IJBPAS, August, 2019, 8(8): 1607-1619

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

# ASSESSMENT OF VARIOUS PHYSIOCHEMICAL PROPERTIES OF PARACETAMOL BRANDS AVAILABLE IN THE MARKET OF QUETTA CITY

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Received 12th Jan. 2019; Revised 2nd Feb. 2019; Accepted 9th March 2019; Available online 1st Aug. 2019

https://doi.org/10.31032/IJBPAS/2019/8.8.4793

## ABSTRACT

Paracetamol is mostly prescribed and OTC drug. Paracetamol is normally used to get moderate pain reliever. It is similarly used as antipyretic in kids and can be used in combination with other medication to treat cold. Paracetamol is also used in different diseases related to headache and headache caused by stress. Good manufacturing practice (GMP) is part of quality assurance department in which products are manufactured according to the standard. Quality confirmation is the substance of value control. QA may likewise characterize as all exercises acknowledged going before and counteracting low quality. This study was comprised to analyse the Quality check of different brands of Paracetamol. Seven different brands of Paracetamol were collected from the market of Quetta city, Pakistan to analyse the physiochemical properties, these results were compared with each other and with standards. The physiochemical tests were performed they were Weight variation, Hardness, Thickness, Friability, Disintegration and Dissolution. The results were analysed and compared with standards. Different brands of Paracetamol were checked their physiochemical properties and showed slight difference in their physiochemical analysis but found within acceptable range. All the results showed within the acceptable range which indicates that the pharmaceutical companies are following the standard specifications.

**Keywords: Paracetamol, Physiochemical Properties, Quetta**

## INTRODUCTION

It is normally used to get moderate pain reliever. It is similarly used as antipyretic in kids and can be used in combination with other medication to treat cold (Bertolini, *et al*., 2006). For example in combination with tranquillizers, Paracetamol similarly used in different diseases elated to headache and headache caused by stress (McGrath, et al., 2003). The pain reliever effects started around 11 minutes after administration of drug. (McGrath, *et al.*, 2003). Metabolites are settled over the kidneys in the urine. Just 2-5% of portion settled in an unchanged structure in the urine. In view of its short removal half-life (1-4h), 24 hours after acid reflux of portion of Paracetamol, 98% of the portion distributed by kidney (Prescott, *et al*., 1971). Good manufacturing practice (GMP) is part of quality assurance department in which products are manufactured according to the standard (Allen et al., 2013). cGMP rules for medications contain least necessities for the strategies, workplaces, and regulate used in accumulating, and preparation , and medication items bundles , the rules ensure that the item is alright for use, and that it has the best quality (Akyar, *et al*., 2012). Quality confirmation is a broad idea covering all issues that separately or on the whole impact the nature of an item. It is the entire of the arrangements made with objects of affirming that pharmaceutical ingredients are of the quality required for their future use (Wilson, *et al*., 1993). Quality confirmation is the substance of value control. QA may likewise characterize as all exercises acknowledged going before and counteracting low quality. Significant terms identified with QA are Quality upgrades, Total Quality administration, Quality control, Quality circles (Whitney, *et al*., 1998). Any medication which is made-up in a Pharma Industry must follow the standards and guidelines referenced in GMP or cGMP. The nature of the drug thoroughly depends upon Quality control tests just as its time duration of usability. Quality control is an administration structure for beginning and planning. Quality advancement, quality maintenance and quality enhancements in the different divisions of plan and assembling, for accomplish the destinations of, economical creation and consumer loyalty (Lee, *et al*., 2009). Quality control is a section of GMP doubts with inspecting, detail, testing, documentations and discharge strategy with guarantee where important and applicable tests are performed, and the item is prepared to utilize simply subsequent to

state its quality. QC is lab based while, QA is organization based (Lee, *et al*., 2009).

## METHODOLOGY

### 3.1 Chemicals/ Glassware

| | |
|---|---|
| 1 | Active ingredients (Paracetamol) |
| 2 | Beakers |
| 3 | Funnels |
| 4 | Conical Flask |
| 5 | Test Tube |
| 6 | Volumetric flask |

### 3.2 Tablets with Manufacturer

| S. No | Brand Name | Company Name |
|---|---|---|
| 1. | Calpol | Gsk, Pvt Ltd Pakistan |
| 2. | Febrol | Bh, Pvt Ltd Pakistan |
| 3. | Tylol | Don Valley |
| 4. | Panadol | Gsk, Pvt Ltd Pakistan |
| 5. | Febrinol | Pharm Pvt Ltd Pakistan Awise |
| 6. | Pyrol | Semos, Pvt, Ltd Pakistan |
| 7. | Reliefal | Nabiqasim, Pvt, Ltd Pakistan |

Seven different brands of Acetaminophen (Paracetamol) were selected for this study.

