2. LITERATURE REVIEW:

1. **Gurpreet A et al** (2011), developed oral controlled release mucoadhesive matrix tablets for domperidone as model drug using natural mucoadhesive material myrrh oleo gum resin (MOGR) in different concentration (5, 10, 15 and 20% w/w) employing direct compression technology. These research outcomes clearly specified the potential of MOGR to be used as binder, release retardant and mucoadhesive natural material in tablet formulations.

2. **Amir S et al** (2011), formulated sustained release dosage form of Ambroxol hydrochloride with natural gums like Xanthan, Guar and κ-Carrageenan gum and their combinations in different ratios. Result showed that Xanthan gum and κ-Carrageenan gum retarded the drug release more than Guar gum. It can be concluded that that natural gums can be effectively used for oral sustained release dosage form.

3. **Ravi Kumar N et al** (2011), formulated mouth dissolving tablets of metformin HCl using *Mangifera indica* gum powder as disintegrant. The study revealed that *Mangifera indica* gum powder was effective as disintegrants in low concentrations (6% w/w).

4. **Ravi Kumar et al** (2009), isolated Polysaccharide mucilage derived from the seeds of fenugreek, *Trigonella foenum-graecum* L (family Leguminosae) was investigated as disintegrant for use in mouth dissolving tablet formulations containing metformin hydrochloride using different concentration (2, 4, 6, 8 and 10% w/w) of natural disintegrant. The result showed that Fenugreek mucilage in the concentration of 4% gives shorter disintegration in 15 sec. and shows 100% drug release within 18 min.

5. **Ravi Kumar et al** (2009), developed dispersible tablets of Aceclofenac using *Salicornia fruticosa* (L.) mucilage powder as disintegrant. Dispersible tablets of
aceclofenac were prepared and compared with different concentrations viz; 5, 10, 15 and 20 %( w/w) of Salicornia fruticosa mucilage powder. The study revealed that Salicornia fruticosa mucilage powder was effective as disintegrants in low concentrations (5%).

6. Ravi Kumar et al\textsuperscript{19} (2007), formulated Dispersible tablets of Metformin Hydrochloride using different proportions of Ocimum gratissimum mucilage powder and Ocimum gratissimum seed powder. The study revealed that Ocimum gratissimum mucilage powder and Ocimum gratissimum seed powder were effective as disintegrants in low concentrations (5%).

7. Ravi Kumar et al\textsuperscript{20} (2009), evaluated the binding potentials of a natural gum obtained from plant Anacardium occidentale (Ao) using Diclofenac as a model drug. Result showed that at 6% concentration it has given similar disintegration time and dissolution profile in comparison to starch at 10 % w/v.

8. Ravi Kumar et al\textsuperscript{21} (2009), evaluated the gelling potentials of a natural gum obtained from plant Anacardium occidentale. In the present study eight batches of Aceclofenac gels were prepared with different concentration of mucilage (viz; 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 and 5.5). Results showed that the gels prepared with 5.0% of mucilage were found to be ideal and comparable with a commercial preparation.

9. Ravi Kumar et al\textsuperscript{22} (2009), evaluated mucilage from the pods of Abelmoschus esculentus as suspending agent. Suspensions of paracetamol were prepared and compared with different concentrations (1%, 2%, 3% and 4% w/v) of Abelmoschus esculentus mucilage, sodium CMC and tragacanth gum. Studies indicated that the mucilage of Abelmoschus esculentus may be used as a pharmaceutical adjuvant and as a suspending agent at 4%w/v.

10. Ravi Kumar et al\textsuperscript{23} (2010), evaluated the emulsifying property of Tamarind seed polysaccharide (TSP). For emulsifying activity study, castor oil was taken as a
model drug and emulsified with TSP. The comparative stability studies were done with that of the emulsion prepared by taking gum acacia as standard emulsifying agent and it was found that the emulsion prepared with 2% w/v of TSP is more effective in comparison to that of the emulsion prepared by using 10% w/v of gum acacia.

11. **Lakshmana P et al**\(^{24}\) (2009), developed Matrix tablets of diltiazem HCl by direct compression method using rosin as matrix forming material in different proportions and with different diluent combinations. The results suggest that the rosin is useful in developing sustained release matrix tablets, prolong release of water soluble drug for up to 24h. Rosin thus promises considerable utility in the development of oral sustained release drug delivery systems.

