Biological Forum – An International Journal **15(4): 70-82(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Qualitative Analysis of Bioactive Components in *Microporus xanthopus* (Fr.) Kuntze

K.N. Gurav* and V.P. Patil
Department of Botany and Plant Protection,
Sadguru Gadage Maharaj College Karad, Distt. Satara (Maharashtra), India.

(Corresponding author: K.N. Gurav)*
(Received: 16 February 2023; Revised: 27 February 2023; Accepted: 10 March 2023; Published: 20 April 2023)
(Published by Research Trend)

ABSTRACT: Qualitative analysis has played a crucial role in the identification of new bioactive compounds. The contributions of this study include providing a comprehensive review of the bioactive compounds found in the Polyporales and their pharmacological characteristics as well as identifying several specific compounds using mass spectroscopy. In *Microporus xanthopus* (Fr.) Kuntze compound identification both for positive ion and negative ion mode was done using mass spectroscopy. MS detected presence of several Phenols, Tannin, Sesquiterpenoid, Fatty acid, Macrolide, Steroid like compounds.

Keywords: Polyporales, Bioactive, Mass spectroscopy, Phenols, Tannin.

INTRODUCTION

White-rot basidiomycetes are a group of filamentous fungi that are capable of breaking down lignocellulose in environments rich in lignin and high humidity. These fungi play a crucial role in the degradation of lignin, cellulose, and hemicellulose, and are therefore important in the carbon cycle. Fungi are known to be a significant source of various biological and chemical entities that can have either beneficial or harmful effects (Hyde *et al.,* 2019). In addition, most filamentous fungi produce secondary metabolites that are valuable sources of compounds for various biotechnological and pharmaceutical industries. These metabolites include antibiotics, medicinal products, organic acids, food processing enzymes, and many others that are used in the feed and food industry. Moreover, white and brown-rot fungi that degrade lignocellulose and secrete polysaccharides exhibit a greater diversity of lignin-degrading peroxidases, multi-copper oxidases, and glycoside hydrolases. These enzymes work in a sequential pattern to assist in the gradual decay of lignin-rich substrates (Jain *et al*., 2020; Saini *et al.,* 2020).

Polyporeshas been used in traditional Chinese medicine for thousands of years and is becoming increasingly popular around the world. They exhibit a wide range of bioactivities, including anti-cancer, anti-inflammatory, antiviral, and immunostimulant properties. Many studies have focused on their secondary metabolites, but the importance of Basidiomycetes fungi for bioactivity and metabolite production has not been investigated (Dresch *et al.,* 2015). Bioactive proteins are another essential category of functional components found in mushrooms, which have significant potential for pharmaceutical applications (Xu *et al.,* 2011).

An estimated 75% of polypore fungi tested have strong antimicrobial activity, suggesting that they could be a good source for developing new antibiotics. Numerous compounds derived from these fungi have antiviral, cytotoxic, and antineoplastic properties (Zjawiony 2004). Numerous antioxidant compounds have been identified in Polyporales fungi, including phenolic compounds, β-glucans, ergosterol, ergothioneine, vitamin C, and tocopherols. Each compound contributes differently to the antioxidant potential of fungi. Besides the health benefits for rural communities caused by fungi consumption, their antioxidant composition attracts the food, cosmetic, and pharmaceutical industries' interest (Quintero-Cabello *et al.,* 2021). *Coriolopsis rigida* was isolated as an endophytic fungus and two phenolic compounds, tyrosol (**1**) and a new natural product *p*-hydroxyphenylacetamide (**2**), were isolated from the extract (Dantas *et al.,* 2022).

Medicinal mushrooms also possess several essential biological effects that are beneficial for human health (Bhambri *et al.,* 2022). *Ganoderma lucidum* main attractive pharmacological characteristics are antitumor and immunomodulatory activities which are chiefly associated with its two principal bioactive compounds, those are polysaccharides and triterpenoids (Ahmad *et al*., 2022). Fungi bioactive substances are classified into two type's high molecular weight compounds i.e. primarily polysaccharides and proteins and low molecular weight compounds such as steroles, terpenoids, or phenols (Matuszewska *et al*., 2018). The research problem addressed in this study is the identification of bioactive compounds present in the hot aqueous of *Microporus xanthopus* (Fr.) Kuntze using mass spectrometry. Specifically, the study aims to identify the different classes of bioactive secondary metabolites, as well as their potential therapeutic properties. This information can provide insight into the bioactivity and metabolite production of these Polypore fungi, which can potentially lead to the development of new drugs.

MATERIAL AND METHODS

Collection of specimen: The specimen collected from Koyananagar near ozarde waterfall Satara district on fallen angiosperm wood longs. The specimen brought to the laboratory and identify.

Preparation of sample: The specimens washed with distilled water then dry in hot air oven. The basidiocarp is cut into small pieces and grinded to powder. Extracts were prepared by using Soxhlet apparatus. The extract was sent for analysis to the CAMS, Entrepreneurship Development Center, Pune.

Fig. 1. Basidiocarp of *Microporus xanthopus* (Fr.) Kuntze

Sample analysis: The Mass spectrometry was carried out through Agilent TOF/6540B Connected to Agilent 1260 Infinity II HPLC. The Column was Agilent Eclipse XDB –C18, 3X150mm, 3.5 micron. The column temperature is 40°C. Mobile Phase A 0.1% Formic acid in water & Mobile Phase B 0.1% Formic acid in acetonitrile used as in 95:5 percent. The Mobile Phase flow Rate is 0.3 ml/min. Ions source is Dual AJS ESI selected for Positive and Negative polarity. Accurate mass spectra were acquired in the m/z range of 100–1700.Metabolites are identified by matching them to the METLIN database.

RESULT

The sample was analyzed, and the peaks were compared to those of reference chemicals analyzed under the same circumstances. Compounds have some bioactive and pharmacological properties like antifungal, antiviral, anticancer, antitumor, anti-obesity, and anti-inflammatory, etc. This study discovered that compounds from *Microporus xanthopus* (Fr.) Kuntze contains medicinally and nutritionally significant substances. *M. xanthopus* (Fr.) Kuntze can be used in effluent treatment, the pulp and paper industry, synthetic chemistry, bio-fuels (Nonate), cosmetics (Lithol Rubine, Polyporusterone F and Hyaluronic acid), agro industry (Dinex, Ethyl(E,Z)-decadienoate, Dinoterb, Malathion and Bromacil), and textile industry produce essential products. Table 1& 2 provides a summary of the bioactive compounds found in *Microporus xanthopus* (Fr.) Kuntze.

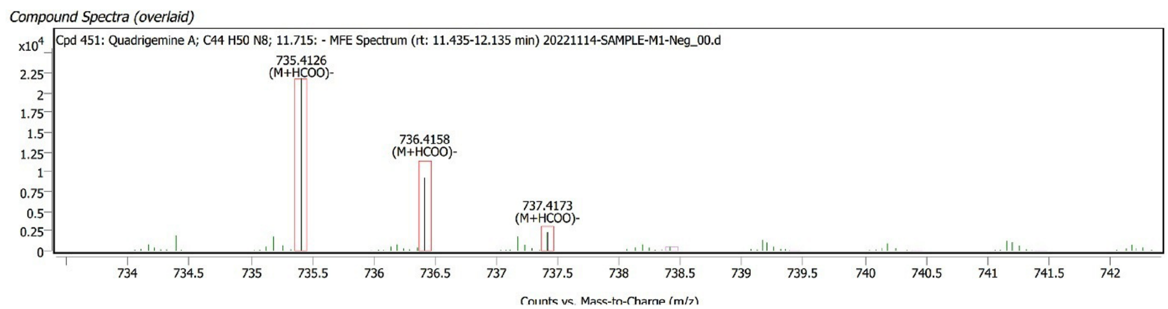
Table 1: Proposed compounds of *Microporus xanthopus* (Fr.) Kuntze detected by in Negative mode.

