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A Research on Formulation, Characterization and Evaluation of Pre-Formulation Studies and Pre - Compressional Parameters of Anti -Hypertensive Drug Losartan Potassium by using Locust Bean Gum as Super-Disintegrant

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Abstract:

Patients who struggle to swallow pills, capsules, or other oral medications might find relief using fast-dissolving drug delivery devices. Fast-dissolving pills can be eaten without the assistance of water since they dissolve instantly in the mouth. The purpose of the current work was to use locust bean gum as a natural super disintegrant in pre-formulation trials of the medication losartan potassium. Conduct pre-formulation research on the drug's identification, solubility, and partition coefficient. Precompressional characteristics, such as angle of repose, swelling index, and micromeritic properties, can have an impact on tablet formulation in addition to the drug's characterisation, compatibility, and melting point.

Material and methods: Losartan potassium was received as gift sample from Elfin drug pvt ltd baddi, nalagarh (Himachal Pradesh). Locust bean gum was purchased from Lucid colloids, Mumbai. Microcrystalline cellulose (avice1102), aspartame and magnesium stearate was received as gift sample from helios pharmaceutical pvt. ltd. baddi (H.P). Menthol was purchased from Yarrow Chem. Mumbai (Maharashtra) and talc was purchased from Qualichems Fines Chemicals ltd New Delhi.

Result: The results suggested that locust bean gum in 7.5% concentration possess excellent super disintegrant property and resulted in fast dissolving tablets. Swelling index was found to be 22 which indicated appreciable capability of locust bean gum to be used as super disintegrant. IR spectra and DSC study showed that there was no any kind of interaction with formulation additives of the tablets.

Conclusion: Based on the pre formulation studies locust bean gum show a super disintegrant properties and it is clear that we can formulate fast dissolving antihypertensive tablet with losartan potassium by using locust bean gum as superdisintegrant.

Key words: Super disintegrant, preformulation, fast dissolving tablets (FDTs), locust bean gum, losartan potassium.

INTRODUCTION

Due to its ease of manufacturing, compact size, and ease of self-administration by patients, tablets are currently the most often used dosage form. Nevertheless, some patients refuse to take their prescription as directed because they have difficulties swallowing, hand tremors, dysphasia in their elder patients, and immature muscles and nerve systems in their younger patients. People of all ages can suffer from dysphagia, or the difficulty to swallow. Swallowing difficulties affect around 35% of the general population, 30–40% of senior patients in nursing homes, and 18%–22% of all residents in long-term care institutions. The oral route is still the best way to deliver therapeutic chemicals because of its low cost of therapy, ease of administration, accurate dosage, self-medication, ability to prevent discomfort, variety, and high patient compliance. Conversely, a new drug delivery method that combines an already-approved medication can significantly improve the drug's efficiency, security, and patient adherence. [1]

Tablet shape, size, flavor, and surface are some of the most commonly mentioned elements that make it harder to swallow pills. The elderly and children, as well as those who are traveling and might not always have access to water, are the patients who most need easy-to-swallow dosage forms.[2] A literature study states that 50% of persons are impacted by these problems. These studies highlight the critical need for a new dosage form that can improve patient compliance.[3] In the past few decades, a wide spectrum of pharmaceutical research has been conducted in an effort to develop innovative dosage formulations. The goal of recent advancements in novel drug delivery systems (NDDS) is to enhance patient compliance by developing a convenient dosage form that will boost the safety and efficacy of therapeutic molecules. These efforts have centered mostly on how simple medication can be.[4] Among the several dosage forms developed to improve ease of administration, the most widely used product is the fast-dissolving tablet for patients who prefer the ease of conveniently taken dose forms, especially Those in the paediatric and geriatric population, solid dosage forms that can be dissolved or suspended with water in the mouth are very preferred. [3]

FAST DISINTEGRATING TABLETS

Orally disintegrating tablets (ODTs) and fast dissolving tablets (FDTs) have become more and more popular as alternatives to standard oral dosing forms. New medications that degrade in the mouth in a matter of seconds have been discovered by modern medicine. Academics and business professionals are beginning to recognize the benefits of FDTs. The European Pharmacopoeia has recently used the term "orodispersible tablet" to highlight their increasing significance. The ODTs should disperse or dissolve after three minutes, as per the European Pharmacopoeia.[5] Orally disintegrating tablet guidelines were first proposed in April 2007 by the Food and Drug Administration. Quickly dissolving in the mouth and having an in vitro disintegration time of 30 seconds or less are the criteria for oral disintegrants that meet the USP disintegration test technique or an equivalent. [6]

Applications of Fast Dissolving Tablets 1. Simple dosage for patients who have trouble swallowing, including the elderly, stroke victims, bedridden individuals, people with renal failure, and people in pediatric, geriatric, or mental health care who refuse to swallow. 2. Patients who are on the go and do not always have access to water will find it extremely convenient since the dosage

form may be consumed without water. 3. The drug will start working rapidly since it will dissolve and absorb swiftly. 4. Some drugs are absorbed from the mouth, throat, and esophagus when saliva moves down into the stomach. The bioavailability of a medicine is significantly increased under these conditions. 5. A pleasant mouth feel can assist patients, especially younger ones, stop viewing medications as bitter pills. 6. Because there is no physical obstruction during oral delivery of the standard formulation, there is less chance of choking or asphyxia, improving safety.7

Limitations of fast dissolving tablets 1. The pills usually lack sufficient mechanical strength. As a result, handling needs to be done carefully. 2. Incorrect tablet formation might result in an off-putting flavor and/or grittiness in the tongue.8

Ideal Qualities for Creating Pills That Dissolve Quickly

1. When used orally, it should dissolve, disperse, or disintegrate in the mouth in a matter of seconds without the need for water.
2. The parent component needs to dissolve fast enough to provide for an adequate amount of contact time at the administration site, while also being stable, soluble, and fast enough to cross the mucosal barrier.
3. Including hydrophilic excipients. Able to rapidly absorb water, which accelerates the matrix's disintegration.
4. The tablet must have a lot of porosity. After ingestion, there should be little to no residual in the mouth.
5. Have a taste that is appropriate. If there is an unpleasant taste that can be covered up with the right taste masking techniques
6. It should feel good in the mouth.
7. Need to be more robust and less pliable. Must demonstrate minimal susceptibility to external factors such as humidity and temperature. [9]

MATERIAL AND METHODS

MATERIAL UESD FOR FORMULATION

All the materials used in the formulation and evaluation are listed below: (Distilled water was used in the present study)

Losartan potassium was received as gift sample from Elfin drug pvt ltd baddi, nalagarh (Himachal Pradesh). Locust bean gum was purchased from Lucid colloids, Mumbai. Microcrystalline cellulose (avice1102), aspartame and magnesium stearate was received as gift sample from helios pharmaceutical pvt. ltd. baddi (H.P). Menthol was purchased from Yarrow Chem. Mumbai (Maharashtra) and talc was purchased from Qualichems Fines Chemicals ltd New Delhi.