12. **Lakshmana P et al**\(^{25}\) (2009), formulated Aceclofenac microencapsules using rosin by o/w emulsion solvent evaporation technique. The effect of three formulation variables including the drug:polymer ratio, emulsifier (polyvinyl alcohol) concentration and organic solvent (dichloromethane) volume were examined. The study reveals that drug: polymer ratio had a considerable effect on the entrapment efficiency. Drug, polymer concentrations were varied to obtain optimum release profile for sustaining the action of the drug.

13. **Tushar D et al**\(^{26}\) (2011), evaluated the gum of *Butea monosperma* as a tablet binder employing ibuprofen as a model drug. Different formulations of tablets using *Butea monosperma* gum were prepared by wet granulation method. The binder concentrations in the present tablet were 2, 4, 6, 8, 10 and 12% w/v. Tablets at 8% w/v binder concentration showed optimum results as tablet binder. The Butea monosperma gum was found to be useful for the preparation of tablet dosage form.

14. **Mann AS et al**\(^{27}\) (2007), evaluated the suspending properties of *Cassia tora* comparatively with those of compound tragacanth, *Acacia* and gelatin at
concentration range of 0.5 – 4.0%w/v in sulphadimidine suspension. The results showed that *Cassia tora* mucilage (2.5%w/v) produced a comparable suspending ability as 4%w/v compound tragacanth. Also, the suspending ability of all the materials was found to be in the order: *Cassia tora* > Compound tragacanth gum > *Acacia* gum > Gelatin.

15. **Tavakoli N et al**\(^{28}\) (2008), evaluated the effectiveness of a new binder extracted from *Hibiscus esculentus* (Okra gum) in tableting. Granules were prepared by different concentrations (0.5-6 %w/w) of Okra gum and tabletted using a Kilian single punch press. Cornstarch (12.5 % w/w) and P.V.P (22 %w/w) were employed as the standard binders for comparison. Okra gum produced some tablet formulations with good hardness and friability and it also prolonged the dissolution rate of some slightly soluble drugs and hence may be good candidate for sustained release formulations.

16. **Sourabh J et al**\(^{29}\) (2008), formulated Sustained release tablets of furosemide using pectin, guar gum and xanthan gum. The tablet with guar gum exhibited greater swelling index than those with pectin and xanthan gum. A better controlled drug release (80.74%) was obtained with the matrix tablet made-up of the guar gum than with the pectin and xanthan gum.

17. **Nisarg CP et al**\(^{30}\) (2011), isolated mucilage from the seeds of *Cydonia vulgaris* Pers. and explored it as tablet disintegrant. The disintegrating efficiency of isolated mucilage was equivalent to cross-povidone.

18. **Chandra SY et al**\(^{31}\) (2011), formulated sustained release matrix tablets of Didanosine by using natural gums like xanthan gum and guar gum. The granules were prepared by wet granulation method using different concentrations of polymers. Results show that as the concentration of gum increases, swelling index
also increased proportionally. Among all the prepared formulations F-5 shows good invitro release up to 12hrs.

19. Sathyaraj A et al\textsuperscript{32} (2011), developed controlled release tablets of Metoprolol succinate using Natural polymer, guar gum and synthetic polymer, carbopol as a rate controlling polymers. Though both the Natural and Synthetic polymer retards the drug release, the tablets prepared using Carbopol-934(5%) require lower amount and better release than the tablets prepared using Guar gum (25%).

20. Rishabha M et al\textsuperscript{33} (2010), formulated sustained release matrix tablets of Diclofenac sodium using gum acacia and tamarind gum as release modifier. Six batches of sustained release matrix tablets of Diclofenac sodium were prepared by using different drug: polymer ratios viz. 1:1, 1:1.5, 1:2, 1:2.5, 1:3, and 1:3.5 for both gum acacia and tamarind gum. Gum acacia showed better swelling than tamarind gum. A better sustained drug release (98.7%) was obtained with the matrix tablet (Batch F) of the tamarind gum.

21. Sajid Ali MD et al\textsuperscript{34} (2010), developed sustained release matrix tablets of phenytoin sodium. The tablets were fabricated by the wet granulation method using water as granulating agent along with matrix materials like guar gum, sodium alginate, tragacanth and xanthan gum with varying percentage. The results showed that F8 (55% guar gum with 10% acacia), the most successful formulation of the study, exhibited satisfactory drug release and could extend the release up to 12 hours.