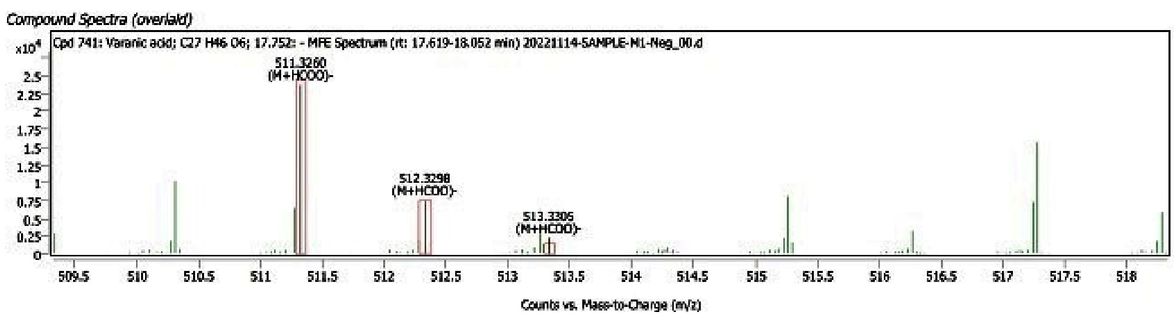
Sr. No.	Compound Name	Retation Time (RT)	Mass	Score	Chemical Nature	Formula	Uses	Reference
1.	Quinoline-3-carboxamides	2.449	359.1056	77.24	-	$C_{21}H_{14}FN_3O_2$	antimalarial, antibacterial, antifungal, antiviral, anticancer, antitumor, anti-obesity, and anti-inflammmatory activities.	Govender *et al.* (2018), Nilsson *et al.* (1994).
2.	Quadrigemine A	11.715	690.4143	90.09	Pyrroloindole	$C_{44}H_{50}N_8$	Inhibitors of platelet aggregation	Beretz *et al.* (1985)
3.	Varanic acid	17.752	466.3278	90.55	Conjugate acid	$C_{27}H_{46}O6$	Bile acid metabolite	National Center for Biotechnology Information (2004)
4.	Antimycin A1	19.630	548.2743	91.67	phenols	$C_{28}H_{40}N_2O_9$	Antibiotics use as a fungicide and possibly as an insecticide and miticide	National Center for Biotechnology Information, (2023)
5.	Bisacurone B	19.737	252.1717	96.81	Sesquiterpenoid	$C_{15}H_{24}O_3$	preventing hepatic lipid accumulation	Ashida *et al.* (2020)
6.	Ethyl(E,Z)-decadienoate	19.926	196.1457	95.93	Ester derivative of geraniol	$C_{12}H_{20}O_2$	Agrochemicals -Pesticides	National Center for Biotechnology Information (2004)
7.	Dinoterb	20.925	240.0741	98.97	Phenols and a C-nitro compound.	$C_{10}H_{12}N2O5$	Used as a herbicide and a rodenticide	National Center for Biotechnology Information (2004)
8.	Stavudine	21.145	224.0788	93.32	Dideoxynucleoside	$C_{10}H_{12}N_2O_4$	Used in the treatment of HIV infection.	National Institute of Diabetes and Digestive and Kidney Diseases. (2012)
9.	8-(3,3-Dimethylallyl) spatheliachromene	21.586	326.1511	98.36	Polyketides	$C_{20}H_{22}O_4$	Trypanocidal activity	Batista *et al.* (2008)
10.	Leucomycin V	22.171	701.4002	93.69	Macrolide antibiotic	$C_{35}H_{59}NO_{13}$	Antimicrobial activity against a wide spectrum of pathogens.	National Center for Biotechnology Information (2023)
11.	Dinex	23.753	266.0891	90.80	Alkylbenzene	$C_{12}H_{14}N_2O_5$	Used as an insecticide (control of red mites on citrus) and molluscide	National Center for Biotechnology Information (2004)
12.	Ethyl decanoate	24.013	200.1769	97.42	Fatty acid	$C_{12}H_{24}O_2$	Food additives Flavoring Agents	National Center for Biotechnology

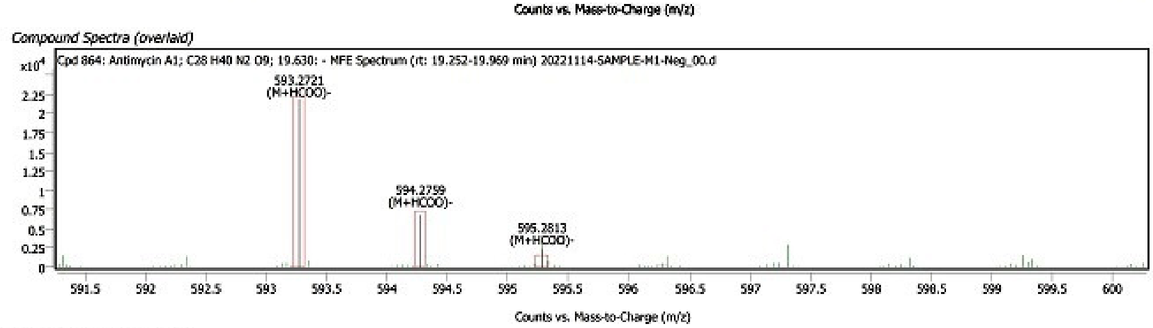
								Information (2023)
13.	Fungichromin	24.479	670.3908	91.55	Macrolide	$C_{35}H_{58}O_{12}$	Antifungal activity	Shih *et al.* (2003)
14.	Scarlet Red	27.531	380.1637	91.06	Bis(azo) compound	$C_{24}H_{20}N_4O$	Role as a histological dye, used in human and veterinary medicine to promote wound healing	National Center for Biotechnology Information (2023)
15.	Bromacil	10.705	260.0163	62.37	Pyrimidone and an organobromine	$C_9H_{13}BrN_2O_2$	Used as an herbicide	National Center for Biotechnology Information (2023)
16.	Contignasterol	20.252	508.3385	93.75	Steroid	$C_{29}H_{48}O_7$	Prevention of inflammatory or allergic reactions, or the treatment of cardiovascular or haemodynamic disorders.	Burgoyn *et al.* (1992)
17.	Polyporusterone F	20.252	462.3330	93.28	Bile acid	$C_{28}H_{46}O_5$	Hair Regrowth Substance	Ishida *et al.* (2010)
18.	Lithol Rubine	17.686	386.0568	94.68	Azo dye	$C_{18}H_{14}N_2O_6S$	In Cosmetics, Used for the coloring of paints, inks, oil colors and watercolors. coloring of rubber, plastic wires, electrospray and daily chemical products.	Lai-Hao *et al.* 2011
19.	Saussurea lactone	18.907	234.1615	98.67	Lactone	$C_{15}H_{22}O_2$	Anti-inflammatory, antioxidant, hepatoprotective, antiulcer, anticancer, immunomodulatory and pesticidal activities.	Onoja *et al.* (2019)
20.	Curcumenol	22.464	234.1612	96.71	Natural product	$C_{15}H_{22}O_2$	Anti-inflammatory activity antistroke agent with anti-inflammatory and cytotoxic activity for sepsis and leukemia, Anti-proliferative activity against human gastric cancer cells	Gupta *et al.* (2018); Lee *et al.* (2019); Jung *et al.* (2018)
21.	Stigmatellin Y	22.442	484.2810	84.92	Chromones	$C_{29}H_{40}O_6$	An Anti-biofilm compound	Boopathi *et al.* (2017)
22.	6-gingerol	18.907	294.1826	98.84	Gingerols	$C_{17}H_{26}O_4$	anticancer, anti-inflammation, and anti-oxidation	Wang *et al.* (2014)
23.	Tanacetol A	18.907	294.1826	98.84	Germacrane sesquiterpenoid	$C_{17}H_{26}O_4$	antimicrobial and anti-proliferative activities	Ali *et al.* (2017)
24.	Nordihydrocapsiate	18.907	294.1826	98.84	Phenols and a member of methoxybenzenes.	$C_{17}H_{26}O_4$	Natural product found in *Capsicum annuum*	National Center for Biotechnology Information (2023
25.	Annuionone A	16.703	224.1409	92.46	Triterpene saponins	$C_{13}H_{20}O_3$	Anti-inflammatory	Onoja *et al.* (2019)
26.	Malathion	16.161	330.0373	73.89	Organophosphates	$C_{10}H_{19}O_6PS_2$	Biocide, non-systemic broad-spectrum insecticide	Moore *et al.* (2009)
27.	Nonate	16.161	330.0373	73.89	Dicarboxylic acid	$C_9H_{16}O_4$	Important Constituent of Pennsylvania petroleum	Mabery *et al.* (1901)
28.	Rhein	16.161	284.0316	98.72	Anthraquinone	$C_{15}H_8O_6$	Hepatoprotective, nephroprotective, anti-inflammatory, antioxidant, anticancer, and antimicrobial activities	Zhou *et al.* (2015)
29.	Phytuberin	18.907	294.1826		Sesquiterpenoid	$C_{17}H_{26}O_4$	Antifungal activities	Coxon *et al.* (1974)
30.	2,3-Di-O-methylellagic acid	16.161	330.0370	98.86	Tannin	$C_{16}H_{10}O_8$	antimicrobial and antioxidant activities	Vigbedor *et al.* (2022)
31.	Hyaluronic acid	2.592	425.1526	98.35	Glycosaminoglycan	$C_{16}H_{27}NO_{12}$	Ophthalmic, dermal, burns, wound repair, and other health conditions	Gupta *et al.* (2019)

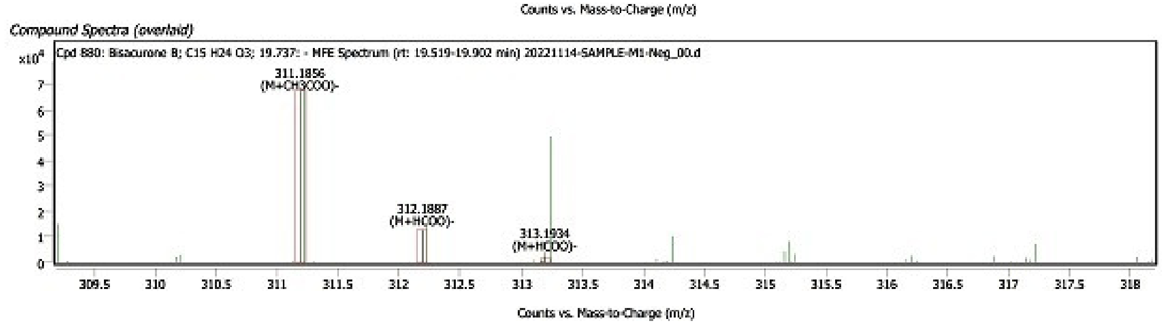
Table 2: Proposed compounds of *Microporus xanthopus* detected by in Positive mode.

