Pakistan J. Sci. Ind. Res., Vol. 30, No. 9, September 1987

STABILITY TRENDS OF ASPIRIN TABLETS

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(Received March 13, 1986; revised July 26, 1987)

Hydrolytic degradation of aspirin in tablet form in Pakistan climate have been studied. The discrete data of degradation have been subjected to least square analysis.

Key words: Aspirin; Stability; Hydrolysis.

INTRODUCTION

Aspirin, the most popular remedy for pain and fever, is known to almost everybody and recently by virtue of the work of Lewis *et al.* [1] it has found its way into heart disease drugs – its usefulness in myocardial infarction has been proved.

Importance of the presence of salicylic acid in aspirin tablets formulations has since long been recognised and documented in official compendia [2,3,4]. The compendia have specified limits and prescribed tests for the determination of salicylic acid in the dosage forms of aspirin.

The present study was conducted to determine the stability trend of a brand of aspirin tablets available in the Pakistan market. The market trend was compared with shelf samples.

Aspirin tablets (300 mg) were strip sealed in a polyethylene coated paper laminate (57 g per sq. meter grammage). These tablets were analysed for the levels of salicylic acid present in them. The discrete data so obtained was subjected to least square analysis.

EXPERIMENTAL

Aspirin tablets. Plain uncoated compressed tablets containing each 300 mg of Aspirin*, were collected at random from the market shelf. A sample of at least 40 tablets was collected at a time. The other group of samples was collected from the manufacturer's shelf. Both these samples were from a population made by one leading manufacturer**.

Estimation of salicylic acid. Method for determination of salicylic acid in British Pharmacopoeia have been criticized for giving inaccurate results at higher values. The following method developed from BPC monograph of salicylic acid collodion [6] was found to be suitable for estimating salicylic acid at a wider range of concentrations. Before actual use the method was validated by employing known concentrations of salicylic acid reference standard. The results were in conformity with the theoretical quantities.

Method. (a). Preparation of acetate buffer pH 2.45: 17.2 g of sodium acetate (Anhyd.) Merck (GR CAT. No. 6268) was dissolved in 200 ml of distilled water and volume was made upto mark. (b). N/1 hydrochloric acid was made from hydrochloric acid (Merck USP Art No. 314).

100 ml of sodium acetate solution was mixed with 100 ml of N/1 HCl in a one-litre beaker. Both were mixed and 300 ml of distilled water was added to it, mixing was done and pH checked on pH meter (Fisher Model 230 pH meter). The pH was adjusted to 2.45 with the help of either N/1 hydrochloric Acid or sodium acetate solution.

The collected sample was first subjected to content uniformity test, and after having passed the content uniformity test few tablets were selected at random and were weighed. The tablets were powdered in a dry mortar and transferred completely to a 50 ml Nesseler's cylinder 5 ml of water, 5 ml ethanol (Merck Art No. 93) and 2 ml ferric nitrate 1 % solution (Merck GR 3883) were added to it and the volume was made upto 50 ml with the aid of pH 2.45 acetate buffer. The solution was then mixed and was filtered through Whatmann No. 41 filter paper and absorption was recorded at 525 nm on a spectrophotometer (Bausch & Lomb Spectronic 2000). Water was used as blank.

Each determination was done in duplicate, and each time a salicylic acid (Merck extra pure 635) standard was run.

Precaution was taken to take minimum possible time in making dilutions and determining the content of salicylic acid.

*Aspirin 40 mesh B.P.

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RESULTS AND DISCUSSIONS

Pakistan is geographically located in tropical region [7] where the average temperature and humidity during summer are very much favourable for enchanced hydrolytic degradation of a vulnerable molecule like aspirin.

Hydrolytic degradation of aspirin which is manifested by gradual increase in levels of salicylic acid is dependent on availability of water molecules to the drug in tablet matrix.