PREFORMULATION STUDIES OF DRUG

Identification of Drug

Physical appearance

Physical appearance of drug was examined by various organoleptic properties:

Table 1: Organoleptic characters of Losartan Potassium

Color	White crystal powder.
Taste	Slightly Bitter
State	Fine to crystalline powder

Melting Point

Melting point of losartan potassium was determined by Capillary fusion method; one sided capillary filled with drug and put in to the Melting point apparatus. Temperature was noted at which solid drug convert in to liquid.

Ultraviolet absorption

Ultraviolet absorption in the range 200 nm to 450 nm of a 10 µg/ ml solution in methanol was determined.

I.R spectra determination

IR (KBr) cm^{-1} of pure drug losartan potassium exhibited characteristics absorption bands Interpreted with reference standard of losartan potassium.

Partition Coefficient

The partition coefficient of losartan potassium was determined in n-octanol and double distilled water. Mixture saturated for a period of 24 h. 20 mg of losartan potassium was added to the mixture and was agitated for 1 h. These two layers were separated using separating funnel. Water phase was suitably diluted and absorbance was measured at 209 nm. The partition coefficient of losartan potassium was calculated as ratio of concentration of losartan potassium in n-octanol to that in the aqueous phase using following equation:

$P_{O/W} = (C_{org}/C_{water})$ equilibrium

(Initial conc. – conc. in aqueous phase)

Solubility studies

An excess quantity of losartan potassium was added to 10 ml of different solvents like distilled water (pH 7.0) water and phosphate buffer of pH 6.8 in a shaking water bath at room temperature for 24 hrs. The solutions were then filtered through whatman filter paper (No. 41) and the filtrate was suitably diluted and analyzed using UV-visible spectrophotometer at 209 nm wavelength.

QUANTITATIVE ESTIMATION OF DRUG

In present study, a UV Spectrophotometric method is selected for the estimation of the drug because the method was simple, economic and gave reproducible results in the acceptable limits. The double beam UV spectrophotometer **(**UV-1800, Shimadzu**)** was used for the analysis.

Preparation of buffer [1]

Phosphate buffer (pH 6.8)

Phosphate buffer of pH 6.8 was prepared by dissolving 28.8gm disodium hydrogen orthophosphate and 11.45gm potassium dihydrogen orthophosphate in 1000 ml volumetric flasks and the pH was adjusted with the help of 0.1N HCl and 0.1N $NaHCO_3$ solution and volume was made up to 1000ml with distilled water.

Preparation of standard plot of Losartan potassium

1. Preparation of stock solution (stock solution I)

100 mg of losartan potassium was accurately weighed and transferred into a 100 ml volumetric flask and dissolved in phosphate buffer (pH 6.8). The volume was made up to 100 ml. This gives the standard stock solution of 1 mg/ml concentration.

2. Spectrophotometric scanning of losartan potassium in phosphate buffer (pH 6.8)

From the standard stock solution prepared in phosphate buffer (pH 6.8) one ml solution was pipetted out and volume was made up to 10 ml in a 10 ml volumetric flask and U.V. scan was taken between wavelength of 200-400 nm. The blank used here was phosphate buffer.

3. Preparation of calibration curve

From the standard stock solution of losartan potassium **(stock solution I)**, 1ml was pipetted out and volume was made up to 100 ml in a 100 ml volumetric flask **(stock solution II)** From the stock solution II, aliquots of 0.1 ml, 0.2 ml, 0.3 ml……. 1.0 ml pipetted out into 10 ml volumetric flask and volume was made up to 10 ml with phosphate buffer (pH 6.8). The absorbance of these dilutions was measured at 209 nm using UV spectrophotometer (Shimadzu, UV-1800) against phosphate buffer as reference. The calibration curve was plotted between concentration and absorbance on X and Y axis respectively.

VALIDATION OF ANALYTICAL METHODS AND PROCEDURES (USP)[2]

The USP has published specific guidelines for method validation for compound evaluation. USP defines six steps for validation.

1. Accuracy
2. Precision
3. Limit of Detection (LOD)
4. Limit of Quantitation (LOQ)
5. Linearity
6. Range

1. Accuracy

The accuracy of an analytical procedure expresses the closeness of agreement between the value which is accepted either as a conventional true value or an accepted reference value and the value found. This is sometimes termed trueness.

2. Precision

The precision of an analytical procedure expresses the closeness of agreement (degree of scatter) between a series of measurements obtained from multiple sampling of the same homogeneous sample under the prescribed conditions. Precision may be considered at three levels: repeatability, intermediate precision and reproducibility. The amount of drug was estimated by measuring the absorbance and by fitting these values to the straight-line equation of calibration curve.

3. Limit of Detection (LOD)

The detection limit of an individual analytical procedure is the lowest amount of analyte in a sample which can be detected but not necessarily quantitated as an exact value.

The limit of detection is the point at which a measured value is larger than the uncertainty associated with it. The limit of detection is frequently confused with the sensitivity of the method. The sensitivity of an analytical method is the capability of the method to discriminate small differences in concentration or mass of the test analyte. In practical terms, sensitivity is the slope of the calibration curve that is obtained by plotting the response against the analyte concentration or mass.

The Limit of detection (LOD) may be expressed as:

$$LOD = \frac{3.3\ \sigma}{S}$$

Where σ = the standard deviation of the response

S = the slope of the calibration curve

Based on the Standard Deviation of the Blank

Measurement of the magnitude of analytical background response is performed by analyzing an appropriate number of blank samples and calculating the standard deviation of these responses.

