IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12511

AIR POLLUTION CONTROL OF FISH MEAL & OIL INDUSTRY USING BIO-FILTERS

Vishnu[1], Preetham Naik M[2], Jayaprakash M C[3], Vineetha Telma D'Souza[4]

UG Student, Department of Civil Engineering and Department of Chemistry, Mangalore Institute of Technology &Engineering, Moodbidri, India, Autonomous Institute Affiliated to V.T.U., Belagavi, Approved by AICTE, New Delhi[1,2]

Associate Professor, Department of Civil Engineering and Department of Chemistry, Mangalore Institute of Technology &Engineering, Moodbidri, India, Autonomous Institute Affiliated to V.T.U., Belagavi, Approved by AICTE, New Delhi[3,4]

Abstract: The fish oil extraction industry plays a critical role in providing essential omega-3 fatty acids and other valuable compounds to consumers worldwide. However, this process often generates toxic and noxious odors due to dimethylamine (DMA) and trimethylamine (TMA) gases, which pose serious ecological and socio-environmental problems and are considered strong environmental pollutants. This project aims to reduce the noxious odor emissions from the fish meal and oil extraction industry by introducing a novel approach using odor-reducing agents such as acetic acid, lactic acid, and activated charcoal as a bio-filters. The research aims to improve the overall quality of final products while addressing environmental concerns. The findings contribute to the development of sustainable practices in the industry, promoting efficient and eco-friendly fish processing.

Key words: omega-3 fatty acids, toxic and noxious odors, noxious odor emissions, activated charcoal as a bio-filters.

I. INTRODUCTION

Fish tissues are rendered in order to extract the precious oil, which is high in omega-3 fatty acids and other beneficial substances. This technique can be problematic for the workers as well as the neighboring community because it frequently generates offensive and sometimes dangerous aromas into the surrounding area.

These smells are strong and poisonous, which can make it difficult to comply with environmental regulations and lower the general standard of living in the neighborhoods that surround fish processing plants.

Our project's reaction to this problem centers on putting in place a complex plan to lessen the harmful aromas that fish oil extraction tanks emit. The main goal is to provide an efficient and practical approach that can be easily incorporated into current processing facilities without sacrificing quality.

II. OBJECTIVES

a. To evaluate the effectiveness of activated charcoal in reducing noxious odors during fish meal & oil extraction as a bio- filters.

b. To determine the practical applicability of these odor-reducing agents within the fish processing industry.

c. To improve the working environment for overall quality of life in the areas surrounding of the fish processing facilities and pose environmental compliance challenges.

d. To ensure compliance with environmental regulations by reducing odor emissions.

e. To enhance the quality of life for communities located near fish processing facilities by minimizing the impact of noxious odors.