**Equipments:**

| S. No | Name of equipment | Makers Name |
|---|---|---|
| 1 | Electronic Balance | Mettler Toledo |
| 2 | Resolution Apparatus | Germany |
| 3 | Stability Chamber | China |
| 4 | UV Spectrophotometer | Shimadzu |
| 5 | Friability Tester | FR2000 |
| 6 | Hardness Tester | Pharma test |
| 7 | Vanier Calliper | Pharma test |
| 8 | Disintegrator | Pharma test |

### 1.3 Stock Solution Preparation:

Prepared 100 ml of stock solution of Paracetamol. In 100 ml of volumetric flask added 20mg of Paracetamol in pH 7.4 phosphate buffer and up to the mark of volume 100ml made which contained active ingredient of Paracetamol 0.2 per ml.

### 1.4 Preparation of Different Dilution Of Paracetamol:

Original stock solution were made with the help of 5 different dilution by adding 50 ml buffer of 7.4 pH solution

### 1.5 Analysis of Stock Dilution by Spectrophotometric:

Five different dilutions of Paracetamol which were further analysed by UV visible spectroscopy (UV) at 265.6nm, the absorbance reading were noted.

### 1.6 Study of Solubility:

Study of solubility was performed with different temperatures at PH 7.4 for 24 hours and distilled water. In 100 ml of volumetric flask 100 mg of Paracetamol was added and kept for shaking. The temperature of shaker was

maintained according to the condition. By spectrophotometer at 265.6 nm wavelength 5ml sample were analysed.

**1.7 Standard Curve Calibration of Paracetamol:**

With the help of UV visible spectrophotometer five-different dissolution of Paracetamol were prepared and checked. The absorbance and reading were calculated at the wavelength of 265.6nm were analysed on UV Visible spectrophotometer.

**Physical Characteristics Analysis**

To check the Quality of the product different Quality control tests were performed according to the standard procedures mentions in NF, BP and USP. Following different tests were performed accordingly.

Weight Variation, Hardness, Friability test, thickness, Disintegrations and Dissolution tests were performed**.**

**Weight Variation**

As per USP, the weight variation test is course by balancing 20 tablets separately in analytical balance to manipulate the average weight and matching the single tablet weight of the average.

**Friability of Paracetamol:**

The phenomenon behind this test is the ability of the compressed tablet formulations to avoid crushes or breaking during its transportation and handling or storage. Selected 20 tablets randomly. First, weighed them and after that I placed them in friabilator where it was rotated on 100 rpm for four minutes and after this procedure the tablets are again weighed and the difference in weights were noted and loss in weight calculated in difference were compared with standards.

**3.8 Disintegration Test of Paracetamol**:

The objective of disintegration test of Paracetamol was to determine whether the tablet disintegrate withinthe 30 minutes when placed in a phosphate buffer.First, I collected the disintegration tester than placed 600ml of distilled water in each 1000mlbeaker. The temperature was maintained at $37^{o}$c. After that in each tube one tablet was placed. Apparatus was operated for the five minutes and all tablets disintegrated within 30 minutes.

**3.14 In-Vitro Dissolution test of Paracetamol:**

By using the USP standard procedures in vitro studies for dissolution. Tests were performed by using the apparatus

(dissolution Apparatus) i.e. Pharma test dissolution Machine. Each of the vessel was filled up to 900ml with 6.8 pH Phosphate buffer , this medium is used as dissolution medium which observed to check the release of active drug constitute from designed tablets, the rotations were kept at 100 rounds/minute also the temperature was kept not more than or less than 37±1°C, different time intervals. The samples were collected i.e. with the help of syringe 5ml of that samples were collected that samples were passed through membrane filter (0.45µ) and were analyzed on UV visible spectrophotometer, at wavelength of 249nm. After each observation volume was filled by the same medium which was made up to the mark i.e. 600ml and the same experiments which were done in trice. From that standard curve ofand its UV absorption different values, the %age drug release was computed.

**3.15 Drug Release Investigation**

Power law equation was applied for the determination of the drug release from various formulations.

