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Reliability, Speed And Simplicity Of Nicorandil Determination By High-Performance Liquid Chromatography Reverse-Phase Technique

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Abstract: This study aims to use a high-performance liquid chromatography-ultraviolet technique to assess Nicorandil in drug products using LC100. The experimental estimating procedure also emphasizes the importance of studying the relative stability of Nicorandil in drug products. It conducts a variety of tasks to validate the chromatographic method for estimating Nicorandil in drug products. Analysis of pharmaceuticals obtained from either The purity of the medicine and its composition, if it is concerned with its components, is determined using a synthetic or natural source. The quantitative and qualitative characterization of samples is carried out. In this study, a new method for Nicorandil was developed using RP-HPLC-UV, which is simple, sensitive, accurate, robust, rugged, and quick. The sample was weighed using an electronic balance and a Quantum prominence Isocratic HPLC system along with an L.C. 20 pump, SPD-20A detector, and spinchrom CFR software (column, C18, 250 4.6 mm; 5). A 50:50 mixture of 0.1 percent formic acid and acetonitrile was used to create the versatile stage. A hundred milligrams of the drug were accurately weighed and broken up in methanol to provide one milligram per milliliter. This work aimed to provide a sensitive, exact, and precise RP HPLC technique for analyzing Nicorandil in mass examples or prescription dose configurations. Nicorandil retention was 4.0 minutes over a 10-minute run, with column pressures ranging from 138 to 141 kg/cm2. The lack of extra pinnacles implies that the tablet's active component is not hindered. With a C.V. of less than 1%, the pills were determined to have 99.89 to 100.08 percent of the designated total, indicating the repeatability of the Nicorandil evaluation in the tablet measurement structure. The proposed switching stage HPLC technique was simple, precise, explicit, and less time-consuming.

KEYWORDS: Isocratic HPLC system, Quantitative HPLC, Nicorandil, Tablet composition, SPD-20A detector

INTRODUCTION

Nicorandil, as shown in Figure 1 and 2, is the-[(pyridine-3-ylcarbonyl)amino]ethyl nitrate, a vasodilator, and anti-angina drug. It is being used to treat angina (Kandabashi, T: 2000; Al‑Salman, H.

N. K.:2020). It is a nitric vasodilator with low plasma concentrations that dilates major coronary arteries. It lowers coronary vascular resistance when given in high doses. Half-life: 1 second, Molecular mass: 211.175 g/mol (M Takemoto, 2002) Take Composition formula: C8H9N3O4 (WHO) C01DX16, which is the code for Therapeutic chemical anatomical (Kugiyama, K; 1996;Al‑Salman, Hussein N.: 2020).

