Bull. Pharm. Sci., Assiut University, Vol. 47, Issue 1, 2024, pp. 249-259.

Bulletin of Pharmaceutical Sciences
Assiut University
Website: http://bpsa.journals.ekb.eg/

BULL. PHARM. SCI. Assiut Univ.

QUALITATIVE ANALYSIS FOR ILLICIT DRUGS AND NPS (NEW PSYCHOACTIVE SUBSTANCES) USING GC-MS

Galih Satrio Putra[1*], Sumari Sumari[1], Melanny Ika Sulistyowaty[2], Magdalena Sri Handayani[3], Farida Suhud[3], Dini Kesuma[3], Farida Anwari[4]

[1]*Department of Chemistry, Faculty of Mathematics and Natural Sciences State University of Malang,Malang-65145, Indonesia*
[2]*Department of Pharmaceutical Sciences, Faculty of Pharmacy Universitas Airlangga, Surabaya-60115, Indonesia*
[3]*Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Surabaya-60293, Indonesia*
[4]*Medical Laboratory Science, University of Anwar Medika, Sidoarjo 61262, Indonesia*

This research aims to analyze 500 samples for illicit drugs and NPS (New Psychoactive Substances) using GC-MS (Gas Chromatography Mass Spectrometry) in East Java Indonesia. Sample analysis was carried out by GC-MS with HP-5 column, injection port temperature of 250°C. Column temperature was maintained at 100°C for 2 minutes. It was then raised from10°C/minute to 280°C and maintained for 5 minutes Based on the results, it was detected 244 (48.8 %) Methamphetamine (MA); 30 (6 %) 3,4-Methylenedioxymethamphetamine (MDMA); 44 (8.8 %) 3,4-Methylenedioxyethylamphetamine (MDA); 56 (11.2 %) 3,4-Methylenedioxyethylamphetamine (MDEA); 106 (21.2 %) AB-Fubinaca; 5 (1.0 %) Tramadol; 5 (1.0 %) Ketamine; and 10 (2.0 %) Mephedrone. The identification of illicit drugs and NPS in confiscated materials was successfully achieved via GC-MS. The availability of GC-MS libraries is of great assistance in the identification of new drugs. Alternatively, the study of characteristic molecule fragments combined with the determination of their accurate masses can be a useful approach to identify unknown samples that were not previously analyzed.

Keywords: *Qualitative Analysis, illicit drugs, NPS, GC-MS*

INTRODUCTION

illicit drugs market are a troubling phenomenon in International and National scope, especially in, East Java, which remains as the second highest in Indonesia after Jakarta.[1] Similarly, the detected of New Psychoactive Substances (NPS) will increase its level in not only the national community, but international community are also likely to pose a more significant social problem in the future.[2-5] NPS (New Psychoactive Substances) are compounds that affect the central nervous system and make potential addiction. However, its use has not been regulated in the United Nations Single Convention on Narcotic Drugs of 1961, the 1971 United Nations Convention on Psychotropic Substances. There are some groups of NPS, synthetic cannabinoids derivatives, cathinones derivatives, ketamine derivatives, phenethylamines derivatives, piperazines derivatives, and plant-based substances which are deliberately developed to deceive the law.[6-8]

During the past decades, NPS has been introduced and traded through various distribution modes, including the internet. This has increased the demand and number of users throughout the world, thereby making it a serious threat to humanity.[4,8,9]

The existence of NPS in Indonesia became publicized in 2013 at the time an Indonesian actor used drugs containing 3,4-methylendioxymethcathinone. In 2015, new and unregistered evidence containing mephedrone/4-MMC was found and in early

Received : 8/1/2024 & Accepted : 10/3/2024

*Corresponding author: Galih Satrio Putra, E-mail: galih.satrio.fmipa@um.ac.id

2017, "blue sapphires" containing 4-chloromethcathinona/4-CMC were found in several cafes in in East Java. In 2016 and early 2017, the public was confronted by the trading of AB-Chimanaca and AB-Fubinaca in gorilla tobacco, which is a type of synthetic cannabinoids. Based on the World Drugs Report 2014, UNODC noted a 50% increase in the synthetic cannabinoids trend compared to other new substances.[1] In 2020 until 2022, AB-Fubinaca detected in Indonesia were increase, many cases reported people used it as illicit drugs.[10]

GC-MS is a method that is often used to detect the presence of NPS in powders, crystals, tablets, and tobacco samples. GC-MS is still able to detected 500 samples of NPS with high specificity, selectivity, accuracy and precision. These samples contain of synthetic cannabinoids derivatives (AB-Fubinaca); cathinones derivatives (Mephedrone); phenethylamines derivatives (amphetamine; methylamphetamine (MA); 3,4-Methylenedioxymethamphetamine (MDMA); 3,4-Methylenedioxyethylamphetamine (MDA); Phencyclidine/Ketamine derivatives, and semi opiate (tramadol). This article study showed chromatogram and mass spectra of 500 samples of NPS from some dosage form such as tablets, capsules, powders,; crystal powders, and some of simplicia.

EXPERIMENTAL
MATERIAL AND METHODS

All reagents and solvents such as ethyl acetate was purchased from standard commercial suppliers from Merck pro analysis grade, with samples obtained from the Surabaya Forensic Laboratory in the form of powder, crystals, tablets, capsules, crude material.

Sample preparation

100 mg of the sample was dissolved in 10.0 ml ethyl acetate, and then centrifuged at 1000 rpm. It was filtered by 0.2 microns, and 1-2 µl was injected into the GC-MS instrument.

Method of GC-MS analysis

Sample analysis was carried out by GC-MS with HP-5 column, injection port temperature of 250°C. Column temperature was maintained at 100°C for 2 minutes. It was then raised from10°C/minute to 280°C and maintained for 5 minutes. Data analysis was performed using GC-MS chromatogram approach which was determined by Library MS data from NIST or UNODC with fragmentation analysis from MS.

RESULTS AND DISCUSSION

Results

GC-MS are a reproducible method to quickly and accurately analyse illicit drugs and NPS (new psychoactive substances) on samples of tablets, capsules, and powder, crude material.[11] LC-MS method is commonly used for routine analysis of NPS and illicit drugs in biological fluid analysis such as urine and blood specimens.[11-13] Narcotics Schedules I-V are compounds that are classified as thermostable such as heroin, lysergic acid diethylamide (LSD), marijuana (cannabis), peyote, methaqualone, and 3,4-methylenedioxymethamphetamine that is called ecstasy. Therefore, they could be analysed using GC-MS.[14-16.]

Some crime scene evidence for illicit drugs such as powders, tablets, capsules, and crude material consist of synthetic cannabinoids derivatives (AB-Fubinaca); cathinones derivatives (Mephedrone); phenethylamines derivatives (amphetamine; methylamphetamine (MA); 3,4-Methylenedioxymethamphetamine (MDMA); 3,4-Methylenedioxyethylamphetamine (MDA); Phencyclidine/Ketamine derivatives an and semi opiate (tramadol) could be detected with high specificity and selectivity using GC-MS instrument. Validation method for analysing illicit drugs are necessary based on criteria acceptance of International Council for Harmonisation (ICH) consisting of specificity, selectivity, accuracy and precision, LOQ (Limit of Quantification) and LOD (Limit of Detection). Illicit drugs and NPS (New psychoactive Substances) are major compounds, therefore, LOQ (limit of Quantification) and LOD (Limit of Detection) are not necessary because they does not match the analysis of traces elements (heavy metals) or organic contamination compounds such as contamination of organic solvents, and pesticides.[17]