**Power Law Equation**

**(diffusion/ relaxation model)**

$M_t / M_\alpha = kt^n$

Paracetamol and its UV absorption different values, the %age drug release was computed.

**RESULTS AND DISCUSSIONS**

Weight variations have been shown in **Table 1, 2 & Figure 1, 2.**

The friability was expressed as percentage loss and was tabulated. All the brands were within the acceptable range **(Table 3 & Figure 3)**.

It is concluded that all the hardness results **(Table 4, 5 and Figure 4, 5)** of different brands of Paracetamol were within the acceptable range.

The disintegration of the all brands were performed accordingly and observed that Calpol was disintegrated in 1 minute, Febrol was 02 minutes, Panadol was 03, Febrinol was 4, Reliefal and Pyrol was disintegrated in 05 minutes while Tylol was disintegrated 06 minutes. It is concluded that all the brands have variations with each other in disintegration time but are with and acceptable range when compared with standards **(Table 6)**.

All the results of thickness were within the acceptable range mentioned in standard specifications **(Table 7)**.

Dissolution was performed according to the specified standards all results were found within the limits. The results of dissolution of calpol was 100.635, Panadol was 100.635, Tylol was 101.312 and Febrol was 100.258.

All the results were within the acceptable range which indicates that the pharmaceutical companies fallowing the standards specifications. As according to the USP the tolerance is not more than 70% of the labeled amount of the acetaminophen is dissolved in a within 45 minutes **(Table 8, 9 & Figure 8, 9)**.

**Table 1: Weight Variations of Panadol, Febrol, Tylol Brands**

| S.NO | PANADOL weight in mg | FEBROL weight in mg | TYLOL weight in mg |
|---|---|---|---|
| 1 | 0.59 | 0.55 | 0.58 |
| 2 | 0.58 | 0.57 | 0.57 |
| 3 | 0.60 | 0.56 | 0.58 |
| 4 | 0.56 | 0.56 | 0.57 |
| 5 | 0.60 | 0.56 | 0.57 |
| 6 | 0.58 | 0.56 | 0.57 |
| 7 | 0.55 | 0.54 | 0.55 |
| 8 | 0.52 | 0.54 | 0.57 |
| 9 | 0.59 | 0.55 | 0.57 |
| 10 | 0.57 | 0.56 | 0.56 |
| 11 | 0.59 | 0.55 | 0.58 |
| 12 | 0.58 | 0.57 | 0.57 |
| 13 | 0.60 | 0.56 | 0.58 |
| 14 | 0.56 | 0.56 | 0.57 |
| 15 | 0.60 | 0.56 | 0.57 |
| 16 | 0.58 | 0.56 | 0.57 |
| 17 | 0.55 | 0.54 | 0.55 |
| 18 | 0.52 | 0.54 | 0.57 |
| 19 | 0.59 | 0.55 | 0.57 |
| 20 | 0.57 | 0.56 | 0.56 |