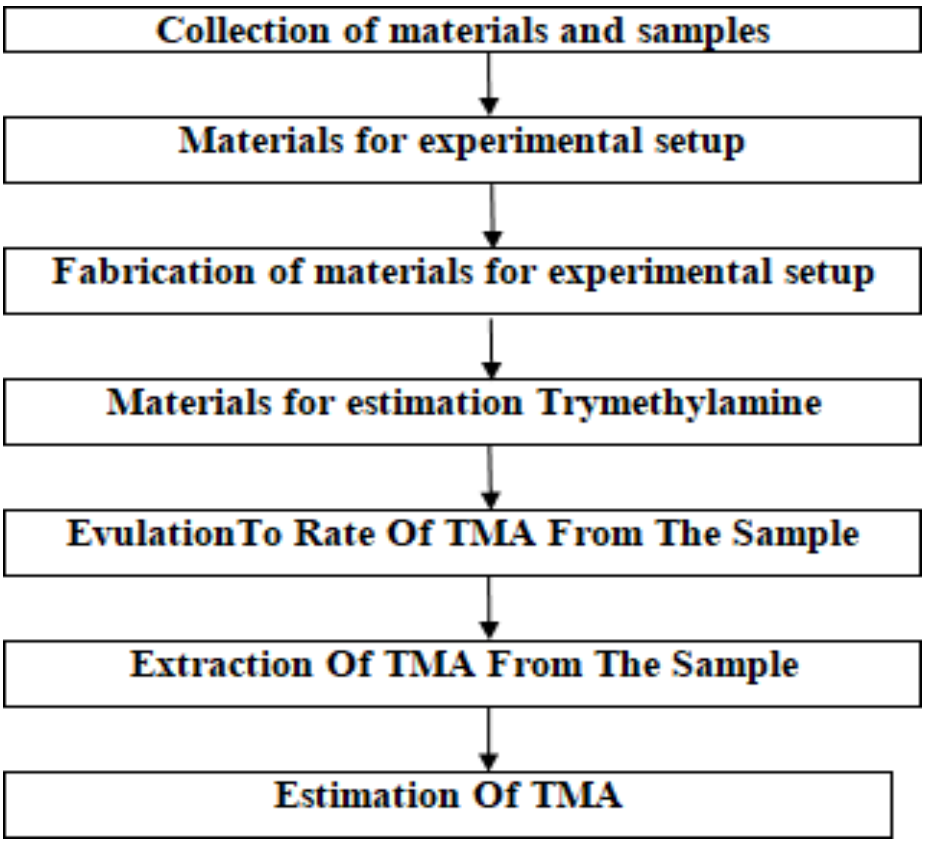
IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12511