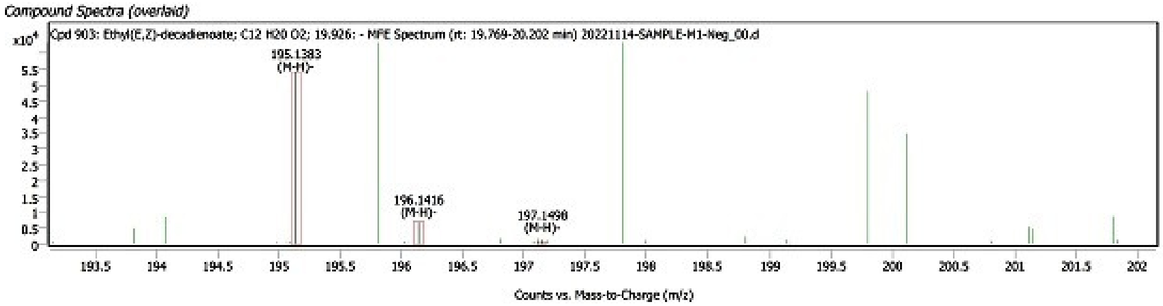
Sr. No.	Compound Name	RT	Mass	Score	Chemical Nature	Formula	Uses	Ref
1.	Tenuazonic Acid	20.401	197.1048	98.80	Mycotoxin	$C_{10} H_{15} N O_3$	Antibiotic with antiviral and antineoplastic properties	National Center for Biotechnology Information (2023)
2.	Pantothenic Acid	9.248	219.1100	93.47	Vitamin	$C_9 H_{17} N O_5$	Antidote to cure poisoning,antioxidant property	National Center for Biotechnology Information (2023)
3.	Ganodosterone	26.392	408.3016	91.77	Ergostanoid	$C_{28} H_{40} O_2$	Liver protectant and stimulates liver	Subramanian (1995)
4.	Irinotecan	28.282	586.2795	99.43	antineoplastic enzyme	$C_{33} H_{38} N_4 O_6$	Treatment of colorectal cancer	National Center for Biotechnology Information (2023)
5.	Cinnamic acid	2.726	148.0519	94.96	Phenolic compound	$C_9 H_8 O_2$	Antimicrobial properties	Siddiqui (2018)
6.	Threo-Syringoylglycerol	17.551	244.0943	97.69	Phenolic compound	$C_{11} H_{16} O_6$	Anti HSV-1 activities	Tian et al;(2010)
7.	Telithromycin	23.469	811.4710	93.77	Ketolide	$C_{43} H_{65} N_5 O_{10}$	Antibiotic treated for pneumonia	Hoofnagle (2013)
8.	Deltaline	22.882	507.2836	98.14	diterpenoid alkaloid	$C_{27} H_{41} N O_8$	To treat rheumatic pain, paralysis due to stroke, rheumatoid arthritis	Chen *et al.* (2015)

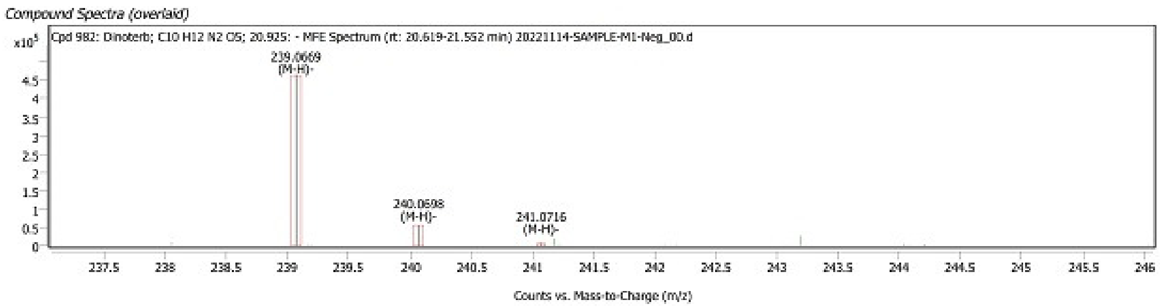


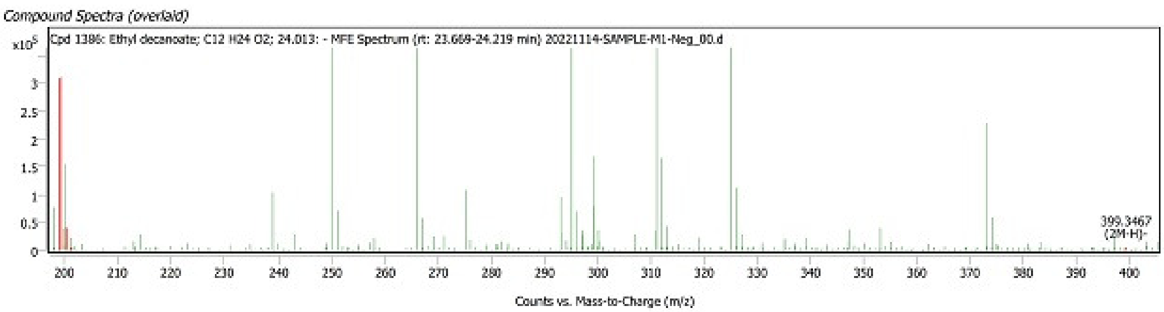


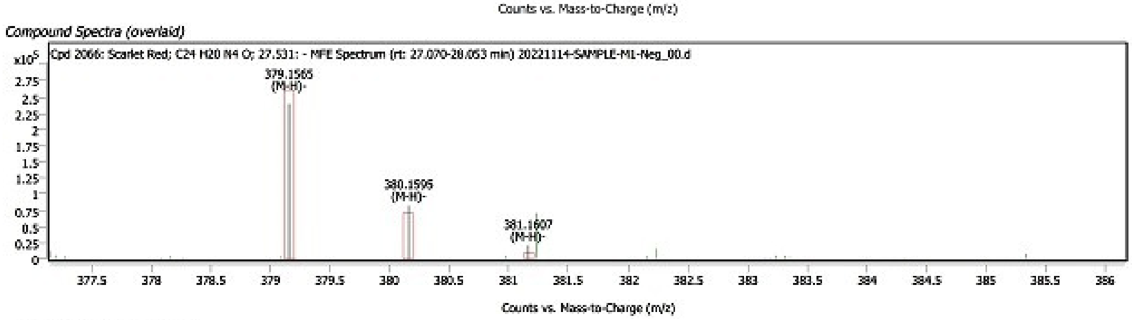


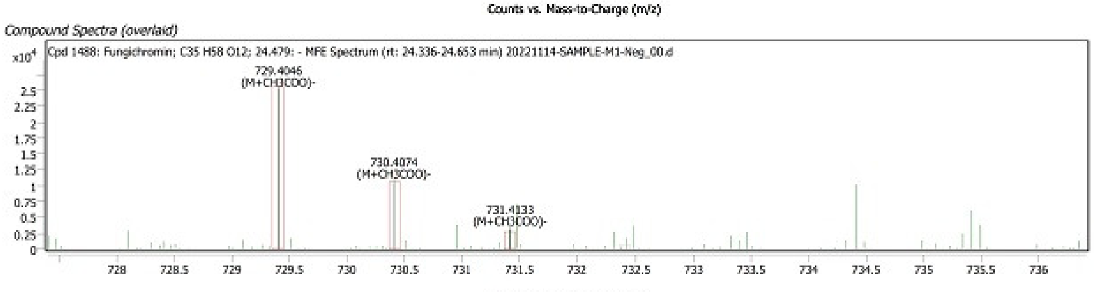


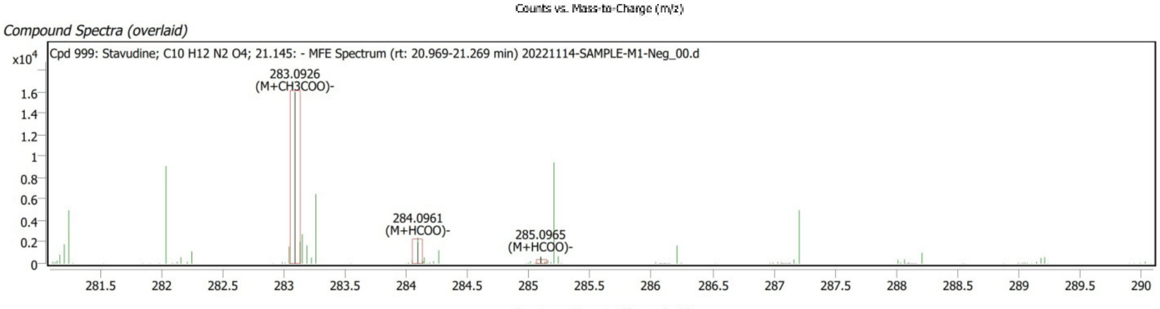

Compound Spectra (overlaid)
Cpd 903: Ethyl(E,Z)-decadienoate; C12 H20 O2; 19.926: - MFE Spectrum (rt: 19.769-20.202 min) 20221114-SAMPLE-M1-Neg_00.d
195.1383 (M-H)-
196.1416 (M-H)-
197.1490 (M-H)-
Counts vs. Mass-to-Charge (m/z)