4. Limit of Quantitation (LOQ)

The quantitation limit of an individual analytical procedure is the lowest amount of analyte in a sample which can be quantitatively determined with suitable precision and accuracy. The quantitation limit is a parameter of quantitative assays for low levels of compounds in sample matrices, and is used particularly for the determination of impurities and/or degradation products.

The Limit of quantitation (LOQ) may be expressed as:

$$LOQ = \frac{10\ \sigma}{S}$$

Where σ = the standard deviation of the response
S = the slope of the calibration curve

The slope S may be estimated from the calibration curve of the analyte. The estimate of σ may be carried out in a variety of ways including:

Based on Standard Deviation of the Blank

Measurement of the magnitude of analytical background response is performed by analyzing an appropriate number of blank samples and calculating the standard deviation of these responses.

LOQ: 10 σ / S

5. Linearity

The linearity of an analytical procedure is its ability (within a given range) to obtain test results which are directly proportional to the concentration (amount) of analyte in the sample.

6. Range

The range of an analytical procedure is the interval between the upper and lower concentration (amounts) of analyte in the sample (including these concentrations) for which it has been demonstrated that the analytical procedure has a suitable level of precision, accuracy and linearity.

DRUG POLYMER INTERACTION STUDY

In the preparation of tablet formulation drug and polymer may interact as they are in close contact with each other, which could lead to the instability of drug. Therefore drug polymer interaction studies are very critical in selecting appropriate polymers. For the present study, the drug- superdisintegrants interaction studies were conducted by comparing it with the pure drug and physical mixture of drug-polymer and formulation by FTIR and DSC.

EVALUATION OF LOSARTAN POTASSIUM DRUG AND EXCIPIENTS

Pre-compressional Parameters/ Micromeritic properties

Angle of repose (ɵ) [3]

Angle of repose of losartan potassium and tablet blends was determined using fixed funnel method. The physical mixtures of drug with different excipients were prepared and the accurately weighed. A funnel was held in plane with a clamp on a ring spot over a plate. A fixed amount of powder was transfer in to the funnel, keeping the orifice of the funnel blocked by the funnel. As the thumb is removed the powder is emptied from the funnel.

The height (h) and diameter of the powder cone was measured and angle of repose was calculated by following formula:

Angle of repose (θ) = $\tan^{-1}$ (h/r)

Where, h = the height of powder cone and r = the radius of powder cone

Apparent bulk density and tapped density [4]

Apparent bulk density and tapped density of losartan potassium and tablet blends were determined using bulk density apparatus. A weighed amount of drug or blend was poured into graduated cylinder and the volume (Vo) was noted. Then the graduated cylinder was fixed on the density apparatus and timer knob set for 100 tapping. The tapped volume was measured to nearest graduated unit. The bulk density and tapped density were calculated by following formula:

Bulk Density = W/ Vo
Tapped density = W/V_f
W= weight of the powder
Vo = Initial volume of the powder
V_f = Final volume of the powder

Compressibility index (Carr's index) [5]

Based on the apparent bulk density and the tapped density, the percentage compressibility of the powder mixture was determined by the following formula:

$$\text{Compressibility index} = \frac{\text{Tapped density - Bulk density}}{\text{Tapped density}} \times 100$$

Hausner's ratio

Hausner ratio is an indirect index of ease of measuring the powder flow. It is calculated by the following formula:

$$\text{Hausner's ratio} = \frac{\text{Tapped density}}{\text{Bulk density}}$$

Swelling Index of gum

Swelling index is the volume in millilitres that is occupied by 1 gm of drug or any adhering mucilage after it has swollen in an aqueous liquid for 4 hours. The method of studying swelling index for locust bean gum was carried out as per BP specifications. Swelling index was calculated from mean readings of three determinations:

RESULTS AND DISCUSSION

IDENTIFICATION OF DRUG

Melting Point[1]

Melting point of Losartan Potassium was determined by Capillary fusion method. It was found to be 264-268°C which is similar to the reported in literature 263-265°C.

Ultraviolet absorption[2]

The absorption maxima (λ max.) of losartan potassium solution (10 µg/ml) were found to be 209 nm which is concordant with the literature shown in figure 1 and table 2.

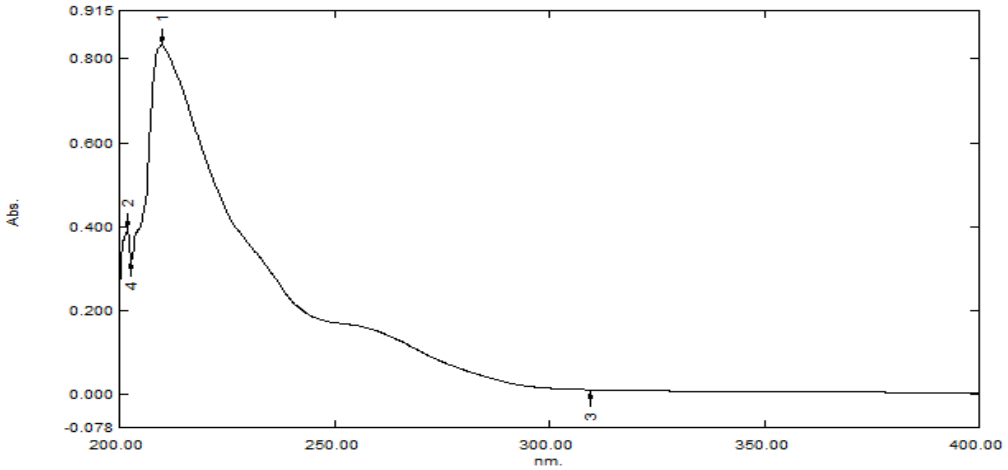

Fig.1 Spectrum of losartan Potassium in acid buffer pH 6.8

I.R. spectra determination

IR (KBr) cm^{-1} of pure drug losartan potassium exhibited characteristics absorption bands like 3197.63 (NH str.), 2928.53 (CH str., aliphatic), 1575.92 (Skeletal vibrations phenyl ring), 988.92 (Ring breathing mode, imidazole/ tetrazole), 759.62 (C-Cl str.).

