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# DEVELOPMENT OF PARTITION COEFFICIENT VALUE OF THE SITAGLIPTINE PURE DRUG

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## ABSTRACT

**Background-** The ratio of a compound's equilibrium concentrations in a mixture of two immiscible liquids is known as the partition coefficient (P). This ratio therefore compares the solute's solubility in each of these two liquids. The partition coefficient is a term that describes the concentration ratio of unionised chemical species. The aim of this study is to have a better understanding of sitagliptine's (SGP) molecular behavior. In the current work, the logP of sitagliptine were considered experimentally beyond compare. LogP is the main physiochemical variable employed in drug improvement.

**Methods-**For determination of Partition Co-efficient of sitagliptine, the following steps are to be followed, At first, separating funnel (250ml) was cleaned and dried properly and labeled it.100 ml of n-Octanol, 100 ml of distilled water and 100mg of standard drug (sitagliptine) were transferred into the separating funnel. Separating funnel was shacked properly by shaking (shake flax method) for 2hrs intermittently 15minutes. Then this solution was stand for 24 hours for separating the aqueous and organic layers. Aqueous layer was separated out from organic layers

after 24 hrs in the two different beakers. The absorbance values were measured in two different medium i.e. organic and aqueous layers at two different wavelengths with the help of UV-visible spectrophotometer. Then these values were used for calculating the partition coefficient.

**Result-** According to our research, sitagliptine has logP value of 1.45, which were calculated from our experiments.

**Conclusion-** We performed this experiment in order to gain insights about the molecular behavior of Sitagliptine (SGP). In the present study log P of Sitagliptine was calculated experimentally for the first time. log P is the main important physicochemical parameter helpful in drug development. We concluded our study of sitagliptine log P value to be 1.45 as calculated from our experiments.

**Keywords: Sitagliptine, Calibration Curve, Standard Stock Solution, Partition coefficient**

## INTRODUCTION

**Partition Coefficient:**

The ratio of a compound's equilibrium concentrations in a mixture of two immiscible liquids is known as the partition coefficient (P). This ratio therefore compares the solute's solubility in each of these two liquids. The partition coefficient is a term that describes the concentration ratio of unionised chemical species **[1]**.

**General Features [2, 3]:**

1) Drugs separate between the aqueous phase and the lipophilic membrane.
2) A drug has a higher partition coefficient if it is more lipophilic.
3) If a drug's partition coefficient is lower than one, it is less lipophilic.
4) It acts as a barometer for a chemical's ability to partition between lipid and water.
5) Hydrophobic substances are distributed preferentially to hydrophobic areas, such as the bi-lipid layers of cells, when they have high partition coefficients.
6) Hydrophilic drugs with low partition coefficients are present in hydrophilic compartments, such as blood serum.
7) Partition coefficients have no units.

**Limitations [4-6]:**

1) Dilute solutions: The solute's concentration in both solvents must be minimal. This rule is broken at high concentrations.

2) Consistent temperature: Because solubility is temperature-dependent, the experiment's temperature should stay the same throughout.

3) The identical molecular state is required for both the solvent and the solute. This law

is nullified if solute molecules associate or dissociate in one of the solvents.

4) A strong shake of the liquid results in equilibrium concentration.

5) Due to their non-miscibility, the solvents must thus be allowed considerable time to separate.

**Octanol [7, 8]**

Octanol and olive oil are expected to imitate the lipophilic characteristics of biological membranes more accurately than other organic solvents like chloroform. The n-octanol/water partitioning system imitates the lipid membranes/water systems seen in the body.

**Distribution Coefficient**: logD It is the ratio of the sum of the chemical form concentrations in the two phases. The dispersion coefficient is measured using the pH.

**Materials And Instruments [9, 10]**

Sitagliptine was purchased from Dr. Reddy's Laboratories in Hyderabad as a pure medication. All spectrum measurements were performed using a Shimadzu UV-Vis Spectrophotometer (pharmaspec-1700) with 1 cm matched quartz cells. The assay method used a single electronic pan balance, a Metzer pH metre, an Elico CL 220 colorimeter with a microprocessor, and an Elico SL 220 double-beam UV-visible spectrophotometer (Contech). The solvents and reagents were all analytical-grade (AR).