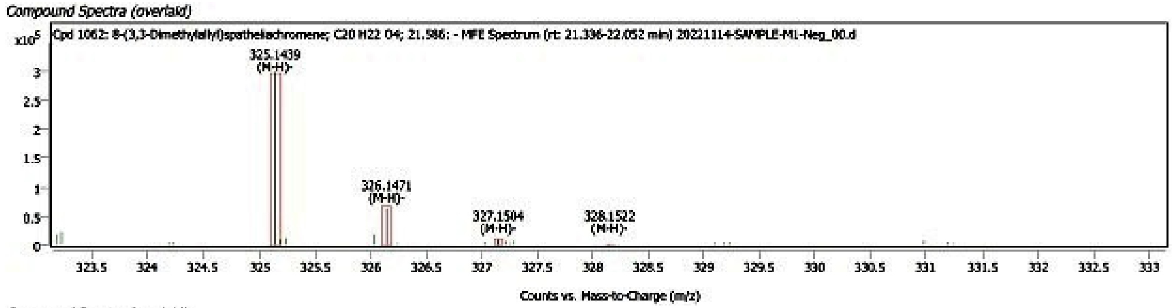

Compound Spectra (overlaid)
Cpd 982: Dinoterb; C10 H12 N2 O5; 20.925: - MFE Spectrum (rt: 20.619-21.552 min) 20221114-SAMPLE-M1-Neg_00.d
239.0669 (M-H)-
240.0698 (M-H)-
241.0716 (M-H)-
Counts vs. Mass-to-Charge (m/z)

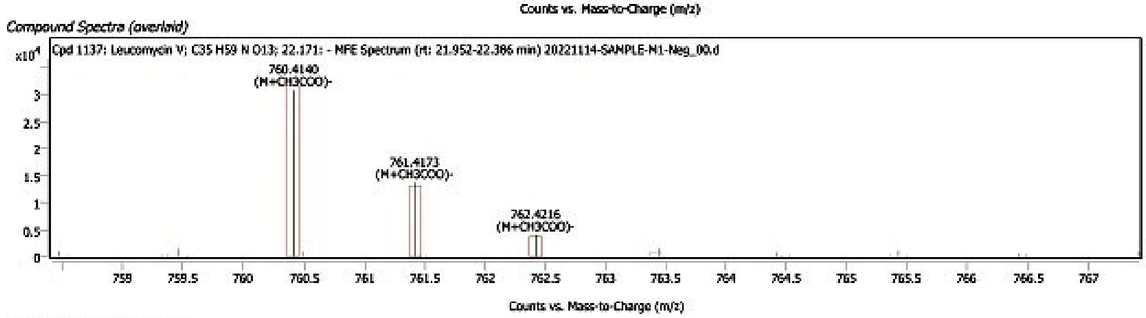

Compound Spectra (overlaid)
Cpd 1386: Ethyl decanoate; C12 H24 O2; 24.013: - MFE Spectrum (rt: 23.669-24.219 min) 20221114-SAMPLE-M1-Neg_00.d
399.3467 (2M-H)-
Counts vs. Mass-to-Charge (m/z)

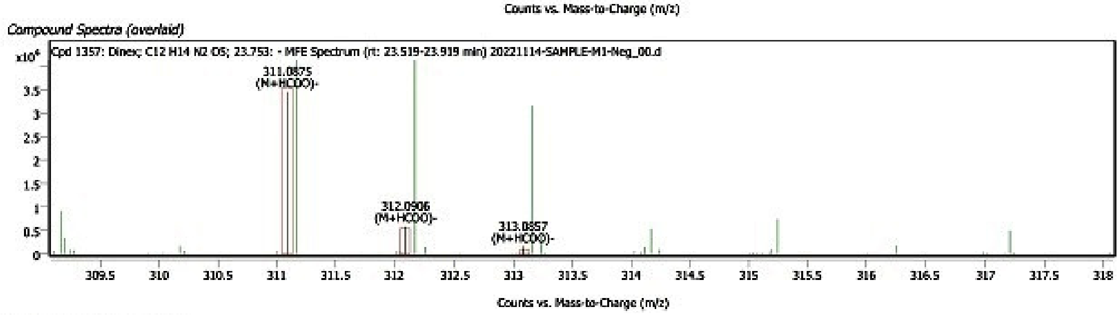

Compound Spectra (overlaid)
Cpd 2066: Scarlet Red; C24 H20 N4 O; 27.531: - MFE Spectrum (rt: 27.070-28.053 min) 20221114-SAMPLE-M1-Neg_00.d
379.1565 (M-H)-
380.1596 (M-H)-
381.1607 (M-H)-
Counts vs. Mass-to-Charge (m/z)

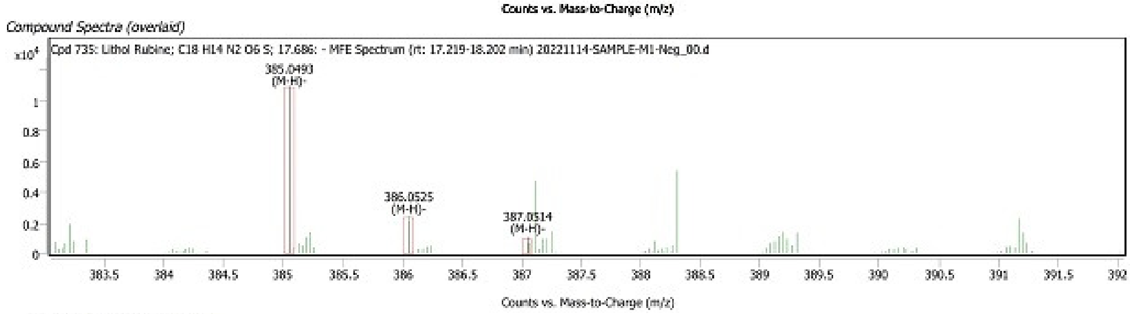

Compound Spectra (overlaid)
Cpd 1488: Fungichromin; C35 H58 O12; 24.479: - MFE Spectrum (rt: 24.336-24.653 min) 20221114-SAMPLE-M1-Neg_00.d
729.4046 (M+CH3COO)-
730.4074 (M+CH3COO)-
731.4133 (M+CH3COO)-
Counts vs. Mass-to-Charge (m/z)

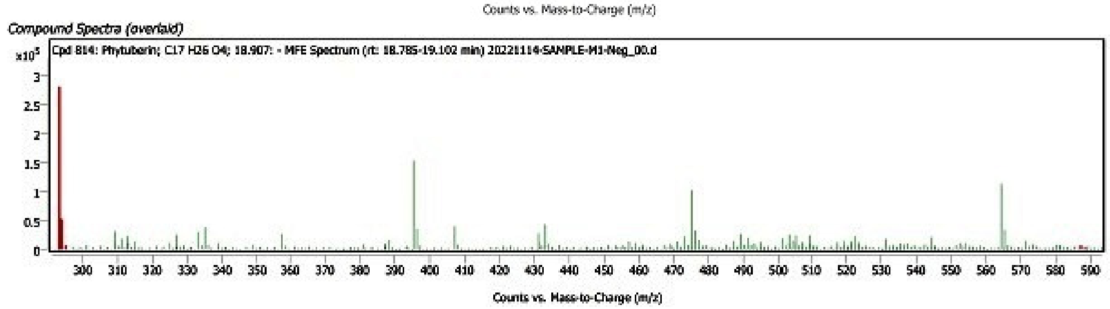

Compound Spectra (overlaid)
Cpd 999: Stavudine; C10 H12 N2 O4; 21.145: - MFE Spectrum (rt: 20.969-21.269 min) 20221114-SAMPLE-M1-Neg_00.d
283.0926 (M+CH3COO)-
284.0961 (M+HCOO)-
285.0965 (M+HCOO)-
Counts vs. Mass-to-Charge (m/z)

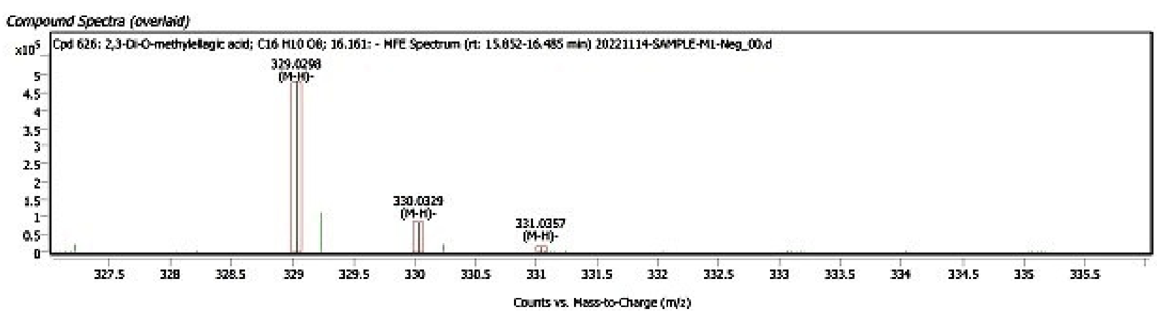

Compound Spectra (overlaid)
Cpd 1062: 8-(3,3-Dimethylallyl)spatheliachromene; C20 H22 O4; 21.586: - MFE Spectrum (rt: 21.336-22.052 min) 20221114-SAMPLE-M1-Neg_00.d
325.1439 (M-H)-
326.1471 (M-H)-
327.1504 (M-H)-
328.1522 (M-H)-
Counts vs. Mass-to-Charge (m/z)


Compound Spectra (overlaid)
Cpd 1137: Leucomycin V; C35 H59 N O13; 22.171: - MFE Spectrum (rt: 21.952-22.386 min) 20221114-SAMPLE-M1-Neg_00.d
760.4140 (M+CH3COO)-
761.4173 (M+CH3COO)-
762.4216 (M+CH3COO)-
Counts vs. Mass-to-Charge (m/z)


