Oxidative Coupling Reaction for Spectrophotometric Determination of Phenylephrine Hydrochloride

Deepa.N*[1], Arun A C[2], Lohith S[3], Keerthana S[4], Bharath S[5], Mohammed Fazan O[6], Kowsik E[7], Gowtham S[8], Divya S[9], Jenifer J[10], Hari M[11], Prabakaran C[12], Sheela .M[13], Jayasree J.N[14]

Saveetha College of Pharmacy, Saveetha Institute Of Medical and Technical Sciences, Thandalam, Chennai, Tamil Nadu, India.

Corresponding Author: Dr.Deepa.N, Email: deepanatarajan@yahoo.com

Abstract

PEH (phenylephrine hydrochloride) is a medication that reduces nasal congestion by restricting the blood vessels in the nasal mucosa. This medicine is also used to dilate the pupil and treat cold and rhinitis symptoms. EH is a sympathomimetic drug (-Adrienne) with the chemical name (R)-1-(3-hydroxyphenyl)-2-methylamino ethanol hydrochloride. This medication may help treat low blood pressure and relieve the symptoms of external or internal haemorrhoids.This study focused on the oxidative coupling reaction of phenylephrine with N, N dimethyl-p-phenylenediamine dihydrochloride and ferric chloride in a primary medium to produce a green-blue soluble dye product is the basis for this approach.0.1 gramme of phenylephrine in 100 mL of H2O was used to make a 1,000 g/mL PEH solution. 25 and 10 ml of the obtained solution were diluted to 100 ml with distilled water, respectively, to get 250 and 100 g/mL. Tulshiram syrup was used as a sample, and 50 mL was taken. After that, the oxidizing agent was made by dissolving 0.23 gramme FeCl3 in 100 mL distilled water. Dissolving 0.4 gramme of sodium hydroxide in 100 mL of distilled water yielded a sodium hydroxide solution.

The t-test method was utilized to evaluate the validity of the proposed method for precision with the standard method. Potentiometric titration of pure medication solution in anhydrous acetic acid with per-chloric acid was used for the evaluation. As a result, NNDPH and other existing approaches are compared. F = 3.22, t = 1.24; the obtained result was smaller than the tabular value for F, t. (required). The tabular value for F, t was F = 6.36, t = 2.776 at a confidence level of 95%, and for four degrees of freedom was F = 6.36, t = 2.776. As a result, these figures show that the proposed strategy is effective.PEH is a nasal decongestant that can help you breathe easier if you have a stuffy nose. It helps you breathe more easily by shrinking the blood vessels in your nose and sinuses.

Key Words: Phenylephrine Hydrochloride, Nasal Decongestant,Hemorrhoids

Introduction:

PEH (phenylephrine hydrochloride) is a medication that reduces nasal congestion by restricting the blood vessels in the nasal mucosa. This medicine is also used to dilate the pupil and treat cold

and rhinitis symptoms. EH is a sympathomimetic drug (-Adrienne) with the chemical name (R)-1-(3-hydroxyphenyl)-2-methylamino ethanol hydrochloride. This medication may help treat low blood pressure and relieve the symptoms of external or internal haemorrhoids. Many methods for estimating phenylephrine have been proposed in the literature, including the following:

• Flow-injection-chemiluminescence

• Chromatographic

• Spectrophotometric

• Electrical

Nanotubes can also be used to determine phenylephrine levels. The approach was recently adopted using an oxidative coupling reaction with N, N-dimethyl-phenylenediamine dihydrochloride in the presence of ferric chloride in a robust base solution.

Aim and Objective:

This study focused on the oxidative coupling reaction of phenylephrine with N, N dimethyl-p-phenylenediamine dihydrochloride and ferric chloride in a primary medium to produce a green-blue soluble dye product is the basis for this approach.

Material and Methods:

0.1 gramme of phenylephrine in 100 mL of H2O was used to make a 1,000 g/mL PEH solution. 25 and 10 ml of the obtained solution were diluted to 100 ml with distilled water, respectively, to get 250 and 100 g/mL. Tussiram syrup was used as a sample, and 50 mL was taken. After that, the oxidizing agent was made by dissolving 0.23 gramme FeCl3 in 100 mL distilled water. Dissolving 0.4 gramme of sodium hydroxide in 100 mL of distilled water yielded a sodium hydroxide solution. The reagent was produced by dissolving 0.209 gramme of N, N dimethyl-p-phenylenediamine dihydrochloride 0.01M in 100 mL of distilled water to achieve the necessary concentration.

Results and Discussion:

Using 2 mL of 250 g/mL concentrated medication, the optimal circumstances for determining the best number of elements that affect the intensity of the product colour and absorption were investigated. The Number of Oxidizing Reagents Has an Effect 1-mL ferric chloride oxidant solution, 2 mL phenylephrine solution, and 1-mL sodium hydroxide solution were combined to make the oxidizing reagent. A variety of reagent quantities was created, ranging from 0.5 to 2 ml, as demonstrated in Table 1

Table 1: Effect of oxidizing reagent amount

Amount of oxidizing reagent	Absorbance	
	BW	SB
0.5	0.044	0.265
0.8	0.052	0.345
1	0.074	0.355

1.5	0.056	0.551
2	0.086	0.412

1.5 mL of reagent volume resulted in the highest absorption. As a result, it has been used in recent studies. The Effect of Coupling Reagent Quantity. A series of 0.5 to 2 mL of the oxidizing agent ferric chloride, 1-mL of N, N dimethyl-p-phenylenediamine dihydrochloride, and 1-mL of sodium hydroxide solution was made to evaluate the effect of the coupling reagent. The higher amount of absorption is absorbed by 2 mL of the prepared series (Table 2)

Table 2: Impact of the amount of coupling reagent

Amount of coupling reagent (mL)	Absorbance	
	BW	SB
0.5	0.052	0.326
0.8	0.041	0.325
1	0.05	0.321
1.5	0.081	0.422
2	0.042	0.521

To test the compliance of the produced solution with Beer's law, a series of PEH solutions containing 100 g/mL (1–6.5 mL) was prepared. The equation's constants were calculated using linear regression. With a range of 4 to 22 g.mL-1 of PEH, the coefficient of determination (R2) was (Y =0.0272x – 0.0115), as shown.