III. METHODOLOGY



IV. DETAILS OF THE SAMPLE

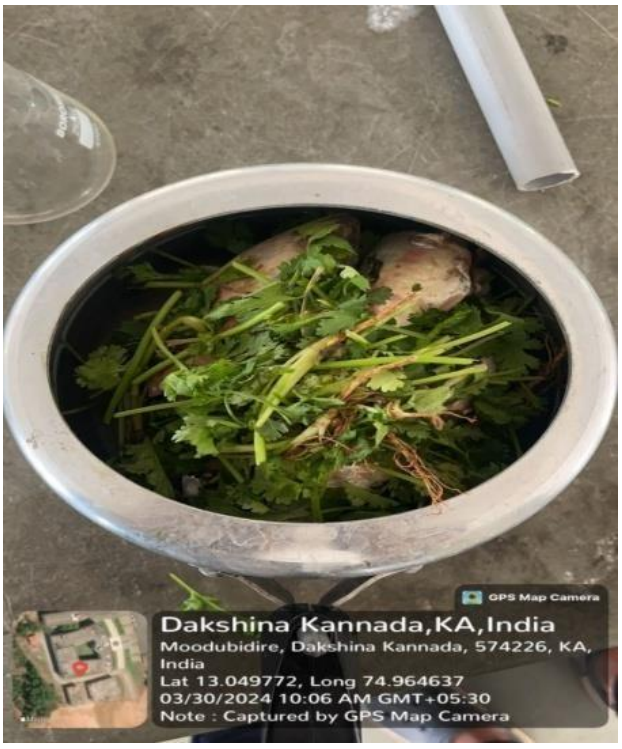


Figure 1: Raw material – Fish & Green leaves

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12511

Figure 2: Extracted Sample from the steam without filter media

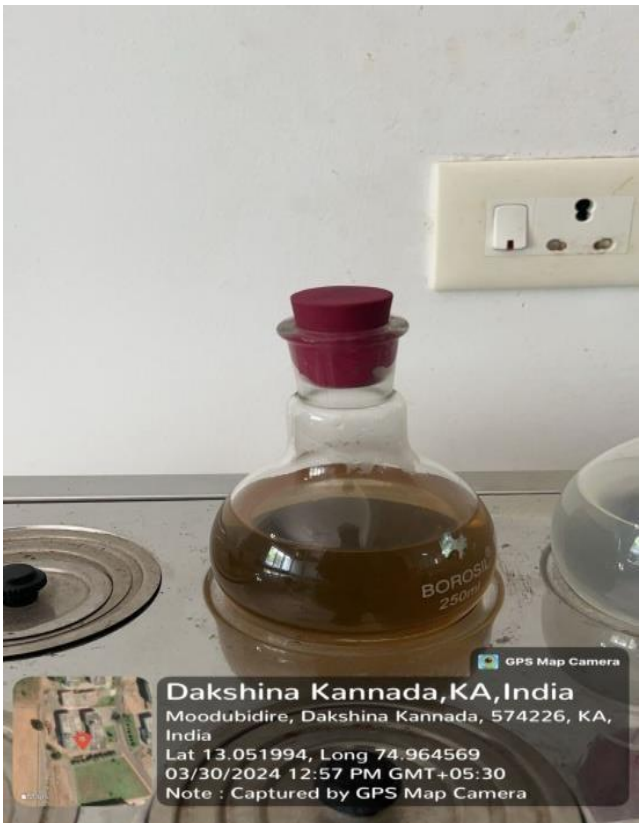


Figure 3: Extracted Sample from the steam using coconut charcoal as a filter media

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12511

V. RESULT AND DISCUSSION

