EVALUATION OF ANTIDEPRESSANT ACTIVITY OF SOLID-LIPID NANOPARTICLES USING *ALBIZZIA LEBBECK*

Kavitha S K[1]*, Dr Rupesh Kumar Mani[2*], Shaeena MH[3]

Abstract:
The innovative nanoparticles are very familiar for its widespread claims. The current research is carried out by albizzia lebbeck plants for using solid-lipid nano particles. The employed restrictions complex are contact time, pH, original absorption, amount of nano particle determination and contamination. The characterization modifications elaborate are FTIR and XRD. by means of albizzia lebbeck nano particle solution. The balance statement time obtained is 40 min. Like tendency also followed. The confident characteristics confirmed that albizzia lebbeck leaves along with stearic acid formed SLN nano particles. Solid lipid nanoparticles (SLN) current in 1991 denote a substitute carrier system to old-style colloidal carriers, such as emulsions, liposomes and polymeric micro- and nanoparticles. The SLN association the returns (e.g., physical stability, defense of combined labile drugs from deprivation, expert release, outstanding permissibility) of other traditional colloidal systems. This review defines the dissimilar ways of SLN production such as high-pressure homogenization, ultrasonication, solvent emulsification/ evaporation, microemulsion, spray drying and double emulsion, Supercritical Fluid technology, method along with novel drug delivery classification and drug combination models and also clarify about the In vitro and former vivo approaches the for estimate of drug release from SLN.

Keywords: SLN, XRD, SEM, FTIR, *Albizzia lebbeck*, SSRI *etc.*

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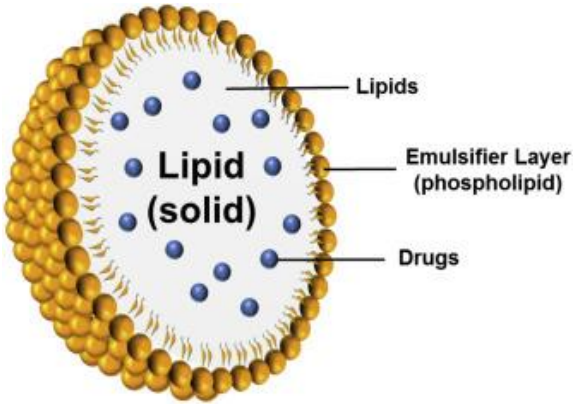
INTRODUCTION:

The expected drug delivery system (oral route) is restrained to be the furthermost suitable route of drug direction since of advanced submission, reduced difficulties and lesser cost as related to the novel drug delivery system. But due to poor stability, poor Permeability they lack in the oral bioavailability. The physicochemical and metabolic variability in the intestinal and the liver harmfully effects the drug absorption in the blood. Due to degradation of the drug (via hepatic first pass metabolism) there is casual of increased harmfulness and the favorite awareness of medication may not be able to influence the site of action (target site). Henceforth to stunned these difficulties linked with the oral route, the new colloidal medication transfer system was advanced which make available controlled drug delivery system and the abused drug distribution system. Colloidal carrier drug delivery system such as emulsions, liposomes and polymeric micro and Nano-particles. The colloidal subdivisions reaching in size between 10 and 1000 nm are known as Nanoparticles. They are typically factory-made from unreal or natural polymers. And ideally suited to optimize drug transport and reduce toxicity.[1,2] The Nano-particles have the ability to penetrate through some structural barriers due to their nanometer size and they can release the drug in the continued manner.

Nano-particles for Drug Targeting: Nano-particles can be defined as compact, sub-micron, colloidal units extending in size from 10 nm to 1000 nm in diameter, commonly but not automatically complete of natural or synthetic polymers, in which drugs container be adsorbed, entrapped, summarized or covalently involved and are formed by mechanical or chemical means. Nano-particles have converted one of the most active areas of investigate in the field of drug delivery due to their skill to deliver drugs to the right place, at appropriate times, and in the right dosage. They have traditional important care over the past 20 years due to their advantages related to other drug delivery systems.[3]

- Dependent on the type of solid or carrier used, four broad classes of Nano-particles are familiar: Polymeric Nano-particles,
- Phospholipid based Nano-particles,
- Iron based Nano-particles and
- Genetic Nano-particles

SOLID LIPID NANO-PARTICLES[1]: Solid lipid Nano-particles introduced in 1991, represent an alternative carrier system to old colloidal system such as emulsions, liposomes and polymeric micro and nano-particles. SLN's are appealing most important consideration as novel colloidal drug carrier for circulatory application. SLN's are the submicron colloidal transporters fluctuating from 50 to 1000nm, which are collected of functional lipid spread in water or in aqueous surface-active agent solution. SLN's offer unique properties such as small size, large surface area, high drug loading and the interaction of phase at the interface and are outstanding for their possible to improve routine of treatments. In order to overcome the disadvantages related with the liquid state of the oil condensations, the liquid was replaced by a solid lipid, which ultimately transformed into solid lipid Nano-particles.