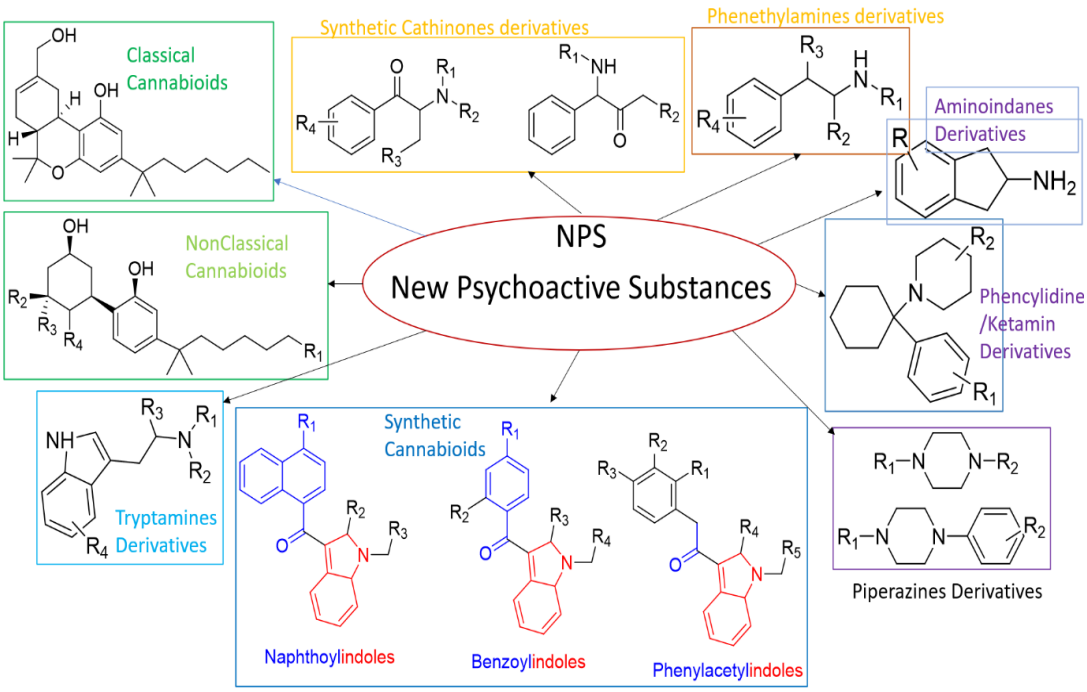
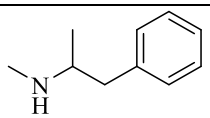
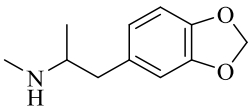
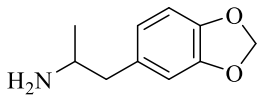
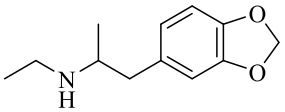
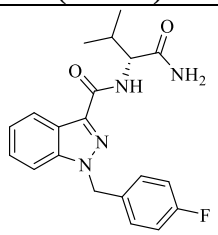
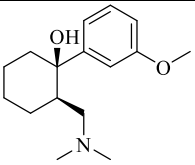
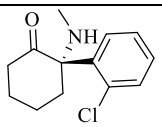
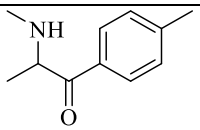


Fig. 1 : The groups of New Psychoactive Substances (NPS).

The result of qualitative analysis on 500 samples consisting of tablets, capsules, powder, and crude material is shown in **Fig. 2**. Based on the results, it was detected 244 (48.8%) Methamphetamine (MA); 30 (6 %) 3,4-Methylenedioxymethamphetamine (MDMA); 44 (8.8%) 3,4-Methylenedioxyethylamphetamine (MDA) ;56 (11.2%) 3,4-Methylenedioxyethylamphetamine (MDEA); 106 (21.2) AB-fubinaca ; 5 (1.0 %) tramadol; 5 (1.0%) ketamine; 10(2.0%) mephedrone that is shown in **Table 1**.

Fig. 2: The samples of Drugs of Abused and NPS.

Table 1: The result of Qualitative analysis on Drugs of Abuse and NPS Using GS-MS Instrument.

Samples	% Samples	Compound	TR (Retention Time)	Similarity Index
244	48.8	 Methamphetamine (MA)	5.7	100%
30	6	 3,4-Methylenedioxymethamphetamine (MDMA)	10.92	100%
44	8.8	 3,4-Methylenedioxyethylamphetamine (MDA)	7.05	100%
56	11.2	 3,4-Methylenedioxyethylamphetamine (MDEA)	17.5	100%
106	21.2	 AB-Fubinaca	27.5	100%
5	1	 Tramadol	24.01	99%
5	1	 Ketamine	23.12	98%
10	2	 Mephedrone	17.5	99%
500	100 %	Total samples		

AB-Fubinaca contains cigarette or tobacco or simplicia. Samples were detected at 27.5 minutes (time retention) followed by other phytochemicals such as eugenol and caffeine with chromatogram profile that is shown ion **Fig. 3**, and while their mass profile spectra that is shown in **Fig. 4**. AB-Fubinaca is an NPS from synthetic cannabinoids derivatives laced on plant material that has been encountered by law enforcement in recent years. These products laced with synthetic cannabinoids which are smoked for their psychoactive effects.[18] Based on reported data UNODC 2022 and National Narcotics Board, there were a signification increased of illicit drugs from and NPS from synthetic cannabinoids derivatives such as AB-Fubinaca. AB-Fubinaca was previously reported in a patent by Pfizer in 2009. There are no commercial or medical uses for this substance. AB-Fubinaca has a high affinity binding as agonist to the CB1 receptor.[5,18] AB-Fubinaca is a synthetic cannabinoid that is recently encountered on the designer drug market and has been found laced on plant material and marketed under the guise of herbal incense products.

Phenethylamines derivatives such as Methamphetamine (MA); Methylenedioxymethamphetamine (MDMA); Methylenedioxyethylamphetamine (MDA); and Methylenedioxyethylamphetamine (MDEA) are commonly detected for illicit drugs. Methamphetamine (MA) is a compound that dominates illicit drugs and often found in tablet dosage forms like candies, not only Methamphetamine (MA), but also Methylenedioxymethamphetamine (MDMA) (ecstasy); Methylenedioxyethylamphetamine (MDA); and Methylenedioxyethylamphetamine (MDEA) that is shown in **Fig. 5 and Fig. 6**. MA; MDMA; MDA dan MDEA are narcotic schedule that have strong activity as analgesic nevertheless these have strong addiction side effect. Because of the strong addiction side effect, MA and MDMA were never used as medicine on clinical practices.

Ketamine and tramadol are medicines on clinical practices. Ketamine has strong analgesic and general anaesthesia with moderate addiction side effect. Ketamine is a class of Phencyclidine derivatives which are often used as illicit drugs. Tramadol is a medicine that has strong analgesic with mild addiction side effect. Tramadol is classified as semi-opioid medicine that is often used as illicit drugs. Tramadol is often detected in tablets or caplet dosage form and ketamine is often detected in white crystal powders dosage form that is shown in **Fig. 7**.

Mephedrone (4-MMC) was also found in the drug market. Mephedrone is a group of synthetic cathinone derivatives. Mass profile spectra of Mephedrone can be shown in **Fig. 8**. Mephedrone exhibits high abuse liability. It has earlier onset and shorter duration of effects probably related to its short elimination of half-life compared to MDMA, and this, could explain a more compulsive pattern of use as described by the user's illicit drugs users.[19]

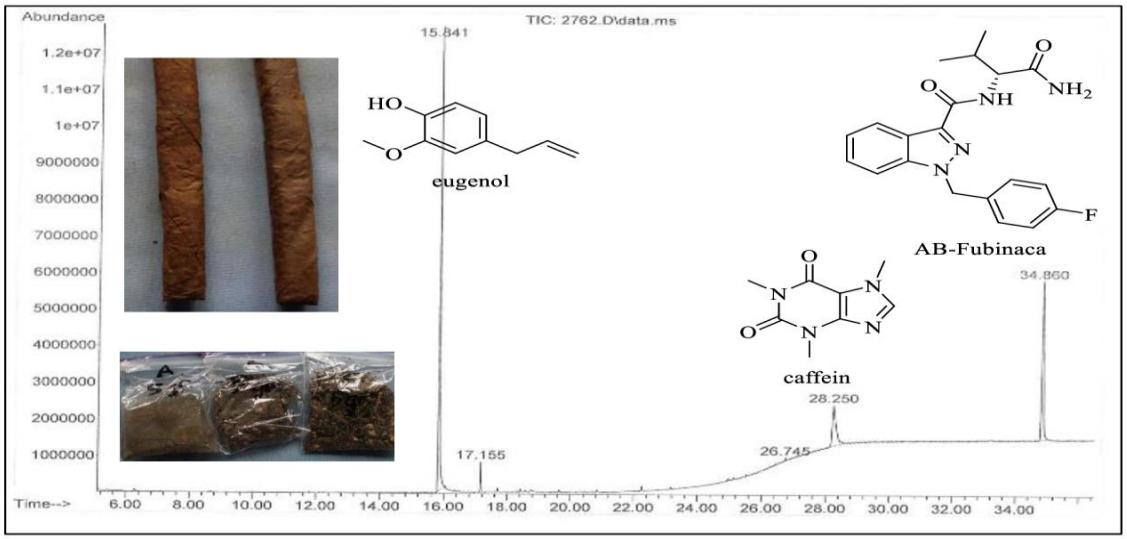


Fig. 3: Chromatogram profile of cigarette or tobacco or simplicia samples.