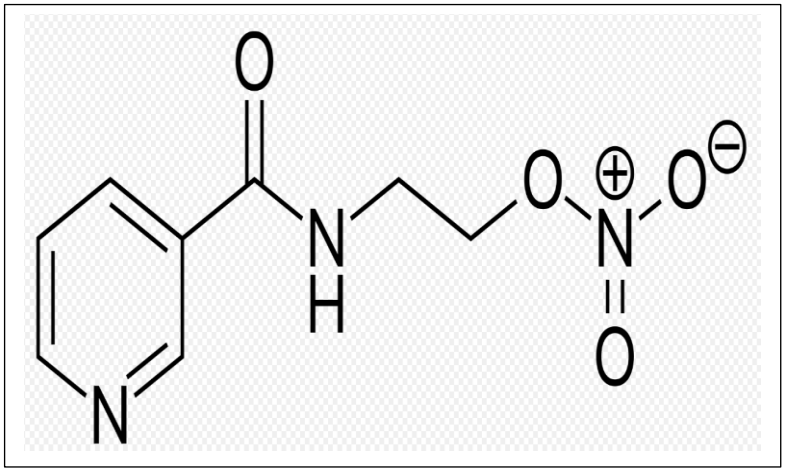

Figure 1: Nicorandil's chemical composition

In the treatment of angina, nicorandil appears to be as successful as isosorbidedinitrate, propranolol, atenolol, nifedipine, or diltiazem. Clinical experiments have also shown that congenital and ischemia problems improve for up to a year after treatment. The effectiveness of nicorandil in other kinds of angina pectoris has not been investigated. This drug can be given intravenously and is just as efficient as isosorbidedinitrate in treating unsteady and variable angina pectoris, according to clinical trials. The effectiveness of nicorandil for individuals with unstable and fluctuating angina pectoris who cannot use typical antianginal medications is frequently limited by data, which is why this is a critical study. The most common contributing factor is mild to moderate headaches, affecting one-third of individuals on the prescribed nicorandil 10 to 20 mg twice daily (Fischer, Jnos; 2006; Al-Bahadily, Dawood CH.: 2020).The case of headache caused by nicorandil was identical to that generated by isosorbidemononitrate and isosorbidedinitrate in a trial including 84 people. After starting therapy, the most common symptom was a headache. However, it faded as time went on (Jump, Nakae; 2000). Approximately 5% of European study participants have dropped out due to headaches, though this rate could be reduced by starting with a lower dose of nicorandil (5 mg twice daily). In conclusion, clinical evidence demonstrates that nicorandil is a convincing long-term alternative to

traditional vasodilator therapy with conventional nitrates and calcium antagonists in treating stable angina pectoris, thanks to its novel combination of two separate separate treatments vasodilator processes (Jump up to: Sauzeau; 2000). More research is needed to determine whether nicorandil's unique pharmacological profile is beneficial for treating other kinds of angina and/or the ischemic myocardium (Vrolix, M; 1988).

The purpose of drug analysis is to assess the purity of medications received from either a synthetic or natural source and ascertain their composition when it comes to their ingredients. Both quantitative and qualitative methods are used to characterize samples (Liu, Y; 1998). Many new formulations have emerged in recent years, either as single-component or multi-component formulations (Frederick William field,2000). As a result, it cannot confirm the product's quality; otherwise, it must meet specific analytical/testing labs standards. The International Organization for Standardization (ISO) and the National Good Laboratory Practices Compliance Monitoring Authority are two organizations that monitor compliance with good laboratory practices (NGCMA), as well as the National Accreditation Board for Laboratories, are both internationally recognized (NABL). Analyses based on peak height, peak locations, calibration inner standard method, and area normalization technique were used to determine peak height, peak areas, calibration internal traditional manner, and area normalization method (Skoog, Holler, Crouch,2012).

The main goal of this research is to develop a new scientific approach based on the analysis of numerous characteristics that can be used to calculate the maximum absorbance at different nm of medications that produce a decent peak and inject the appropriate volume. For this study, a moderate temperature column was chosen. The flow rate is set at ml per minute, demonstrating an adequate reaction time and reasonable resolution. Following this, a mobile phase is maintained throughout the procedure and recovery studies that should be precise over its scale. The drug's detection limit and further linearity are determined. Ruggedness and correlation confection are at allowed levels as this procedure moves on.

EXPERIMENTAL WORK

The current study developed a new RP-HPLC method for Nicorandil, which is simple, sensitive, accurate, robust, rugged, and quick.

INSTRUMENTATION:

An electronic balance and a quantitative HPLC system with an Angstrom central Isocratic

HPLC system with an LC 100 pump, SPD-20A detector, and LC100 Angstrom software were used to weigh the substance (column, C18, 250 4.6 mm; 5).

Table 1: The research materials used.

materials	classification	Equipped company
Acetonitrile	HPLC	Ranbaxy, Merck
Methanol	HPLC	Merck
Formic acid	AR	Merck
Water	HPLC	Ranbaxy

Chromatographic Environment:

A 50:50 mixture of 0.1 percent formic acid and acetonitrile was used to create the versatile stage. Before use, the material from the portable stage was sifted through a 0.45m layer channel, degassed with helium cleaning for 15 minutes, and pumped from the dissolvable supply to the section at a stream rate of 1.0 mL/min, yielding a segment with a back weight of 138-141 kg/cm2. The run time was set to ten minutes, and the temperature of the part was maintained at 30 degrees Celsius. The infusion circle had a volume of 20µL. With a moveable stage traveling through the framework, the section was equilibrated for at least 30 minutes before the infusion of medicinal preparations. With a moveable phase traveling through the framework, the area was equilibrated for at least 30 minutes before injecting medicinal preparations. At 260 nm, the components were evaluated, and data was collected, stored, and deconstructed using the "Angstrom" programming language.