COMPOSITION OF NANO-PARTICLES.[7-11]

SLN's are the circulations containing about 70-99.9% of water and about 0.1% - 30% w/w solid lipid spread in aqueous transitional and if essential even out with rather 0.5 to 5% w/w of surface-active agent.

WAX PHASE

The phospholipid medium is collected of highly tolerable and biocompatible lipids having excellent biodegradability and low harmfulness. The fats used should hold the ideal characteristics.

- Strength and compatibility with preparation molecule.
- Biocompatible and biodegradable.
- Ease of production on a large scale.
- Flexibility to yield multiple release profiles.

Lipid biocompatibility and deficiency of harmful ness are significant attention in the design of a drug delivery system. Particularly individuals planned for general application.

SURFACTANTS: The type of the surface-active agent or wetting agent mixture and their concentration used the stage a major influence on the superiority of SLN, later surfactants affect surface properties of SLN. The best choice

subsidizes to higher solidity by preventing particle mixture more capably. In SLN the components of wetting agent used are (with respect to charge and molecular weight) have been used to stable the phospholipid spreading listing phospholipids, bile salts, poloxamers and other ionic and non-ionic surfactants.

OTHER INGREDIENTS:

SLN dispersals, which are stabilized by electrical charge, are complex to the accumulation of electrolytes. Whereas, high salt meditations make a rise in thickness and lead to progress of gels, low salt considerations, in difference reduction the handful adhesiveness. The untried viscosity effect in circulations with ionic stabilizers is maybe due to a decrease of the particle electrical double layer by the influence of added electrolytes and corresponds to the drop of the particle's active volume fraction.

METHODS OF PREPARATION AND PRINCIPLES FOR SOLID LIPID NANO- PARTICLES.[1]

SLNs are formed by several methods expansively defined in the literature. The confidence of all methods is based on group of Nano emulsions by replacing oil for melt lipid using both high- and low-energy methods. Then extra cooling gives rise to lipid image and the generation of SLNs.

The high energy method for SLN manufacture, in universal contains in (i) charge the phospholipid phase (plus theoretically solubilized drug) 5–10 °C above its melting point, (ii) premixing it with the aqueous surfactant solution at the same temperature, (iii) Nano- emulsifying the pre-emulsion using a high-powered process (high pressure homogenizer or high shear sonication and finally, (iv) cooling it down to room temperature to form the lipids. The low energy approaches for SLN are either based on generation of Nano-emulsions by spontaneous emulsification (lipid melt instead of oil) generated by solvent evaporation or diffusion so rapid displacement of the surfactants from the oily to aqueous phase, or other based on formation of a micro-emulsion above melting point of the lipid (lipid melt/ SAA/coSAA/water system) followed by cooling to precipitate the Nano-particles.

In brief, methods used for SLN production include:

1. Homogenization followed by Ultrasonication
2. High pressure homogenization

a) Hot homogenization

b) Cold homogenization

3.Ultra sonication/high speed homogenization

c) Probe ultra-sonication

d) Bath ultra-sonication

4. Solvent evaporation method.
5. Solvent emulsification-diffusion method
6. Supercritical fluid method
7. Micro emulsion-based method
8. Spray drying method
9. Double emulsion method

MODEL OF DRUG RELEASE.[6, 10]

The over-all principles of treatment issue from lipid Nano-particles are as follows:

1. There is an inverse affiliation among medication release and the screen coefficient of the drug.
2. Higher surface area due to smaller particle size in millimicron range gives higher drug release.
3. Slow drug release can be realized when the drug is consistently distributed in the lipid background. It be subject to on type and drug set-up model of SLN. Crystallization behavior of the lipid carrier and high flexibility of the drug lead to fast drug release. There is an reverse relationship between manifestation mark and mobility of drug.

The drug combination model of SLN is critical to the drug release design. It is connected to the arrangement and construction method of SLN as described above. For occurrence, the drug-loaded lipid phase remainders mainly in the solid state in the case of invention by cold homogenization technique. The solid solution drug combination model seems here. Drug release is long over some weeks since flexibility of the drug molecularly dispersed in colloidal particles is very limited.

Fast initial drug release (burst effect) exists in the first 5 minutes in the drug-enriched shell model (i.e., about 100% within <5 min) as a result of the outer layer of the particles due to the large surface area of drug statement on the particle surface. The rupture announcement is summary with collective particle size and prolonged release could be obtained when the particles were sufficiently large, i.e., lipid Nano-particles. The type of surfactant and its concentration, which will interact with the outer shell and affect its structure, should be noted as the other important factor, because a low surfactant concentration leads to a minimal burst and continued drug release. The particle size that affects drug release rate directly depends on various parameters such as composition of SLN formulation (such as surfactant/surfactant mixture, amount of drug incorporated, structural properties of lipid and drug), invention methods and conditions (such as time, production temperature, equipment, sterilization and lyophilization).