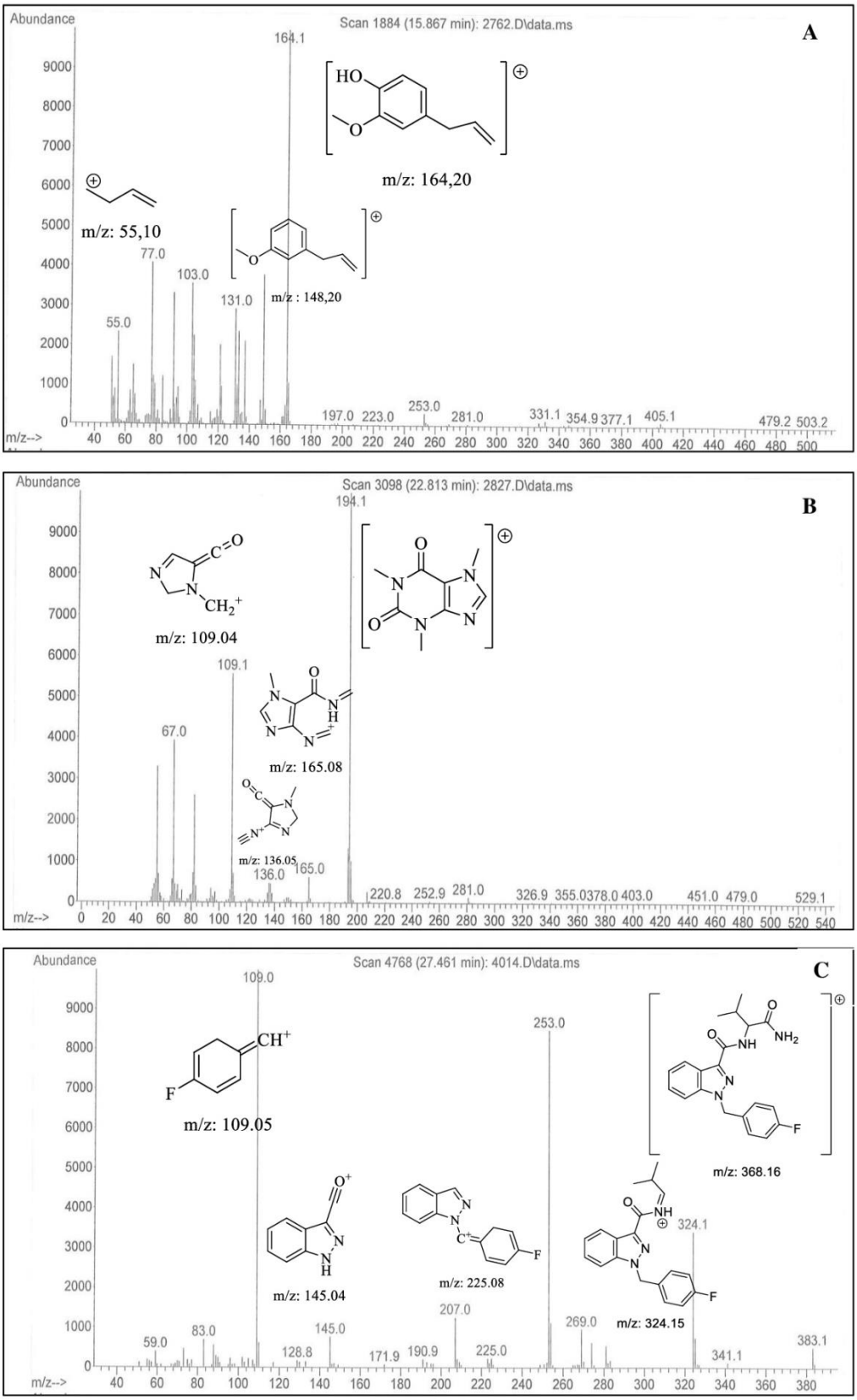


Fig. 4: Mass profile spectra of **A**.eugenol, **B**.caffeine . **C**.AB-Fubinaca.

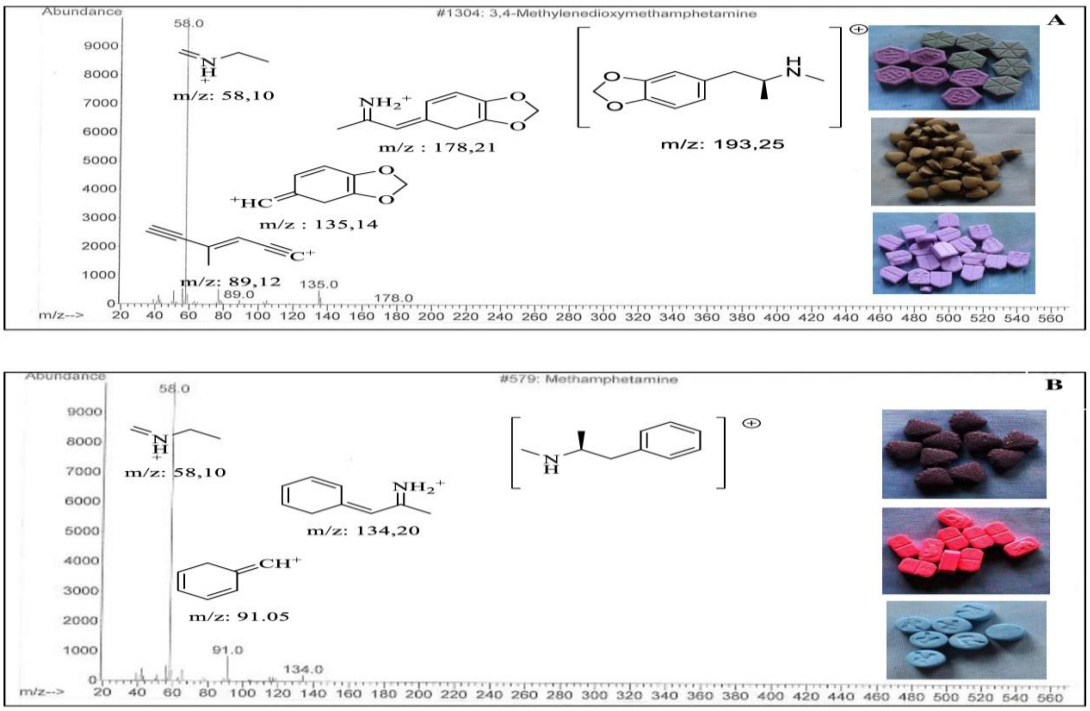


Fig.5: Mass profile spectra of **A.** Methamphetamine (MA) and **B.**Methylendioxymethamphetamine (MDMA).