The t-test method was utilized to evaluate the validity of the proposed method for precision with the standard method. Potentiometric titration of pure medication solution in anhydrous acetic acid with per-chloric acid was used for the evaluation. As a result, NNDPH and other existing approaches are compared. F = 3.22, t = 1.24; the obtained result was smaller than the tabular value for F, t. (required). The tabular value for F, t was F = 6.36, t = 2.776 at a confidence level of 95%, and for four degrees of freedom was F = 6.36, t = 2.776. As a result, these figures show that the proposed strategy is effective.

Conclusion:

PEH is a nasal decongestant that can help you breathe more manageable if you have a stuffy nose. It helps you breathe more easily by shrinking the blood vessels in your nose and sinuses. On the other hand, many reagents were utilized as an oxidative coupling for this medication. This drug's characteristics were determined using a variety of approaches. An oxidative coupling reaction of phenylephrine with N, N dimethyl-p-phenylenediamine dihydrochloride, and ferric chloride in fundamental conditions to create a green-blue soluble dye product has been proposed this study. According to the findings, the current method is suitable for routine analysis of this substance in pharmaceutical preparations and its pure form. This method is also known for its linearity, precision, and high compatibility. It does not require particular parameters, such as temperature or pH limit.

References:

1. Journal, B. S. (2015). Spectrophotometric determination of Phenylephrine hydrochloride and Salbutamol sulphate drugs in pharmaceutical preparations using diazotized Metoclopramide hydrochloride. *Baghdad Science Journal*. https://doi.org/10.21123/bsj.12.1.167-177

1. Aljeboree, A. M., & Alshirifi, A. N. (2018). Spectrophotometric determination of phenylephrine hydrochloride drug in the existence of 4-aminoantipyrine: Statistical study. *International Journal of Pharmaceutical Research*. https://doi.org/10.31838/ijpr/2018.10.04.103
2. Beyene, N. W., & Van Staden, J. F. (2004). Sequential injection spectrophotometric determination of phenylephrine hydrochloride in pharmaceutical preparations. *Talanta*. https://doi.org/10.1016/j.talanta.2003.11.041
3. WASAN An AL-UZRI. (2019). DETERMINATION OF PHENYLEPHRINE HYDROCHLORIDE IN PHARMACEUTICAL PREPARATIONS USING SPECTROPHOTOMETRIC METHOD. *Asian Journal of Pharmaceutical and Clinical Research*. https://doi.org/10.22159/ajpcr.2019.v12i5.32339
4. Elfatatry, H. M., Mabrouk, M. M., Hammad, S. F., Mansour, F. R., Kamal, A. H., & Alahmad, S. (2016). Development and validation of chemometric-assisted spectrophotometric methods for simultaneous determination of phenylephrine hydrochloride and ketorolac tromethamine in binary combinations. *Journal of AOAC International*. https://doi.org/10.5740/jaoacint.16-0106
5. De Fabrizio, F. (1968). Spectrophotometric determination of acetaminophen, phenylephrine hydrochloride, codeine phosphate, and pyrilamine maleate in tablets or powder. *Journal of Pharmaceutical Sciences*. https://doi.org/10.1002/jps.2600570422
6. Abd-Alaah, H. J., & Hamody, A. S. (2018). Design of experiments model for optimization of spectrophotometric determination of phenylephrine hydrochloride in pure and pharmaceutical formulations using p-bromanil. *Journal of Pharmaceutical Sciences and Research*.
7. Al-Abachi, M. Q., & Subhi, S. (2013). Flow injection-Spectrophotometric Determination of Phenylephrine Hydrochloride and Amoxicillin Trihydrate in Pharmaceutical Preparations. *Journal of Al-Nahrain University Science*. https://doi.org/10.22401/jnus.16.1.07
8. Rocha, J. R. C., Galhardo, C. X., Natividade, M. A. E., & Masini, J. C. (2002). Spectrophotometric determination of phenylephrine hydrochloride in pharmaceuticals by flow injection analysis exploiting the reaction with potassium ferricyanide and 4-aminoantipyrine. *Journal of AOAC International*. https://doi.org/10.1093/jaoac/85.4.875
9. Savić, I., Nikolić, G., Savić, I., & Banković, V. (2008). The simultaneous spectrophotometric determination of trimazolin and phenylephrine hydrochloride in nasal preparations. *Chemical Industry and Chemical Engineering Quarterly*. https://doi.org/10.2298/CICEQ0804261S
10. Mostafa, N. M., Elsayed, G. M., Hassan, N. Y., & El Mously, D. A. (2017). Development and Validation of Eco-Friendly Liquid Chromatographic and Spectrophotometric Methods for Simultaneous Determination of Coformulated Drugs: Phenylephrine Hydrochloride and Prednisolone Acetate. *Journal of AOAC International*. https://doi.org/10.5740/jaoacint.17-0001

11. Aljeboree, A. M., & Alshirifi, A. N. (2018). Colorimetric determination of phenylephrine hydrochloride drug using 4-aminoantipyrine: Stability and higher sensitivity. *Journal of Pharmaceutical Sciences and Research*.