22. Jaganath S et al\textsuperscript{35} (2011), formulated and evaluated silymarin controlled release (CR) tablets using natural polymers (xanthan gum and guar gum) CR Tablets of silymarin were prepared by direct compression method at different ratios of 1:0.25, 1:0.5 and 1:0.75 (drug:polymer). It could be concluded that both xanthan gum and guar gum can be used as an effective controlled release polymers to retard the release of silymarin for extended period of time.
23. **Indira MY et al**\(^{36}\) (2011), formulated Ambroxol hydrochloride matrix sustained release tablet employing gum olibanum in different drug: polymer ratios, such as F1 (1:1), F2 (1:1.5), F3 (1:2) by wet granulation technique. The results showed that F2 formulation was considered as optimized batch. Present work indicated that utility of gum olibanum in the formulations of sustained release dosage forms.

24. **Gangurde AB et al**\(^{37}\) (2012), evaluated *Bauhinia racemosa* Lam. seed mucilage as a binder for the preparation of amoxicillin trihydrate tablets. Granules were prepared with its varying concentrations and evaluated for tablet characteristics. The binder concentrations used in the formulation were 2, 4, 6 & 8 % w/w. The Tablets at 8% w/w binder concentration showed more optimum results as tablet binder. The mucilage was found to be useful for the preparation of uncoated tablet dosage form.

25. **Bangale GS et al**\(^{38}\) (2011), formulated sustained release matrix tablets of nimodipine by using various natural matrix former gums as Xanthan gum, Olibanum gum, and Locust bean gum separately. Tablets were prepared by wet granulation method. Among different formulation, F-9 which contains Locust bean gum with drug: polymer ratio as (1:3) and (46.15 % gum) exhibited precise controlled release of drug up to (88%) within 10 hrs time period.

26. **Sreenivasa RN et al**\(^{39}\) (2010), Formulated floating matrix tablets of Captopril containing a mixture of drug along with Xanthan gum, Gum karaya, Gellan gum & Pullulan gum along with HPMC K4M, PVP K-30, and Sodium bicarbonate were prepared by direct compression. Among the studied formulations, F9 was found to be suitable for gastric retention based on evaluation parameters, which was considered desirable for the drugs with absorption window in upper GIT.

27. **Edukondalu V et al**\(^{40}\) (2011), Formulated and evaluated floating tablets of atenolol using Semi-synthetic polymer, HPMC K100M and natural polymer i.e. okra gum were used as release retarding agents by its swelling nature. Sodium bicarbonate was
used as a gas-generating agent, atenolol tablets were prepared by direct compression method. The concentration of okra gum with a gas-generating agent was optimized to get the sustained release of atenolol for 8hrs. The optimized (F6) formulation has better release rate.

28. **Apparao P et al**<sup>41</sup> (2011), formulated and evaluated gum based sustained release matrix tablets of Lamivudine using different natural polymers such as Guar gum, Xanthan gum, Rosin gum, Pectin, and Sodium alginate taken at 30%, 40% and 50% of the total weight of the tablet. All the formulations were able to retard the release of the drug beyond 18 hours except pectin and sodium alginate was unable to sustain the drug release from the matrix tablets. F5 (40% Xanthan Gum) formulation was selected as optimized formulation.

29. **Mahmud HS et al**<sup>42</sup> (2009), evaluated the suspending property of *Khaya senegalensis* gum in Co-trimoxazole suspension. The gum was used to formulate 4.8% w/v co-trimoxazole suspension in concentrations of 0.2-5.0% w/v. *Acacia senegal* gum was used as a standard for comparison. The results indicated that khaya gum may find application as suspending agent at 0.2%w/v concentrations.

30. **Singh S et al**<sup>43</sup> (2010), an oral mucoadhesive polymer has been extracted from the seeds of *Caesalpinia pulchirrima* and *Leucaena leucocephala*. The result showed that mucoadhesive properties of seeds are comparable to synthetic polymers such as hydroxyl propyl methyl cellulose (HPMC) and sodium alginate but greater than hydroxyl propyl cellulose (HPC) and chitosan under the experimental conditions used in this study. Briefly, it could be concluded that the seed mucilage of *Caesalpinia pulchirrima* and *Leucaena leucocephala* can be used as a pharmaceutical excipient in oral mucoadhesive drug delivery systems.

31. **Viral S et al**<sup>44</sup> (2010), extracted mucilage from leaves of *Hibuscus rosasinensis* and explored its use as tablet disintegrant. Dispersible tablets of Aceclofenac were
prepared and compared with different concentrations viz; 2, 4, 6 and 8 % (w/w) of *Hibiscus rosasinensis* mucilage powder and Ac-Di-Sol®. The study revealed that *Hibiscus rosasinensis* mucilage powder was effective as disintegrant in low concentrations (4%). The mucilage was found to be a superior disintegrating agent than Ac-Di-Sol®.