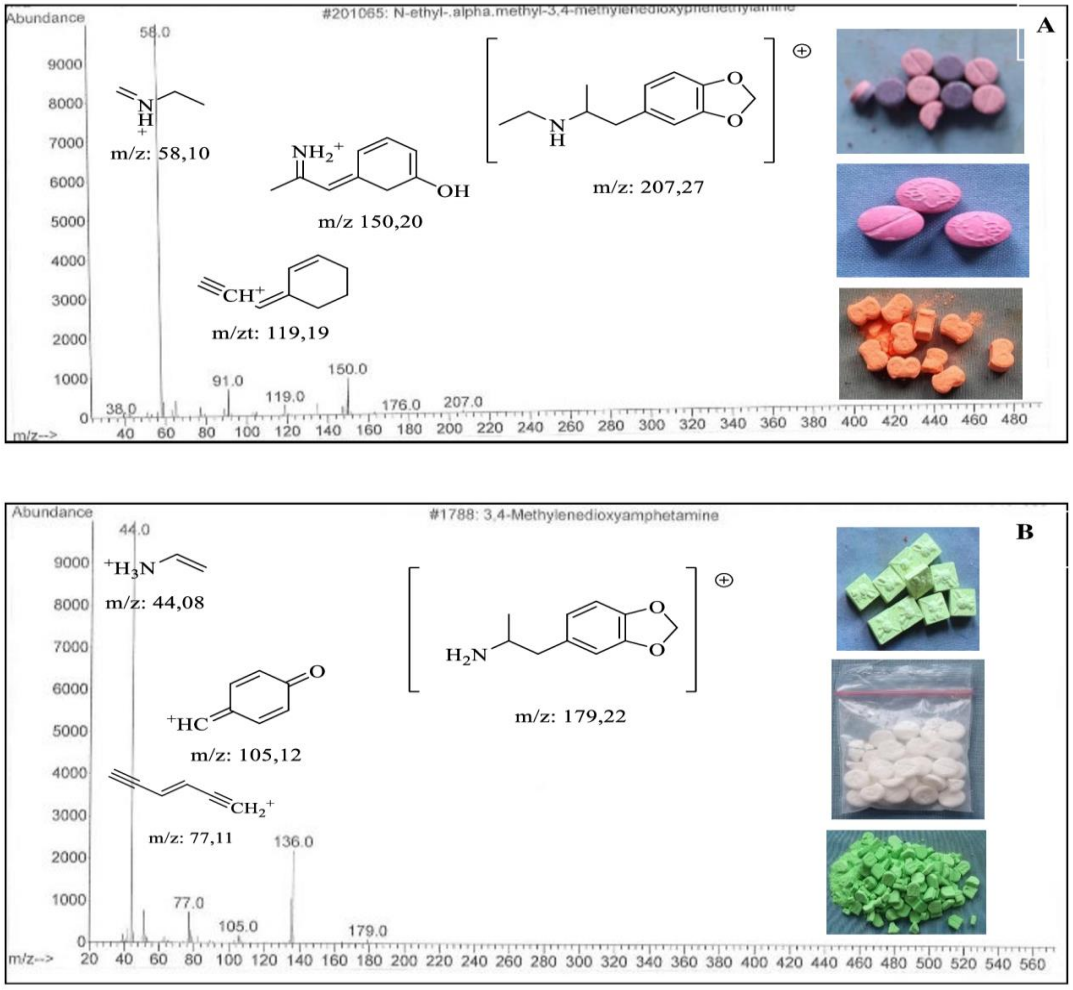


Fig. 6 : Mass profile spectra of **A.** Methylenedioxyethylamphetamine (MDEA) and **B.** Methylenedioxyethylamphetamine (MDA).

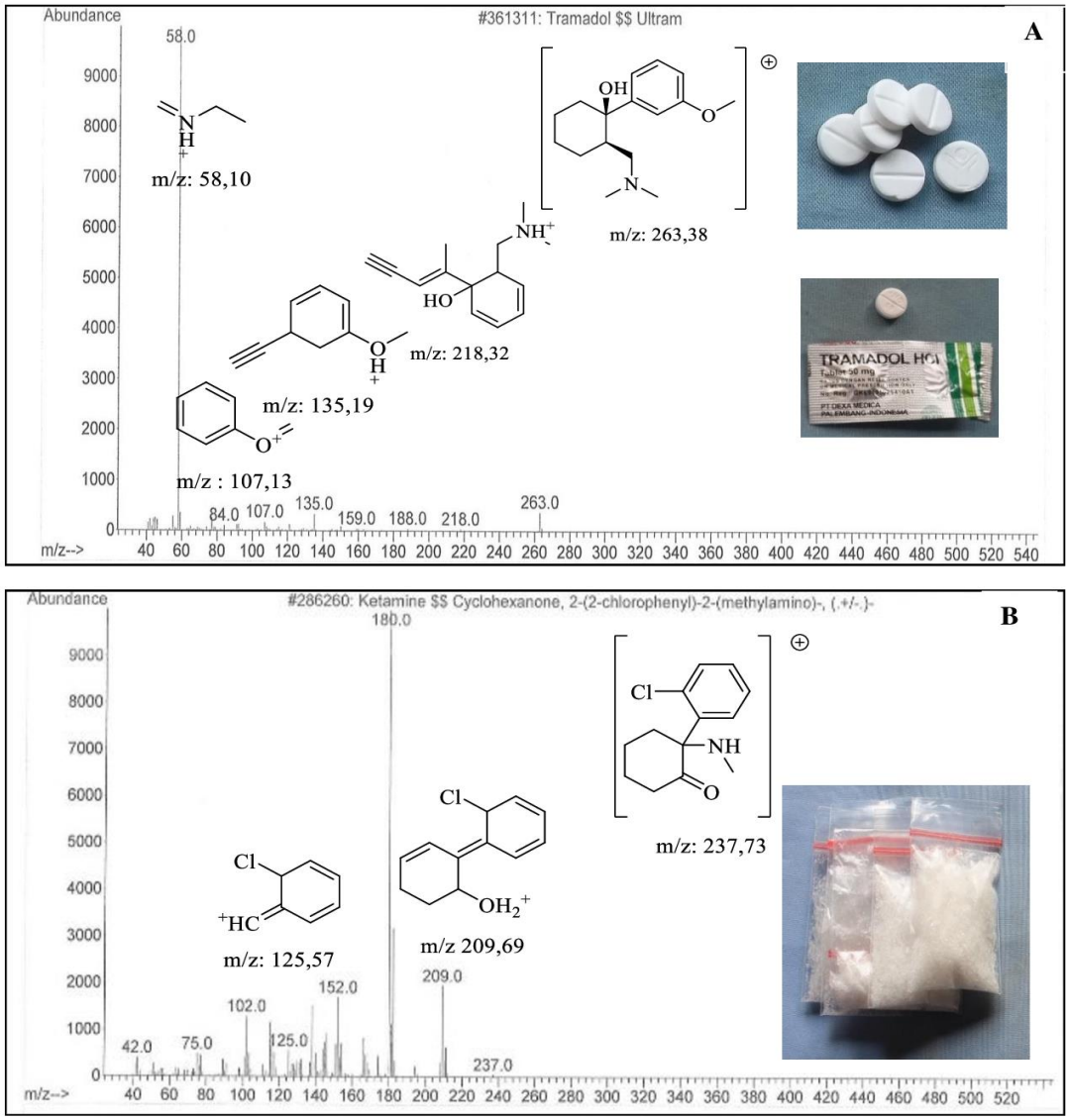


Fig. 7: Mass profile spectra of **A.** Tramadol and **B.** Ketamin.

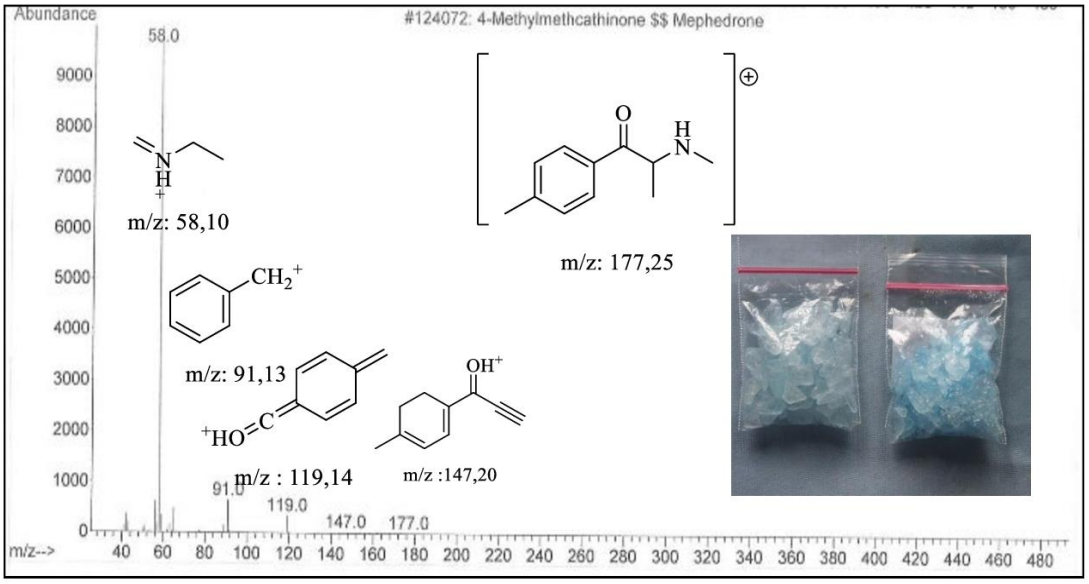


Fig. 8: Mass profile spectra of Mephedrone.

Conclusion

GC-MS is a method that can detect the presence of NPS with high specificity and selectivity. From 500 samples, it was detected 244 (48.8%) Methamphetamine (MA); 30 (6%) 3,4-Methylenedioxymethamphetamine (MDMA); 44 (8.8%) 3,4-Methylenedioxyethylamphetamine (MDA) ; 56 (11.2%) 3,4-Methylenedioxyethylamphetamine (MDEA); 106 (21.2%) AB-fubinaca; 5 (1.0%) Tramadol; 5 (1.0%) ketamine; and 10 (2.0%)mephedrone

Acknowledgement

This research was funded by Lembaga Penelitian dan Pengabdian Masyarakat (LPPM) University of Surabaya.

