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Degradation Study Of Paracetamol In Bulk And Tablet Using Uv Spectroscopy

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ABSTRACT:

Objective: To study the degradation study of Paracetamol in bulk and tablet using uv spectroscopy.

Methods: The study was a Paracetamol in bulk and tablets using UV spectroscopy. To study duration was 3 month October to December 2022.

Result: The stability studies indicates that appreciable changes were observed by treating the drug, Paracetamol with UV light, thermal stress, Addition of acids and bases, Oxidation and Hydrolysis reaction along with their appreciable changes in λ max value, Absorbance, Percentage and Degraded rate of Paracetamol. For forced degradation studies, the study of effect of drug with various conditions, for alkaline media, it was performed by refluxing 10mg of Paracetamol with alkaline solution (NAOH). For acidic media, refluxation is made with acidic solution (Con.H2SO4). For Oxidation, Hydrolysis, Photolysis and Thermal stress. It was made by using Oxidizing agent, Reducing acid, UV light and Heat.

Conclusion: All these factors lead to the conclusion that the stability indicating UV spectroscopic method Degradation can be applied sussesfully for the estimation Paracetamol in bulk and in Pharmaceutical formulation without interference using distilled water. However there was no appreciable change with thermal and alkaline hydrolysis.So the proposed method can be used for routine quantative estimation of Paracetamol in bulk and Pharmaceutical formulation.

Keywords: Paracetamol bulk and tablet, UV spectroscopy, Degradation process

I. INTRODUCTION:

Chemical stability of pharmaceutical molecules is a matter of great concern as it affects the safety and efficacy of the drug product. The authority and ICH guidances state the requirement of stability testing data belowstand|to know|to grasp} how the quality of a drug substance and drug product changes with time under the influence of various environmental factors. Knowledge of the stability of molecule helps in selecting proper formulation and package as well as providing proper storage conditions and shelf life, which is essential for regulatory documentation. Forced degradation could be a method that involves degradation of drug products and drug substances at conditions additional severe than accelerated conditions and product generates degradation products that may be studied to determine the stability of the molecules. The ICH guideline states that stress testing is meant to identify the probably degradation products that further helps in determination of the intrinsic stability of the molecule and establishing degradation pathways, and to validate the stability indicating procedures used but these guidelines are very general in conduct of forced degradation and do not provide details about the practical approach towards stress testing. The stability studies include long term studies (12 months) and accelerated stability studies (6 months). But intermediate studies (6 months) can be performed at conditions milder than that used in accelerated studies. So the study of degradation products like separation, identification and quantitation would take even more time. As compared to stability studies, forced degradation studies help in generating degradants in much shorter span of time, mostly a few weeks. The samples generated from forced degradation can be accustomed develop the stability indicating

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methodology which might be applied latter for the analysis of samples generated from accelerated and long term stability studies. This project provides a proposal on the practical performance of forced degradation and its application for the development of stability indicating method.

Selection Of Degradation Conditions:

Forced degradation is carried out to produce representative samples for developing stability-indicating methods for drug substances and drug products. A minimal list of stress factors suggested for forced degradation studies must include acid and base hydrolysis, thermal degradation, photolysis, and oxidation could include freeze–thaw cycles and shear.

SELECTION OF DRUG CONCENTRATION:

Which concentration of drug should be used for degradation study has not been laid out in regulative guidance. it's recommended that the studies should be initiated at a concentration of 1 mg/mL. By using drug concentration of 1 mg/mL, it is usually doable to get even minor decomposition products within the vary of detection. It's suggested that some degradation studies should also be done at a degree which the drug is predicted to be present within the final formulations. Samples of for proposing this is often the examples of amino penicillin and amino cephalosporin wherever a spread of chemical compound shaped are found to be formed in commercial preparations containing drug in high concentrations.

INTRODUCTION OF PARACETAMOL:

Paracetamol is one of the most commonly prescribed pharmaceutical drugs as it has been according as safe for human usage in analgesic and antipyretic therapy.It is considered one in every of the three most prescribed drugs, and is ranked among the 200 prime prescriptions in the u. s.. Paracetamol has been found in aquatic ecosystems within the wild. This compound reaches the natural environment either through direct disposal of domestic drugs, discharges of feces/urine, or the inappropriate treatment of industrial effluents.The toxicity of paracetamol has been documented extensively in animals and humans. Shown in Fig.1