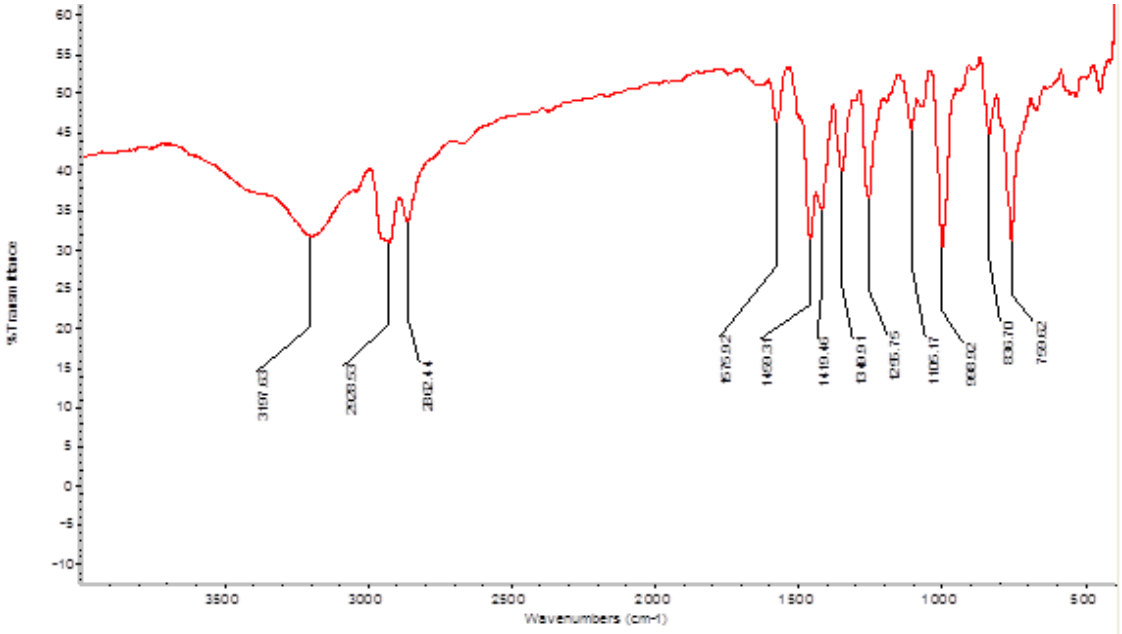

Fig.2 I.R. Spectra of losartan potassium

Partition Coefficient[3-4]

The partition coefficient of losartan potassium was calculated as ratio of concentration of losartan potassium in n-octanol to that in the aqueous phase and it was found 4.54 (shown in table 2).

Solubility studies[5]

The available literature on solubility profile losartan potassium indicated that the drug is very soluble in water, methanol, sparingly soluble in acetic acid and practically soluble in acetonitrile. The results of losartan potassium solubility in various media are shown in Table 2.

The study was carried out to select suitable dissolution medium for *in-vitro* release studies.

Table 2: Preformulation studies of losartan potassium

Studies	Identification* (UV)	Partition Coefficient	Solubility (gm/ml)*	
Result	209	4.54	Water	pH 6.8 (phosphate buffer)
Reported	209 & 210	4.5	1.230	1.289

*Average of 3 determinations

Scanning of losartan potassium in phosphate buffer pH 6.8

The absorption maximum (λ max.) of losartan potassium in pH 6.8 was found to be 209 nm. The results were shown in shown in figure 1 and table 2.

Preparation of standard plot of Losartan potassium

The calibration curve of losartan potassium was prepared in phosphate buffer (pH 6.8). The plot of different concentrations of losartan potassium versus absorbance was found to be linear in the concentration range of 0.1-10µg/ml at 209nm. The absorbance at different concentrations was shown in table 7. The data of standard curve were linearity regressed. The slop and correlation coefficient values were found to be 0.096 and 0.997 respectively. The intercepts on Y-axis found to be 0.100. The calibration curve and regression data was shown in figure 3 and table 3.

Table: 3 Standard plot (calibration curve) for the estimation of Losartan Potassium in phosphate buffer (pH 6.8)

Sr. No	Concentration (µg/ml)	Absorbance ±S.D.*
1	1	0.107±0.011
2	2	0.214± 0.008
3	3	0.326±0.007
4	4	0.433±0.012
5	5	0.533±0.007
6	6	0.623±0.009
7	7	0.728±0.002
8	8	0.800±0.010
9	9	0.893±0.008
10	10	0.984±0.013

*Average of three determinations

Table 4: Regression data of calibration curves

Sr. No.	Medium	Regression data		
		M	C	R
1	pH 6.8	0.096	0.031	0.997

m = slope, c = intercept, r = correlation co-efficient

The linear regression analysis was done on absorbance data points. A straight-line equation (Y = mx + c) was generated to facilitate the calculation of amount of drug.