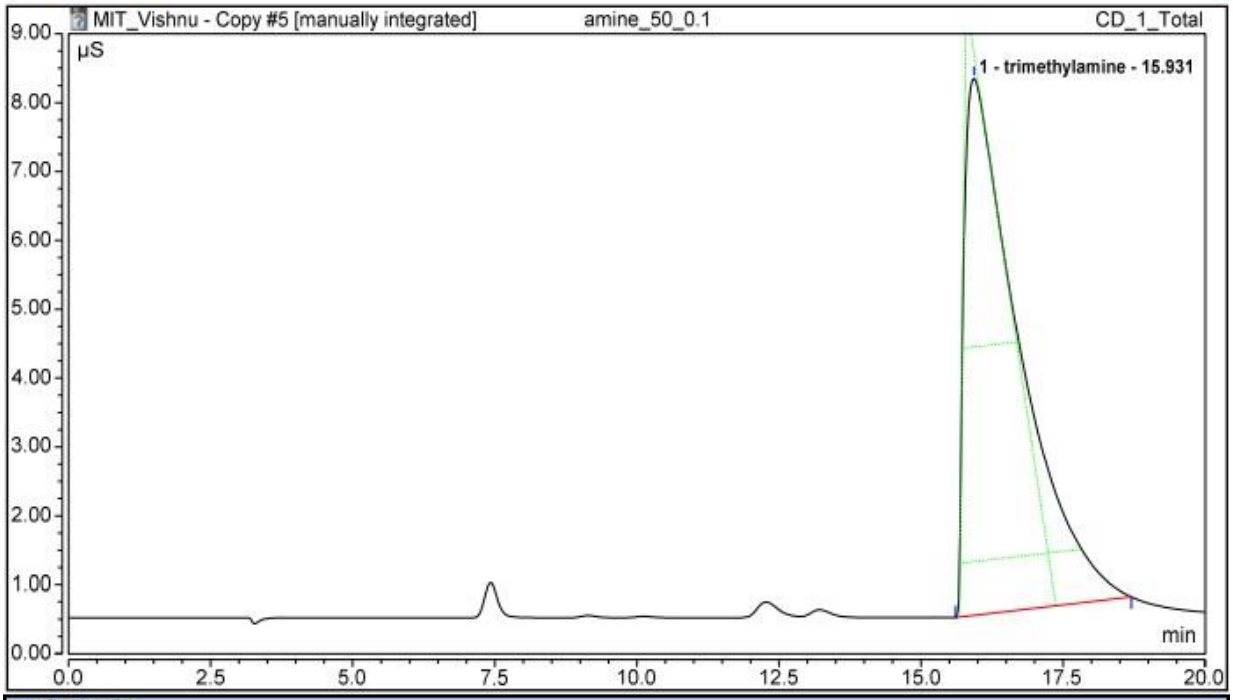
Retention time, peak shape, peak height, and area under the curve are typical features of the trimethylamine peak in the chromatograph.The amount of time it takes for trimethylamine to elute from the chromatographic column and arrive at the detector is known as the retention time. Information regarding the effectiveness of the chromatographic separation process can be obtained from peak shape and resolution.