MECHANISM OF ABSORPTION OF SLN.[13, 14, 15]

The general belongings of Nano-particles is that they are paste (this is a general behavior of all Nano-particles, not specific for lipid Nano-particles). The gumminess of particles to a superficial growth with the increase of the surface area of the particles and after adhesion to the gut wall the drug is exactly released at its place of absorption. The lipid absorption enhancing effect can be explained by the degradation of the lipids by enzymes in the gut leading to the formation of surface-active mono and di-glycerides on the surface of the lipid Nano-particles. These molecules isolate and form micelles. Throughout the impartiality and micelle founding process, the drug dissolved in the lipid is taken up in the micelle (solubilized). The formed micelles relate with surface- active bile salts important to the establishment of the so called "*mixed micelles*." In the consequent absorption process of the lipid degradation product, the drug is concurrently absorbed. These two mechanisms are exemplified in Figure2

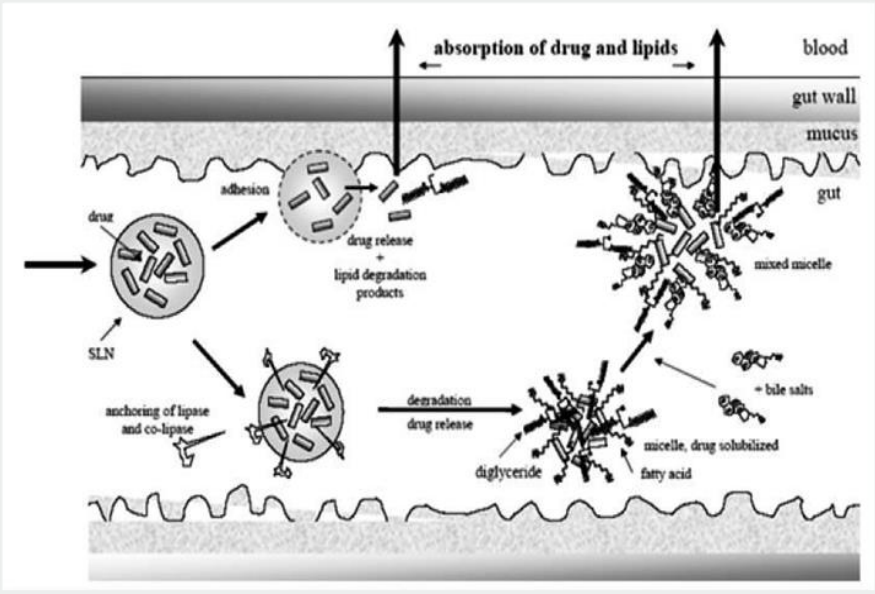


Figure 2: Mechanism: Lipid Nanoparticles for oral bioavailability enhancement [13].

Figure 2: Mechanism of absorption promotion effect of lipid being formulated as lipid Nanoparticles.

STABILITY.[6, 16, 17]

The physical properties of SLN's during long storage can be resolute by intensive care variations in zeta potential, particle size, drug content, appearance and viscosity as the function of time. External parameters such as temperature and light appear to be of main standing for long term stability. The zeta potential should be in general, remain higher than -60mV for a diffusion to continue actually stable. Shared difficulties of SLN include particle growth, impulsive gelation tendency, unexpected dynamics of polymorphic transitions, characteristically low incorporation capacities due to crystalline structure of solid lipid, drug expulsion after polymorphic transition during storage the dispersions (70-99.9%) have been observed. The preparation, method of choice of lipids and surfactants could be optimized to increase their stability.

TOXICOLOGICAL CONCERNS:

To express parenteral lipid- based carriers, surfactant of qualified status must be active, e.g., lecithin, Tween 80, Poloxamer 188, Span 85 and Sodium glycocholate. It can be expected that the cytotoxicity of the SLN can be mainly credited to mechanisms of the aqueous phase, specially to non-ionic emulsifiers and additives that have ultimately been used. The communications of SLN and their particular cytotoxicity were studied with human granulocytes, showing low uptake by phagocytosis resulting in long duration time in blood. Furthermore, when acting bolus immunizations into mice good acceptability was found for most of the surfactant's covering SLN. After autopsy and histopathology no significant evidence was recognized that SLN were extremely toxic to verified animals.

ADVANTAGES OFSLNs.[6]

Control and / or target drug release.

- ✓ First-rate biocompatibility
- ✓ Advance stability of pharmaceuticals.
- ✓ High and improved drug content.

- ✓ Relaxed to measure up and can be subjected to commercial sterilization procedures.
- ✓ Improved control over release kinetics of encapsulated compounds.
- ✓ Higher bioavailability of entrapped bioactive compounds.
- ✓ Chemical safety of labile combined compounds.
- ✓ Conservative mixture work methods applicable.
- ✓ Very high long-term stability.
- ✓ Application versatility.