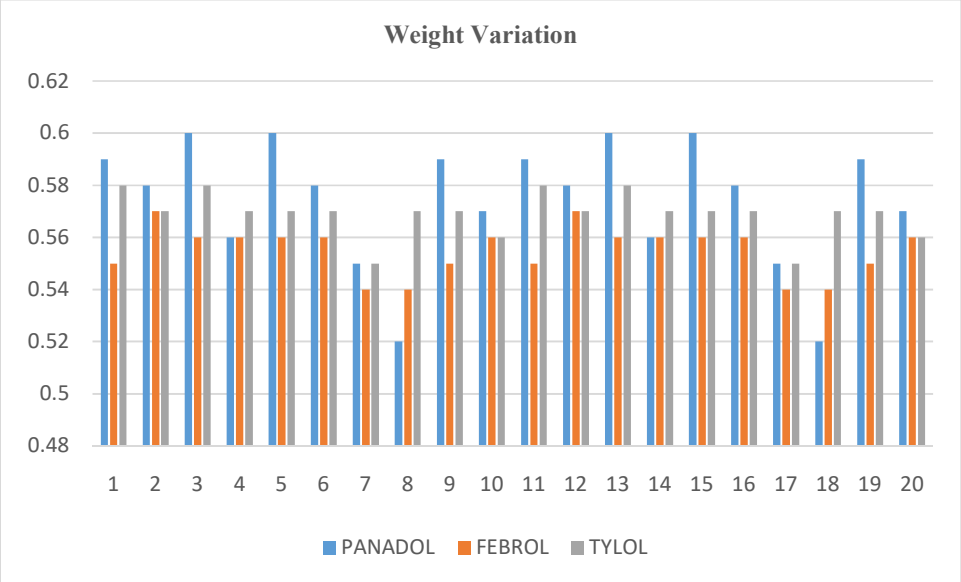


**Figure 1: Weight Variations of Panadol, Febrol, Tylol Brands**

**Table 2: Weight Variations of Calpol, Relifal, Febrinol, Pyrol brands**

| S.NO | Calpol wt. in mg | Reliefal wt. in mg | Febrinol wt. in mg | Pyrol wt. in mg |
|---|---|---|---|---|
| 1 | 0.60 | 0.58 | 0.58 | 0.60 |
| 2 | 0.59 | 0.56 | 0.54 | 0.59 |
| 3 | 0.61 | 0.60 | 0.57 | 0.61 |
| 4 | 0.61 | 0.58 | 0.57 | 0.55 |
| 5 | 0.60 | 0.57 | 0.60 | 0.52 |
| 6 | 0.60 | 0.55 | 0.57 | 0.59 |
| 7 | 0.60 | 0.61 | 0.58 | 0.57 |
| 8 | 0.60 | 0.57 | 0.56 | 0.60 |
| 9 | 0.60 | 0.61 | 0.55 | 0.58 |
| 10 | 0.61 | 0.58 | 0.56 | 0.55 |
| 11 | 0.60 | 0.58 | 0.58 | 0.60 |
| 12 | 0.59 | 0.56 | 0.54 | 0.59 |
| 13 | 0.61 | 0.60 | 0.57 | 0.61 |
| 14 | 0.61 | 0.58 | 0.57 | 0.55 |
| 15 | 0.60 | 0.57 | 0.60 | 0.52 |
| 16 | 0.60 | 0.55 | 0.57 | 0.59 |
| 17 | 0.60 | 0.61 | 0.58 | 0.57 |
| 18 | 0.60 | 0.57 | 0.56 | 0.60 |
| 19 | 0.60 | 0.61 | 0.55 | 0.58 |
| 20 | 0.61 | 0.58 | 0.56 | 0.55 |

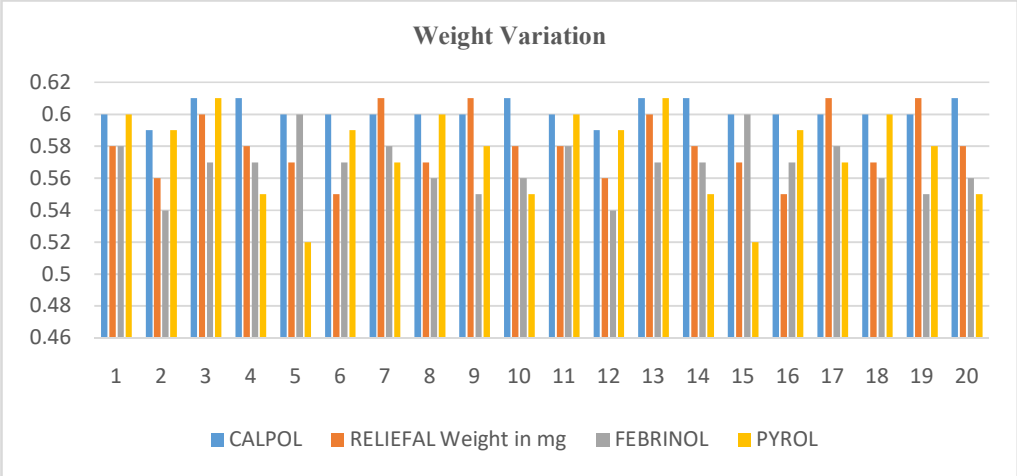


**Figure 2: Weight Variations of Calpol, Relifal, Febrinol, Pyrol Brands**
**Note: All weight variations of above mentioned Tablets were within the range of 10%**

**Table 3: Friability Tests of Panadol, Febrol, Tylol Brands of Acetaminophen**

| PANADOL | FEBROL | TYLOL | CALPOL | RELIEFAL | FEBRINOL | PYROL |
|---|---|---|---|---|---|---|
| 0.69% | 0.43% | 0.87% | 0.68% | 0.89% | 0.54% | 0.43% |