Compound Spectra (overlaid)
Cpd 1357: Dinex; C12 H14 N2 O5; 23.753: - MFE Spectrum (rt: 23.519-23.919 min) 20221114-SAMPLE-M1-Neg_00.d
311.0875 (M+HCOO)-
312.0906 (M+HCOO)-
313.0857 (M+HCOO)-
Counts vs. Mass-to-Charge (m/z)


Compound Spectra (overlaid)
Cpd 735: Lithol Rubine; C18 H14 N2 O6 S; 17.686: - MFE Spectrum (rt: 17.219-18.202 min) 20221114-SAMPLE-M1-Neg_00.d
385.0493 (M-H)-
386.0525 (M-H)-
387.0514 (M-H)-
Counts vs. Mass-to-Charge (m/z)


Compound Spectra (overlaid)
Cpd 814: Phytuberin; C17 H26 O4; 18.907: - MFE Spectrum (rt: 18.785-19.102 min) 20221114-SAMPLE-M1-Neg_00.d
Counts vs. Mass-to-Charge (m/z)


Compound Spectra (overlaid)
Cpd 626: 2,3-Di-O-methylellagic acid; C16 H10 O8; 16.161: - MFE Spectrum (rt: 15.852-16.485 min) 20221114-SAMPLE-M1-Neg_00.d
329.0298 (M-H)-
330.0329 (M-H)-
331.0357 (M-H)-
Counts vs. Mass-to-Charge (m/z)

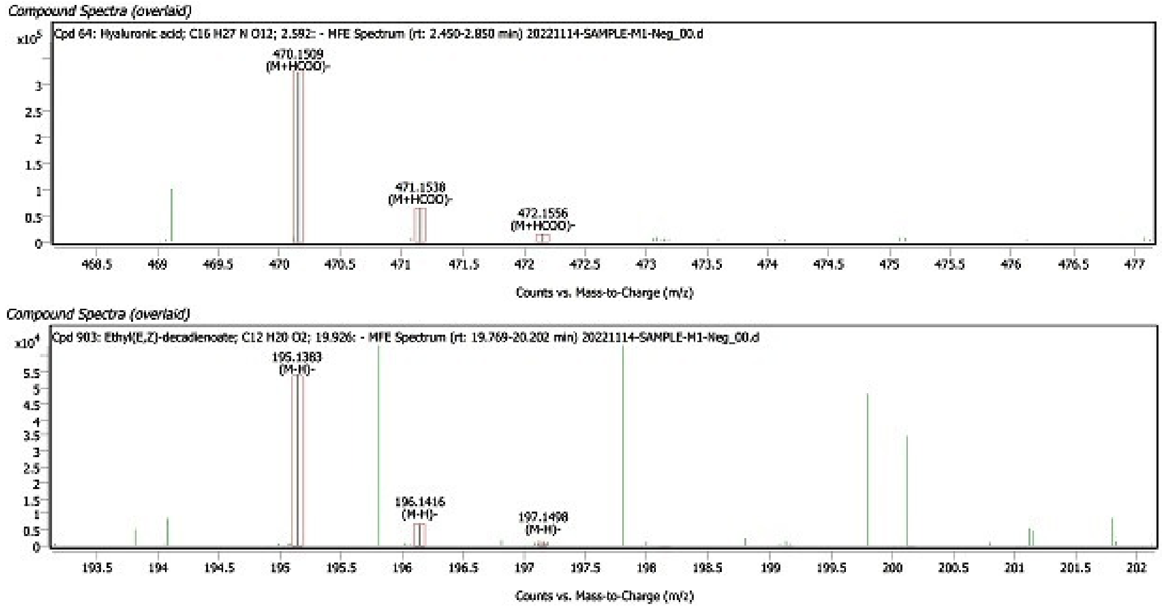
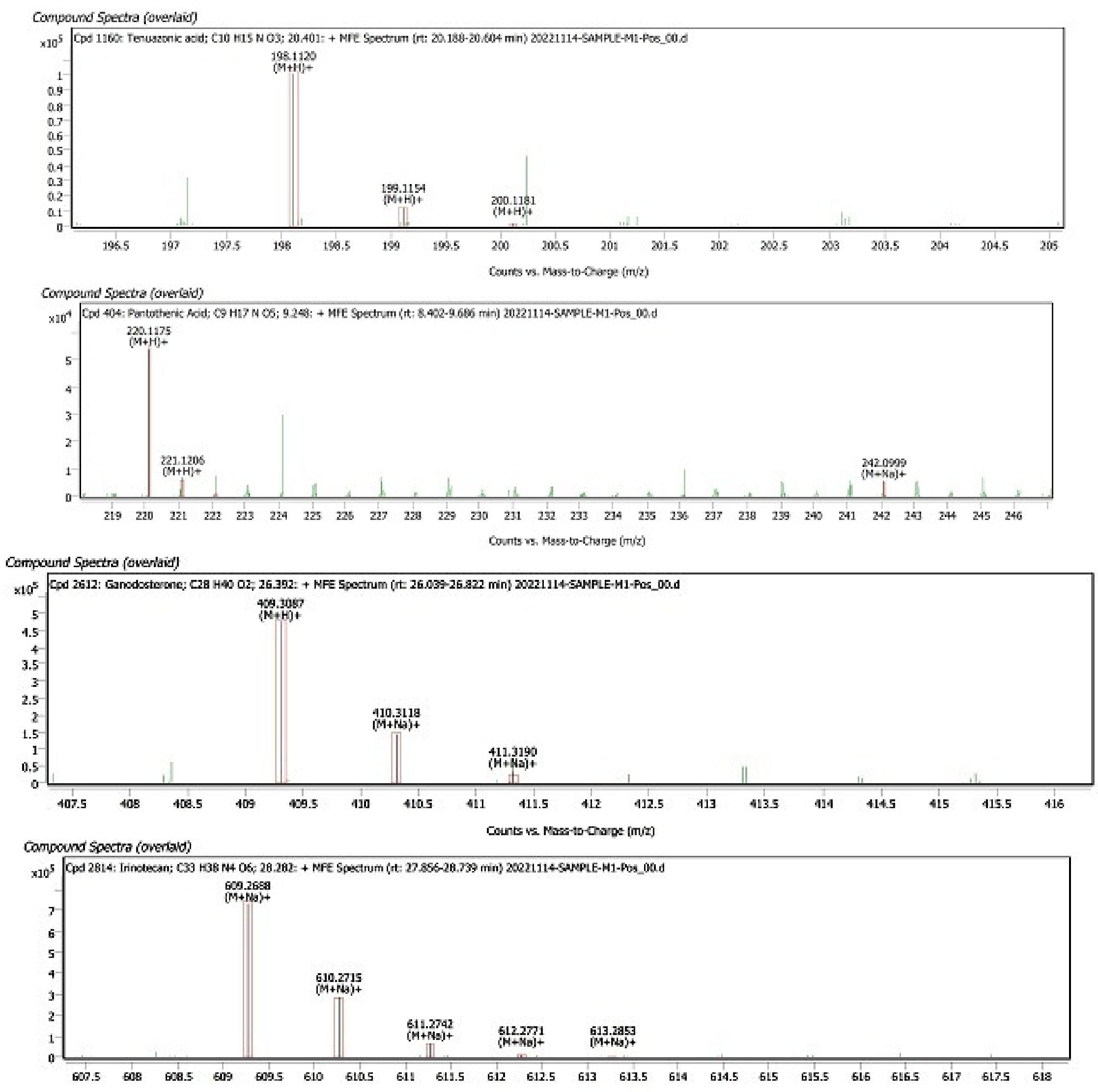


Fig. 1. Compound Spectra shows Mass to Charge (m/z) in Negative Mode.



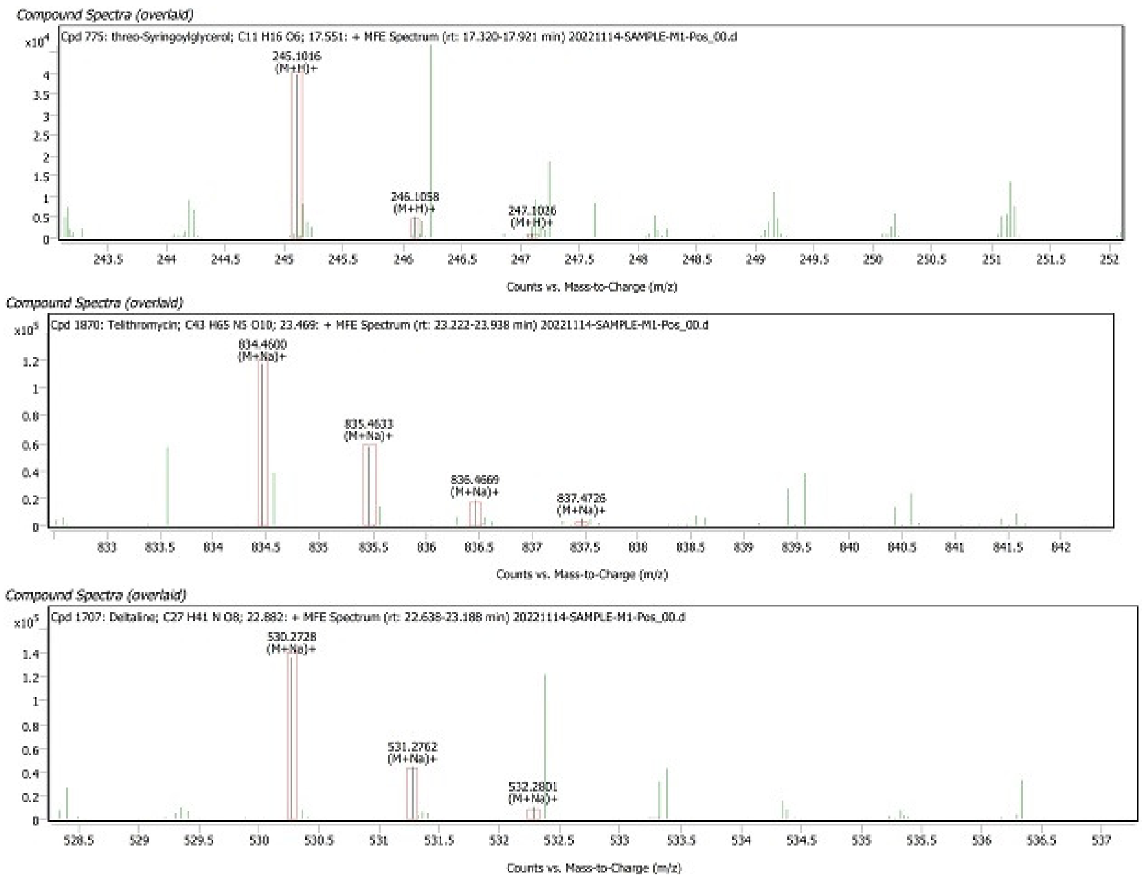
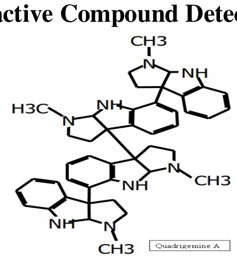
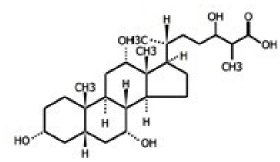