REFERENCES

1. B.N.N. Health Research on Drug Abuse Effect. Research, Data, and Information Center National Narcotics Board of the Republic of Indonesia : Jakarta. ISBN : 978-623-93034-1-9 (2019).
2. A. M. Araújo, M. J. Valente, M. Carvalho, D. D. Silva, H. Gaspar, F. Carvalho, M. L. Bastos and P. G. Pinho, "Raising awareness of new psychoactive substances: chemical analysis and in vitro toxicity screening of 'legal high' packages containing synthetic cathinones", ***Arch Toxicol***, 89 (5),757-771 (2014).
3. T. Seddon, "Drug policy and global regulatory capitalism: the case of new psychoactive substances (NPS). International Journal of Drug Policy", ***Int J Drug Discov***, 25(5), 1019-1024 (2014).
4. J. Mounteney, P. Griffiths, R. Sedefov, A. Noor, J. Vicente and R. Simon, "The drug situation in Europe: an overview of data available on illicit drugs and new psychoactive substances from European monitoring in 2015", ***Addiction,*** 111 (1) 34-48 (2015).
5. A. C. Moffat, M. D. Osselton, B. Widdop, 2011. Clarke's Analysis of Drugs and Poisons in pharmaceuticals, body fluids and postmortem material. 4th edition. London : Pharmaceutical Press.
6. D. Favretto, J. P. Pascali and F. Tagliaro, "New challenges and innovation in forensic toxicology: Focus on the "New Psychoactive Substances", ***J Chromatogr A***, 1287, 84-95 (2013).
7. S, Elliott and J. Evans, "A 3-year review of new psychoactive substances in casework", ***Forensic Sci Int,*** 243(1), 55-60 (2014).
8. UNODC, 2013. Global Smart Programme : New Psychoactive Substances.
9. S. S. Rossi, S. Odoardi, A. Gregori, G. Peluso, L. Ripani, G. Ortar, G. Serpelloni and F. S. Romolo, " An Analytical Approach to the Forensic Identification of Different Classes of New Psychoactive Substances (NPS) in Seized Materials**",** ***Rapid Commun. Mass Spectrom***, 28(17), 1904-1916 (2014).
10. S. M. Handajani, R. R. Risthanti, A. A. Setiawan and G. S. Putra, "Trends in drug abuse in the East Java region in 2016-2017", ***J-PhAM***, 4 (1), 58-70 (2021)
11. M. P. Elie, L. E. Elie and M. G. Baron, "Keeping pace with NPS releases: fast GC-MS screening of legal high products. Drug Testing and Analysis", ***Drug Test Anal***, 5(5), 281-90 (2013).
12. C. Bell, C. George, A.T. Kicman and A. Traynor, "Development of a rapid LC-MS/MS method for direct urinalysis of designer drugs", ***Drug Test Anal,*** 3(7-8), 496-504 (2013)
13. A. A. Aldubayyan, E. Castrignanò, S. Elliott and V. Abbate, "A Quantitative LC–MS/MS Method for the Detection of 16 Synthetic Cathinones and 10 Metabolites and Its Application to Suspicious Clinical and Forensic Urine Samples", ***Pharmaceuticals,*** 15(5),1-22 (2022).
14. DEA "Drug Enforcement Administration", 2020 AB-FUBINACA, Diversion Control Division Drug & Chemical Evaluation Section
15. B. Byrska and D. Zuba, "Application of Fast Gas Chromatography to Routine Analysis of Narcotic Drugs and Psychotropic Substances", ***Probl Forensic Sci,*** 79 (LXXIX); 303-313. (2009)
16. S. Assi, A. Guirguis, S. Halsey, S. Fergus and J.L. Stair, "Analysis of 'legal high' substances and common adulterants using

handheld spectroscopic techniques", ***Anal Methods***, 7(2),736–746 (2012).
17. ICH "International Conference on Harmonisation". (2005) Validation of Analytical Procedures: Text And Methodology Q2(R1).
18. Drug Enforcement Administration (DEA). ***US Department of Justice***, Part 1308 — schedules of controlled substances. Link to an amendment published at 85 FR 5322, Jan, 30, (2020).
19. E. Papaseit, C. Pérez-Mañá, J.A. Mateus, M. Pujadas, F. Fonseca, M. Torrens, E. Olesti, R. Torre and M. Farré, "Human Pharmacology of Mephedrone", in Comparison with MDMA ***Neuropsychopharmacol***, 41(11), 2704-2713 (2016).

Bull. Pharm. Sci., Assiut University, Vol. 47, Issue 1, 2024, pp. 249-259.

نشرة العلوم الصيدلية
جامعة أسيوط

BULL. PHARM. SCI. Assiut Univ.

تحليل الأدوية التي اسئ استخدامها مع مواد نفسية نشطة جديدة باستخدام التحليل الغازي الكروماتوجرافي مع طيف الكتلة

جاليه ساتريو بوترا[1*] – سوماري سوماري[1] – ميلاني إيكا سوليستيواتي[2] – ماجدالينا سري هانداياني[3] – فريدة سهود[3] – ديني كيسوما[3] – فريدة أنواري[4]

[1]قسم الكيمياء ، كلية الرياضيات والعلوم الطبيعية ، جامعة مالانج الحكومية، مالانج ٦٥١٤٥ ، إندونيسيا

[2]قسم العلوم الصيدلانية ، كلية الصيدلة، جامعة إيرلانجا، سورابايا ٦٠١١٥ ، إندونيسيا

[3]قسم الكيمياء الصيدلية ، كلية الصيدلة، سورابايا ٦٠٢٩٣ ، إندونيسيا

[4]علوم المختبرات الطبية ، جامعة أنور ميديكا، سيدوارجو ٦١٢٦٢ ، إندونيسيا

يهدف هذا البحث إلى تحليل ٥٠٠ عينة للمخدرات غير المشروعة و المواد ذات التأثير النفسي الجديدة باستخدام التحليل الغازي الكروماتوجرافي مع طيف الكتلة في جاوة الشرقية بإندونيسيا. تم إجراء تحليل العينة بواسطة GC-MS مع عمود HP-5، ودرجة حرارة منفذ الحقن ٢٥٠ درجة مئوية. تم الحفاظ على درجة حرارة العمود عند ١٠٠ درجة مئوية لمدة دقيقتين. ثم تم رفعها من ١٠ درجة مئوية / دقيقة إلى ٢٨٠ درجة مئوية والحفاظ عليها لمدة ٥ دقائق. وبناء على النتائج، تم الكشف عن ٢٤٤ (٤٨,٨٪) من الميثامفيتامين (MA)؛ ٣٠ (٦%) ٣،٤–ميثيلين ديوكسي ميثامفيتامين (MDMA)؛ ٤٤ (٨,٨%) ٣،٤–ميثيلين ديوكسي إيثيلامفيتامين (MDA)؛ ٥٦ (١١,٢%) ٣،٤–ميثيلين ديوكسي إيثيلامفيتامين (MDEA)؛ ١٠٦ (٢١,٢%) أب–فوبيناكا؛ ٥ (١,٠%) ترامادول؛ ٥ (١,٠%) كيتامين؛ و١٠ (٢,٠%) ميفيدرون. تم بنجاح التعرف على المخدرات غير المشروعة وNPS في المواد المصادرة عبر GC-MS. يعد توفر مكتبات GC-MS بمثابة مساعدة كبيرة في تحديد الأدوية الجديدة. وبدلاً من ذلك، يمكن أن تكون دراسة أجزاء الجزيء المميزة جنبًا إلى جنب مع تحديد كتلتها الدقيقة طريقة مفيدة لتحديد العينات غير المعروفة التي لم يتم تحليلها مسبقًا.