Peak Analysis

Injection Details

Injection Name:	**amine_50_0.1**	*Run Time (min):*	**20.00**
Vial Number:	**27**	*Injection Volume:*	**25.00**
Injection Type:	**Unknown**	*Channel:*	**CD_1_Total**
Calibration Level:		*Wavelength:*	**n.a.**
Instrument Method:	**Cation method 16022024**	*Bandwidth:*	**n.a.**
Processing Method:	**cation_24_03_23**	*Dilution Factor:*	**5.0000**
Injection Date/Time:	**30/Apr/24 13:34**	*Sample Weight:*	**0.1000**

Chromatogram



Peak Results

No.	Peak Name	Retention Time min	Width (50%) min	Type	Resolution (EP)	Asymmetry (EP)	Plates (EP)
n.a.	Ethylenediamine	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1	trimethylamine	15.931	0.995	BMB*	n.a.	4.73	1422

Figure 4: Standard sample trimethylamine of peak graph

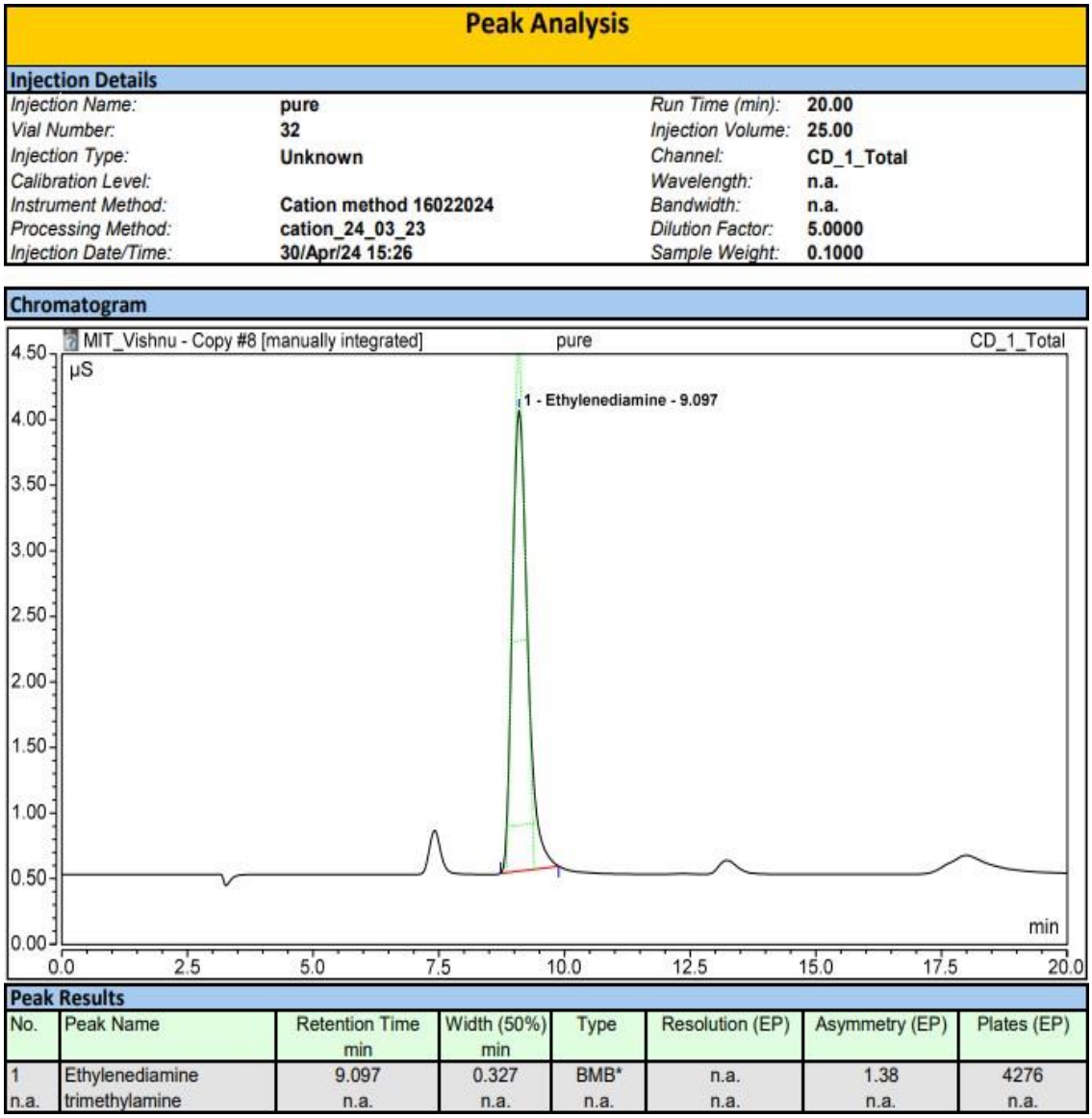
Extracted Sample from the steam using coconut charcoal as a filter media and testing the sample in ion chromatograph. Retention time, peak shape, peak height, and area under the curve are typical features of the amine peak in the chromatograph.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12511



