



SYNTHESIS AND DEVELOPMENT OF MOBILE PHASE BY THINLAYER CHROMATOGRAPHY OF BENZIMIDAZOLE

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ABSTRACT

Benzimidazoles are bicyclic compounds consists of the fusion of benzene and imidazole ring. It having many pharmacological properties like antidiabetic, anticancer, antimicrobial, analgesic, and antihistaminic. Chromatography is the method of separating mixture of components into individual components. Thin layer chromatography is a chromatographic technique used to determine purity of substance and also used to monitor the progress of reaction.

Keywords: O-Phenylenediamine, Benzimidazole, chromatography

1. INTRODUCTION

Benzimidazoles are heterocyclic aromatic compound. These are bicyclic compound consists of the fusion of benzene and imidazole ring with acidic and basic nitrogen. Benzimidazole moiety shows many potent pharmacological properties like antidiabetic, anticancer, antimicrobial, antiparacytic, analgesic, and antihistaminic. It is also used in cardiovascular disease, neurology, endocrinology, ophthalmology etc. Benzimidazoles containing anthelmintic drugs are commonly used in veterinary practices to treat gastro-intestinal infections and animal fattening purposes. Benzimidazole moiety is very popular due to its excellent properties like bioavailability and significant biological activity.

Chromatography is the method of separating mixture of components through equilibrium distribution between two phases i.e. mobile phase and stationary phase. Chromatography is non-destructive method for resolving a multicomponent mixture of trace, minor, major, constituents into its individual fractions. There are different types of chromatography like thin layer chromatography, column chromatography, partition chromatography, paper chromatography, gas chromatography, ion exchange chromatography etc.

Thin layer chromatography is a chromatographic technique used to separate component from mixtures. Thin layer chromatography performed on glass sheet or aluminum foil coated with a thin layer adsorbent. There are different types of adsorbents are used such as silica gel, alumina, kiesleguhr and cellulose powder. Silica gel G is most common and widely used adsorbent. The adsorbent layer is known as Stationary phase and the solvent mixture is known as Mobile phase. Thin layer chromatography is simple cost effective and easy to operate technique with numerous applications which is used in the development of new drug in pharmaceutical industry. Thin layer chromatography is laboratory technique that is used:

- i) To monitor the progress of reaction.
- ii) To identify compounds present in a given substance.
- iii) To determine the purity of substance.

2. MATERIAL AND METHODS

O-Phenyldiamine, Formic acid, Sodium hydroxide solution Charcoal were purchased from merck chemicals. All organic solvents were purchased from research laboratory chemicals.

2.1 Synthesis of Benzimidazole

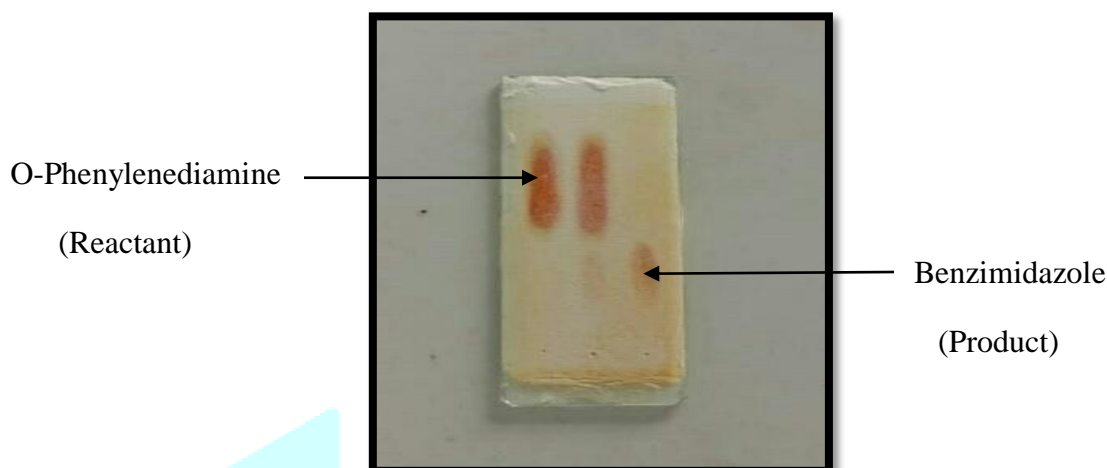
2.1.1 Procedure:

1. Place 27gm o-phenyldiamine in 250ml of RBF and add 17.5gm (16ml) of 90% formic acid.
2. Heat mixture on water bath at 100°C for 2Hrs.
3. Cool, and add 10% sodium hydroxide solution slowly with constant rotation of the flask until the mixture is just alkaline to litmus.
4. Filter of crude Benzimidazole at pump, wash with ice cold water, drain well and wash again with 25ml cold water.
5. Dissolve the crude product in 400ml boiling water added 2gm decolorising carbon and digested for 15 min. Filter rapidly pump through a preheated buchner funnel and flask.
6. Cool filtrate about 10°C filtered off Benzimidazole washed with 25ml cold water and dry at 100°C.

2.2 Mobile Phase and Chromatographic Analysis :

Mobile phase of benzimidazole optimized by using polar and non polar solvents like benzene, acetone, methanol, ethanol, etc. Best optimized mobile phase was Benzene : Acetone, 7 : 3 (10ml).

3. RESULT AND DISCUSSION



Calculation of R_f Value

$$R_f = \frac{\text{Distance Travelled By Solute}}{\text{Distance Travelled By Solvent}}$$

O-Phenylenediamine (Reactant) = 0.73

Benzimidazole (Product) = 0.39

The percentage practical yield of Benzimidazole was 84%w/w. The melting point was 171°C. The mobile phase carried out by various polar and non-polar solvents. The optimized mobile phase for Benzimidazole was found that Benzene : Acetone (7:3) by volume. The R_f value of O-Phenylenediamine (Reactant) and Benzimidazole (Product) was found to be 0.73 and 0.39 respectively.

4. CONCLUSION

In this present work, Benzimidazole synthesized from O-Phenylenediamine with good practical yield. Optimization of mobile phase carried out by using laboratory polar and non-polar solvents with good results of chromatogram.

5. REFERENCES:

1. A. H. Beckett, J. B. Stenlakes, Practical pharmaceutical chemistry, Thin layer chromatography, CBS Publication 4th edition, 2005, 114-128.
2. D. A. Skoog, F. J. Holler, Principles of Instrumental Analysis, Saunder's publications, 5th edition, 2006, 2.599-2.616.
3. Gurdeep R. Chatwal, Sham K. Aannad, Instrumental methods of chemical analysis, Himalaya Publication, 2008, 2.567-2.575, 2.600-2.615.
4. P. G. Mann, B. C. Saunders, Practical Organic Chemistry, 4th edition, Pearson Education, 2011, 207
5. Archana A. Bele, Anubha Khale, An overview on thin layer chromatography, International Journal of pharmaceutical sciences and research, 2011, 2(2), 256-267.
6. Brian S. Fueiss, Vogel's textbook of practical organic chemistry, 5th edition, Dorling Kindersley (India) Pearson Education, 2012, 1153.
7. Sanjeet Kumar, K. Jyotirmayee, Monalisa Sarangi, Thin layer chromatography: A tool of biotechnology for isolation of bioactive compounds from medical plants, International Journal of pharmaceutical sciences review and research, 2013, 18(1), 256-267.
8. Le chai, Thin Layer chromatography, Current protocols essential laboratory techniques, 2014, 6.3.1-6.3.18.
9. Ritupurana Palit, Rajesh Kumar, Nikita Sarawat, Ankita Wal, Prabhat Kumar Upadhyaya, Benzimidazole An Overview, International journal of research in Ayurveda and pharmacy, 2016, 7(6), 68-73.
10. Marina A Tazani, Catherine Gabrial, Selective synthesis of benzimidazoles from O-Phenylenediamine and aldehydes promoted by supported gold nanoparticles, MDPI nanoparticles, 2020,10,2405.