Absorbance = slope x concentration + Intercept

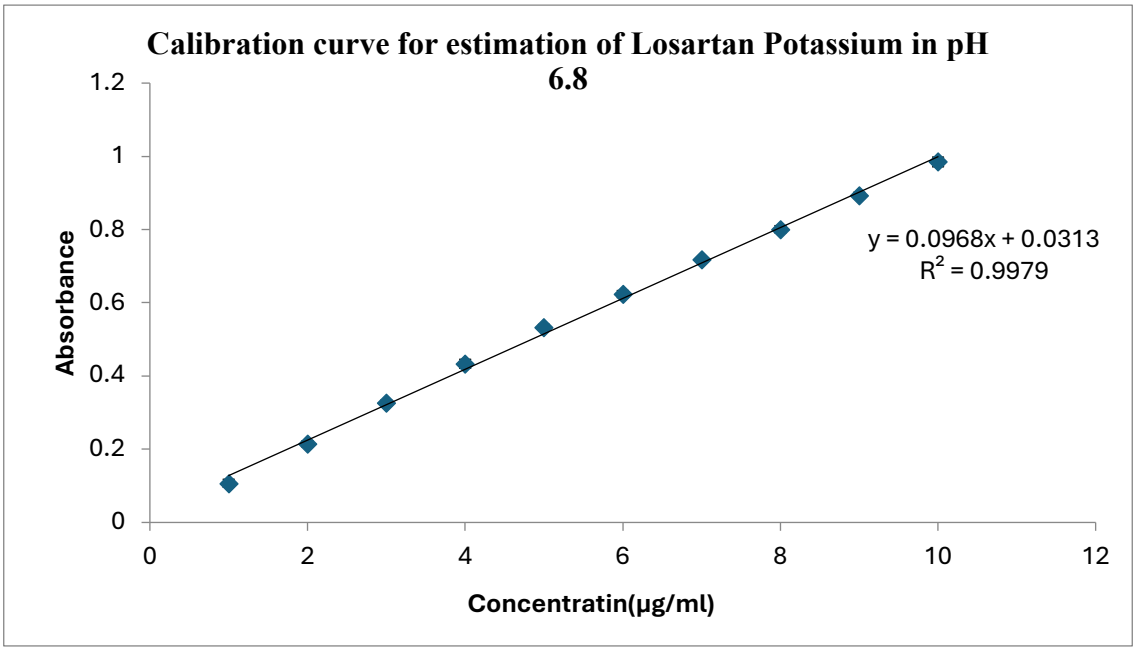

Fig. 3 Calibration curve of losartan Potassium

Table 5: Regression data of calibration curves

Validation Parameters	Phosphate buffer pH 6.8
Linearity Equation	y = 0.096+0.031
Lineraity Range (b)	1-10 mcg/ml
Slope (m)	0.096
Intercept (C)	0.031
R^2 Value	0.997
LOD, n=3	0.46 µg/ml
LOQ, n=3	1.40 µg/ml
Precision, n=3(%RSD)	10.49187
Accuracy, n=3	96.02%

DRUG POLYMER INTERACTION STUDY

As described in methodology section the FT-IR and DSC studies were carried out for pure drug alone and along with polymers.

FT-IR studies

FT-IR spectra of pure losartan potassium and polymer locust bean and physical mixture (drug + polymer) are shown in figure 12-14 and peaks are listed in table 10-11. The peaks given in table 10 matched with that of literature values for the functional groups present in losartan potassium. The peaks listed in the table 10 for pure drug under considered as characteristics peaks. The peak of the drug in presence of polymer were not affected and prominently observed in FT-IR spectra given in figures 12-14.This indicates that there is not any kind of interaction between losartan potassium and polymer and the drug was compatible with the formulation components.

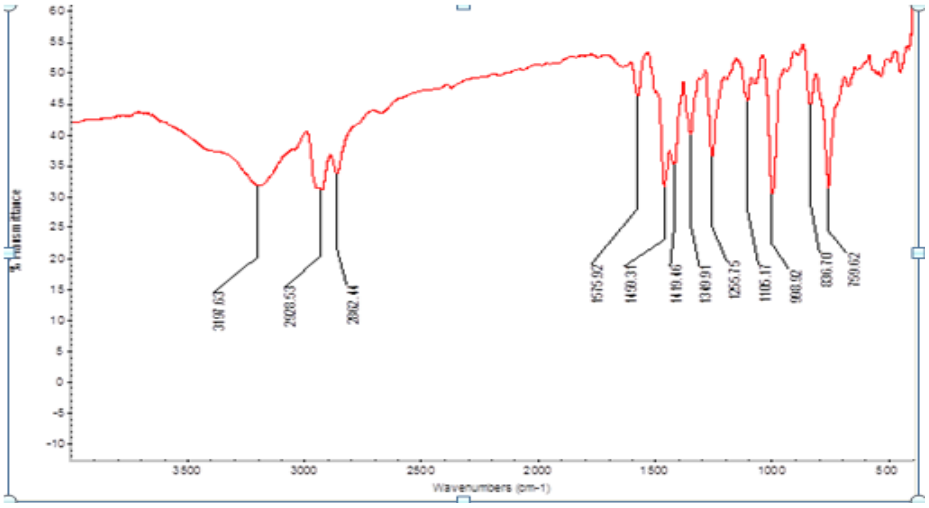

Fig. 4 IR spectra losartan potassium pure drug

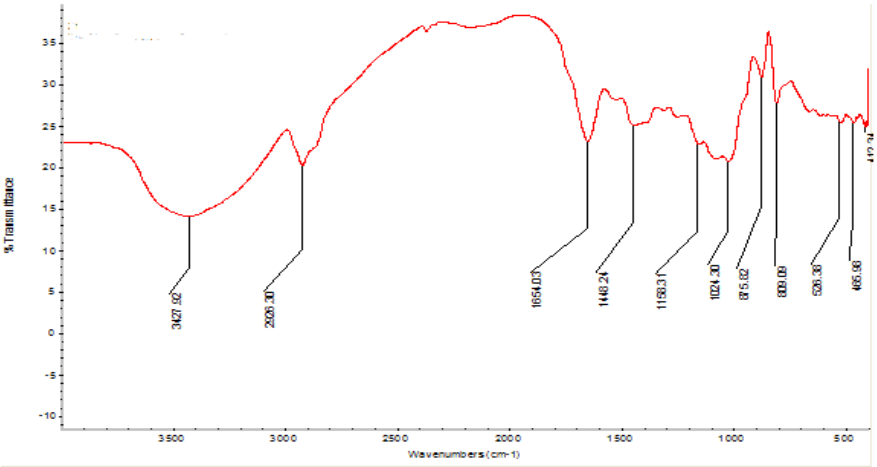

Fig. 5 IR spectra Locust bean gum pure polymer

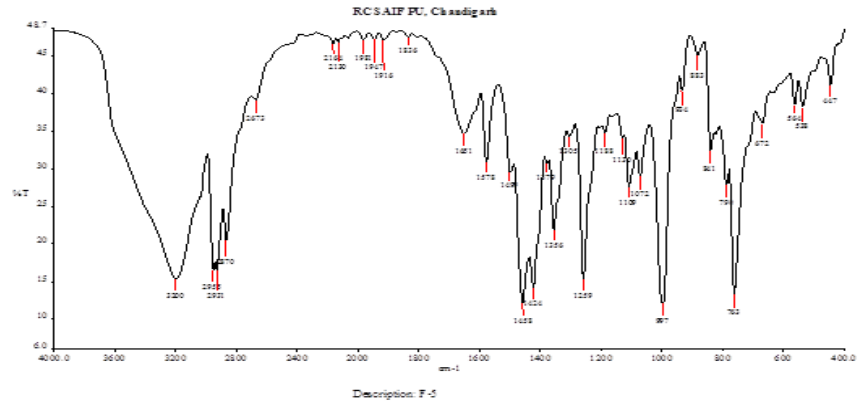

Fig. 6 IR spectra of physical mixture of pure losartan potassium+ locust bean gum