Peak Analysis

Injection Details

Injection Name:	**pure**	*Run Time (min):*	**20.00**
Vial Number:	**32**	*Injection Volume:*	**25.00**
Injection Type:	**Unknown**	*Channel:*	**CD_1_Total**
Calibration Level:		*Wavelength:*	**n.a.**
Instrument Method:	**Cation method 16022024**	*Bandwidth:*	**n.a.**
Processing Method:	**cation_24_03_23**	*Dilution Factor:*	**5.0000**
Injection Date/Time:	**30/Apr/24 15:26**	*Sample Weight:*	**0.1000**

Chromatogram

Peak Results

No.	Peak Name	Retention Time min	Width (50%) min	Type	Resolution (EP)	Asymmetry (EP)	Plates (EP)
1	Ethylenediamine	9.097	0.327	BMB*	n.a.	1.38	4276
n.a.	trimethylamine	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Figure 5: Pure sample peak graph

Extracted Sample from the steam without filter media and testing the sample in ion chromatograph. Retention time, peak shape, peak height, and area under the curve are typical features of the amine peak in the chromatograph.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

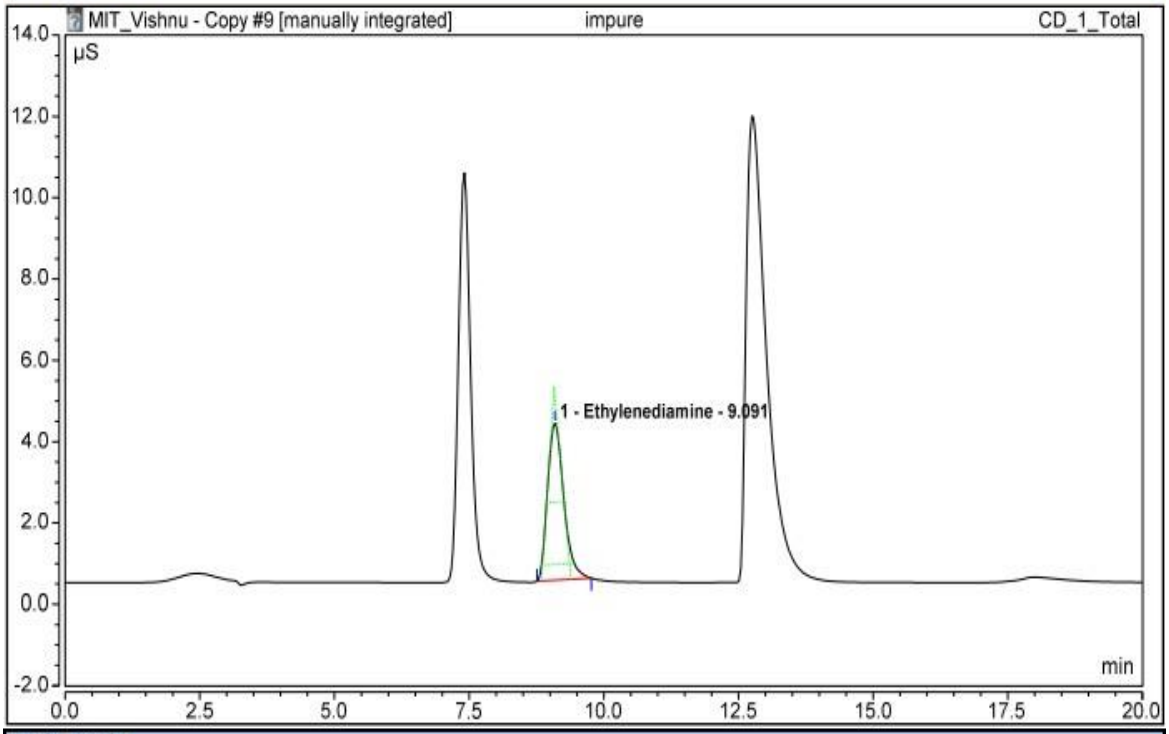
DOI: 10.17148/IJIREEICE.2024.12511

Peak Analysis

Injection Details

Injection Name:	**impure**	*Run Time (min):*	**20.00**
Vial Number:	**34**	*Injection Volume:*	**25.00**
Injection Type:	**Unknown**	*Channel:*	**CD_1_Total**
Calibration Level:		*Wavelength:*	**n.a.**
Instrument Method:	**Cation method 16022024**	*Bandwidth:*	**n.a.**
Processing Method:	**cation_24_03_23**	*Dilution Factor:*	**5.0000**
Injection Date/Time:	**30/Apr/24 15:48**	*Sample Weight:*	**0.1000**

Chromatogram



Peak Results

No.	Peak Name	Retention Time min	Width (50%) min	Type	Resolution (EP)	Asymmetry (EP)	Plates (EP)
1	Ethylenediamine	9.091	0.328	BMB*	n.a.	1.34	4261
n.a.	trimethylamine	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Figure 6: Impure sample peak graph