BULLETIN OF PHARMACEUTICAL SCIENCES

Assiut University
ISSN - 1110-0052

Editorial Board

Editor-in-Chief

Prof. Gihan Fetih

Vice Dean of Faculty of Pharmacy

Professor, Department of Pharmaceutics, Faculty of Pharmacy, Assiut University, Egypt

gfetih@aun.edu.eg

Associate Editor

Prof. Dina Fathalla Mohamed Mohamed

Head of Department of Pharmaceutics
Professor, Department of Pharmaceutics, Faculty of Pharmacy, Assiut University, Egypt

dina.mohamed@pharm.aun.edu.eg

Executive Editor

Dr. Jelan Abd Elrazik Abd Elalim Abd Elrazak

Associate Professor, Industrial Pharmacy Department, Faculty of Pharmacy, Assiut University, Egypt

jelan.abdelrazik@pharm.aun.edu.eg

Editorial Board

Prof. Soad Bayoumi

Head of Department of Pharmacognosy

Professor, Department of Pharmacognosy, Faculty of Pharmacy, Assiut University, Egypt

soad.bayoumi@pharm.aun.edu.eg

Prof. Ahmed Safwat Mohamed Aboraia

Head of Medicinal Chemistry Department

Professor, Medicinal Chemistry Department, Faculty of Pharmacy, Assiut University, Egypt

ahmed.mohamed15@pharm.aun.edu.eg

Prof. Noha Nahedj Atia Mohamed

Professor and Head of Pharmaceutical Analytical Chemistry Department, Faculty of Pharmacy, Assiut University, Egypt

noha.mohamed1@pharm.aun.edu.eg

Prof. Hesham Mohamed Tawfeek Hassan

Professor and Head of Pharmaceutical Industry Department, Faculty of Pharmacy, Assiut University

heshamtawfeek@aun.edu.eg

Volume & Issue: Volume 47, Issue 1, June 2024, Pages 1-679
Number of Articles: 45

View Article PDF 1.16 M View on SCiNiTO

IN VITRO AND IN SILICO APPROACHES FOR SCREENING INTESTINAL PERMEABILITY AND ABSORPTION OF DRUGS.

Pages 101-117

Ahmed Elgendy; Adeboye Adejare; Saleh Abd El-Rasoul; Abdullah Asiri

View Article PDF 862.8 K View on SCiNiTO

SKIN CANCER ADVANCED TOPICAL TREATMENT WITH IMIQUIMOD LOADED NANOCARRIERS: AN IN-DEPTH REVIEW

Pages 119-140

Huda Mustafa Abdel-Ghaffar; Hend Mohamed Abdel-Bar; Abdulaziz Mohsen Al-mahallawi; Omaima Naim El Gazayerly

View Article PDF 967.74 K View on SCiNiTO

IN VIVO WOUND HEALING AND IN VITRO ANTI- ANTIOXIDANT ACTIVITY EVALUATION OF COTULA CINEREA

Pages 141-150

Zineb LAKACHE; Mohcene Sadallah; Hamza Aliboudhar; Hinda HACIB; kameli abdelkrim; Hassina TOUNSSI

View Article PDF 587.85 K View on SCiNiTO

MACROLACTONES AND MACROLIDES FROM PLANT ENDOPHYTIC FUNGI, CHEMICAL SCAFFOLDS, BIOLOGICAL ACTIVITIES AND SPECTROSCOPY: A COMPREHENSIVE REVIEW

Pages 151-168

ehab Saad Elkhayat; Mohamed E Abouelela; Reda Ahmed Abdelhamid; Mohammad S Alorainy; Khaled A Shaaban

View Article PDF 1.08 M View on SCiNiTO

DETERMINATION OF THE FLAVONOIDS OF BROCCHIA CINEREA FROM ALGERIA

Pages 169-177

Mohammed Tahar Ben Moussa; Said Nadji; Abdelhakim Bounab; Youcef Hadef

View Article PDF 604.56 K View on SCiNiTO

SCREENING OF YEAST ABILITY TO DECOLORIZATION AND COMPLETE BIODEGRADATION

OF MALACHITE GREEN TEXTILE DYE AND INVESTIGATION OF THEIR PHYTOTOXICITY

Pages 179-195

Nivien Allam; Eman Mostafa Mohamed; Somaya Mahmoud Nassar; Maysa Ahmed Ali

View Article PDF 1.49 M View on SCiNiTO

INVESTIGATING THE PROTECTIVE ACTIVITY OF POLYGONUM AVICULARE EXTRACTS AGAINST THE METHOTREXATE-INDUCED HEPATIC INJURY IN EXPERIMENTAL ANIMALS

Pages 197-206

Wiam Abdel-Nasser Hmidan; Adawia Kitaz; Samer Haj Kaddour; Mohammad Yaser Abajy

View Article PDF 1.39 M View on SCiNiTO

COMPARATIVE PROTEIN KINASE INHIBITORY ACTIVITY OF THREE ACACIA SPECIES GROWING IN NIGERIA

Pages 207-215

AUGUSTINE AJIBOGUN AHMADU; Bilqis Abiola Lawal; Aniefiok Sunday Udobre; Florence Tarfa; Adesegun Jubril Kashimawo; Patricia Odumosu

View Article PDF 743.46 K View on SCiNiTO

AMELIORATIVE EFFECT OF COPPER ALBUMIN COMPLEX AGAINST AFLATOXICOSIS COMPARED WITH CURCUMIN

Pages 217-231

Aisha A. El-Waheed; Ahmed R. Shatat; Gamal A. Gouda

View Article PDF 1.59 M View on SCiNiTO

CHEMICAL PROFILE AND MEMBRANE STABILIZATION ACTIVITY: UNVEILING THE ANTI-INFLAMMATORY MECHANISM OF MYRRH

Pages 233-248

Eman A El-Wakil; Heba Abdel-Hady; Eman A Morsi

View Article PDF 1.14 M View on SCiNiTO

QUALITATIVE ANALYSIS FOR ILLICIT DRUGS AND NPS (NEW PSYCHOACTIVE SUBSTANCES) USING GC-MS

Pages 249-259

Galih Satrio Putra; Sumari Sumari; Melanny Ika Sulistyowaty; Magdalena Sri Handajani; Farida Suhud; Dini Kesuma; Farida Anwari

View Article PDF 1.78 M View on SCiNiTO

FABRICATION OF ION SELECTIVE PVC MEMBRANE SENSOR FOR POTENTIOMETRIC DETERMINATION OF ESCITALOPRAM OXALATE IN ITS PURE FORM AND PHARMACEUTICAL TABLET

Pages 261-272

Ali Mohammed Atiyah; Kameran Shukur Hussein; Abdul Majeed Khorsheed Ahmed

View Article PDF 1.44 M View on SCiNiTO

NEO-ADJUVANT VERSUS ADJUVANT USE OF BEVACIZUMAB IN THE MANAGEMENT OF ADVANCED OVARIAN CANCER

Pages 273-287

Nada Hassan Salah; hisham ahmed aboutaleb; mohammed alaa el din hassan; Mohammed abdelHakim Mekkawy; ola nabih abdel fattah

View Article PDF 988.49 K View on SCiNiTO

A COMPARATIVE STUDY OF THE EFFICACY AND SAFETY OF NEBULIZED VERSUS INTRAVENOUS MAGNESIUM SULFATE IN ADULTS WITH ACUTE ASTHMA EXACERBATIONS: A RANDOMIZED CONTROLLED STUDY

Pages 289-301

Maged Naguib; Nada A Saad; Mohammad Farouk Mohammad; Rasha M.Kharshoum; Raghda Hussein

View Article PDF 1.02 M View on SCiNiTO

COMPARING THE IMPACT OF LIDOCAINE SPRAY AND ICE SPRAY ON PAIN INTENSITY DURING THE CATHETERIZATION OF HEMODIALYSIS PATIENTS: A TRIPLE-BLIND CLINICAL TRIAL

Pages 303-310

Samira Foji; Hamid Roodsarabi; Fatemeh Torklalebag

View Article PDF 679.04 K View on SCiNiTO

ASSOCIATION OF SERUM VITAMIN D-BINDING PROTEIN WITH COMPONENTS OF METABOLIC SYNDROME IN TYPE 2 DIABETIC PATIENTS IN GORGAN

Pages 311-319

Abdoljalal Marjani; Safa Jalal Abdalsahib Alhasoon; Karrar Jaber Hasan Al-hajmee; Mojtaba Zare Ebrahimabad; Taghi Amiriani

View Article PDF 629.58 K View on SCiNiTO

COMPARATIVE ACTION OF ALTERNATIVE MEDICINES ARSENICUM ALBUM 30CH AND PHOSPHORUS 30CH FOR BALANCING CYTOKINES GENE EXPRESSIONS IN SARS-COV-2 SPIKE PROTEIN INDUCED PATHOLOGICAL CHANGES

Pages 321-333

Debasmita Chatterjee; Krishnendu Paira; Satadal Das

View Article PDF 1.33 M View on SCiNiTO

INVESTIGATING THE LUNG CYTOTOXICITY OF KINETIN PROLONGED TREATMENT; IN VITRO AND IN VIVO STUDY

Pages 335-343

Eman M Othman; Sahar Mohamed Saad Eldin; Moustafa Fathy

View Article PDF 839.31 K View on SCiNiTO

ANTI-OBESITY ACTION OF GREEN TEA EXTRACT AND CURCUMIN: ROLE OF C1Q/TNF-RELATED PROTEIN-12 (CTRP-12) AND CASPASE-2.