Table 6: IR spectra interpretation of Losartan Potassium (drug) and Locust bean gum (superdisintegrant) interaction study

Formulation Name	Functional group	Characteristics absorption peak cm^{-2}	Bond vibration Range
Losartan Potassium	NH (Stretching)	3197.63	3077-3497
	CH_3 group C-H (bending)	1419.46,1459.31	1375-1450
	C-Cl (stretching)	759.62	550-850
	C-N(stretching)	1255.75	1020-1280
	C-C multiple bond(stretching)	1575.92	1510-1600
	CH aromatic hydrocarbon (stretching)	2928.53,2862.44	2800-3000
	Aromatic ring two adjacent H atom	836.70	855-910
Locust bean gum	O-H (stretching)	3427.92	3400-3700
	C-H (stretching) due to CH_2 group	2926.30	2760-3000
	Galactose & mannose ring (stretching)	1654.03	1580-1650
	Deformation of CH_2&COH groups	1448.24	1440-1470
	CH_2OH(stretching)	1158.31	1100-1380
	CH_2 twisting (vibration)	1024.30	900-1100

Table 7: IR spectra interpretation of physical mixture of drug+ gum interaction study (Losartan potassium + Locust bean gum)

Physical mixture	Functional group	Characteristics absorption peak cm^{-2}	Bond vibration range
(A) Due to losartan potassium	NH (Stretching)	3200	3077-3497
	CH_3 group C-H (bending)	1424,1458	1375-1450
	C-Cl (stretching)	763	550-850
	C-N(stretching)	1259	1020-1280
	C-C multiple bond(stretching)	1578	1510-1600
	CH aromatic hydrocarbon(stretching)	2955	2800-3000
	Aromatic ring two adjacent H atom	841	855-910
(B)Due to Locust bean gum	C-H (stretching) due to CH_2 group	2931	2760-3000
	Galactose & mannose ring (stretching)	1651	1580-1650
	Deformation of CH_2&COH groups	1499	1440-1470
	CH_2OH(stretching)	1188	1100-1380
	CH_2 twisting (vibration)	1072	900-1100
	NH (Stretching)	3200	3077-3497

DSC studies

DSC studies for pure losartan potassium, polymer locust bean and physical mixture (drug + polymer) were carried out. Thermo grams are shown in figure 15-17 for pure drug and polymer and physical mixture (drug + polymer) respectively. Figure 15 indicates that the melting point of losartan potassium has taken place at sharp at 273.79°C. It is matching with the literature value[6] of losartan potassium 263-268°C. The thermogram indicates that the drug is pure. Figure 16 indicates that the melting of the polymer has taken place at 97.20°C. The comparative study of DSC thermogram revealed that there is no any appreciable change in the nature of the melting endotherms suggesting that the drug has not lost its characteristic properties even in its formulation form as there is no interaction of the drug with the polymer and other excipients used for the study.