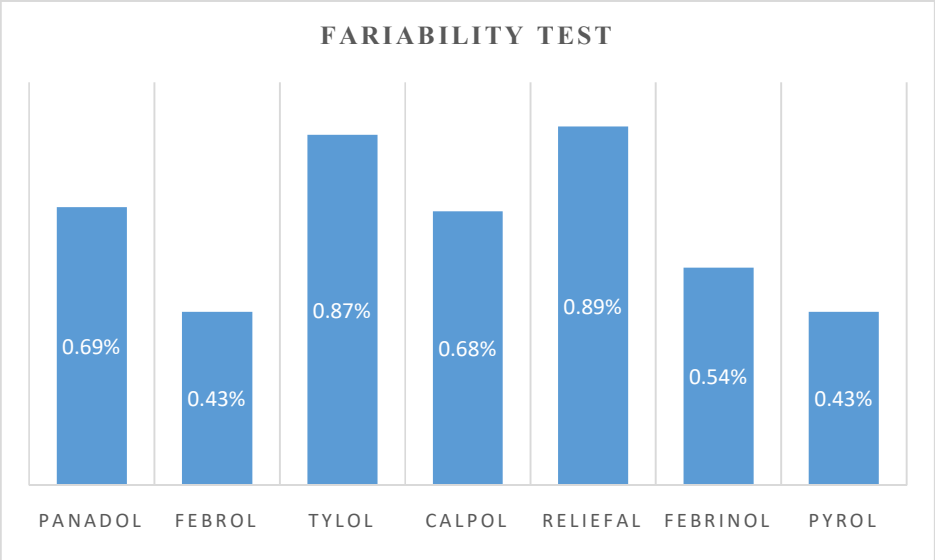


**Figure 3: Friability Tests of PANADOL, FEBROL, TYLOL Brands of Acetaminophen**

**Table 4: Hardness Test of PANADOL, FEBROL, TYLOL Brands of Acetaminophen**

| S.NO | PANDOLKg/cm$^2$ | FEBROLKg/cm$^2$ | TYLOLkg/cm$^2$ |
|---|---|---|---|
| 1 | 06.0 | 08.4 | 06.4 |
| 2 | 06.3 | 09.9 | 07.9 |
| 3 | 08.0 | 10.0 | 07.3 |
| 4 | 10.0 | 10.5 | 07.3 |
| 5 | 06.0 | 11.5 | 06.4 |
| 6 | 08.0 | 12.6 | 07.4 |
| 7 | 10.1 | 13.2 | 06.8 |
| 8 | 07.2 | 10.5 | 08.0 |
| 9 | 09.3 | 10.4 | 08.5 |
| 10 | 07.1 | 09.3 | 09.6 |