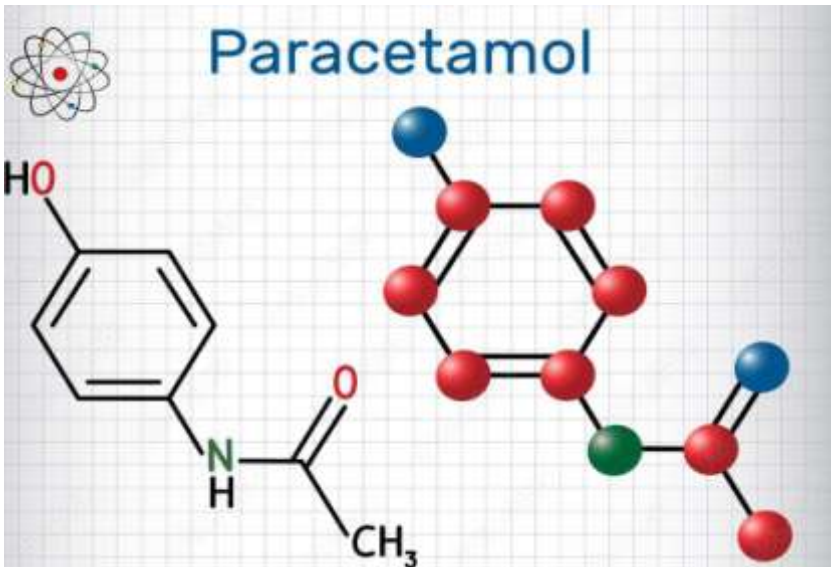

Fig.1 Structure of Paracetamol

OBJECTIVE:

The quality of the finished products is very important from the point of view of,

- Safety
- Acceptability
- Efficacy

The stability is considered as one of the most important criteria in pharmaceutical quality control as stable preparation would promise precise delivery of the drug to patients.

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II. MATERIALS AND METHOD:

Apparatus:

A Systronics, AU-270/UV Visible Double Beam Spectrometer provided with 1cm matched quartz cell was used for absorbance measurement.

Reagents and Chemicals:

Paracetamol was obtained as gift sample for Micro Lab Pharmaceuticals Pvt. Ltd. (Bangalore Karnataka). All other reagents used were of analytical grade.

Preparation of Standard solution of PCT:

10 mg pure Paracetamol was transferred to 100ml volumetric flask and diluted up to the mark with distilled water to get a concentration of 100µg/ml solution. In a 10ml volumetric flask, pipette out 1ml from the standard stock solution and dilute it up to the mark with distilled water (10µg/ml) and scanned between 200 to 400nm and 257nm was found to be maximum wavelength for absorption. Shown in Fig .2

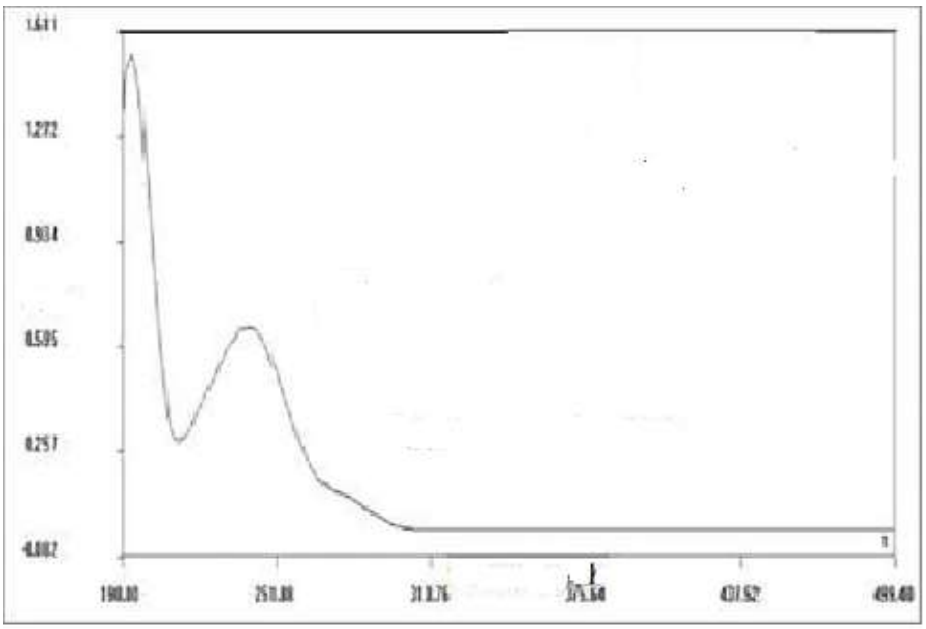

Fig.2 UV curve of standard solution of PCT.