Standard Solutions:

A hundred milligrams of the drug were accurately weighed and broken up in methanol to provide one milligram per milliliter (Figure 2 and 3). Methanol was used to weaken this arrangement, resulting in a convergence of 60 to 300 g/mL Nicorandil (Figure 4 and 5). The above-mentioned standard arrangements were administered numerous times into a portion at a 1.0 mL/min rate. The apex

zones of medicine concentration have been identified. It was discovered that the pharmaceutical fixation over the pinnacle zones had relapsed. This relapse situation was used to evaluate the Nicorandil dose structure in tablet form.ANicorandil solution containing 60 g/mL and 360 g/mL was subjected to the suggested HPLC analysis to determine intraday and interday changes. The recovery experiments were carried out by adding a known amount of Nicorandil to the pre-investigated sample and analyzing the proposed RP-HPLC method.

Assay of Nicorandil tablet:

In total, ten 100 mg pills were measured and powdered. In a 100ml volumetric cup containing 50ml of methanol, a carefully calculated amount of powder equivalent to 100 mg of Nicorandil was inserted. The contents of the cup were sonicated for 15 minutes. A portable stage was used to break up and build up the volume of nicorandil, and the resulting mixture was separated using a 0.45m channel. To weaken this arrangement, methanol was utilized, resulting in a grouping of 20 µg/mL. This configuration (60 µl) was repeated multiple times in the segment. The medication content in the tablet was assessed using the previously acquired relapse condition, and the mean pinnacle zone estimations of six such findings were calculated. A similar procedure was used to analyze Nicorandil in several industrially available tablet dosage forms.

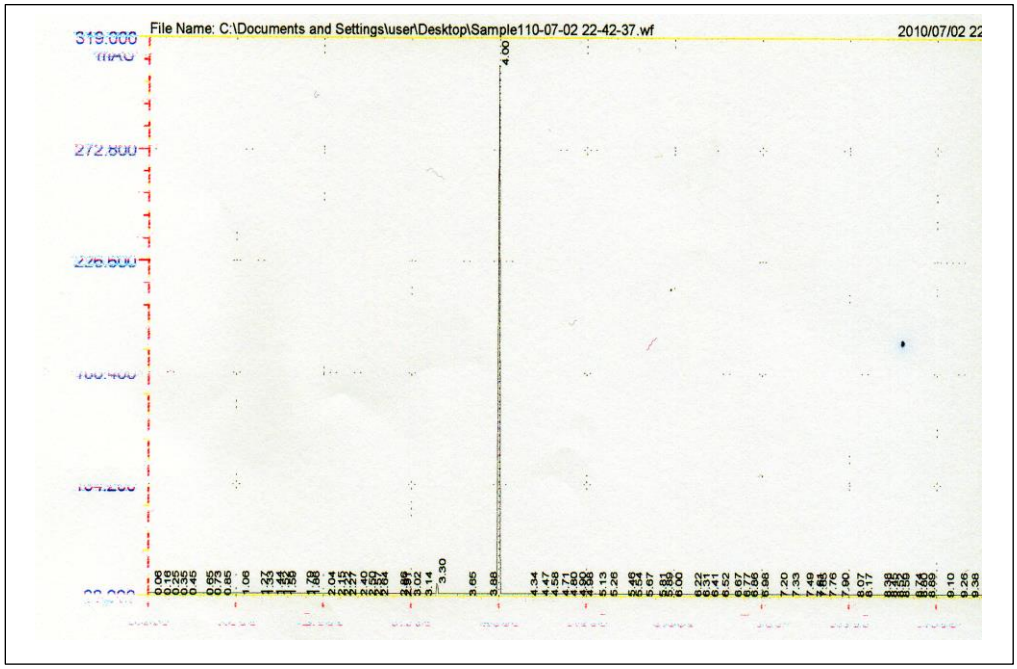

Figure 2: Nicorandil chromatogram (Pure)