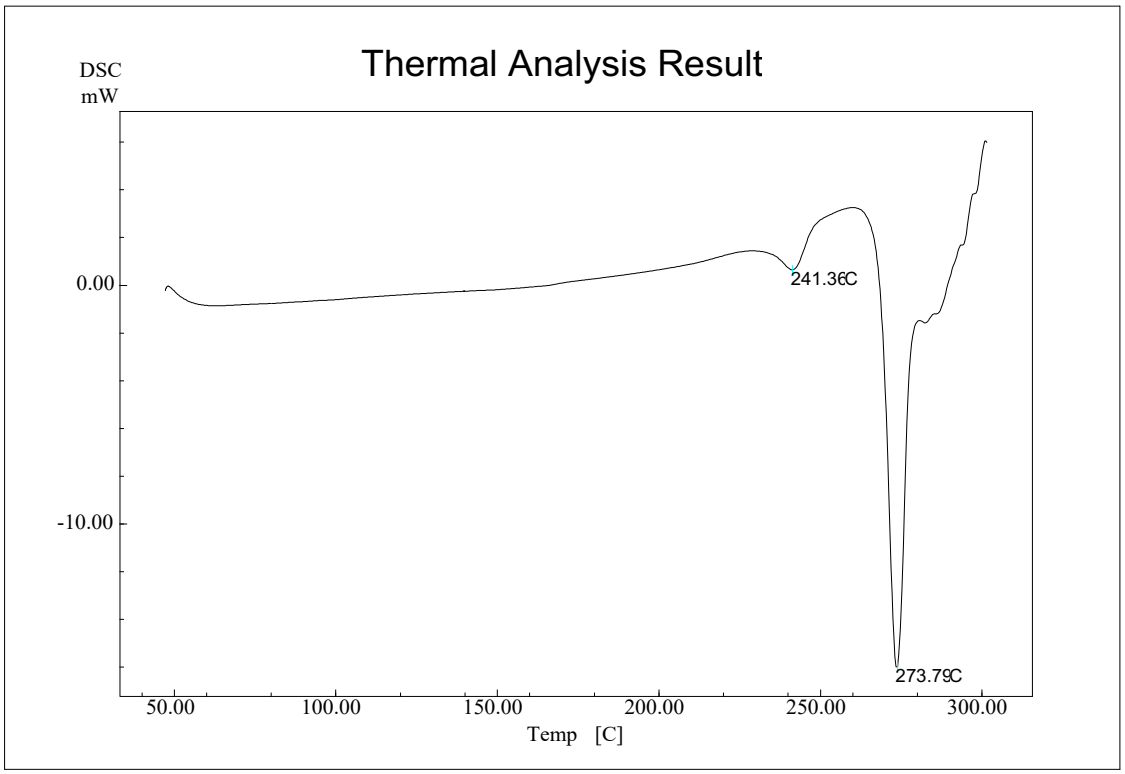

Fig.7 DSC thermogram of losartan potassium pure drug

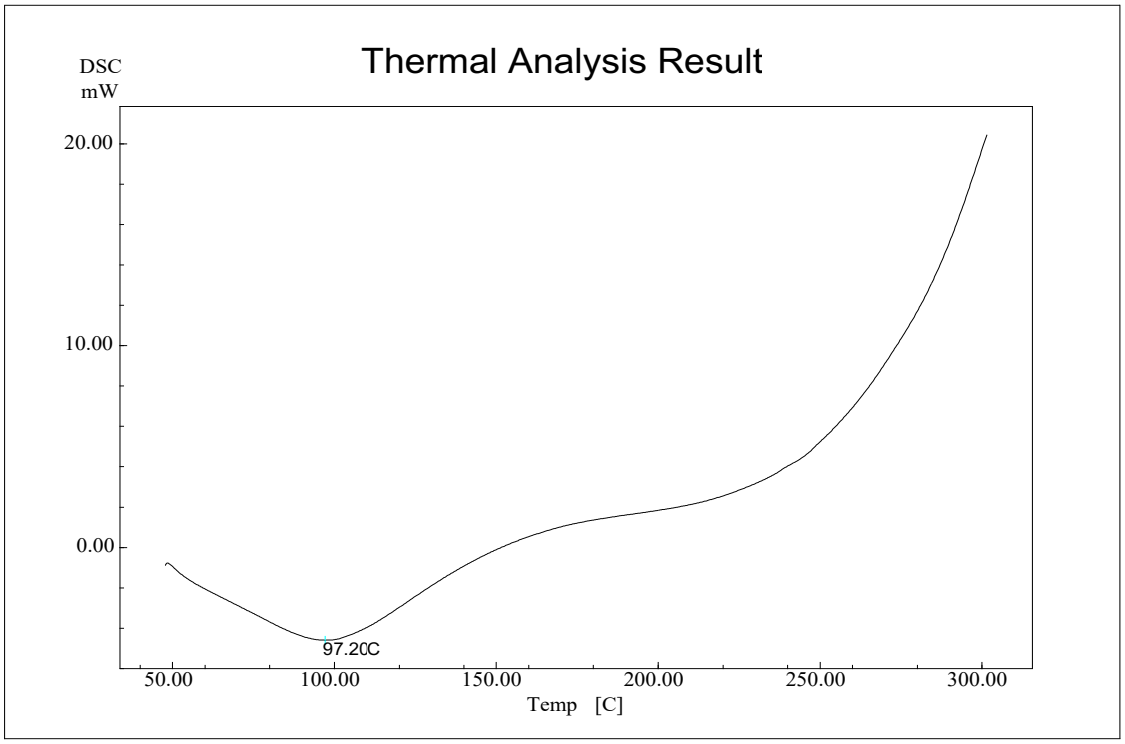

Fig.8 DSC thermogram of locust bean superdisintegrant

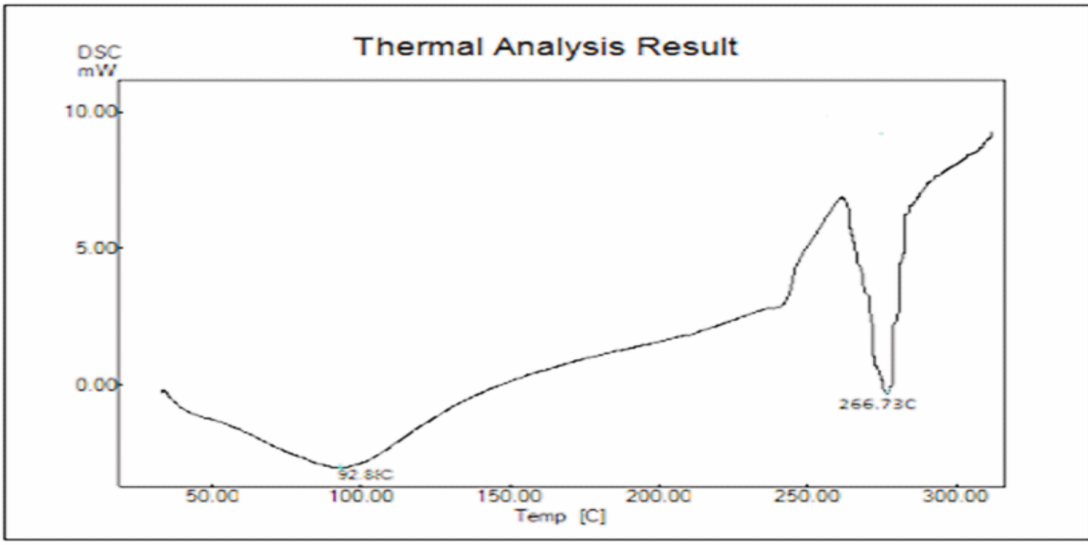

Fig. 9 DSC thermogram of physical mixture (drug+ superdisintegrant)

RESULTS OF PRECOMPRESSIONAL PARAMETERS MICROMERITICS PROPERTIES

Powder ready for compression containing drug and various excipients were evaluated for pre-compression parameters (Micromeritic properties) like flow properties of granules, bulk density and tapped density. The results of all the pre formulation parameters are given in table 9.

Angle of repose (ɵ)

Plain losartan potassium exhibited angle of repose value of (40.21±0.16) indicating poor flow property. The data obtained from angle of repose after addition of magnesium stearate and talc as a lubricant for all the formulations were found to be in the range of (25.08±0.61° to 29.05±0.09°). All the formulations prepared by direct compression method showed angle of repose less than 30 which reveals good flow property. The mean average of angle of repose results are tabulated in table 9.

Bulk density and Tapped density

Loose bulk density (LBD) and tapped bulk density (TBD) for the blend was measured. The loose bulk density for the entire formulation blend varied from 0.375±.002gm/cm^3 to 0.46±0.02gm/cm^3 and tapped bulk density for the entire formulation blend varied from 0.41±0.001gm/cm^3 to 0.53±0.02 gm/cm^3. The mean bulk density and tapped bulk density results are tabulated in table no. 9.

