RJC

RASĀYAN ***J. Chem.***
Vol. 16 | No. 3 |1127-1130| July - September | 2023
ISSN: 0974-1496 | e-ISSN: 0976-0083 | CODEN: RJCABP
http://www.rasayanjournal.com
http://www.rasayanjournal.co.in

ANALYSIS AND SEPARATION OF COMMON ADULTERANTS AND DILUENTS FROM THE ILLICIT DRUG (HEROIN)SAMPLES

Shobhana Sharma[1], Mamta Rathor[2], Geeta Wadhvani[2], Mukesh Goyal[2] and Sushil Kumar Sharma[3,✉]

[1]Department of Chemistry, S. S. Jain Subodh P.G. College, Jaipur-302004(Rajasthan)India
[2]Chemistry Division, State Forensic Science Laboratory, Jaipur-302016(Rajasthan)India
[3]Department of Pure and Applied Chemistry, University of Kota, Kota-324005(Rajasthan)India
✉Corresponding Author: sushil@uok.ac.in

ABSTRACT

The drug trafficking problem in Rajasthan is quite common as Rajasthan is the largest state in India, and many international and interstate borders surround it. Illicit traffickers can add unlimited diluents and adulterants to heroin. Only 5% or less than that alkaloid is present; the rest is of diluents and adulterants. Adulterants can associate with a significant risk of overdose, which may lead to death due to severe poisoning. Thus, the purity of drugs may vary, and the presence and percentage of diluents and adulterants depend on the region. The present article aims to identify and separate diluents and adulterants from diacetylmorphine drug samples. The illicit drug samples were deposited for investigations in the narcotics division of the state forensic science laboratory, Jaipur. During studies, sophisticated instruments like GCMS confirmed the preliminary results obtained from TLC and color tests. The variety and quantity of adulterants and diluents differ in all the samples, but the pattern is similar. The extensive and widespread cutting agent of illicit drugs used to analyze these drug samples.

Keywords: Illicit Drugs, Heroin, Muscle Relaxants, Adulterant, Cutting Agent, TLC, GCMS.

RASĀYAN *J. Chem.*, Vol. 16, No.3, 2023

INTRODUCTION

The most significant volume of criminal cases frames illicit drugs.[1] These illegal drugs create various social and health problems worldwide.[2] It is essential to monitor the use of illicit drugs as they continuously pose a significant threat in the context of worldwide public health.[3] Illegal drugs reduce the age of young people, and injecting drugs is a challenge in preventing HIV transmission.[4] Various factors enhance the use of abused drugs, like economic recessions, psychological distress, unemployment, etc.[5] Forensic laboratories employ for the investigation of these illicit drugs.[6] These illegal drugs contain several natural and synthetic opiate alkaloids with several adulterants and diluents.[7] Adulterants are substances added to enhance the bulk ratio of illegal drugs.[8] The psychoactive substances are called diluents, which increase the available drug in addition to the drug.[9] Readily available and economical adulterants are commonly used, like alprazolam, caffeine, paracetamol, Chloroquine, etc.[10] The analgesic effects and bitter taste of paracetamol degrade the quality of heroin. Caffeine possesses a stimulatory and synergistic effect as it improves the uptake of diacetylmorphine during heroin base smoking.[11] The pharmacological properties of alprazolam, like high potency, high binding affinity, and fast-acting, enhances the abuse potential of alprazolam.[12] The physical dependence and withdrawal syndrome of alprazolam also contribute to the addictive nature of alprazolam.[12] Chloroquine possesses a bitter taste but is used as a diluent as it is similar to heroin.[13] The instrumental techniques for the confirmatory chemical analysis of narcotic substances are required.[14] The preliminary investigations followed by TLC and double dimension TLC for identifying and separating narcotic substances from others.[15] Afterward, a sophisticated GC-Mass spectrometry technique employs for efficient and accurate results.[16] The present study helps determine the best solvent system for separating illicit diacetylmorphine from adulterants and diluents by chromatographic methods. It is essential to know the presence of diluents and adulterants and their percentage in the illicit sample, as an overdose of diluents and adulterants may lead to the death of individuals.