Disadvantages of SLN's

- ✓ Subdivision growth.
- ✓ Random gelation tendency.
- ✓ Surprising dynamics of polymeric transitions.

APPLICATIONS OF SOLID LIPIDNANO-PARTICLES.[11]

A) Oral SLNs in anti-tubercular chemotherapy

Anti-tubercular drugs such as Rifampicin, Isoniazid, Pyrazinamide-loaded SLN systems, were able to decrease the dosing frequency and improve patient compliance. The nebulization in animal by incorporating the above drugs in SLN also reported for improving the bioavailability of the drug.

B) SLNs for topical use

SLNs have been used for topical application for various drugs such as Tropolide, Imidazole, Flurbiprofen and Glucocorticoids. The penetration of Podophyllotoxin-SLN into stratum corneum leads to the epidermal targeting.

C) SLNs as a targeted carrier for anticancer drug to solid tumors

SLNs have been reported to be useful as drug carriers to treat neoplasms. Tamoxifen, an anticancer drug incorporated in SLN to prolong release of drug after i.v administration in breast cancer and to enhance the permeability and retention effect.

D)SLNs in breast cancer and lymph node metastases

Mitoxantrone-loaded SLN local injections were formulated to reduce the toxicity and improve the safety and bioavailability of drug. Efficacy of Doxorubicin (Dox) has been reported to be enhanced by incorporation in SLNs. The system has enhanced its efficacy and reduced breast cancer cells.

E) SLNs as gene vector carrier

SLN can be used in the gene vector formulation. In one work, the gene transfer was optimized by incorporation of a diametric HIV-1 HAT peptide (TAT 2) into SLN gene vector. There are several recent reports of SLN carrying genetic/peptide materials such as DNA, plasmid DNA and other nucleic acids.

F) SLNs as cosmeceuticals

The SLNs have been applied in the preparation of sunscreens and as an active carrier agent for molecular sunscreens and UV blockers. The in vivo study showed that skin hydration will be increased by 31% after 4 weeks by addition of 4% SLN to a conventional cream.

DEPRESSION: [18]

According to WHO, Despair is a common mental illness that presents with depressed mood, loss of concentration or pleasure, reduced energy, emotional state of responsibility or low self-worth, concerned sleep or appetite, and deprived meditation. Moreover, sadness often comes with signs of nervousness. These difficulties can become long-lasting or regular and lead to considerable losses in an individual's capability to take care of his or her average responsibilities. At its worst, depression can lead to suicide. Almost 1 million lives are lost yearly due to self-destruction, which renders to 3000 self-annihilation demises every day. For every individual who finalizes a suicide, 20 or more may effort to end his or her life.

Current concepts of classification: [19, 20]

Depressive illnesses have extended been familiar as mixed. Their suborganization has generated as much research, and as much heat, as any controversy in psychiatry. The two official schemes are parallel, but not equal, and neither is entirely satisfactory.

Its major classes are depressive disorders and bipolar disorders. Both have subsections. The ICD has up to eighter imaginable groups for artificial role presentation miserable mood. One of these, affecting psychoses have various units. DSM-III has unlike difficulties, and rendered more confusing by its rejection of out-of-date nomenclature. The affecting disorders are divided into two main groups, major affective disorders and other specific affective disorders, with a third group of atypical affective disorders which are those not quite fitting the criteria.

1. Main emotional syndrome

a) Bipolar illness

- Overexcited
- Unhappy
- Varied

b) Main despair

- Single episode or recurrent
- With or without melancholia

- With or without psychotic features

2. Additional detailed emotional disorders

- Cyclothymic disorder
- Dysthymic disorder

3. Different affective disorders

- Atypical bipolar disorder
- Atypical depression

SYMPTOMS[20]:

Needs a medical diagnosis:

The determined feeling of sadness or loss of interest that characterizes major depression can lead to a range of behavioral and physical symptoms. These may include changes in sleep, appetite, energy level, concentration, daily behavior or self-esteem. Depression can also be associated with thoughts of suicide.

Pain areas: in the back.

Mood: anxiety, apathy, general discontent, guilt, hopelessness, loneliness, loss of interest, loss of interest or pleasure in activities, mood swings, panic attack, sadness, or emotional distress.

Behavioral: agitation, excessive crying, irritability, restlessness, self-harm.

Sleep: early awakening, excess sleepiness, insomnia, or restless sleep.

Whole body: excessive hunger, fatigue, or loss of appetite.

Cognitive: lack of concentration, slowness in activity, or thoughts of suicide.

Psychological: depression or repeatedly going over thoughts.

Also common: constipation, headache, poor appetite, substance abuse, or weight loss.

Anti-depressants [(21)]:

Antidepressants are psychiatric medications given to patients with depressive disorders to alleviate symptoms. They correct chemical imbalances of neurotransmitters in the brain which probably cause changes in mood and behavior.