Pages 345-362

Mohamed Hussein; Manal Mandour; Sary AbdElghaffar Nasr; Abdel-Raheim Meki; Michel E. Fakhry

View Article PDF 1.85 M View on SCiNiTO

IMPACT OF LETROZOLE TREATMENT ON LIPID PROFILE IN POSTMENOPAUSAL WOMEN WITH HORMONE RECEPTOR-POSITIVE EARLY BREAST CANCER: A PROSPECTIVE STUDY

Pages 363-374

Ali Ghassan Ali; Remal Abdulaziz Asaad; Nader Mohammad Abedallaa

View Article PDF 796.87 K View on SCiNiTO

NOVEL THERAPEUTIC REGIMENS FOR URETHANE-INDUCED LUNG CANCER IN RATS: II CISPLATIN NANOPARTICLES COMBINED WITH CURCUMIN NANOPARTICLS ADJUVANT

Pages 375-394

Nahed A. Mohamed; Soad M.A. Faied; Naglaa T El Melegy; Hosaam E. Omer; Wael Sabry; Sary Kh. Abdel Ghaffar; Abdel Rahman Abdel qawy; Hala M. Mohamed

View Article PDF 1.32 M View on SCiNiTO

NOVEL POTENTIAL DRUG INTERACTIONS WITH BISOPROLOL IN HOSPITALIZED ACUTE CORONARY SYNDROME PATIENTS

Pages 395-413

Sherouk Okda; Amira B. Kassem; Ahmed Mahmoud Elamrawy; Ahmad Salahuddin; sohila M Elonsy; Noha El-Bassiouny

View Article PDF 1.75 M View on SCiNiTO

ALTERATIONS OF NEUROBEHAVIORAL PERFORMANCE, BLOOD AND BRAIN CHOLINESTERASE ACTIVITIES AND CHOLESTEROL LEVELS BY REPEATED STATIN TREATMENTS IN MICE

Pages 415-425

Rawnaq Faris Al-Shalchi; Fouad Kasim Mohammad

View Article PDF 836.61 K View on SCiNiTO

PREVALENCE OF OCCULT HEPATITIS B VIRUS INFECTION AMONG CHRONIC HEMODIALYSIS ADULT PATIENTS IN MINIA GOVERNORATE, EGYPT

Pages 427-435

Mustafa Hemeda; Rehab Mahmoud; Hala Rady Ahmed; Helal F. Hetta; Amr elzawily; Nancy G F wally

View Article PDF 772.89 K View on SCiNiTO

SQUALENE EXPLORING ITS VITAL ROLES IN VACCINE PRODUCTION, SKINCARE, CHOLESTEROL METABOLISM, ANTI-CANCER STRATEGIES, CARDIOVASCULAR HEALTH, AND ANTIOXIDANT POTENCY

Pages 437-448

BASIM SALEEM AHMED; HUSNI MHAMMAD

View Article PDF 648.81 K View on SCiNiTO

T CELL EXHAUSTION: SUPREMACY IN LEUKEMIA AS FOR DISEASE AND THERAPY

Pages 449-461

Nourhan Kamal Mohamed; Mohamed Ahmed El-Mokhtar; Reham Aly Ibrahem; Asmaa M Zahran; Gamal Fadl

View Article PDF 1 M View on SCiNiTO

THE ANTIMICROBIAL AND ANTIBIOFILM EFFECTS OF CITRUS LIMON AND CINNAMON CASSIA ESSENTIAL OILS AGAINST BIOFILM PRODUCING STAPHYLOCOCCI CAUSING

CHRONIC TONSILLITIS.

Pages 463-481

Elana Rafat Zaky; Nahla Mohammed Elsherbiny; Soad A. L. Bayoumi; Mohamed M Osman; amany adawy nafeh; Mohammed Saad Badary

View Article PDF 1.09 M View on SCiNiTO

EFFECT OF CHITOSAN OR N-ACETYL CYSTEINE COMBINATIONS WITH SOME ANTIBIOTICS ON BIOFILM FORMATION ON INTRAUTERINE DEVICES

Pages 483-497

Heba Ahmed Mohamed; Gamal Fadl Gad; Gehad Mostafa Elheiny; Ahmed Reda Eladway

View Article PDF 1.52 M View on SCiNiTO

BIOSYNTHESIS OF ZINC OXIDE NANOPARTICLES USING ALOE VERA LEAVES EXTRACT AND THEIR ANTIBACTERIAL IMPACT

Pages 499-517

Magdy Abu-Gharbia; Jehan Salem; Gehad Al-Arabi

View Article PDF 1.33 M View on SCiNiTO

CIRCULATING MIRNA-122, MIRNA-155, AND MIRNA- 200 AS PREDICTORS FOR HEPATOCELLULAR CARCINOMA OCCURRENCE IN EGYPTIAN PATIENTS WITH HEPATITIS C RELATED LIVER CIRRHOSIS TREATED WITH DIRECT ACTING ANTIVIRAL DRUGS

Pages 519-532

Hanan M Nafeh; Alshaimaa Mohammed Rafat; Sahar Hassany; Abdelmajeed M. Moussa; Helal F. Hetta

View Article PDF 845.3 K View on SCiNiTO

IS THE ANTIMICROBIAL RESISTANCE OF ESCHERICHIA COLI. PATHOGEN IN CHILDREN WITH DIARRHEAL INFECTION STILL A CONCERN IN INDONESIA? : AN UPDATED REVIEW

Pages 533-553

Omnia Amir Osman Abdelrazig; Fadilah Fadilah; Badriul Hegar; Yulia Rosa Saharman

View Article PDF 984.94 K View on SCiNiTO

EVALUATION OF BIOFIRE FILMARRAY PNEUMONIA PANEL IN DIAGNOSIS OF PNEUMONIA IN PEDIATRIC PATIENTS IN INTENSIVE CARE UNIT IN COMPARISON TO VITEK 2 COMPACT SYSTEM AND ROUTINE CULTURE METHODS

Pages 555-569

Amal Mohamed Hosni; Alaa Kadry Moawad; Hanan Hares AbdElateef; Mohamed Zakaria Abd El Rahman; Azaa Ahmed El-Tayeb; Noha Omer Sayed Khalil

View Article PDF 871 K View on SCiNiTO

THE DIVERSE ROLES OF MUCOSAL-ASSOCIATED INVARIANT T LYMPHOCYTES IN HEMATOLOGICAL MALIGNANCIES

Pages 571-584

Ali A Ahmed; Omnia Hasan Bakr Badawy; Mohamed El Mokhtar; Omer A Ahmed; Marwa Sabet; A M Zahran; Salwa Seif Eldin

View Article PDF 1.08 M View on SCiNiTO

SNAPSHOT ON A POSSIBLE THERAPEUTIC EFFECT OF ANTI-DIABETIC DRUGS IN GASTRIC ULCER

Pages 585-595

Samah Omar Hassan; Asmaa H Matouk; Aliaa Anter; Gehan Heeba

View Article PDF 863.99 K View on SCiNiTO

EMPAGLIFLOZIN MITIGATES ISCHEMIA/REPERFUSION-INDUCED LIVER INJURY IN RATS: MODULATION OF NF-ΚB, SMAD-4, VEGF, AND FIBRINOGEN PROTEIN EXPRESSIONS

Pages 597-612

DeiaaEldeen Elsayed Abouzed; Heba Mohsen Mahmoud; Amira Murad; Ramadan Hemada Hemada

View Article PDF 1.65 M View on SCiNiTO

THERAPEUTIC EFFICIENCY OF RANIBIZUMAB AND 4-METHYL CATECHOL ON THE PROGRESSION OF STREPTOZOTOCIN-INDUCED DIABETIC RETINOPATHY IN RATS: INVOLVING VASCULAR ENDOTHELIAL GROWTH FACTOR-A AND NERVE GROWTH FACTOR

Pages 613-627

Eman Elsayed; Amira El-Saadany; Walaa Elwan; Amany Abdin; Fleur Abd Elmonem

View Article PDF 1.69 M View on SCiNiTO

EMERGING THERAPIES IN PRIMARY BILIARY CHOLANGITIS: OVERVIEW OF CLINICALTRIALS.GOV

Pages 629-638

Nasser M Alorfi; Mansour Alourfi; Saeed Alsharif; Mohannad Abdulrahman Aljehani;