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

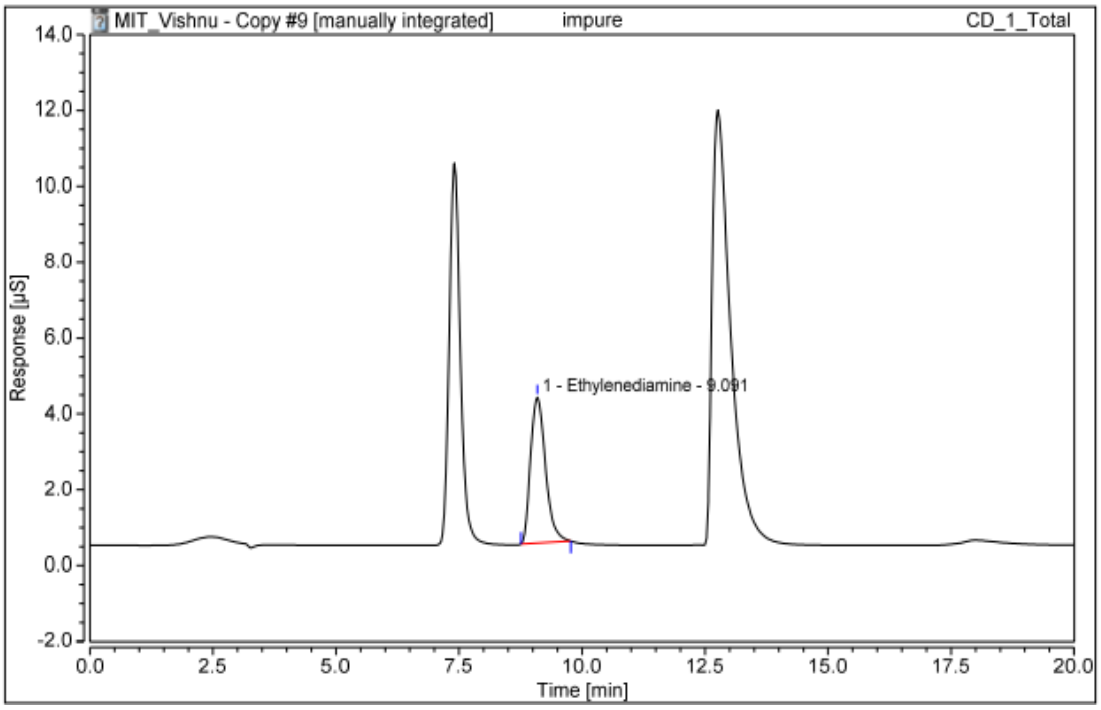
Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 12, Issue 5, May 2024

DOI: 10.17148/IJIREEICE.2024.12511

Summary of the samples

Summary			
Sequence Details			
Name:	**MIT_Vishnu - Copy**	*Created On:*	**01/Apr/24 14:36:56**
Directory:	**external**	*Created By:*	**NITK IC**
Data Vault:	**ChromeleonLocal**	*Updated On:*	**09/May/24 13:38:51**
No. of Injections:	**9**	*Updated By:*	**NITK IC**
By Component	**Ethylenediamine**		

No.	Injection Name	Ret.Time min CD_1_Total Ethylenediamine	Area µS*min CD_1_Total Ethylenediamine	Height µS CD_1_Total Ethylenediamine	Amount CD_1_Total Ethylenediamine	Rel.Area % CD_1_Total Ethylenediamine	Peak Type CD_1_Total Ethylenediamine
1	amine_1	9.067	0.189	0.542	10.034	100.00	BMB*
2	amine_2	8.797	0.368	1.115	19.932	100.00	BMB*
3	amine_3	8.451	0.551	1.620	30.034	100.00	BMB*
4	blank	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
5	amine_50_0.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
6	amine_50_0.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
7	amine_50_1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
8	pure	9.097	1.253	3.513	3440.045	100.00	BMB*
9	impure	9.091	1.357	3.854	3727.744	100.00	BMB*



From analysis of the samples we got the Ethylenediamine present in the sample which we are extracted from the raw material of Fish and green leaves. Impure sample after testing Ethylenediamine present amount of 3727.744ppm and Pure sample after testing Ethylenediamine present amount of 3440.045ppm.From these results we got the difference of 287.699ppm after using the charcoal as bio filter.

VI. CONCLUSIONS

The fish processing industry is confronted with persistent and noxious odours during the fish meal & oil extraction process. These odours create adverse working conditions for overall quality of life in the areas surrounding of the fish processing facilities and pose environmental compliance challenges. Communities near fish processing plants are negatively impacted by the foul odours, leading to decreased quality of life.

DOI: 10.17148/IJIREEICE.2024.12511

Current odour control methods may be inadequate and environmentally unfriendly. This project aims to address these issues by assessing the viability of activated charcoal as odour-reducing agents in the fish meal & oil extraction process. This project aims to reduce the noxious odour emissions from the fish meal and oil extraction industry by introducing a novel approach using odour-reducing agent activated charcoal as a bio-filters.