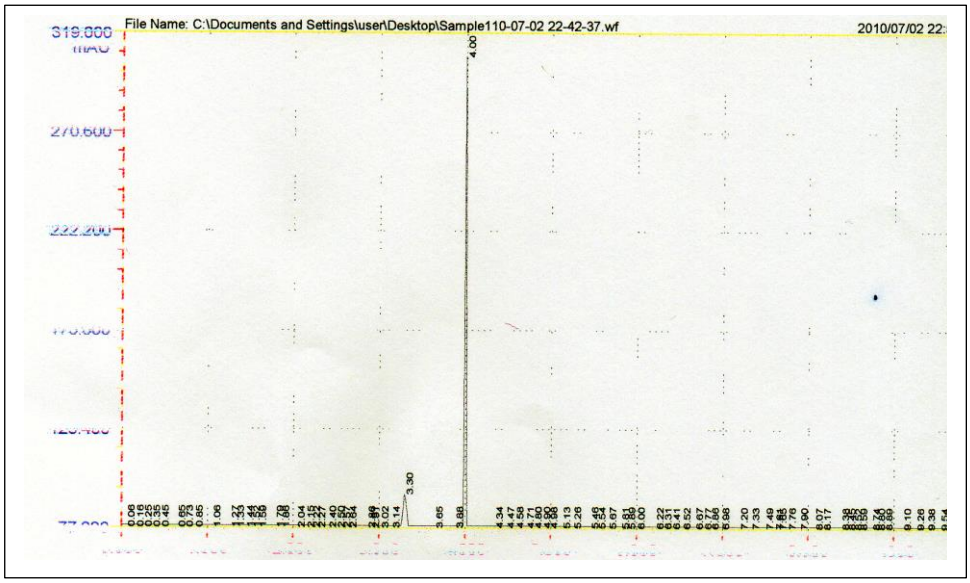

Figure 3: Nicorandil composition chromatogram

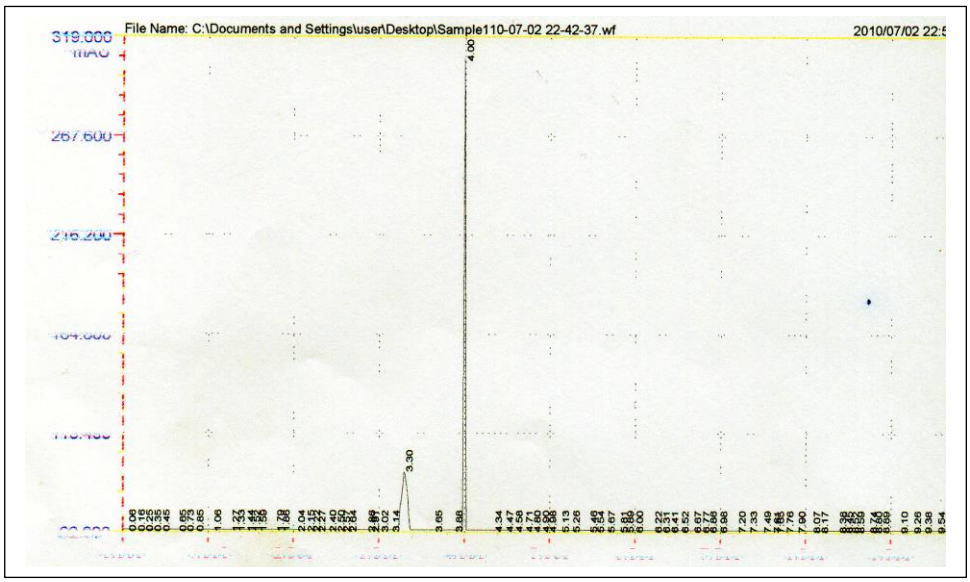

Figure 4: Nicorandil chromatogram at 60 µg/ml

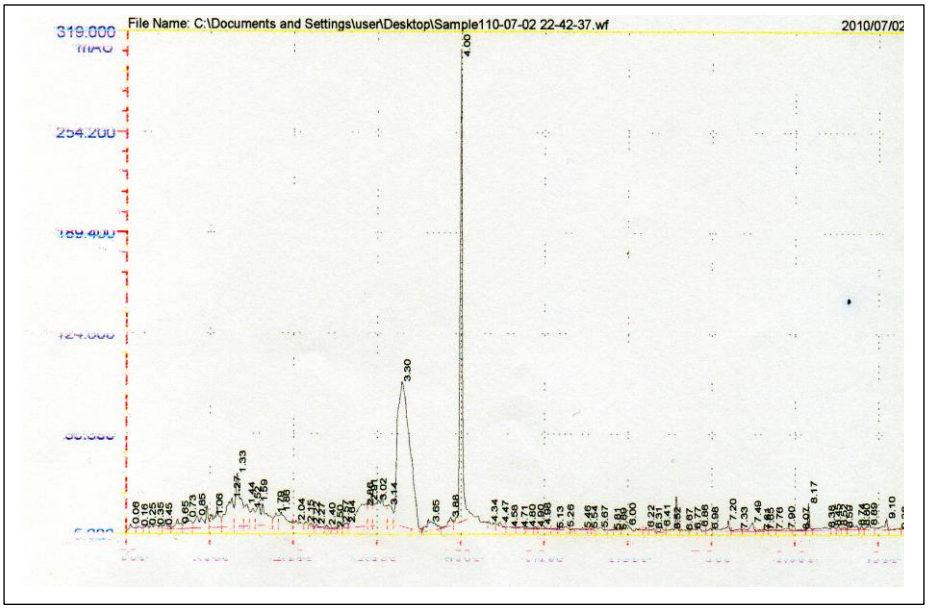

Figure 5: Nicorandil chromatogram at 300 µg/ml

Table 2: linear coefficients

X-axis (µg)	Y-axis (Area)
60	12563
150	32241.67
180	39271
240	51944
300	66339.67
360	78352.33