Carr's consolidation index

Carr's index of plain losartan potassium exhibited 31.29±0.14 indicating poor flow property. The results of Carr's consolidation index or compressibility index (%) after addition of magnesium stearate and talc, as a lubricant, for the entire formulation blend ranged from 6.00±1.07% to 24.051±0.52%. The directly compressible granulations had shown excellent compressibility index values result in good flow properties after addition of lubricants. The mean Carr's index test results are tabulated in table no 9.

Hausner's ratio

Hausner's ratio of plain losartan potassium exhibited 1.42±0.07 indicating poor flow property. Hausner's ratio of entire tablet blends was found between1.06±.04 to 1.31± 0.01. Lower Hausner's ratio (<1.25) indicates better flow properties. All the blends show better flow properties. The mean Hausner's ratio test results are tabulated in table no 9.

Swelling Index of gum

Swelling index of locust bean gum exhibited in range of 21.32±2.08. This indicated appreciable capability of locust bean gum to be used as superdisintegrant. The mean swelling index results are tabulated in table no 8.

Table 8: Swelling index of locust bean gum

Swelling Index	
Locust bean gum	21.32±2.08

Table 9: Micromeritic properties of precomressional powder blend

Formulation code	Angle of repose (θ)	Bulk Density	Tapped Density	Carr's Index (%)	Hausner's ratio
LP	40.21±0.16	0.43±0.01	0.82±0.01	31.29±0.14	1.42±0.07
F1	25.08±0.61	0.38±.002	0.52±.002	24.051±0.52	1.31±0.01
F2	30.38±0.33	0.35±.002	0.41±0.001	18.54±0.18	1.24±.005
F3	26.40±0.83	0.44±.02	0.53±0.02	15.79±2.88	1.17±0.04
F4	26.19±1.2	0.46±0.02	0.49±.002	6.00±1.07	1.06±.04
F5	26.39±0.22	0.42±0.005	0.49±0.001	9.845±1.14	1.17±0.01
F6	29.05±0.09	0.41±0.02	0.51±0.008	17.81±1.69	1.29±0.02

All values are expressed as mean LP (losartan potassium) ± SD. n=3.

CONCLUSION

It is possible to draw the conclusion that all pre formulation parameters are determined to be acceptable for formulation based on pre formulation investigations of locust bean gum and losartan potassium. For the production of a fast-dissolving potassium losartan tablet, all parameters including solubility, angle of repose, Carr's index, bulk density, and tapped density were determined to be optimal. It is evident that by employing locust bean gum as a super disintegrant, we may create an antihypertensive pill that dissolves quickly and contains losartan potassium.

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CONFLICT OF INTRESTS

Authors declare none of conflicts

REFERNCES

1. Kaur T, Gill B, Kumar S, Gupta GD. Mouth dissolving Tablets: A Novel Approach to drug Delivery. Int J Pharm Res 2011; 3(1):1-7.
2. Puttalingaiah L, Kavitha K, Mani T. Fast disintegrating tablets: An overview of formulation, technology and evaluation. Res J Pharm Bio Chem Sci 2011; 2(2): 589- 601.
3. Yourong F, Shicheng Y, Hoon JS, Susumu K, Kinam P: Orally fast disintegrating tablets: developments, technologies, taste-masking and clinical studies. Crit Rev Ther Drug Carr Sys 2004; 21(6): 433-75.
4. Thakur RR, Sharma A, Kashiv M: Formulation, evaluation and optimization of mouth dissolving tablets of losartan potassium: A cost effective antihypertensive drug. J Pharm Res 2011; 4(7):2294-6.
European Pharmacopoeia. 5th ed. Strasbourg, France 2006:628.
http://www.fda/cder/guidance/5909dft.html.
(cited on date 17 sept. 2011).
5. Gupta A, Mishra AK, Gupta V, Bansal P, Singh R, Singh AK. Recent trends of fast dissolving tablet: Review. Int J Pharm Bio Arch 2010; 1(1):1-10.

6. Fast Dissolving Tablets: An Overview [cited 2012 Jan 03]. Available from: http://www.pharmainfo.net/reviews/fast-dissolving-tablets-overview.
7. Kumar VD, Sharma I, Sharma V. A comprehensive review on fast dissolving tablet technology. J App Pharm Sci2011; 1(5): 50-8.
8. Indian Pharmacopeia. Published by Govt. of India, Ministry of Health and Family Welfare. New Delhi 2007 vol. 2:247-48.
9. ICH Harmonized Tripartite Guideline. (2005). "Validation of Analytical Procedures: Text and Methodology Q2 (R1)." Parent Guideline Dated 27 October 1994 (Complementary Guideline on Methodology Dated 6 November 1996 Current Step 4 Version: 6-13.
10. Lieberman HA, Lachman L, Schwartz JB. Pharmaceutical dosage forms: Tablets. New York: Marcel Dekker1990; Vol. 2: 201-43.
11. Reddy KR, Mutalik S, Reddy S. Once daily sustained release matrix tablets of nicorandil: Formulation and In Vitro Evaluation. AAPS Pharm Sci Tech 2003; 4(4) Article 61 (http://www.aapspharmscitech.org).
12. Aulton ME. Pharmaceutics the science of dosage form design London: ELBS/ Churchill Livingstone 2002; 2nd ed: 207-8.
13. www.chemicalbook.com/productchemicalpropertiesCB1442564_EN.htm (Cited on 25 Feb. 2012).
14. Venkateswarlu BS, Chandira RM, Ajay T. Formulation development and evaluation of fast dissolving tablets of carvedilol. J Chem Pharm Res 2010; 2(1): 196-10.
15. http://www.drugbank.ca/drugs/DB00678 (Cited on 25th December 2011).
16. Umakanthareddy MA, Sreeramulu J, Punna S. Formulation development of losartan potassium microspheres using natural polysaccharides and their in-vitro evaluation. Res J Pharm Biochem Sci 2012; 3(2): 725-34.
17. Kaveri K, Saravanan C, Mozhi MT. Simultaneous estimation of losartan potassium and amlodepine besylate in tablet dosage form by UV. Spectrophotometer. Int Res J Pharm 2011; 2(4): 96-100.