Antidepressants are the most prescribed therapy for depression. That antidepressants increase the concentration of one or more brain chemicals (neurotransmitters) that nerves in the brain use to communicate with one another. The neurotransmitters affected .by antidepressants are norepinephrine, serotonin, and dopamine. The different classes of antidepressants differ in the neurotransmitters they affect. This determines some of their side effects and potential drug interactions. All available antidepressants are effective, and for most cases of depression there is no good evidence that any antidepressant is more effective than another. Side effects and potential drug interactions are major factors that influence selection of antidepressants and compliance with therapy. This article discusses side effects and potential drug interactions of the major antidepressant classes. There are 4 main types available right now in the US. Some are less commonly used.

1. Selective serotonin reuptake inhibitors (SSRIs)
2. Serotonin-norepinephrine reuptake inhibitors (SNRIs)
3. Tricyclic antidepressants
4. Monoamine oxidase inhibitors (MAOIs) [(22-31)]

Mechanism of action of Selective Serotonin reuptake inhibitor

Selective serotonin reuptake inhibitors (**SSRIs**) are a class of drugs that are typically used as antidepressants in the treatment of major depressive disorder and anxiety disorders. The exact mechanism of action of SSRIs is unknown. SSRIs are believed to increase the extracellular level of the neurotransmitter serotonin by limiting its reabsorption (reuptake) into the presynaptic cell, increasing the level of serotonin in the synaptic cleft available to bind to the postsynaptic receptor. They have varying degrees of selectivity for the other monoamine transporters, with pure SSRIs having only weak affinity for the norepinephrine and dopamine transporters.

MATERIALS AND METHODS

Materials used:

- Stearic acid
- Plant material
- Acetone
- Polyvinyl alcohol

Ethanolic extract preparation

10 g of plant material was added to ethanol (100 mL), heated to 40 ^{o}C and stirred for 3 h. The mixture was then filtered to get ethanolic extract of plant material

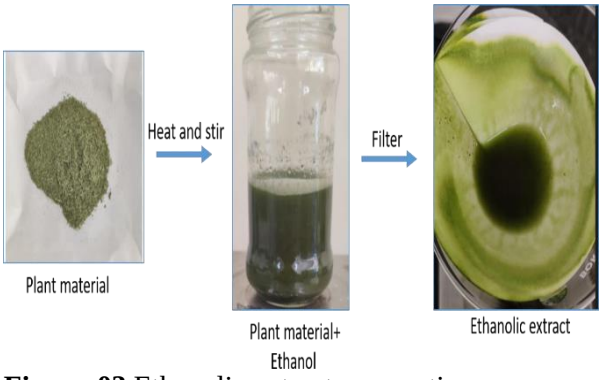


Figure:03 Ethanolic extract preparation

Preparation of solid lipid Nano-particles: 30 mg of stearic acid (SA) was dissolved in a mixture of acetone and ethanol (10 ml each) by applying a heat to 60 ºC in a water bath. 10 mg of ethanolic extract was added, stirred for 2 hours and solicited for half hour. The mixture stayed then transferred into a 100 ml, unfriendly solution of 1 % polyvinyl alcohol (refrigerated) under mechanical stirring. The solidified product was centrifuged, Ultrasonication at 1000 rpm and washed 3 times with deionized water. The SLN prepared were collected and used for further characterizations.

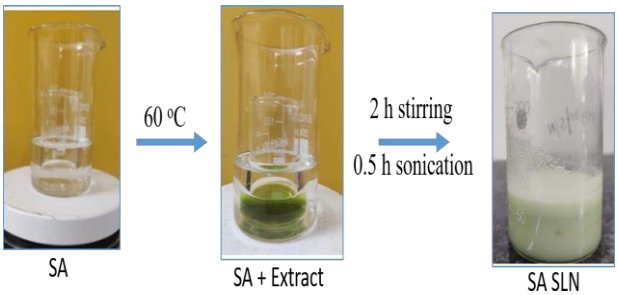


Figure:04 -Preparation of solid lipid Nano-particles

RESULTS:

CHARECTERIZATION OF SLNs

1. UV–Vis spectroscopic analysis: The response advancement for the establishment of SLN using A. lebbeck leaf extract was monitored by visual colour change and UV–Vis spectral scanning. Surface plasmon resonance (SPR) of SLN was characterized by using Ocean Insight HR2000+ High Resolution UV Spectrophoto- meter. A characteristic peak was obtained at 285 nm

Sl. No	Concentration µg/ml	Absorbance @ 285 nm
1.	10	0.1777
2.	20	0.3230
3.	30	0.4753
4.	40	0.6271
5.	50	0.7905
6.	60	0.9493