Forced Degradation Studies:

Acid Hydrolysis:

Forced degradation in acidic media was performed by adding 10 mg of Paracetamol to 10 ml 0.01N HCl and refluxing the mixture at 80ºC for approximately 2 hours. The solution was then left to reach ambient temperature, neutralized to pH 7 by addition of 0.01N NaOH. In a 10 ml volumetric flask, pipette out 1ml from above solution and dilute it up to the mark with distilled water (100µg/ml). In a 10ml volumetric flask pipette out 1ml from above solution and dilute it up to the mark with distilled water so as to get final concentration 10 µg/ml and run the spectrum. Shown in Fig.3

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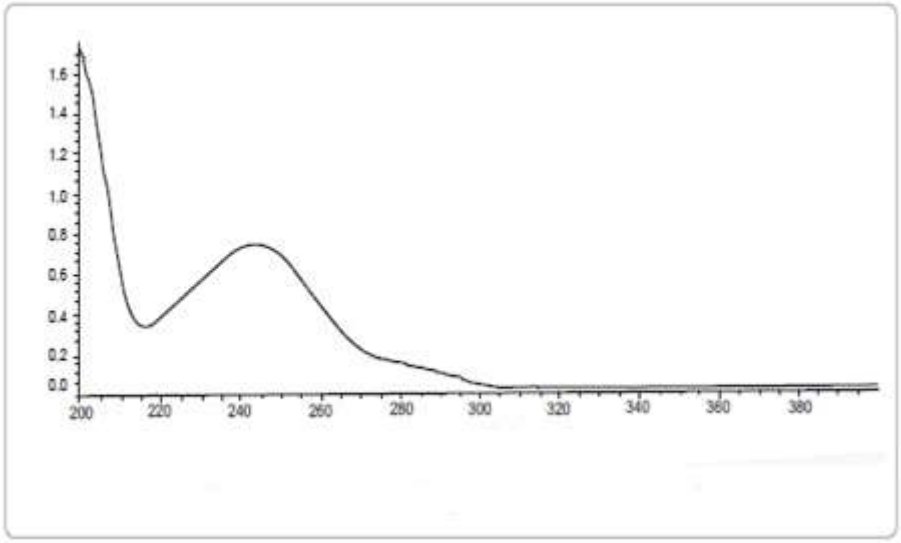

FIG 3: UV curve for acid hydrolysed paracetamol solution

ALKALINE HYDROLYSIS:

Forced degradation in alkaline media was performed by adding 10 mg of Paracetamol to 10 ml 0.01 N NaOH and refluxing the mixture at 80ºC for approximately 2 hours. The solution was then left to reach ambient temperature, neutralized to pH 7 by addition of 0.01N HCl. In a 10ml volumetric flask, pipette out 1ml from above solution and dilute it up to the mark with distilled water (100µg/ml). In a 10ml volumetric flask, pipette out 1ml from above solution and dilute it up to the mark with distilled water so as to get final concentration 10 µg/ml and run the spectrum. Shown in Fig.4

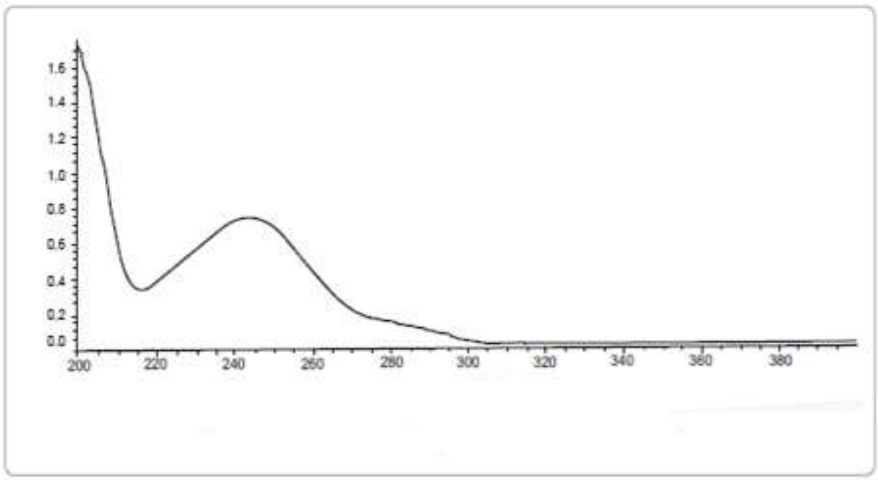

Fig 4: UV curve for alkaline hydrolysed paracetamol solution.