**Experimental Work [11, 12]**

**Preparation of standard stock solution:** A 100 ml volumetric flask containing 40 ml of double-distilled water and 30 mg of standard Sitagliptine phosphate should be accurately weighed before being ultrasonically sonicated for two minutes. It was then further diluted with double-distilled water up to 100 ml to produce 300 g/ml.

**Determination of λ max:**

A UV-visible spectrophotometer was used to scan a 30 g/ml standard stock solution between 200 and 400 nm in order to calculate the maximum. 267 nm was the measurement.

**Preparation of Calibration curve:**

**Preparation of working standard stock solution:**

Following the transfer of standard stock solutions into six independent volumetric flasks of 10 ml each, the concentrations of the 1, 2, 3, 4, 5 and 6 ml standard stock solutions are listed below **(Table 1)**. Data regarding the drug's linearity are provided in table 5 below. The linearity curve was developed by comparing concentration on the X-axis with absorbance on the Y-axis. The linear regression equation was found to be Y = 0.0033 X - 0.0085, and the correlation coefficient (r2) was found to be 0.9933.

**Table 1: Linearity curve of Sitagliptine phosphate (SGP)**

| Sl. No | Concentration (µg/ml) | Absorbance at 267 nm (λmax) |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 30 | 0.097 |
| 3 | 60 | 0.178 |
| 4 | 90 | 0.274 |
| 5 | 120 | 0.352 |
| 6 | 150 | 0.494 |
| 7 | 180 | 0.598 |

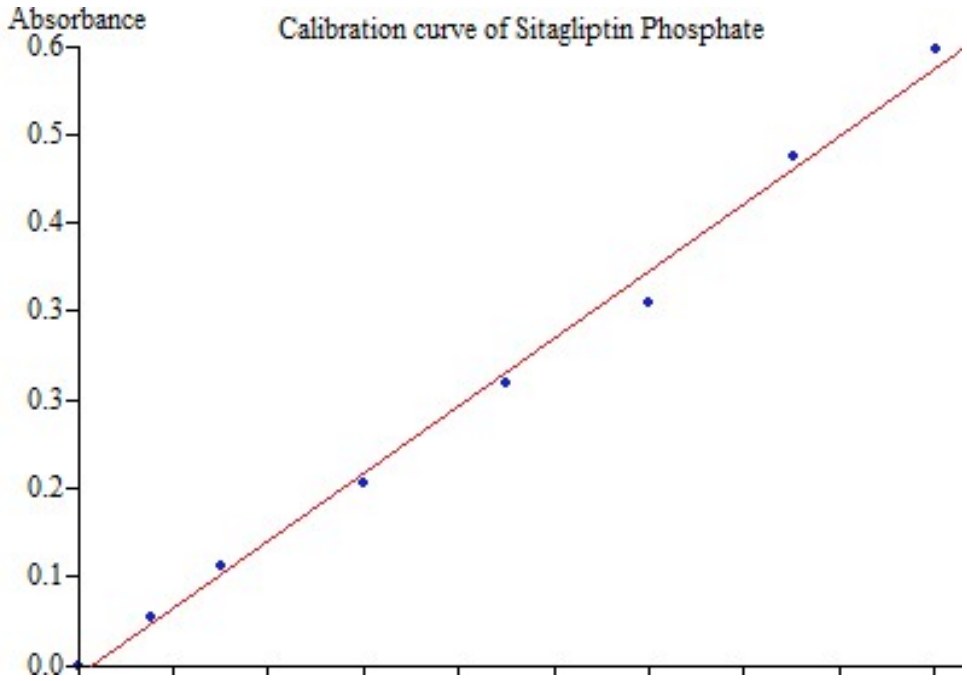


**Figure 1: Linearity curve of Sitagliptin Phosphate (SGP)**

**Determination of Partition coefficient of Sitagliptine phosphate [13, 14]**

**Methods for the determination of Partition coefficient:**

1) Separating funnel (250ml) was cleaned and dried properly and labeled it
2) 100 ml of n-Octanol, 100 ml of distilled water and 100mg of standard drug were transferred into the separating funnel.
3) Separating funnel was shacked properly by shaking (shake flax method) for 2hrs intermittently 15minutes.
4) Then this solution was stand for 24 hours for separating the aqueous and organic layers.