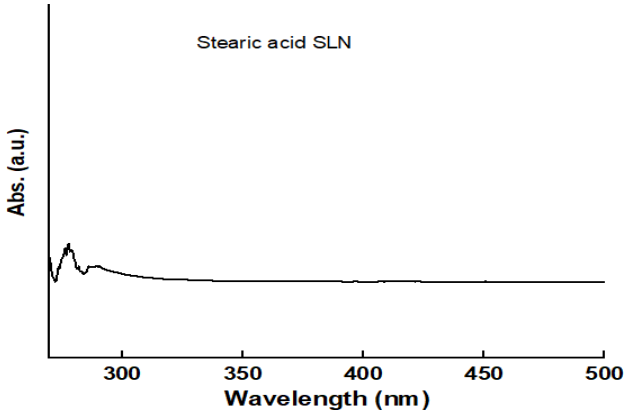


Figure:05: The Standard graph of *Albizzia lebbeck* using ethanol

2. XRD: The XRD of the prepared sample was obtained by Rigaku Smart Lab X-ray diffractometer, Cu Kα radiation (λ = 1.5406 Å). Broad, yet sharp peaks in the range of 10°–35° confirmed the semi-crystalline nature of synthesized SLNS.

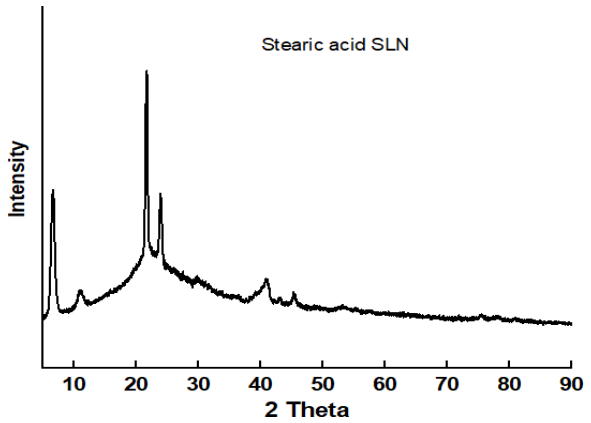


Figure:06-XRD design of SLN manufactured with *A. lebbeck* leaf extract

SEM (Scanning Electron Microscopy): A unassuming progression has remained traditional for the synthesis of SLN instruction leaf extract of *A. lebbeck*. The formation of solid-lipid nanoparticles was visually confirmed by SEM studies revealed the micrograms were obtained from JSM-7001F model. Obtained SLN were mounted on carbon tape and the FESEM along with EDX pattern were analyzed. The FESEM images confirm the shape of nano size of produced nanoparticles as their uniform distribution. with a size series of 100 nm. The consequences of this training showed that A. *lebbeck* leaf extract can be used as an efficient reducing agent for the facile, eco-friendly synthesis of SLN.

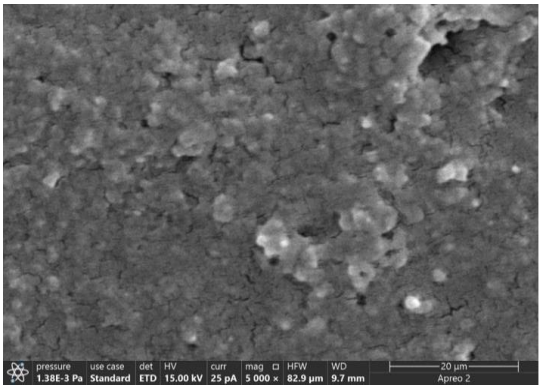


Figure:07- SEM images of synthesis of SLN

EDX: EDX mapping revealed the presence of carbon and oxygen elements in the SLNs. There observed 67.81 % and 32.19 %, wt. % of carbon and oxygen, respectively. The atomic % for the same were 73.73 and 26.27 %.

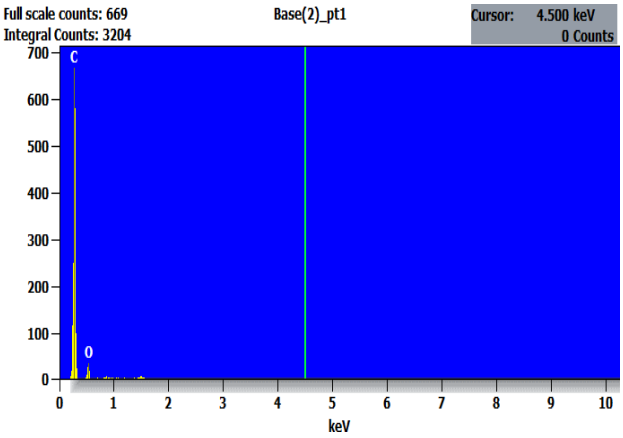


Figure:08- EDX images of synthesis of SLN

Particle size analysis: The particle size remained determined by lively light handful, using a Malvern system, with precipitously differentiated well-lit complete by an argon-ion laser (Cyonics) operated at 40 mW. Research was performed at a temperature of 25.0 ± 0.1ºC at a measure angle of 90º to the incident beam. The zeta-potential of the Nano-particles was measured in distilled water using a Malvern Zeta sizer. The technique of laser diffraction is based around the principle that particles passing through a laser beam will scatter light at an angle that is nonstop related to their size. As the particle size decreases, the observed scattering angle increases logarithmically.