The research aims to study encompasses evaluating the effectiveness of activated charcoal in reducing toxic odors from fish meal & oil extraction. It will involve laboratory experiments and field trials to assess their practical applicability in the fish/rubber/tannery/agriculture/Paper/pharmaceuticals processing industry, aiming to provide a comprehensive odor mitigation solution

REFERENCES

[1]. Mahdi Ghanbari,et al(2013) studied on Seafood bio preservation by lactic acid bacteria said that Bio preservation of fish and seafood products is an alternative to meet safety standards and to control microbial deterioration without negative impact on the sensory quality of the product.
[2]. Miao-Kang Shen (1988) studied on Spectrophotometric Determination of Trimethylamine Nitrogen in Raw Waters Using Picric Acid.
[3]. Satoshi Mohri and Makoto Kanauchi (2019) studied on Isolation of Lactic Acid Bacteria Eliminating Trimethylamine (TMA) for Application to Fishery Processing and noted that Trimethylamine (TMA).
[4]. Tianle Wu et al (2022) worked on Advances in the Formation and Control Methods of Undesirable Flavours in Fish they pointed to that spoilage from microorganisms produces metabolites responsible for various unpleasant undesirable flavours, leading to the eventual sensory rejection of fish products.
[5]. Room temperature hydrogen sulfide removal with zinc oxide nanoparticlesmolecular sieve prepared by melt infiltration. QiangGenga, Long-Jiang Wangb, Chao Yanga, Hong-Yan Zhanga, Ying-RuiZhaoa, HuiLingFana, Chao Huoc (fuel processing Technology 185, 26- 37, 2019).
[6]. Simultaneous removal of ammonia and phosphate using green synthesized iron oxide nanoparticles dispersed onto zeolite QianyuXu, Wenpeng Li, Li Ma, Dan Cao, Gary Owens, Zuliang Chen (Science of the Total Environment (2019)).
[7]. Synthesis and characterization of nano magnesium oxide impregnated granular activated carbon composite for H2S removal applications Induni W. Siriwardane, RanodhiUdangawa, Rohini M. de Silva, A.R. Kumarasinghe, Robert G. Acres, AnandaHettiarachchi, Gehan A.J. Amaratunga, K.M. Nalin de Silva.
[8]. Silver nanoparticle/PDMS nanocomposite catalytic membranes for H2S gas removal Majid Nour, Kyle Berean, Adam Chrimes , Ahmad SabirinZoolfakar, Kay Latham, Chris McSweeney, Matthew R. Field , SharathSriram, KouroshKalantarzadeh, JianZhenOu (Journal of Membrane Science 470 (2014) 346– 355).
[9]. Utilization of cocoa activated carbon for trimethylamine and hydrogen sulfide gas removals in a confined space and its techno-economic analysis and life-cycle analysis Wang Shuang, Nam Hoseok, Nam Hyungseok (Environment progress and sustainable energy, 2019).
[10]. Using modified coir pith–glucose syrup beads inoculated with Bacillus thuringiensis as a packing material in trimethylamine (fishy odor) biofilter, July 2019, Nuttapong Santawee, Chairat Treesubsuntorn, Paitip Thiravetyan, Thailand, Microbe based.
[11]. Characteristics and storage stability of nanoliposomes loaded with shrimp oil as affected by ultrasonication and microfluidization. November 2019, SaqibGulzar, SoottawatBenjakul, Thailand, Nanoliposome loaded with shrimp oil.
[12]. TMA and H2S gas removals using metal loaded on rice husk activated carbon for indoor air purification, November 2017, Hyungseok Nam, Shuang Wang, Korea, activated carbon.
[13]. Removal of trimethylamine by adsorption over zeolite catalysts and deodorization of fish oil, 09 December 2009, Kyong- Hwan Chung, Ki-Young Lee, Korea, Zeolite catalyst.