5) Aqueous layer was separated out from organic layers after 24 hrs in the two different beakers.
6) The absorbance values were measured in two different medium i.e. organic and aqueous layers at two different wavelengths with the help of UV-visible spectrophotometer.
7) Then these values were used in the given below equation to calculate the partition coefficient.

**Calculation:**

As a result, the partition coefficient (P), which is commonly stated as a logarithm to base 10, is the ratio of two concentrations (log P).

So,

Partition coefficient (Log p) or k = Log ($C_2$ / $C_1$)

k = Log (0.090/2.56)

k = Log 0.0351

= -1.454

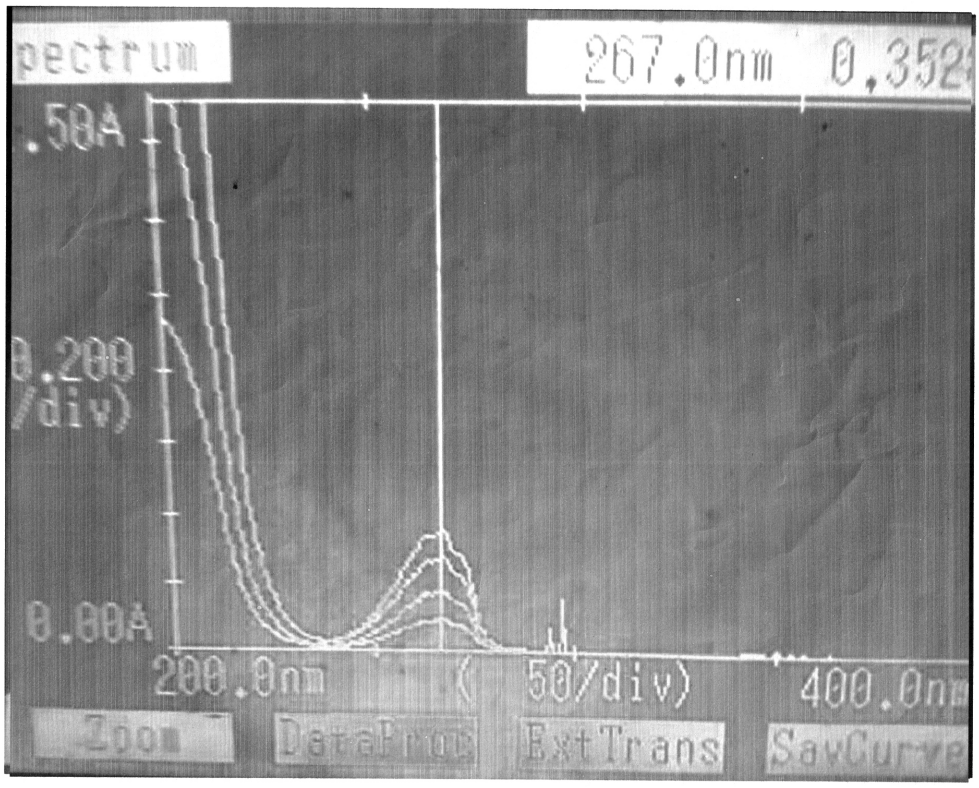


**Figure 2: UV-Visible Spectrophotometry Analysis of Parttion Coeefient Value of sigagliptine**

## RESULT AND DISCUSSION

From the above experiment, the Log P value of the Sitagliptine pure drug is found out to be 1.45.

## CONCLUSION

We performed this experiment in order to gain insights about the molecular behavior of Sitagliptine (SGP). In the present study log P of Sitagliptine was calculated experimentally for the first time. log P is the main important physicochemical parameter helpful in drug development. We concluded our study of sitagliptine log P value to be 1.45 as calculated from our experiments.

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