http://doi.org/10.31788/RJC.2023.1638268

EXPERIMENTAL

Materials

AR-grade solvents employ for the analysis of illicit drug samples. These samples were deposited in the narcotic division of the state forensic science laboratory, Jaipur. Solvents like chloroform, methanol, toluene, cyclohexane, diethylamine, absolute alcohol, etc., and spray reagents such as iodoplatinate and acidified potassium permanganate were employed for the analysis of these illicit drug samples. Iodoplatinate reagent is suitable for alprazolam, caffeine, chloroquine, and heroin, whereas acidifying potassium permanganate reagent utilizes for Paracetamol. A 0.5 g sample was employed to investigate and separate illicit drugs. TLC plates coated with 250 mm of a thin layer of silica gel-G. These plates activate at 110 0C temperature for 30 minutes before use.

Solvent Systems

The three sets of the solvent system in a particular ratio are used in the present investigation as follows:

1. Chloroform: Methanol: 90: 10 (solvent system-1)
2. Toluene: Diethylamine: 85:15 (solvent system-2)

Methods

TLC Method

The TLC and double-dimension TLC techniques are employed to separate the contaminants in illicit drug samples. Before use, the activation of a thin layered glass plate is essential. The illegal samples of the drug (A, B, C, and D with control) are dissolved in the absolute alcohol and spotted on chromatoplates through a micropipette. The chromatographic chamber saturates for 30 minutes. Afterward, the spotted chromatoplates were developed ascendingly in the chromatographic section. The TLC plates from the chromatographic chamber remove after the migration of mobile phases till the mark of the solvent front. After that, these TLC plates dried in the air, and then a suitable reagent was sprayed over the TLC plate to develop different colored spots.

Double-Dimension TLC Techniques

During double-dimension TLC techniques, the chromatographic plate of sample E is allowed to run through two different solvent systems. In the first dimension, solvent system-1 followed, whereas, in the second dimension, solvent system-2 employs. This chromatographic plate is sprayed with Iodoplatinate reagent to differentiate different colored spots.

Gas Chromatography-Mass Spectrometry (GC-MS)

GC-Mass spectrometry is a combination method to identify different organic substances in drug samples. It is a standard technique that provides specific and analytically sensitive results.

RESULTS AND DISCUSSION

Analyzing the trace quantities of impurities in drug samples received in forensic science laboratories is critical. Several diluents and adulterants find in these drug samples, and it is pretty challenging to identify and separate the presence of these diluents and contaminants in the samples. In the present communication, attempts were made to determine the suitability of the solvent system required for separating and identifying diluents, adulterants, and other impurities in 4 illicit drug samples (A, B, C & D).

The solvent system-1(Chloroform: Methanol: 90: 10) is unsuitable for the separation due to similar Rf values.

Another solvent system-2 (Toluene: Diethylamine: 85:15), is a suitable solvent system that provides different Rf values for chloroquine, other diluents, and adulterants from heroin. Iodoplatinate reagent is used as a spraying reagent, reacting with carbon and nitrogen-based alkaloids to provide different colors. The Rf values of heroin 0.77; chloroquine 0.68; alprazolam 0.42; caffeine 0.57, and paracetamol 0.26 indicated good separation in solvent system-2. The Rf values of suspected samples agree with traditional values found in the literature, as shown in Fig.-1. Sometimes, the double dimension technique also detects trace quantities of diluents like alprazolam, caffeine, and paracetamol (Fig.-2) present in illicit heroin.

Figure-3 confirms the presence of the diluents like acetaminophen (paracetamol), caffeine, and alprazolam through gas chromatography-mass spectrometry.

