ABSTRACT
A simple, sensitive, accurate, trustworthy, and stable UV spectrophotometric approach has been devised to quantify resveratrol in pharmaceutical formulations and bulk materials. After scanning the UV spectrum from 200 to 400 nm, the highest wavelength for absorption was determined to be 306 nm. For the medication, Beer’s rule has been adhered to within a concentration range of 1 to 5 µg/mL. While the developed method was able to recover a good amount of drug (%Recovery), the precision study’s percentage RSD values were ≥2%. The method demonstrated effective functionality for a pharmaceutical dosage form containing resveratrol, free from interference from the excipients. Correspondingly, the limit of detection (LoD) for resveratrol were 0.13 and 0.40 µg/mL. The results of this investigation have been confirmed in accordance with ICH standards. Research on artificial degradation has been greenlit, which investigates the impacts of several environmental factors over a broad pH spectrum, including heat, oxidation, photolysis, and hydrolysis vulnerability.

Keywords: UV spectrophotometric, Resveratrol, Forced deterioration, ICH norms

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MATERIALS AND METHODS
Lupin Laboratories, located in Aurangabad, Bihar, gave a complimentary sample of resveratrol. Research Lab, Mumbai, supplied the chemicals and solvents of analytical reagent quality. The spectra were recorded using a Jasco UV/VIS double-beam spectrophotometer (Model No.: V-730) equipped with identical quartz cells that were 1-cm in diameter. Methanol was consistently utilized in all experimental procedures.

Standard Stock Solution
After carefully measuring out 10 mg of resveratrol, it was put to a volumetric flask of 100 mL. After that, about 100 mL of methanol was added to dissolve it. A 100 µg/mL stock solution was produced by adjusting the volume with methanol until it reached the mark.

Calibration Curve for Resveratrol
Through scanning an appropriate solution in UV-vis spectrophotometer between 200 and 400 nm in wavelength, \( \lambda_{\text{max}} \) of resveratrol was 306 nm (Figure 2). Then, aliquots (1, 2, 5 mL) were pipetted into each of five volumetric flasks from the standard resveratrol solution, and the volume was adjusted with methanol up to 10 mL and concentration were prepared 1 to 5 ppm respectively. At next, the absorbance at 306 nm was calculated using a blank for the reagent. Overlaid spectra were found in Figure 3. Figure 4 shows the results of creating a calibration curve by graphing absorbance against concentration (µg/mL). We also calculated the correlation coefficient. Table 1 summarizes the analytical parameters in detail, whereas Table 2 provides the data from the calibration curve.

Method Validation
Parameters for validation. The process has been evaluated in terms of ruggedness, accuracy, and precision. This approach aligns with the ICH Q2B guidelines, emphasizing the importance of thorough method validation in analytical chemistry. The linearity of the suggested approach was determined by taking absorbance readings from standard solutions by concentrations reaching from 1 to 5 µg/mL and analyzing results using least square regression. The conventional addition method confirmed the suggested approach’s accuracy, and recovery experiments were conducted at 80, 100, and 120% of the objective concentration. The percentage of analytical recovery was determined by comparing the concentration achieved after adding spiked samples to the actual predicted theoretical concentration increase. By doing the study for six concentrations at two distinct times during the day, the intra-day precision was obtained. Analysis on two consecutive days was used to determine inter-day precision similarly. The proposed methods’ limit of detection (LoD) and limit of quantitation (LoQ) were determined. One indicator of the method’s precision or bias is the success rate of analyte recovery from a given matrix. 11

Stability Studies of Resveratrol
Forced degradation of resveratrol was performed to carry out stability tests. This study examined the effects of oxidation, temperature, photolysis, and hydrolysis all over a broad pH range. 0.1, 1 and 3% H\(_2\)O\(_2\) were utilized for the oxidation study, 0.1, 0.5, 1 N HCl for acidic hydrolysis, 0.1, 0.5, 1 N NaOH for basic hydrolysis, and methanol for neutral hydrolysis. The sample solution was exposed to sunlight for three days to undergo photolysis, and it was also heated to 60 to 70°C for one hour in order to apply thermal stress. 12

RESULT AND DISCUSSION
Creating a quick, sensitive, accurate, and affordable analytical technique for routine quantitative sample analysis can lessen
the need for labor-intensive sample preparations and lower overall labor and material costs. Figure 2 shows the resveratrol absorption spectra in methanol.

Through scans across the whole UV area, the drug’s Amax for analysis was determined to be 306 nm. The data from the calibration curve, which were set up within the expected concentration range of 1 to 5 µg/mL, obeyed Beer’s law. Results from regression equation $Y = 0.1093x+0.0045$ showed a correlation coefficient (r) of 0.9920. Table 2 presents specifics of calibration plot properties. Repeat studies of standard solutions were used to evaluate recommended trials’ accuracy and precision (Tables 3 and 4). Determined boundaries of it was found that the computed LoQ and LoD were 0.404 and 0.132 µg/mL, correspondingly.

These results demonstrate that the created approach was easy to use, affordable, quick, accurate, and precise. As a result, it may be used to determine the amount of resveratrol in pharmaceutical tablets without the excipients interfering.

Regular and quality control analyses of resveratrol in pharmaceutical formulations and raw materials based on forced degradation tests (Table 5) that meet ICH criteria can be conducted using this technology.

**CONCLUSION**

Resveratrol in bulk and pharmaceutical formulations can be quantitatively determined using an established, reliable UV spectrophotometric method. The following advantages of this method stand out: reproducibility, sensitivity, accuracy, and precision. It minimizes the need for solvents and thus cuts down on the time needed to establish a generic approach. We have demonstrated the stability-indicating nature of the technique through forced degradation studies conducted under a number of ailments such as temperature, oxidation, neutral conditions, photolysis, and hydrolysis susceptibility throughout a wide pH range. The protocols followed by these investigations were those established by the ICH. The suggested approach works well for both bulk and pharmaceutical formulation resveratrol regular analysis and quality.

**REFERENCES**