The observed scattering intensity is also dependent on particle sizes and diminishes, to a good approximation, in relation to the particle's cross-sectional area. Large particles therefore scatter light at narrow angles with high intensity, whereas small particles scatter at wider angles but with low intensity.

Zeta potential

Zeta potential study was performed to evaluation the solidity of the Nano-particles. Zeta possible is a quantity of consequence of static responsibilities. This is the basic force that causes the revulsion between together particles. Net outcomes are desirability or repulsion depends upon the size of equally forces.

The thumb rule designates the relative between zeta possible resolve replies of the Nano-particles. Zeta potential was measure using Malvern zetasizer Nano-particles were diluted with distilled water and placed in a clear disposable zeta cell at 25°C. The sample was subjected for 2 zeta runs to determine both size and potential. The particle size, and zeta potential of *Albizzia lebbeck* prepared with stearic acid.

Formulation .no	Particle size (d. nm)	Zeta potential (mV)
AL1	166.9	-12.9
AL2	68.13	-13.9
AL3	47.03	-17.6
AL4	48.67	-16.3
AL5	44.53	-17.7
AL6	158.7	-10.1
AL7	143.0	-21.8
AL8	115.2	0.449
9	124.2	0.435

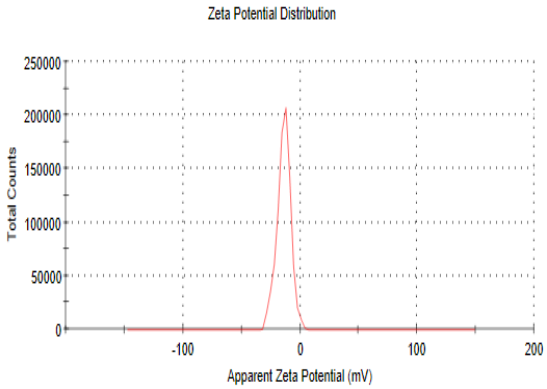


Figure09: Zeta potential

The formulations are carried out by extraction with ethanol as mentioned in the Synthesis (0.2 ml) is extracted for *Albizzia lebbeck* using 5 ml of ethanol. The drug content results were ranged between 88.75 to 100.57%

FT-IR spectrophotometer: An FT-IR spectroscopy study has been carried out separately to check the compatibility between (*Albizzia lebbeck)* and the lipids (Stearic acid) used for the preparation of Nanoparticles. The FT-IR was performed for drug, lipids, surfactants and physical mixture of drug and lipids. The spectra obtained

from FT-IR spectroscopy study at wave number from 4000 to 500 cm^{-1} are shown below.

SL.NO	Name of the compound	Wave number(cm^{-1})	Functional group
1	Stearic acid	3338.89 1508.38 1220.98 2922.25 1184.33	N-H Stretch Aromatic (C=C) Stretch (C-O) Stretch Aliphatic (C-H) Stretch Fluoro aromatic (C-F) Stretch
2	Albizzia lebbeck & Stearic acid (1:1)	3338.89 1508.38 1247.99 2918.40	N-H Stretch Aromatic (C=C) Stretch (C-O) Stretch Aliphatic (C-H) Stretch

Perusal to the above FTIR spectra, the characteristic peaks of Albizzia lebbeck of pure spectrum is retained in the FTIR spectra of physical mixture of drug with stearic acid, there is no drug lipid interaction is found. Hence, these lipids are used for the preparation of SLN.

