Sanghamitra Basu , Abhra Chanda , Pranab Gogoi , Subarna Bhattacharyya,"Organochlorine pesticides and heavy metals in the zooplankton, fishes, and shrimps of tropical shallow tidal creeks and the associated human health risk"Marine Pollution Bulletin Volume 165, April 2021.

18.Saurabh Prajapati , Jonathan K. Challis , Timothy D. Jardine , Markus Brinkmann,"Levels of pesticides and trace metals in water, sediment, and fish of a large, agriculturally-dominated river"Chemosphere Volume 308, Part 1, December 2022

19.Shefali , Rahul Kumar , Mahipal Singh Sankhla , Rajeev Kumar ,Swaroop S. Sonone,"Impact of Pesticide Toxicity in Aquatic Environment"Biointerface Research in Applied Chemistry, Volume 11,2021.

20.Sylvain Slaby , François Le Cor , Vincent Dufour , Lucile Auger , Laure Pasquini , Olivier Cardoso , Laurence Curtet , Jean-Marc Baudoin , Laure Wiest h, Emmanuelle Vulliet , Cyril Feidt , Xavier Dauchy , Damien Banas ,"Distribution of pesticides and some of their transformation products in a small lentic waterbody: Fish, water, and sediment contamination in an agricultural watershed"Environmental Pollution Volume 292, Part B, 1 January 2022.