Fig. 2. Compound Spectra shows Mass to Charge (m/z) in Positive Mode.

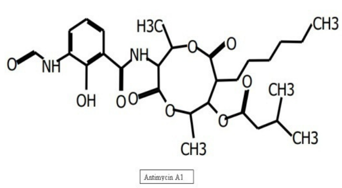
Structures of Bioactive Compound Detected in Negative Mode:



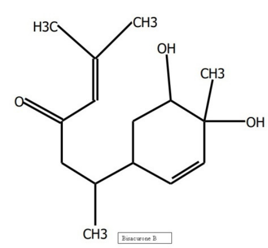
Quadrigemine A



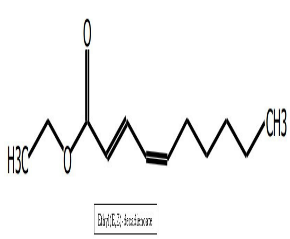
Varanic acid



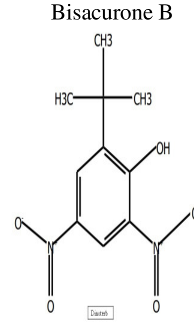
Antimycin A1



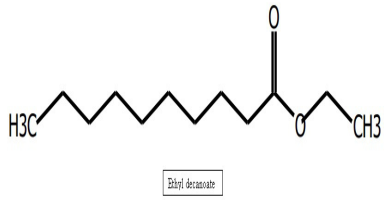
Bisacurone B



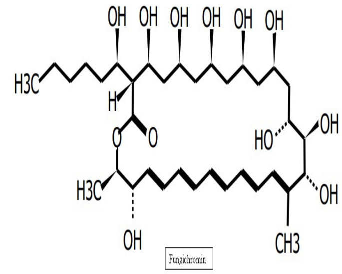
Ethyl(E,Z)-decadienoate



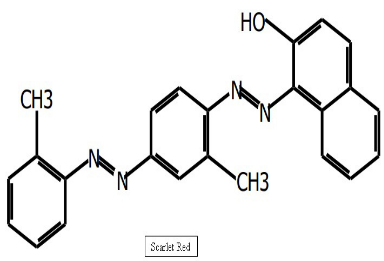
Dinoterb



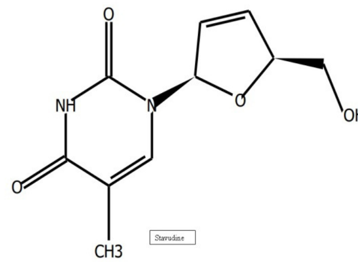
Ethyl decanoate



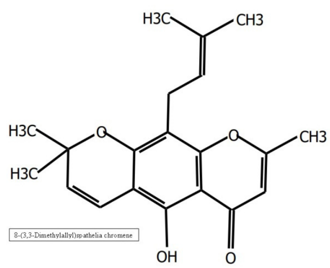
Fungichromin



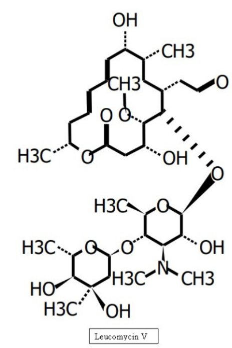
Scarlet Red



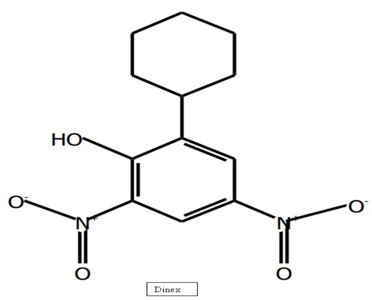
Stavudine



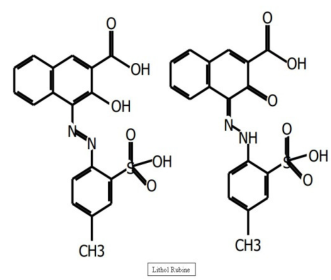
8-(3,3-Dimethylallyl)spathelia



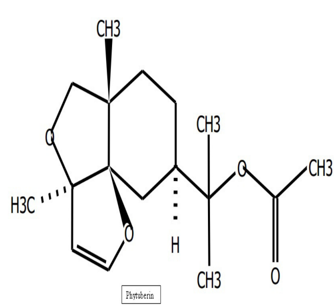
Leucomycin V



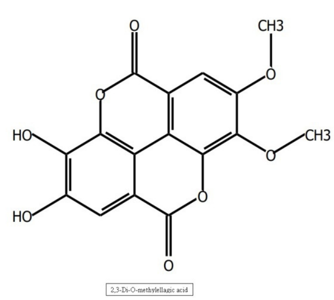
Dinex



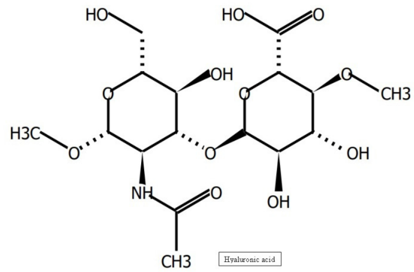
Lithol Rubine



Phytuberin

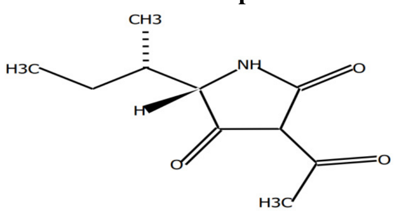


2,3-Di-O-methylellagicacid

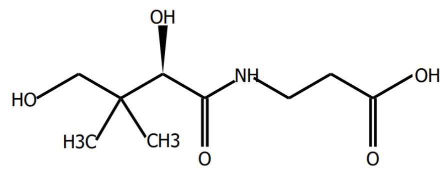


Hyaluronic acid

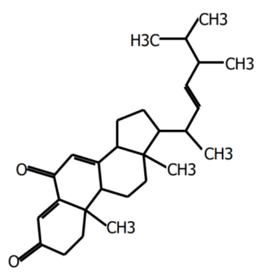
Structures of Bioactive Compound Detected in Positive Mode:



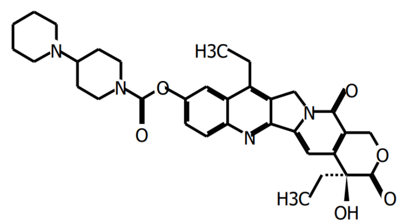
Tenuazonic Acid



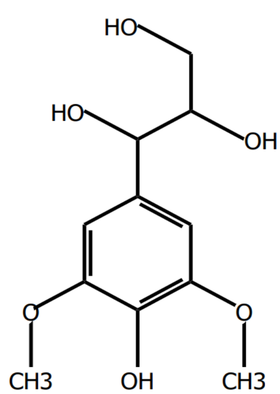
Pantothenic Acid



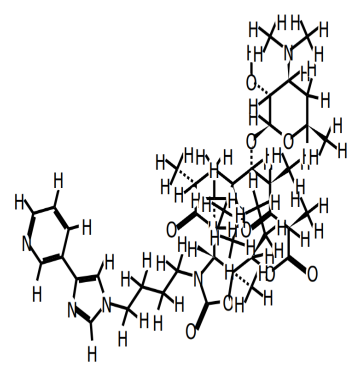
Ganodosterone



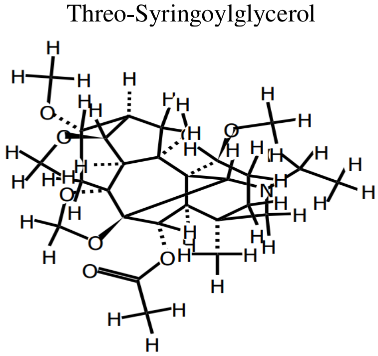
Irinotecan



Threo-Syringoylglycerol



Telithromycin



Deltaline

DISCUSSION

Secondary metabolite study from basidiomycetous fungi which has tremendous commercial potential (Jain *et al.,* 2020). Many industrial products composing of fungal metabolites from basidiomycete source are directly or indirectly benefited to the human health (Shankar and Sharma 2022).