Oxidative Degradation:

To study the effect of oxidizing conditions, 10 mg of Paracetamol was added to 10 ml 30% H_2O_2 solution. In a 10ml volumetric flask, pipette out 1ml from above solution and dilute it up to the mark with distilled water (100µg/ml). In a 10ml volumetric flask, pipette out 1ml from above solution and dilute it up to the mark with distilled water so as to get final concentration 10 µg/ml and run the spectrum. Shown in Fig.5

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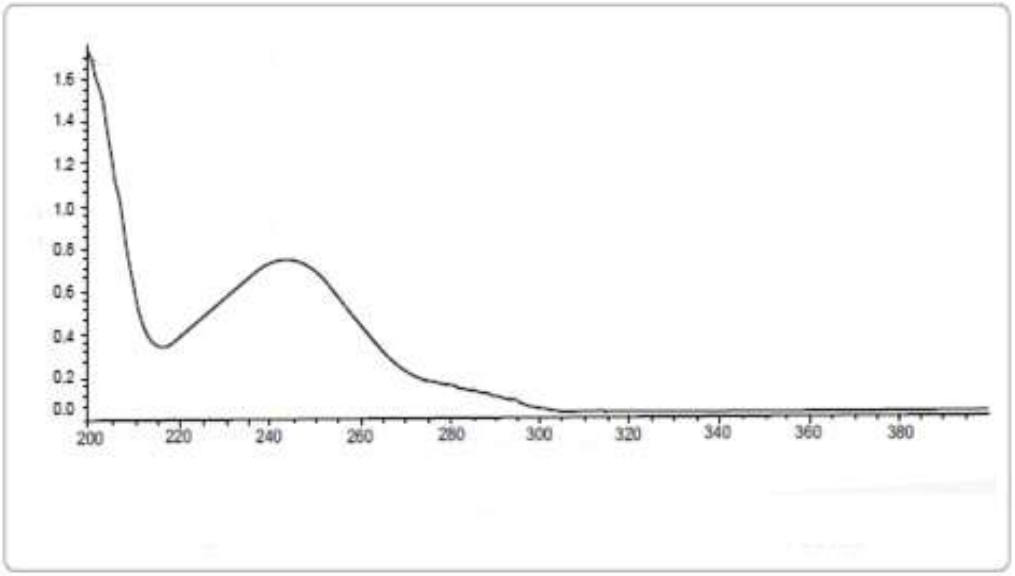

Fig 5: UV curve for oxidative hydrolysed paracetamol solution.

Thermal Degradation:

To study the effect of temperature, approximately 10 mg Paracetamol was stored at 80ºC for 2 days. Then, 10 mg taken and was dissolved in distilled water and volume was adjusted up to 10 ml with distilled water to get concentration of 1000 µg/ml. Pipette out 1ml from above solution and dilute it up to the mark with distilled water (100 µg/ml). In a 10ml volumetric flask, pipette out 1ml from above solution and dilute it up to the mark with distilled water so as to get final concentration 10µg/ml and run the spectrum. Shown in Fig.6

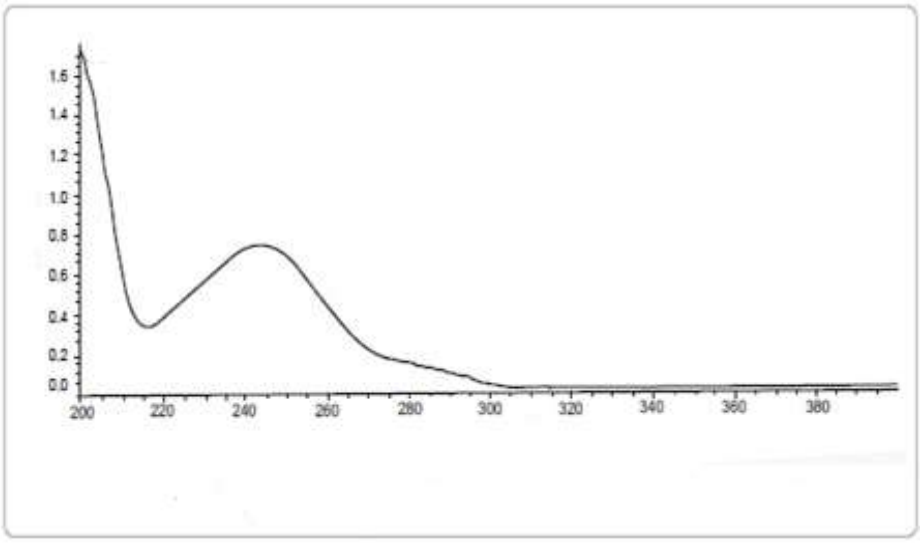

Fig 6: UV curve for Thermal hydrolysed paracetamol solution

Photolysis:

To study the effect of UV light, approximately 10 mg Paracetamol was exposed to short and long wavelength UV light (254 and 366nm, respectively) for 24 hours, then dissolved in distilled water and made up volume 10 ml in volumetric flask to get concentration of 1000 µg/ml. Further dilution was made with distilled water so as to get final concentration 10µg/ml and run the spectrum. Shown in Fig.7

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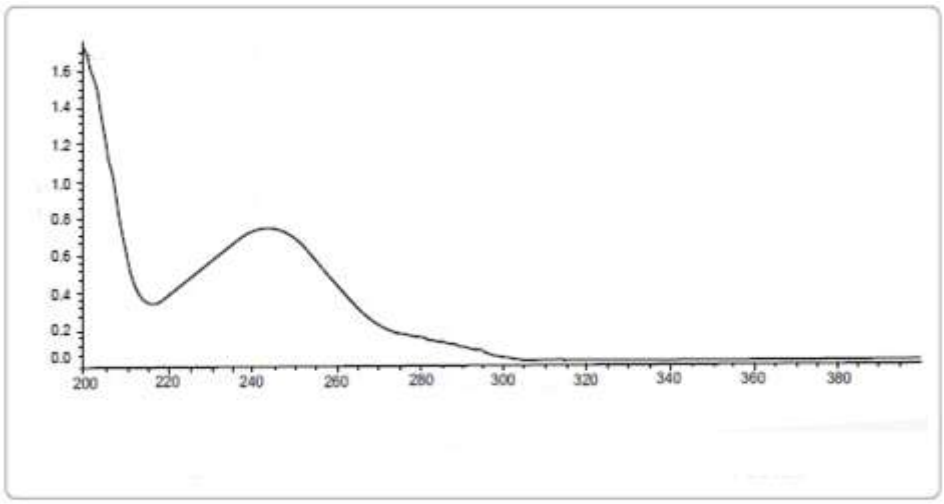

Fig 7: UV curve for Photolysis hydrolysed paracetamol solution

III. RESULT AND DISCUSSION:

The stability studies indicates that appreciable changes were observed by treating the drug, Paracetamol with UV light, thermal stress, Addition of acids and bases, Oxidation and Hydrolysis reaction along with their appreciable changes in λ max value, Absorbance, Percentage and Degraded rate of Paracetamol. For forced degradation studies, the study of effect of drug with various conditions, For alkaline media, it was performed by refluxing 10mg of Paracetamol with alkaline solution (NAOH). For acidic media, refluxation is made with acidic solution (Con.H2SO4). For Oxidation, Hydrolysis, Photolysis and Thermal stress. It was made by using Oxidizing agent, Reducing acid, UV light and Heat.

CONDITION	PCT	AB	CONC	%	DEGRADED
NORMAL	API	0.721	10	100	UNDEGRADED
	TAB	0.695	9.85	98.5	UNDEGRADED
ACID	API	0.667	9.66	96.6	UNDEGRADED
	TAB	0.623	9.491	94.9	UNDEGRADED
ALKALINE	API	0.675	9.75	97.5	UNDEGRADED
	TAB	0.643	9.56	95.6	UNDEGRADED
THERMAL	API TAB (24hrs)	0.598	8.60	86.0	UNDEGRADED
		0.567	8.50	85.0	UNDEGRADED
	API	0.545	8.34	83.4	DEGRADED

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	TAB (48hrs)	0.534	8.28	82.80	DEGRADED
OXIDATIVE	API	0.789	11.39	113	UNDEGRADED
	TAB	0.722	11.21	112	UNDEGRADED
PHOTOLYSIS	API	0.798	11.68	114	UNDEGRADED
	TAB (24hrs)	0.723	11.31	113	UNDEGRADED
	API	0.812	11.79	117	DEGRADED
	TAB (48hrs)	0.799	11.69	116	DEGRADED

IV. CONCLUSION:

All these factors lead to the conclusion that the stability indicating UV spectroscopic method Degradation can be applied sussesfully for the estimation Paracetamol in bulk and in Pharmaceutical formulation without interference using distilled water. However there was no appreciable change with thermal and alkaline hydrolysis.

So the proposed method can be used for routine quantative estimation of Paracetamol in bulk and Pharmaceutical formulation.

V. ACKNOWLEDGEMENT:

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