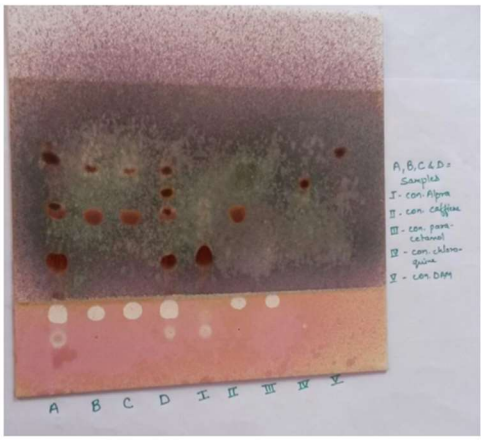


Fig.-1: Separation of Heroin, Chloroquine, Alprazolam, Caffeine, and Paracetamol Present in All Four Samples of Illicit Drug Heroin by TLC Method.

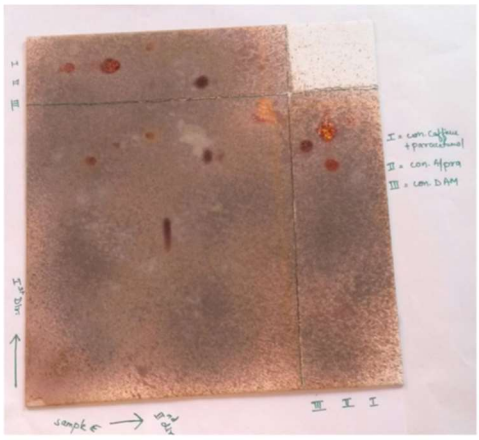
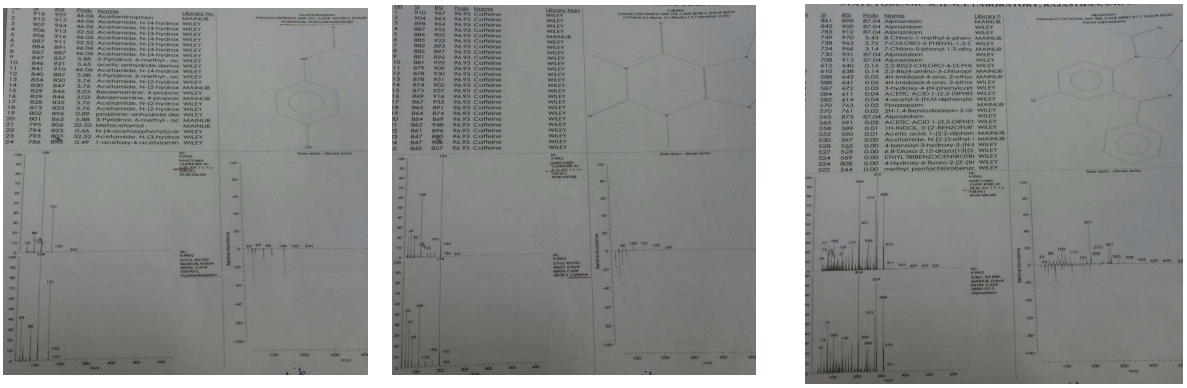


Fig.-2: Detection of Trace Quantity of Diluents Like Alprazolam, Caffeine, and Paracetamol Found in Illicit Drug Samples Through Double Dimension Technique



(a) (b) (c)

Fig.-3: Gas Chromatography-Mass Spectrometry (a) Acetaminophen (Paracetamol), (b) Caffeine, and (c) Alprazolam

CONCLUSION

The cost-effective TLC method is used to screen and analyze opiate compounds. This primary method follows by a sophisticated GC-MS method. The present article concludes that solvent system-2 is more suitable than the other solvent system. The solvent system-2 provides separated R_f values for adulterants, diluents, and impurities in illicit drug samples.