32. **Patil DN et al**\(^45\) (2010), formulated the oral tablets of paracetamol by using *Aegle marmelos* fruit gum as a binder. The four different tablet formulations were prepared by wet granulation method. The binder concentrations used in the formulation were 2, 4, 6 & 8 % w/w of *Aegle marmelos* fruit gum. Tablets at 6 % w/w binder concentration showed more optimum results as tablet binder. The *Aegle marmelos* gum was found to be useful for the preparation of uncoated tablet dosage form.

33. **Rohini SK et al**\(^46\) (2011), formulated the mucoadhesive tablet of diclofenac by using *Aegle marmelos* fruit gum as a binder was formulated. The six tablet formulation were prepared by using 0.25%, 0.50%, 0.75%, 1%, 1.25% and 1.50% w/w of *Aegle marmelos* gum by direct compression. F4 was found to be optimized formulation. The *in-vitro* drug release of F4 formulation exhibits complete release of Diclofenac Sodium with non fiction first order release kinetic.

34. **Anoop KS et al**\(^47\) (2010), elucidated the physical, thermal, sorption and functional properties of a gum obtained from the stem of *mangifera indica* were characterized viz. elemental analysis, Fourier transmittance infra red, particle size analysis, thermo gravimetric analysis, differential scanning colorimetry, scanning electron microscopy and X-ray powder diffraction. The *in vitro* drug release was more than 90 % at 30 min. Tablets with 5% w/w binder concentration showed optimum results than standard binder.

35. **Nayak BS et al**\(^48\) (2008), developed a new sustained release famotidine microcapsules employing bhara gum derived from *Terminalia bellerica* (roxb). The microcapsules
were formulated by ionic gelation technique. The effect of different drug: bhara gum ratio on in vitro drug release profile was examined and compared with guar gum. The gum microcapsules with good structure and satisfactory yield were produced. Microcapsules employing bhara gum exhibited slowly release of famotidine over 10 hr.

36. Gayatri CP et al\(^4^9\) (2009), extracted the mucilage from the endosperm of Sesbania grandiflora seeds and explored it as gelling agent using Diclofenac as model drug. Six batches of drug loaded gels with concentration of mucilage corresponding to 2.0, 2.25, 2.5, 2.75, 3.0 and 3.5%w/w were formulated by using glycerin as wetting agent and thiomersol as preservative. The gel prepared with 2.5% of Sesbania gum mucilage showed desired gel characteristics with better drug release profile when compared with marketed formulation.

37. Jeevanandham S et al\(^5^0\) (2010), formulated Oral mucoadhesive sustained drug delivery systems of salbutamol sulfate using an isolated natural agent from the seeds of Caesalpinia pulcherrima. The in vitro release of three different formulations was studied, which showed sustained action of drug release with an increase in the concentration of the isolated natural mucoadhesive agent. But this research has been conducted to utilize the mucoadhesive action of the isolated natural agent.

38. Martins E et al\(^5^1\) (2009), elucidated the physical, thermal, sorption and functional properties of a gum obtained from the stem of Cissus refescence (CRG). Tablets were prepared by incorporating an anti asthmatic drug; theophylline. Effect of gum concentration on release kinetics was evaluated. The results obtained in this study establish the fundamental characteristics of CRG. The matrices were pH sensitive and can potentially be used for intestinal drug delivery.

39. Shivalingam R et al\(^5^2\) (2010), isolated gum from the stem of Moringa oleifera and evaluated for its binding properties in the formulation of conventional Paracetamol
tablet (500mg) containing 8%, 10% and 12% binding concentration. The binding property of gum was evaluated in relation to conventional binder like gelatin. Studies showed that increase in binding concentration of *M. oleifera* gum from 8% to 12% decreases the percentage of fine, increases the hardness, increases the disintegration time, decreases the percentage of friability and decreases % cumulative release. Hence this gum can be used to formulate sustained/controlled release tablet formulation.

40. **Senthil Selvi R et al** (2010), Isolated the hydrophilic mucilage from the seeds of *Prosopis juliflora* and explored it as binder in tablet formulation. The tablet formulations were prepared by using 2%, 4%, 6%, 8% and 10% of mucilage, using lactose as diluents, Diclofenac sodium as a model drug. And compared with starch which was used as standard binder at 10% concentration. Tablet prepared using 8 and 10 % of mucilage showed drug release over a period of 5 h and it exhibits more hardness than other formulations.