Abdulmalik Mohammed Alsabban; Mohammad J Almatrafi; Ysear Abdulaziz Zakri; Abdullah AlMahmoud; Monther F Ghunaiem; Rami Ahmad Almalki; Ibrahim Smran Aljerary; Abdullah Alkhattabi

View Article PDF 771.15 K View on SCiNiTO

PROTECTIVE EFFECTS OF MELATONIN AND CAPTOPRIL AGAINST CARDIAC OXIDATIVE STRESS AND DYSFUNCTION INDUCED BY NICOTINE IN RATS

Pages 639-654

Azza MA Abouelella; Ahmed Mostafa Mahmoud; Ahmed RH Ahmed; Eman Mohammed Ali

View Article PDF 2.01 M View on SCiNiTO

IMPACT OF DAPAGLIFLOZIN ON APOPTOSIS AND EFFECTOR CYTOTOXIC CELLS USING BREAST CANCER CELLS IN MICE

Pages 655-667

Shimaa M. M Elkhyat; Nageh Ahmed Elmahdy; Mayada E Elhusseiny; Abdel aziz Awad Zidan

View Article PDF 1.22 M View on SCiNiTO

GABAPENTIN PREVENTED DEPRESSIVE BEHAVIOR INITIATED BY DEXAMETHASONE, STRESS OR INFLAMMATION IN MICE

Pages 669-679

Azadeh Mesripour; Asiye Salehzade; Valiollah Hajhashemi

View Article PDF 870.62 K View on SCiNiTO

Bulletin of Pharmaceutical Sciences. Assiut

COUNTRY

Egypt

Universities and research institutions in Egypt

Media Ranking in Egypt

SUBJECT AREA AND CATEGORY

Biochemistry, Genetics and Molecular Biology
- Biochemistry
- Molecular Biology

Chemistry
- Analytical Chemistry

Immunology and Microbiology
- Immunology
- Microbiology

Pharmacology, Toxicology and Pharmaceutics
- Pharmaceutical Science
- Pharmacology

PUBLISHER

H-INDEX

10

PUBLICATION TYPE

Journals

ISSN

11100052

COVERAGE

2008-2014, 2016, 2018-2023

INFORMATION

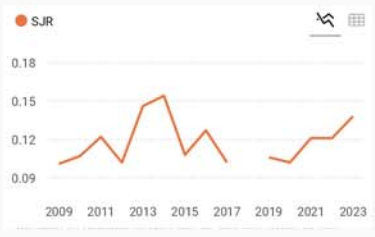
Homepage

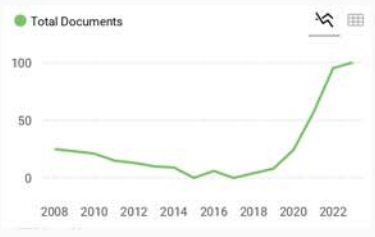
How to publish in this journal

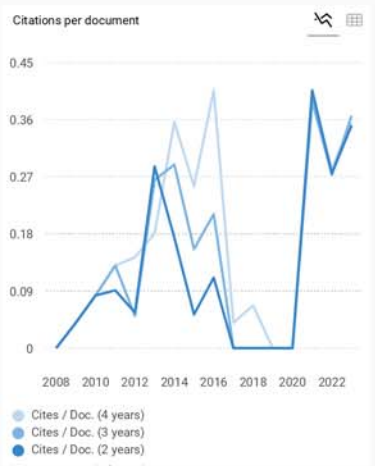
sheha@aun.edu.eg

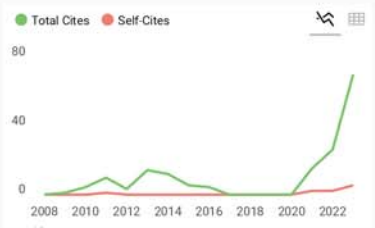
SCOPE

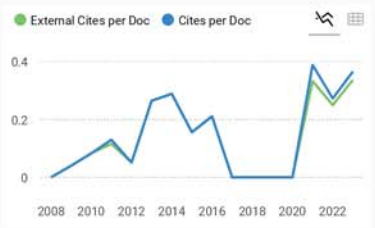
Bulletin of Pharmaceutical Sciences (Assiut University), a peer-reviewed, biannual, open access international journal, is the official journal of Faculty of Pharmacy, Assiut University. Its publications are multidisciplinary in the pharmaceutical fields and emphasis on originality and scientific quality. The Journal is abstracted and indexed by The Chemical Abstracts (CA) and The International Pharmaceutical Abstracts (IPA). Types of submissions that are considered by editors include original research articles, notes, short communication, and review articles. It is a platform for scientific publications of new and innovative research in the areas of: -Pharmaceutics- drug delivery systems- pharmacy practice- clinical pharmacy- analytical chemistry- pharmaceutical and biomedical analysis- medicinal chemistry- chemical synthesis- microbiology, immunology- natural products, pharmacognosy- biochemistry, molecular biology- pharmacology and toxicology

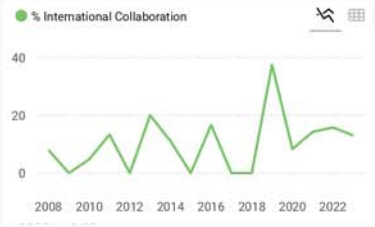


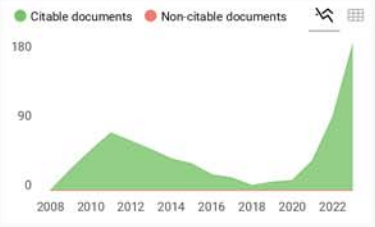


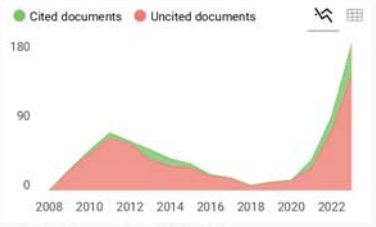


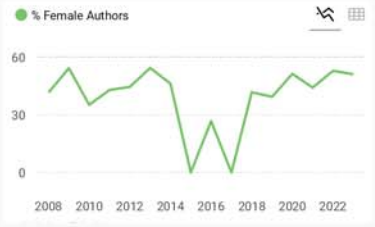


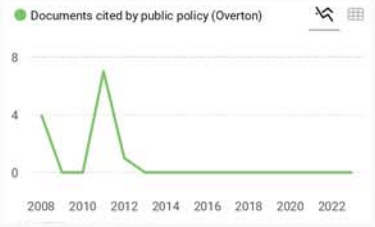


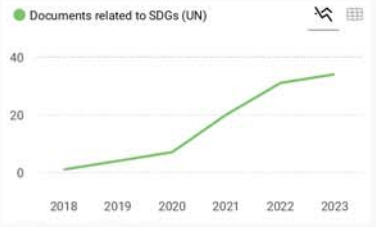












Metrics based on Scopus® data as of March 2024

Leave a comment

Name

Email
(will not be published)

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

Source details

Bulletin of Pharmaceutical Sciences, Assiut

Scopus coverage years: from 2008 to 2014, 2016, from 2018 to 2023

Publisher: Assiut University, Faculty of Pharmacy

ISSN: 1110-0052

Subject area: Pharmacology, Toxicology and Pharmaceutics: Pharmaceutical Science

Pharmacology, Toxicology and Pharmaceutics: Pharmacology

Source type: Journal

CiteScore 2022
0.3

SJR 2022
0.121

SNIP 2022
0.095

View all documents > | Set document alert | Save to source list

CiteScore | CiteScore rank & trend | Scopus content coverage

CiteScore 2022

$$0.3 = \frac{46 \text{ Citations } 2019 - 2022}{183 \text{ Documents } 2019 - 2022}$$

Calculated on 05 May, 2023

CiteScoreTracker 2023

$$0.4 = \frac{114 \text{ Citations to date}}{276 \text{ Documents to date}}$$

Last updated on 05 April, 2024 • Updated monthly

CiteScore rank 2022

Category	Rank	Percentile
Pharmacology, Toxicology and Pharmaceutics — Pharmaceutical Science	#152/171	11th
Pharmacology, Toxicology and Pharmaceutics — Pharmacology	#280/301	7th

View CiteScore methodology > | CiteScore FAQ > | Add CiteScore to your site

About Scopus

What is Scopus

Content coverage

Scopus blog

Scopus API

Privacy matters

Language

日本語版を表示する

查看简体中文版本

查看繁體中文版本

Просмотр версии на русском языке

Customer Service

Help

Tutorials

Contact us

ELSEVIER