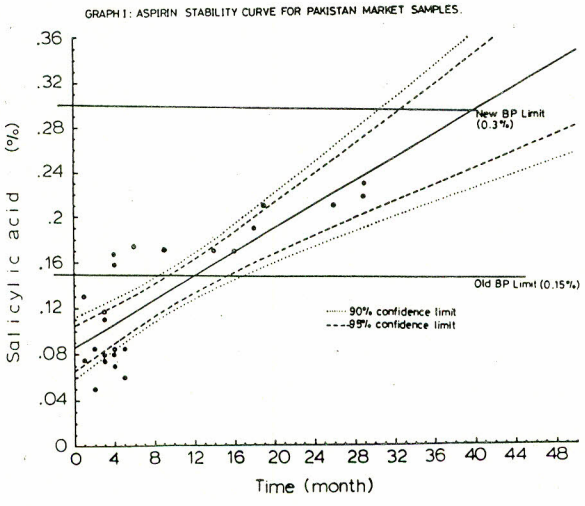
Factors responsible for moisture penetreration and interaction with aspirin in a compressed tablet have been discussed [8].

Moisture uptake by a compressed tablet follows Van Der Waal's phenomenon.

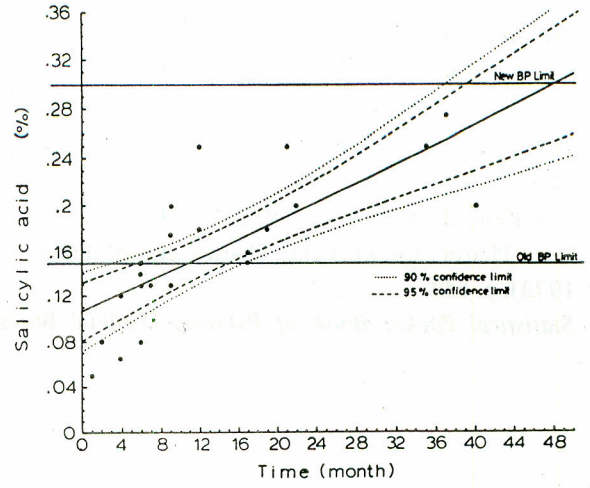
Free bonds available on surface and within approachable pits and pores of the matrix attracts water molecules from the air.

The concept of monomolecular layer of water has been reported by Leeson and Mattocks [9] who have investigated the effects of humidity and temperature on aspirin stability and have postulated that a monomelecular layer of water is adsorbed on the aspirin particles which then produces drug decomposition as though the drug is in solution.

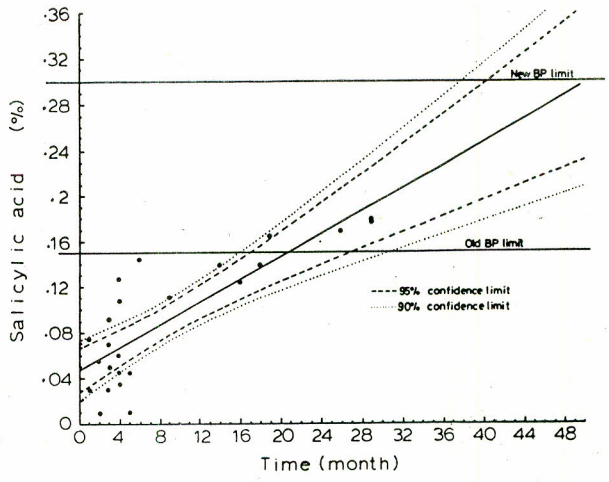
Discrete data were obtained when aspirin samples of different ages were collected at random and analysed for the levels of salicylic acid present in them. Applying the method of least square a regression line was plotted for market and shelf sample data the market population was found to be degrading at almost the same rate as that of sample population (graphs 1,2 and 3).



Graph 1. Aspirin stability curve for Pakistan market samples.



Graph 2. Aspirin stability curve for manufacturer's shelf.



Graph 3. Aspirin stability curve showing net increase (zero time-at age) in salicylic acid.

Attention of the British Pharmacopoeia Commission was drawn in 1983 towards the stability problem of aspirin dosage forms, particularly in tropical climates and the B.P. Commission after due consideration decided to relax the limits of salicylic acid in aspirin dosage forms from 0.15 to 0.3 %, this change was made effective from June 1984 [10].

H.E. El Banna *et al.* [11] have referred to a lag phase in aspirin stability curves; this lag phase however cannot be specified in this case.

It is desirable that manufacturers should label their products with shelf-life and proper storage conditions if they are to be marketed in a tropical and sub-tropical country, e.g. Pakistan.

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