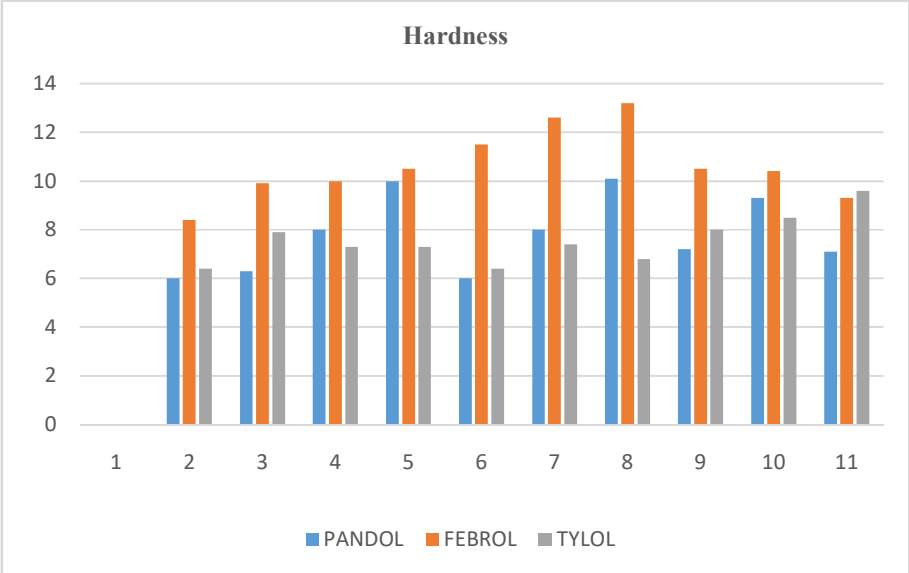


**Figure 4: Hardness Test of PANADOL, FEBROL, TYLOL Brands of Acetaminophen**

**Table 5: Hardness Test of Calpol, Releifal, Febrol, Pyrol Brands of Acetaminophen**

| S.NO | CALPOL Kg/cm$^2$ | RELEIFAL Kg/cm$^2$ | FEBRINOL Kg/cm$^2$ | PYROL Kg/cm$^2$ |
|---|---|---|---|---|
| 1 | 06.0 | 09.3 | 10.5 | 08.3 |
| 2 | 09.3 | 08.0 | 11.5 | 09.3 |
| 3 | 08.3 | 10.0 | 12.6 | 08.0 |
| 4 | 09.3 | 09.3 | 10.4 | 08.5 |
| 5 | 08.0 | 06.4 | 06.3 | 11.5 |
| 6 | 08.5 | 07.9 | 08.0 | 12.6 |
| 7 | 09.3 | 07.3 | 06.4 | 13.2 |
| 8 | 08.4 | 07.3 | 07.9 | 10.5 |
| 9 | 08.5 | 06.0 | 07.3 | 10.0 |
| 10 | 08.8 | 09.3 | 07.3 | 10.5 |

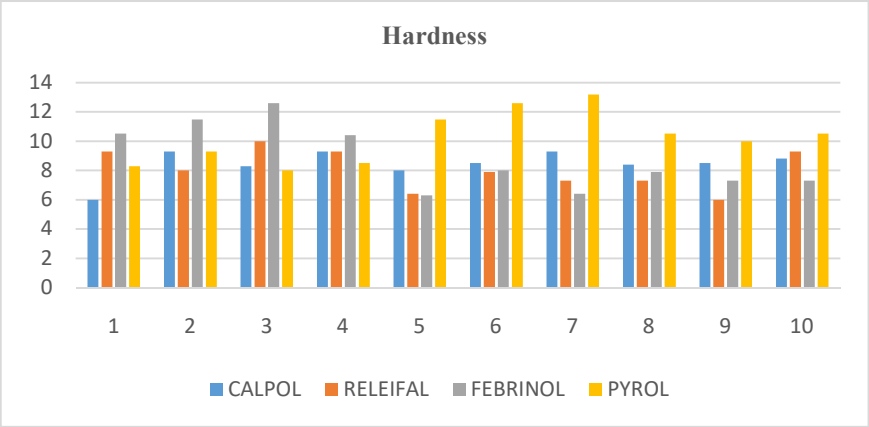


**Figure 5: Hardness Test of Calpol, Releifal, Febrol, Pyrol Brands of Acetaminophen**

**Table 6: Disintegration Time of Different Brands of Acetaminophen**

| S.NO | Brands of Paracetamol | Disintegration time (Minutes) |
|---|---|---|
| 1 | FEBROL | 02 |
| 2 | PANADOL | 03 |
| 3 | CALPOL | 01 |
| 4 | TYLOL | 06 |
| 5 | RELIEFAL | 05 |
| 6 | FEBRINO; | 04 |
| 7 | PYROL | 05 |

**Table 7: Thickness of Panadol, Febrol, Calpol, Tylol, Febrinol, Releifal and Pyrol**

| S.NO | Panadol | Febrol | Calpol | Tylol | Febrienol | Reliefal | Pyrol |
|---|---|---|---|---|---|---|---|
| 1 | 4.3 | 3.9 | 4.3 | 4.4 | 4.4 | 3.6 | 4.3 |
| 2 | 4.5 | 3.9 | 4.4 | 4.6 | 4.4 | 3.5 | 4.3 |
| 3 | 4.6 | 4.0 | 4.4 | 4.3 | 4.3 | 3.5 | 4.3 |
| 4 | 4.6 | 4.0 | 4.4 | 4.5 | 4.3 | 3.4 | 4.3 |
| 5 | 4.3 | 3.9 | 4.4 | 4.3 | 4.3 | 3.4 | 4.3 |
| 6 | 4.6 | 4.0 | 4.4 | 4.5 | 4.3 | 3.6 | 4.3 |
| 7 | 4.5 | 4.0 | 4.4 | 4.4 | 4.3 | 3.6 | 4.4 |
| 8 | 4.5 | 4.0 | 4.4 | 4.3 | 4.3 | 3.5 | 4.4 |
| 9 | 4.3 | 4.0 | 4.4 | 4.6 | 4.3 | 3.5 | 4.3 |
| 10 | 4.3 | 4.0 | 4.4 | 4.5 | 4.3 | 3.4 | 4.3 |
| AVG | 4.45 | 3.97 | 4.39 | 4.44 | 4.32 | 3.51 | 4.32 |