Table 3: Relative standard deviation **(RSD)**

µg/mL	Area	Retention Time
60	12283	8.584
60	12117	8.566

60	12207	8.573
60	12387	8.584
60	12206	8.578
60	12298	8.596

S.D = 93.418 **S.D = 0.0104**

Mean = 12249.66, **Mean = 8.5802**

RSD = 0.762 **RSD = 0.1207**

Table 4: calibration curve.

Concentration (µg/mL)	**Peaks Area**
30	6281.50
60	12563
90	18844.50
120	25126
150	32241.67
180	39271
210	45451
240	51944
270	59705.70
300	66339.67
330	71822.95
360	78352.33

Regression equation (Y = bC+ a) Y is Peak area, C is Concentration	
Slope (b)	219.4
Intercept (a)	- 345.7
Correlation coefficient (r)	0.9999

Table 5: The precision (interday and intraday)

Concentration (µg/mL)	Inter day		Intra day	
	SD	%C.V.	SD	%C.V.
300	76.468	0.11439	93.112	0.1394
360	91.761	0.1372	111.734	0.1672

Table 6: The Recovery test

Drugs Weight (µg)	drug solution		powdered tablet	
	Mean (µg)	%Recovery	Mean (µg)	%recovery
240	239	98.07 ± 0.23	239.7	98.78 ± 0.13
300	295	99.04 ± 0.11	299.39	99.40 ± 0.02
360	358	99.15 ± 0.12	359.8	99.63 ± 0.12

Table 7: The average quantity.

Trade mark	Drugs Weight (mg)	Mean found ±SD% (mg)	Mean found ±SD%
T_1, (Torrent)	10	9.99 ± 0.02	99.89 ± 0.03
T_2, (Zydus)	10	10.009 ± 0.01	100.08 ± 0.02

RESULT AND DISCUSSION:

This research aimed to create a sensitive, exact, and precise RP HPLC technique for analyzing Nicorandil in mass samples or prescription dose structures. Nicorandil retention was 4.0 minutes over a 10-minute run, with column pressures ranging from 138 to 141 kg/cm2. Each example was infused many times, and all of them had similar maintenance times. Table 2 shows the pinnacle territory of various attention setups described above and the typical motivation for six such judgments. The low coefficient of variation demonstrated that the pinnacle region for drug placement was repeatable (0.762 percent). The centralization of Nicorandil and the various pinnacle territories had an excellent direct association (R2= 0.9999). When the proposed RP-HPLC technique was used to break down a Nicorandil arrangement containing 60 to 300 g/mL to find intra and bury day variation, a low co-effective of type was discovered, and values were expressed in tables, the alignment diagram was found to be Y=219.4C 345.7, where Y is the pinnacle region. Nicorandil is classified as C if it has a concentration of 30 to 300 g/mL. (See Tables 3-5 for more details.)

This demonstrates that the current HPLC approach was exact. Table 6 shows that 99.76 percent Nicorandil could be recovered from the pre-broken down example, demonstrating the incredible precision of the suggested RP-HPLC technique. The proposed insightful technique was used to measure the amount of medication in the tablet. Table 7 shows the average Nicorandil substance in two different brands of tablet measuring formats. The absence of extra pinnacles indicates that the tablet's excipient is not obstructing the flow of information. The tablets were found to have 99.89 to 100.08 percent of the marked total, with a C.V. of less than 1% demonstrating the repeatability of the Nicorandil examination in the tablet measuring structure. The proposed switching stage HPLC technique was simple, precise, explicit, and less time-consuming.

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AUTHOR'S CONTRIBUTIONS

This study was carried out independently at the laboratories of the the College of Pharmacy at Al-Ayen University, This study was conducted over three months with severe and constant effort, yielding promising results in developing a sensitive and straightforward HPLC-UV method for estimating the Nicorandil component in medicines.

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