6. SUMMARY, CONCLUSION & RECOMMENDATIONS

- The main objective of the current research work was to formulate crystal tablets with the aim to enhance solubility and *In-vitro* drug release rate compared with the pure drugs. The model drugs selected for the formulations were Amlodipine besylate, Entacapone and Lomefloxacin. Different crystals were formed by using different solvents like ethanol, ethyl acetate; distilled water, di-methyl formide, methanol, acetone etc. The flow patterns of the obtained crystals were evaluated i.e, angle of repose bulk density tapped density, carr’s index, hausner’s ratio. The crystals were compressed directly and evaluated for post compression parameters such as thickness, hardness, friability, weight variation, disintegration time, assay, *In-vitro* drug release studies, stability and bioavailability.

The overall conclusion of the research work was

- The study was beginning with crystallization of reference drugs in different solvents to form different polymorphic forms of Amlodipine besylate, Entacapone and Lomefloxacin different solvents were used by changing their polarity of the solvents.
- The crystals were determined by using scanning electron microscopy, differential scanning calorimeter, melting point, FTIR and powder x-ray studies.
- Unlike DSC and melting point studies, the X-rd studies showed significant variation in each existed form. FTIR studies revealed that there was no change in structure of compound and it could not interact with solvents in preparation of crystals.
- After preparation of each polymorphic form, for all forms of drugs solubility study was conducted to observe the enhancement of solubility when compared to pure drug. All the forms of crystals got increased in solubility when compared with pure drug.
- Preformulation studies were conducted for all forms crystals like angle of repose bulk density tapped density, carr’s index, hausner’s ratio. The flow patterns of the
existed forms were determined and results were showing excellent to good flow properties.

- Various forms of crystals of Amlodipine, Entacapone and Lomefloxacin were made in to tablets by direct compression method. In which micro crystalline cellulose act as diluents, sodium starch glycolate and croscarmellose act as disintegrating agent, magnesium stearate and talc used to provide proper glidant and lubrication action.

- The prepared tablets were evaluated for thickness, hardness, friability, weight variation, disintegration time, drug content uniformity. All the results were shown within the acceptable limits as per I.P.

- **In-vitro** dissolution study was conducted for all forms of crystals tablets. In case of amlodipine besylate Amlo-I (existed with distill water) had released 97.2% in 50 minutes and considered as best formulation. For Entacapone, Entacapone–IV (existed with ethyl acetate) had released 96.4% in 50 minutes which was best formulation compared to other forms along with pure formulation. For Lomefloxacin Lome-III (existed with ethanol) offered fastest rate of drug release i.e., 94.5% within 60 minutes. When compared with the pure drug formulation, all the crystal forms of tablets have released more drugs within 60 minutes. By comparing all the values with the pure forms of drug, it has concluded that there was enhancement of micromeretic characteristics, compressional properties and bioavailability.

- There after accelerated stability studies were conducted at temperature of 40±2°C & 75±5%RH for six months. After stability study i.e. at 1st, 2nd, 3rd and 6th month, samples were evaluated for post compressional parameters and In-vitro drug release rate. The results indicating that, there were no changes in the characteristics of the formulations.

- Finally the anti-microbial activity of Lomefloxacin was determined with different strains of microorganism using agar well diffusion method. The zone of inhibition with Lome-III (existed with ethanol) was higher indicated that the present obtained form of Lome-III was highly inhibited the growth of micro-organism, which was compared with standard drugs zone of inhibition.
The *In-vivo* bioavailability study was conducted for optimized test product of Lomefloxacin hydrochloride crystal with respect to the reference product i.e. pure Lomefloxacin 20 mg tablets under fasting conditions. The results observed that 90% confidence interval was meeting the bioavailability criteria i.e. 80-125 with respect to the rate and extent of absorption. Hence it had concluded that test product bioavailability was enhanced with reference product. So, a polymorphism phenomenon of Lomefloxacin hydrochloride is good candidate for enhancement of micromeritic, compressional properties and bioavailability of some insoluble drugs by polymorphism.
**Recommendations**

Even though many investigations and research was done to characterize the solid state of drug in various aspects, in preformulation studies. Despite of various areas in physicochemical characterization, polymorphic screening is a broad area with wide scope. The following recommendations are suggested for future perspective.

- A simple polymorphic screening can be solving wide variety of problems in pharmaceutical formulation development; even novel technologies unable solve those problems. Improved dissolution rate and stability are two major aspects which defines product efficacy and performance can be easily achieved by simple techniques like solid state manipulation and polymorphic conversion techniques.

- The solvent assisted polymorphic transformation is a simple and economical technique to study the role of solvent in crystal engineering and altered performance. As the solvent is a major element which is chosen carefully in crystallization as well as re-crystallization methods.

- Most of the solid state transformations are carried out with chemical, physical and mechanical process. Apart from all, development of polymorphs of APIs can be done by using solvent assisted re-crystallization technique since it is less laborious and not require much sophisticated equipment. So, an intensive study has needed to find the benefits and pitfalls of the solvent assisted polymorphic conversion process.