**Table 8: Dissolution of Calpol, Panadol, Tylol and Febrol**

| S.No | Brands name | Dissolution %age |
|---|---|---|
| 01 | Calpol | 100.635 |
| 02 | Panadol | 100.635 |
| 03 | Tylol | 101.312 |
| 04 | Febrol | 100.258 |

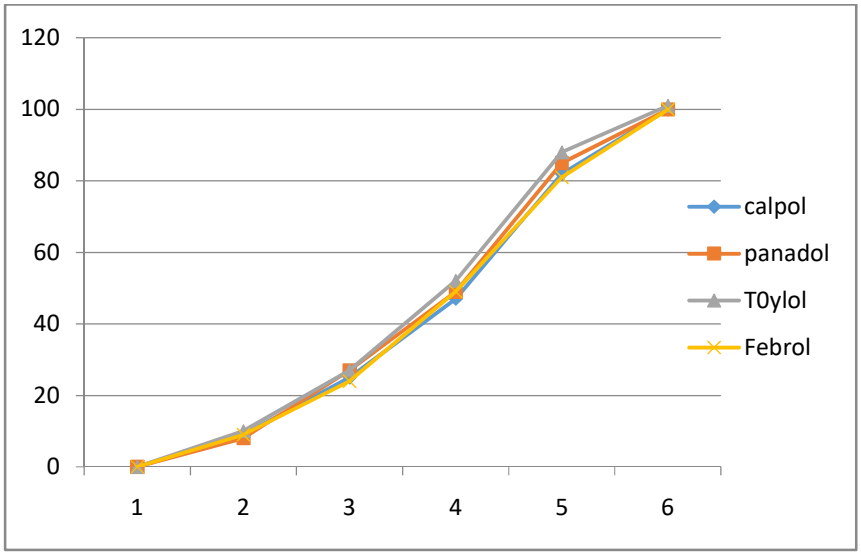


**Figure 8: Dissolution ofCalpol, Panadol, Tylol and Febrol**

**Table 9: Dissolution of Febrinol, Releifal and Pyrol**

| S. No | Name of Product | Dissolution ( 45 minutes) |
|---|---|---|
| 05 | Febrinol | 100.258 |
| 06 | Releifal | 101.312 |
| 07 | Pyrol | 101.313 |

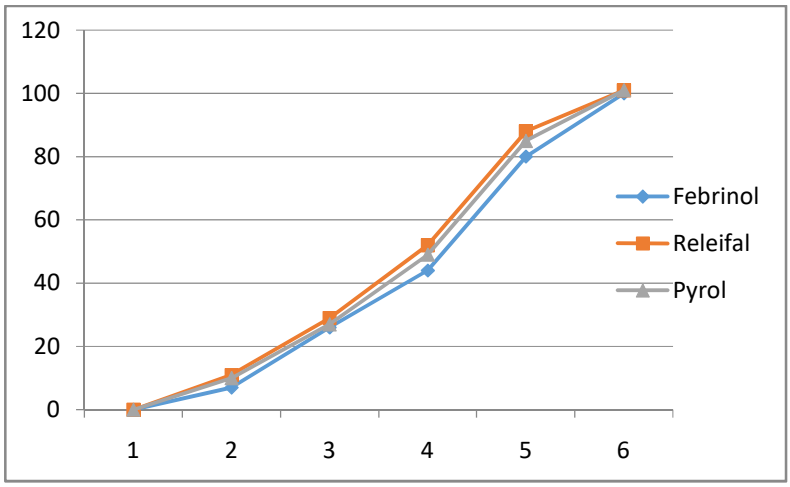


**Figure 9: Dissolution of Febrinol, Releifal and Pyrol**

**DISCUSSION**

All the brands of Paracetamol were evaluated their Physiochemical activities and was found that the weight variation test of Panadol, Febrol, Tylol, Capol, Reliefal, Febrinol and Pyrol brands of Acetaminophen were selected from each brand ten samples were weighed individually on electronic balance machine to determine the average weight. The ranged weight variation of Panadol was from 0.52mg to 0.60mg. The lowest weight variation of Febrol was 0.54mg and the highest was 0.57mg, the lowest weight variation of Tylol was 0.55 and the highest was 0.58mg. The lowest weight of Calpol was 0 .59mg and highest were 0.61mg. The lowest weight of Reliefal was 0.58mg and the highest wt. was 0.61mg. The lowest weight variation of Febrinol was 0.54mg and the highest weight was 0.60mg. The lowest weight variation of Pyrol was 0.52mg and the higheist was 0.61mg. All weight variations of above mentioned tablets were within the range of 10%.