M. xanthopus has been reported to exhibit antibacterial, anticancer, antiangiogenic, and anthelmintic activities. The higher concentrations of these medicinal properties are believed to be a result of the environment and substrate in which the polypore mushroom grows (Chittaragi and Meghalatha 2014; Orango-Bourdette *et al.,* 2018).

The proposed compounds of *Microporus xanthopus* (Fr.) Kuntze detected in negative mode and positive mode, along with their retention times, molecular masses, scores, chemical natures, formulas, and potential uses. These compounds were identified through mass spectrometry, which is a powerful analytical technique used to identify the chemical structure of a compound. The identified compounds have diverse chemical natures and functionalities, ranging from alkaloids, esters, phenols, and steroids to bile acids, macrolides, and sesquiterpenoids.

Among the identified compounds, quinoline-3-carboxamides, quadrigemine A, and varanic acid have high scores and diverse pharmacological activities, including antimalarial, antibacterial, antifungal, antiviral, anticancer, anti-obesity, anti-inflammatory, and inhibitors of platelet aggregation. Fransén *et al.* (2018) studied the immunomodulatory activity of Quinoline-3-carboxamides and reported them to have anti-inflammatory properties.

Antimycin A1 and fungi chromin also have significant potential uses as antibiotics, fungicides, and miticides. Maeda *et al.* (2006) reported on the inhibitory activity of Antimycin A1.

Other compounds such as bromacil, bisacurone B, ethyl(E,Z)-decadienoate, dinoterb, stavudine, 8-(3,3-dimethylallyl) spatheliachromene, leucomycin V, dinex, ethyl decanoate, and scarlet red have diverse applications in agrochemicals, food additives, insecticides, histological dyes, and wound healing promotion.Molinari *et al.* (2010) reported olfactory activity of Ethyl (E,Z)-2,4-Decadienoate on oriental fruit moths.According to Sarkar and Khupse (2022) Bromacil is a herbicide utilized for land management purposes as well as selective weed control in pineapple and citrus crops. Moreover, contignasterol, polyporusterone F, lithol rubine, saussurea lactone, curcumenol, stigmatellin Y, 6-gingerol, tanacetol A, and nordihydrocapsiate have potential therapeutic applications, including anti-inflammatory, antioxidant, hepatoprotective, antiulcer, immunomodulatory, anti-cancer, anti-proliferative, and anti-allergic activities. The 6-gingerol has the potential to enhance the quality of porcine embryos cultured in vitro.

In positive mode eight compounds of *Microporus xanthopus* identified. *M. xanthopus* is significant because it highlights the potential medicinal properties of natural products. Tenuazonic acid, in particular, has been found to have promising antineoplastic properties and could potentially be developed into a cancer treatment. Pantothenic acid, a common vitamin, has antioxidant properties and is involved in essential metabolic processes. Combs and McClung (2022) reported importance of Pantothenic acid. Ganodosterone has potential as a liver protectant, which could be useful in preventing liver damage caused by toxins and alcohol. Irinotecan is an established antineoplastic agent used to treat colorectal cancer, while cinnamic acid and Threo-Syringoylglycerol have antimicrobial and antiviral properties. Shun *et al.* (2023) conducted a case study to investigate the impact of Irinotecan on induced muscle twitching. Telithromycin is a ketolide antibiotic used to treat pneumonia and Deltaline is a diterpenoid alkaloid used to treat various types of pain and inflammation. Xiong *et al.* (2001) detected antibacterial and antibiofilm activity of Telithromycin. Overall, the discovery of these compounds highlights the potential for natural products to be developed into effective drugs for a range of conditions.

CONCLUSIONS

This study has identified a range of compounds present in *Microporus xanthopus* using mass spectrometry. These compounds have diverse chemical natures and functionalities, and compounds have promising pharmacological activities with potential uses in medicine, agriculture, and other industries. The identification of these compounds highlights the potential for natural products to be developed into effective drugs for a range of conditions.

FUTURE SCOPE

Further research could focus on isolating and testing the individual compounds to better understand their potential uses and mechanisms of action. Additionally, investigation into the cultivation and optimization of *Microporus xanthopus* could provide a sustainable source of these compounds for future research and development.

Acknowledgement. The authors are thankful to the Principal, S.G.M. College Karad and Head of the Department of Botany and Plant Protection for providing all facilities for research work. They are also thankful to MAHAJYOTI Nagpur for providing financial support.

Conflict of Interest. None.

REFERENCES

Ahmad, M. F., Wahab, S., Ahmad, F. A., Ashraf, S. A., Abullais, S. S. and Saad, H. H. (2022). *Ganoderma lucidum*: A potential pleiotropic approach of ganoderic acids in health reinforcement and factors influencing their production. *Fungal Biology Reviews*, *39,* 100-125.

Ali, Ş. E. N., ÖZAKPINAR, Ö. B., Tan, S. B., Kültür, Ş., Fikriye, U. R. A. S. and Bitiş, L. (2017). Biological activities of aerial parts extracts of endemic *Tanacetum argenteum* subsp. argenteum. *Marmara Pharmaceutical Journal*, *21*(2), 286-290.

Ashida, H., Tian, X., Kitakaze, T. and Yamashita, Y. (2020). Bisacurone suppresses hepatic lipid accumulation through inhibiting lipogenesis and promoting lipolysis.

Journal of Clinical Biochemistry and Nutrition, *67*(1), 43-52.

Batista Jr, J. M., Lopes, A. A., Ambrósio, D. L., Regasini, L. O., Kato, M. J., da Silva Bolzani, V. and Furlan, M. (2008). Natural chromenes and chromene derivatives as potential anti-trypanosomal agents. *Biological and Pharmaceutical Bulletin*, *31*(3)*,* 538-540.

Beretz, A., Roth-Georger, A., Corre, G., Kuballa, B., Anton, R. and Cazenave, J. P. (1985). Polyindolinic alkaloids from *Psychotria forsteriana*. Potent inhibitors of the aggregation of human platelets. *Planta medica*, *51*(04), 300-303.

Bhambri, A., Srivastava, M., Mahale, V. G., Mahale, S. and Karn, S. K. (2022). Mushrooms as potential sources of active metabolites and medicines. *Frontiers in Microbiology, 13.*

Boopathi, S., Vashisth, R., Manoharan, P., Kandasamy, R. and Sivakumar, N. (2017). Stigmatellin Y–An anti-biofilm compound from Bacillus subtilis BR4 possibly interferes in PQS–PqsR mediated quorum sensing system in *Pseudomonas aeruginosa*. *Bioorganic & Medicinal Chemistry Letters*, *27*(10), 2113-2118.

Burgoyne, D. L., Andersen, R. J. and Allen, T. M. (1992). Contignasterol, a highly oxygenated steroid with the unnatural 14. beta. configuration from the marine sponge *Petrosia contignata* Thiele, 1899. *The Journal of Organic Chemistry*, *57*(2), 525-528.

Chen, Q. F., Wang, F. P., and Liu, X. Y. (2015). Generating Skeletal Diversity from the C19‐Diterpenoid Alkaloid Deltaline: A Ring‐Distortion Approach. *Chemistry–A European Journal, 21(24)*, 8946-8950.

Chittaragi, A. and Meghalatha, R (2014). Evaluation of phytochemical and anthelmintic activity of *Microporus xanthopus* of different solvent extracts. *Int. J. Innov. Appl. Res*, *2*(7), 9-13.

Combs, G. F. and McClung, J. P. (1992). Pantothenic acid. The vitamins, 345-64.

Coxon, D. T., Curtis, R. F., Price, K. R. and Howard, B. (1974). Phytuberin: a novel antifungal terpenoid from potato. *Tetrahedron Letters*, *15*(27), 2363-2366.

Dantas, S. B. S., Moraes, G. K. A., Araujo, A. R. and Chapla, V. M. (2022). Phenolic compounds and bioactive extract produced by endophytic fungus *Coriolopsis rigida*. *Natural Product Research,* 1-6.

Dresch, P., Rosam, K., Grienke, U., Rollinger, J. M. and Peintner, U. (2015). Fungal strain matters: colony growth and bioactivity of the European medicinal polypores *Fomes fomentarius, Fomitopsis pinicola* and *Piptoporus betulinus*. *Amb Express*, *5*(1), 1-14.

Fransén Pettersson, N., Deronic, A., Nilsson, J., Hannibal, T. D., Hansen, L., Schmidt-Christensen, A., and Holmberg, D. (2018). The immunomodulatory quinoline-3-carboxamide paquinimod reverses established fibrosis in a novel mouse model for liver fibrosis. *PLoS One*, *13*(9), e0203228.

Govender, H., Mocktar, C. and Koorbanally, N. A. (2018). Synthesis and Bioactivity of Quinoline‐3‐carboxamide Derivatives. *Journal of Heterocyclic Chemistry*, *55*(4), 1002-1009.

Gupta, R. C., Lall, R., Srivastava, A. and Sinha, A. (2019). Hyaluronic acid: molecular mechanisms and therapeutic trajectory. *Frontiers in veterinary science, 192*.