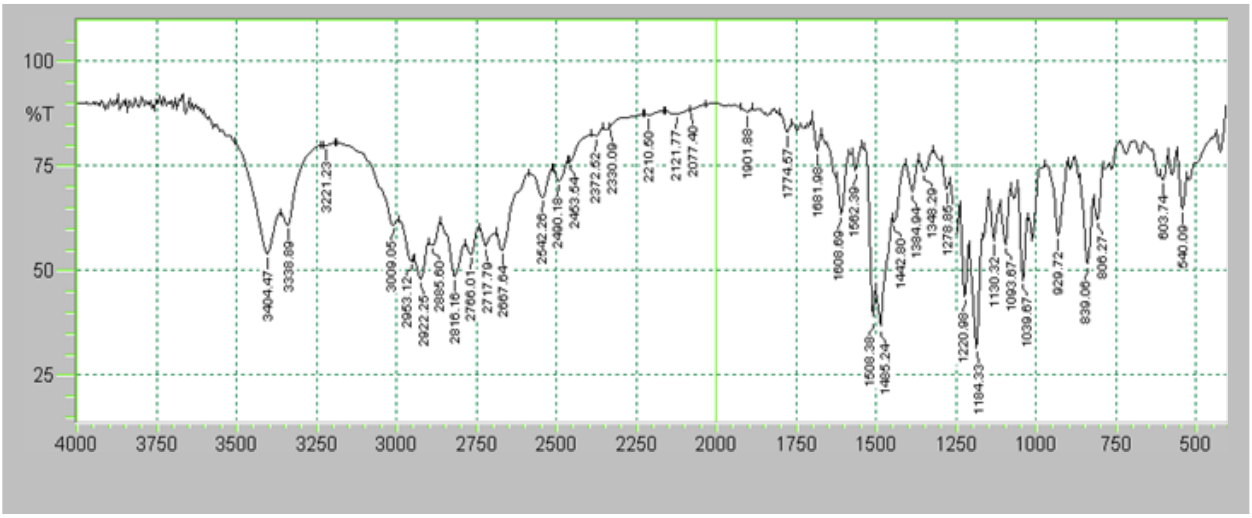


Figure 10: The FTIR spectrum of *Albizzia lebbeck*

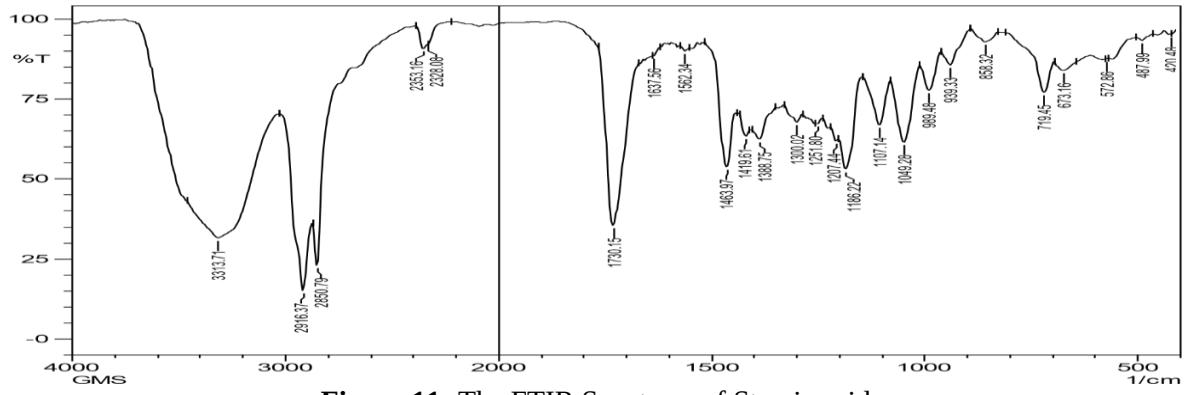


Figure 11: The FTIR Spectrum of Stearic acid

ATR-IR

Brucker ECO-ATR-IR spectrophotometer with a scanning range of 500 to 4000 cm^{-1} was used. The broad bands noted around 3,400 cm^{-1}were derived from the band vibration of O-H. 1,610cm^{-1} (C=O stretch of carboxyl methyl), 2,930 cm^{-1}, and 2,850 cm^{-1} due to C-H stretching vibration. 2923 cm^{-1} is for C-H stretching; 1770 cm^{-1} is for C=O stretching of ester bond.

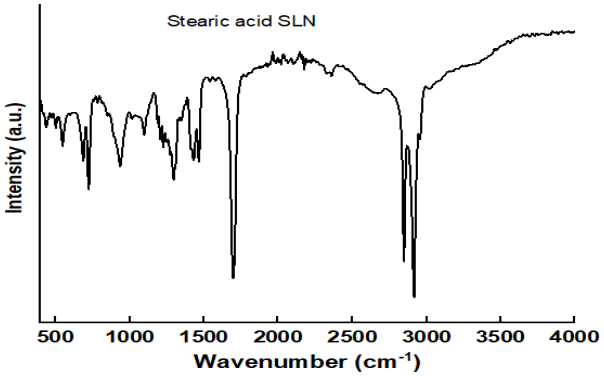


Figure 12: The ATR IR Spectrum

CONCLUSION:

In this research work**,** *Albizzia lebbeck* extract loaded ASLNs were prepared by emulsion-quenching technique. Beeswax ASLNs demonstrated suitable particle size (~175 nm) and low distribution. Administration of the ASLNs at various doses to Swiss albino mice showed significantly greater antidepressant activity when compared with native crude extract of albizzia lebbeck. pharmacological effect was dose-dependent significant improvement in parameters, Currently, there is universal interest in the use of eco-friendly and cost-effective drug delivery systems to improve drug performance. In the current work, as hypothesized, loading albizzia lebbeck extract into SLNs proved to be an effective strategy in improving the pharmacological activity. Moreover, at all other lower doses tested, the ASLNs demonstrated similar, if not superior antidepressant activity compared to the crude drug extract. opens up avenues to explore SLNs as carriers for effective delivery of phyto pharmaceuticals.

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