Tablets are constantly subjected to mechanical shocks and aberration during the manufacturing, packaging and transporting there for-friability test is important that the tablet must be formulated to withstand such breakage. 20, 20 tablets from each brand were put in to the friability tester to check the % of weight loss by tablets due to mechanical action during test. Tablets were weighed before friability and after friability testing. The friability was expressed as percentage loss and was tabulated. All the tested tablets were within the acceptable limits.

Hardness is done to check either the tablets are too hard to crush or too soft because it affects the disintegration if table is hard in may not disintegrate in the prescribed time which is 30 minutes. The hardness of each tablet was checked on hardness tester the average hardness was checked. The lowest hardness of Panadol was 06.0 kg/cm$^2$ and the highest hardness of the Panadol was10.0 kg/cm $^{2.}$The lowest hardness of Calpol was 06.0kg/cm$^2$ and the highest hardness of Calpol was 09.3kg/cm$^2$. The lowest hardness of Releifal is 07.3 kg/cm$^2$ and the highest hardness was 10.0kg/cm2. The lowest hardness of Febrinol 06.3kg/cm$^2$ and the highest hardness was 12.0kg/cm$^2$. The lowest hardness of Pyrol was 08.3KG/cm$^2$ and the highest hardness was 13.2kg/cm$^2$.The lowest hardness of Calpol was 06.0kg/cm$^2$ and the highest hardness of Calpol was 09.3kg/cm$^2$. The lowest hardness of Releifal is 07.3 kg/cm$^2$ and the highest hardness was 10.0kg/cm2. The lowest hardness of Febrinol 06.3kg/cm$^2$ and the highest hardness was 12.0kg/cm$^2$.

The lowest hardness of Pyrol was 08.3KG/cm$^2$ and the highest hardness was 13.2kg/cm$^2$. All the tablets were checked their hardness and found that the tablets having slight difference but were within the acceptable range when compared with the specifications.

The disintegration of the all brands were performed accordingly and observed that Calpol was disintegrated in 1 minute, febrol was 02 minutes, Panadol was 03, Febrinol was 4, Reliefal and Pyrol was disintegrated in 05 minutes while Tylol was disintegrated 06 minutes. It is concluded that all the brands have variations with each other in disintegration time but are with n acceptable range when compared with standards.

Thickness was tabulated as mentioned in above tables. The results of Panadol showed that thickness ranged from 4.3 to 4.6, febrol was ranged from 3.9 to 4.0, calpol was 4.3 o 4.5, Tylol was ranged from 4.3 to 4.6, Febrol 4.3 to 4.4, Reliefal was ranged from 3.4 to 3.6 and Pyrol ranged from 4.3 to 4.4. All the results of Thickness were within the acceptable range mentioned in standard specifications.

Dissolution was performed according to the specified standards all results were found within the limits. The results of dissolution of Calpol was 100.635, Panadol was 100.635, Tylol was 101.312 and Febrol was 100.258, Febrinol was 100.258, Reliefal was 101.312, Pyrol was 101.313. All the results were within the acceptable range which indicates that the pharmaceutical companies fallowing the standards specifications. As according to the USP the tolerance is not more than 70% of the labeled amount of the acetaminophen is dissolved in a within 45 minutes.

**CONCLUSION**

It is concluded that all the tablets of different brands of Paracetamol were checked their physiochemical properties and showed slight difference in their physiochemical analysis and found acceptable range. The weight variations of different tested brands were within the range of 10%. The friability was expressed as percentage loss and was tabulated. And found that all the tested tablets were within the acceptable limits. Hardness of the tablets were also found slight difference but were within the acceptable range when compared with the specifications. It is concluded that all the brands have variations with each other in disintegration time but are with and acceptable range when compared with standards. All the results of thickness were within the acceptable range mentioned in standard specifications. All the results were within the acceptable range which indicates that the pharmaceutical companies following the standards

specifications. As according to the USP the tolerance is not more than 70% of the labeled amount of the acetaminophen is dissolved in a within 45 minutes. This type of research work will contribute the community to check the Quality Control of different manufacturer either n they are following the standard SOPs or not.

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