Gupta, S., Ahmad, H., Shukla, B., Ojha, N. and Dwivedi, A. K. (2018). Isolation, Structural Characterization, and Validation of a New Compound Present in Non‐Carbonyl Curcuma longa (NCCL): A Potential Lead for Stroke. *Journal of Heterocyclic Chemistry*, *55*(8), 1926-1934.

Hoofnagle, J. H. (2013). LiverTox: a website on drug-induced liver injury. In *Drug-Induced Liver Disease* (pp. 725-732). Academic Press.

Hyde, K. D., Xu, J., Rapior, S., Jeewon, R., Lumyong, S., Niego, A. G. T. and Stadler, M. (2019). The amazing potential of fungi: 50 ways we can exploit fungi industrially. *Fungal Diversity*, *97*, 1-136.

Ishida, H., Inaoka, Y., Nozawa, A., SHIBATANI, J. I., Fukushima, M. and Tsuji, K. (1999). Studies of active substances in herbs used for hair treatment. IV. The structure of the hair regrowth substance, polyporusterone A, from *Polyporus umbellatus* F. *Chemical and pharmaceutical bulletin*, *47*(11), 1626-1628.

Jain, K. K., Kumar, A., Shankar, A., Pandey, D., Chaudhary, B. and Sharma, K. K. (2020). De novo transcriptome assembly and protein profiling of copper-induced lignocellulolytic fungus Ganoderma lucidum MDU-7 reveals genes involved in lignocellulose degradation and terpenoid biosynthetic pathways. *Genomics*, *112*(1), 184-198.

Jung, E. B., Trinh, T. A., Lee, T. K., Yamabe, N., Kang, K. S., Song, J. H. and Hwang, G. S. (2018). Curcuzedoalide contributes to the cytotoxicity of *Curcuma zedoaria* rhizomes against human gastric cancer AGS cells through induction of apoptosis. *Journal of ethnopharmacology*, *213*, 48-55.

Lai-Hao, W. and Shu-Juan, H. (2011). Design of a flow-through voltammetric sensor based on an antimony-modified silver electrode for determining Lithol Rubine B in cosmetics. *Journal of Analytical Methods in Chemistry, 2011*.

Lee, T. K., Trinh, T. A., Lee, S. R., Kim, S., So, H. M., Moon, E. and Kim, K. H. (2019). Bioactivity-based analysis and chemical characterization of anti-inflammatory compounds from *Curcuma zedoaria* rhizomes using LPS-stimulated RAW264. 7 cells. *Bioorganic chemistry*, *82*, 26-32.

Mabery, C. F., Hudson, E. J., Sieplein, O. J. and Takano, S. (1901, January). Investigations on the Composition of Petroleum. In *Proceedings of the American Academy of Arts and Sciences* (Vol. *36*, No. 15, pp. 253-304). American Academy of Arts & Sciences.

Maeda, M., Hasebe, Y., Egawa, K., Shibanuma, M. and Nose, K. (2006). Inhibition of angiogenesis and HIF-1α activity by antimycin A1. *Biological and Pharmaceutical Bulletin*, *29*(7), 1344-1348.

Matuszewska, A., Jaszek, M., Stefaniuk, D., Ciszewski, T. and Matuszewski, Ł. (2018). Anticancer, antioxidant, and antibacterial activities of low molecular weight bioactive subfractions isolated from cultures of wood degrading fungus *Cerrena unicolor*. *PloS one*, *13*(6)*,* e0197044.

Molinari, F., Anfora, G., Schmidt, S., Villa, M., Ioriatti, C., Pasqualini, E. and De Cristofaro, A. (2010). Olfactory activity of ethyl (E, Z)-2, 4-decadienoate on adult oriental fruit moths. *The Canadian Entomologist*, *142*(5), 481-488.

Moore, P. D., Yedjou, C. G. and Tchounwou, P. B. (2010). Malathion‐induced oxidative stress, cytotoxicity, and genotoxicity in human liver carcinoma (HepG2) cells. *Environmental toxicology*, *25*(3), 221-226.

National Center for Biotechnology Information (2004). PubChem Compound Summary for CID 3080578, Varanic acid. Retrieved Dec. 17, 2022 from https://pubchem.ncbi.nlm.nih.gov/compound/Varanic-acid.

National Center for Biotechnology Information. (2004). PubChem Compound Summary for CID 81769, Ethyl 2,4-decadienoate. Retrieved November 16, 2022, from

https://pubchem.ncbi.nlm.nih.gov/compound/Ethyl-2_4-decadienoate
National Center for Biotechnology Information. (2004). PubChem Compound Summary for CID 14994, Dinoterb. Retrieved November 18, 2022, from https://pubchem.ncbi.nlm.nih.gov/compound/Dinoterb
National Center for Biotechnology Information. (2004). PubChem Compound Summary for CID 8540, Dinex. Retrieved November 18, 2022, from https://pubchem.ncbi.nlm.nih.gov/compound/Dinex
National Institute of Diabetes and Digestive and Kidney Diseases (US). (2012). *LiverTox: clinical and research information on drug-induced liver injury*. National Institute of Diabetes and Digestive and Kidney Diseases.
Nilsson, B., Svedberg, A., and Gjorstrup, P. (1998). U.S. Patent No. 5,728,713. Washington, DC: U.S. Patent and Trademark Office.
Onoja, S. O., Onyebuchi, G. C., Ijeh, I. I. and Ezeja, M. I. (2019). Anti-inflammatory and analgesic activities of methanol extract of *Helianthus annuus* Linn (Asteraceae) leaf. *Euro. Biotech. J.*, *3*, 112-116.
Orango-Bourdette, J. O., Eyi-Ndong, H. C., Ndong-Atome, G. R., Ngoua-Meye-Misso, R. L., Sima-Obiang, C., Ondo, J. P. and Obame-Engonga, L. C. (2018). Chemical screening, antioxidant potential and antiangiogenic effect of *Microporus xanthopus* (Fr.) Kuntze, *Ganoderma orbiforme* (Fr.) Ryvarden and *Polyporus fasciculatus* (Pat.) Lloyd, medicinal mushrooms from Gabon. *Am J Pharm Health Res*, *6*(10), 13-29.
Quintero-Cabello, K. P., Lugo-Flores, M. A., Rivera-Palafox, P., Silva-Espinoza, B. A., González-Aguilar, G. A., Esqueda, M. and Ayala-Zavala, J. F. (2021). Antioxidant properties and industrial uses of edible polyporales. *Journal of Fungi*, *7*(3), 196.
Saini, S., Chutani, P., Kumar, P. and Sharma, K. K. (2020). Development of an eco-friendly deinking process for the production of bioethanol using diverse hazardous paper wastes. *Renewable Energy, 146*, 2362-2373.
Sarkar, A. B. and Khupse, R. (2022). Bromacil and its lithium salt.
Shankar, A. and Sharma, K. K. (2022). Fungal secondary metabolites in food and pharmaceuticals in the era of multi-omics. *Applied Microbiology and Biotechnology*, *106*(9-10), 3465-3488.
Shih, H. D., Liu, Y. C., Hsu, F. L., Mulabagal, V., Dodda, R. and Huang, J. W. (2003). Fungichromin: a substance from *Streptomyces padanus* with inhibitory effects on *Rhizoctonia solani*. *Journal of agricultural and food chemistry*, *51*(1), 95-99.
Shun, Y. T., Lai, H. Y., Chuang, Y. T., & Lin, H. F. (2023). Successful Treatment of Irinotecan-Induced Muscle Twitching: A Case Report. *Clinical Medicine Insights: Case Reports*, *16*, 11795476221150354.
Siddiqui, M. W. (Ed.). (2018). *Postharvest disinfection of fruits and vegetables*. Academic Press.
Subramanian, C. V. (1995). Mushrooms: Beauty, diversity, relevance. *Current Science*, *69*(12), 986-998.
Tian, L. W., Zhang, Y. J., Qu, C., Wang, Y. F. and Yang, C. R. (2010). Phloroglucinol glycosides from the fresh fruits of *Eucalyptus maideni*. *Journal of natural products, 73*(2), 160-163.
Vigbedor, B. Y., Akoto, C. O. and Neglo, D. (2022). Isolation and characterization of 3, 3′-di-O-methyl ellagic acid from the root bark of *Afzelia africana* and its antimicrobial and antioxidant activities. *Scientific African*, *17*, e01332
Wang, S., Zhang, C., Yang, G. and Yang, Y. (2014). Biological properties of 6-gingerol: a brief review. *Natural product communications*, *9*(7), 1934578X1400900736.
Xiong, Y., Chen, J., Sun, X., Xu, G., Li, P., Deng, Q. and Zheng, J. (2021). The antibacterial and antibiofilm activity of telithromycin against Enterococcus spp. isolated from patients in China. *Frontiers in microbiology*, *11*, 616797.
Xu, X., Yan, H., Chen, J. and Zhang, X. (2011). Bioactive proteins from mushrooms. *Biotechnology advances*, *29*(6), 667-674.
Zjawiony, J. K. (2004). Biologically active compounds from Aphyllophorales (polypore) fungi. *Journal of natural products*, *67*(2), 300-310.
Zhou, Y. X., Xia, W., Yue, W., Peng, C., Rahman, K., and Zhang, H. (2015). Rhein: a review of pharmacological activities. *Evidence-Based Complementary and Alternative Medicine*, *2015*.

How to cite this article: K.N. Gurav and V.P. Patil (2023). Qualitative Analysis of Bioactive Components in *Microporus xanthopus* (Fr.) Kuntze. *Biological Forum – An International Journal, 15*(4): 70-82.