ACKNOWLEDGMENTS

The authors are grateful to Mr. B.B. Arora, Director, State Forensic Science Laboratory, Rajasthan, Jaipur, for providing the necessary facilities for this investigation.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS

All the authors contributed significantly to this manuscript, participated in reviewing/editing, and approved the final draft for publication. The research profile of the authors can be verified from their ORCID ids, given below:

Shobhana Sharma http://orchid.org/0000-0001-8927-3280

Mamta Rathor http://orchid.org/0009-0000-1498-9743
Geeta Wadhvani http://orchid.org/0009-0003-3085-9203
Mukesh Goyal http://orchid.org/0009-0007-1783-940X
Sushil Kumar Sharma http://orchid.org/0000-0001-7591-2029

REFERENCES

1. X. Rêgo, M. J. Oliveira, C. Lameira and O. S. Cruz, *Substance Abuse Treatment, Prevention, and Policy*, **16**, 59(2021), https://doi.org/10.1186/s13011-021-00394-7
2. S. Debbaut, *International Journal of Law, Crime and Justice*, **68**, 100508(2022), https://doi.org/10.1016/j.ijlcj.2021.100508
3. F. Doroudi1 and A.R Vassigh, *East Mediterr Health Journal,* **26(3),** 257(2020), https://doi.org/10.26719/2020.20.3.257
4. K. Tinasti, *Journal of the International AIDS Society*, **21**, e25045(2018), https://doi.org/10.1002/jia2.25045
5. S. Ayllon and N. N. Ferreira-Batista, *Journal of Health Economics*, **57**, 236(2018), https://doi.org/10.1016/j.jhealeco.2017.08.005
6. L. Harper, J. Powell and E. M. Pijl, *Harm Reduction Journal*, **14**, 52(2017), https://doi.org/10.1186/s12954-017-0179-5
7. M. Akhgari, A. Etemadi-Aleagha and F. Jokar, *Neuropathology of Drug Addictions and Substance Misuse*, **1**, 867(2021), https://doi.org/10.1016/B978-0-12-800213-1.00081-X
8. M. Vanila, M. D. Singh, M. A. Thom Browne and J. Montgomery, *Public Heath Report*, **XX(X),** 1(2019), https://doi.org/10.1177/0033354919887741
9. A. Shafi, A.J. Berry, H. Sumnall, D.M. Wood and D. K. Tracy, *Therapeutic Advances in Psychopharmacology,***10**,1(2020), https://doi.org/10.1177/2045125320967197
10. V. Kolbe, D. Rentsch, D. Boy, B. Schmidt, R. Kegler and A. Büttner, *International Journal of Legal Medicine*, **134**, 1727(2020), https://doi.org/10.1007/s00414-020-02352-7
11. A. Bourmaud, G. Dahm, F. Meys, N, Gengler, A. Origer and Serge Schneider, *Harm Reduction Journal*, **18**, 97(2021), https://doi.org/10.1186/s12954-021-00544-x
12. N. Ait-Daoud, A. S. Hamby, S. Sharma and D. Blevins, *Journal of Addiction Medicine*. **12(1)**, 4(2018), https://doi.org/10.1097/ADM.0000000000000350
13. K. A. Phillips, G. A. Hirsch, D. H. Epstein and K. L. Preston, *Journal of General Internal Medicine*, **27**, 1722(2012), https://doi.org/10.1007/s11606-012-2089-2
14. A. M. Ciobanu , D.L. Baconi, C. Bălălău , C. Negrei , M. Stan and M. Bârcă, *Journal of Mind and Medical Sciences*, **2(2)** , 108(2015)
15. E. Matysik, A. Woźniak, R. Paduch, R. Rejdak, B. Polak and H. Donica, *Journal of Analytical Methods in Chemistry*, **2016**, 1813581(2016), https://doi.org/10.1155/2016/1813581
16. J. Piechocka, M. Wieczorek and R. Głowacki, *International Journal of Molecular Sciences,* **21(23)**, 9252(2020), https://doi.org/10.3390/ijms21239252

[RJC- 8268/2023]