ReviewArticle

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Cinnamon Microsphere: A promising drug carrier

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Abstract: Continuous development in new drug delivery systems plays an essential role in Pharma industries. There are various controlled release products available in market, Microsphere is one of them. Microspheres are small spherical free flowing powders. Diameters typically ranging from 1 µm to 1000 µm. Microspheres can be produced by using polymers obtained from natural and synthetic sources. Based on the method porous or solid microspheres can be obtained for specific intended applications. The study is mainly includes various aspects of microspheres, method of preparation, evaluation parameter, its efficiency and applications. Microsphere targeting various types of diseases includes diabetes, cancer, antioxidant, cardiovascular disordered, Hepatotoxicity etc. In present study Microspheres were prepared by cinnamon oil using solvent evaporation method. Prepared microspheres were evaluated for particle size by micrometric technique and shape.

Keywords: Novel Herbal Drug Delivery, Microspheres, Cinnamon oil, Applications, Evaluation.

Introduction: Novel drug delivery system refers to the approaches, formulations, technologies and systems for transporting a pharmaceutical compound in the body as needed to safely achieve its desired therapeutic effects. Several types of NDDS have been developed during last few decades which are- Micro particles, Nanoparticles, Osmotic ally Modulated Drug Delivery

Systems, Transdermal Therapeutic Systems (TTS), Aqua some, Dendrimers, Multiple Emulsions, Micro emulsions, Liposomes, Noisome, Self-Regulating Drug Delivery etc. [(1)]
Microspheres having free flowing powder characteristics, which are consisting of synthetic polymers and proteins. These are biodegradable in nature having particle size less than 200um. Microspheres are the multiparticulate drug delivery systems which are consisting from natural and synthetic material. Microsphere enhance stability, bioavailability also target the pharmaceutical drug to specific site at preset rate. Microspheres are particularly used in novel drug delivery system. [(2)]

Types:

1) Floating microspheres
2) Biodegradable polymeric microspheres
    a. Radioactive microspheres
    b. Synthetic polymeric microspheres
3) Bio adhesive microspheres
4) Mucoadhesive microspheres
5) Magnetic microspheres
    a. Diagnostic microspheres
    b. Therapeutic magnetic microspheres
6) Polymeric microspheres.[(3)]

Materials Used in the Preparation of Microspheres: Polymers are mainly used for the preparation of microsphere. They are classified into two types:

1. Natural and
2. Synthetic

1. Natural polymers are obtained from natural sources like
    a) Carbohydrates: - e.g. Agarose, Chitosan, Carrageenan,Starch.
    b) Proteins: - e.g. Albumin, Gelatine andCollagen
    c) Chemically modified Carbohydrates: -Poly starch, Poly dextran.
2. Synthetic polymers are also divided into two types.
    a) Biodegradable polymers: -e.g. Poly anhydrides, glycosides & their copolymers.
    b) Non-biodegradable polymers: - e.g. Glycidyl methacrylate, epoxy polymers. [(4, 5)]

Various Methods used for Preparation of Microsphere:

1. Spray Drying
2. Quassi emulsion solvent diffusion
3. Double emulsion technique
4. Single emulsion technique
5. Solvent extraction
6. Phase separation coacervation technique
7. Spray drying and spray congealing
8. Solvent Evaporation [6]

Characterization of Microspheres:

1. Particle size and shape[7, 8]:
2. Determination of Density[8]:
3. Dissolution studies[9]:
4. Swelling Index[10]:
5. Microsphere Morphology:
6. Microsphere Size Distribution:
7. Yield Values and Loading Efficiency:
8. Measurement of Glass Transition Temp (Tg) By Dsc:
9. Surface Chemistry by Electron Spectroscopy:
10. Release Study:
11. Isoelectric Point:
12. Degree Of Hydration[11]:

Applications of Microspheres:-

1) Microcapsules are also extensively used as diagnostics, such as temperature-sensitive microcapsules applicable for thermography detection of tumors.

2) In the biotechnology they used for the production of recombinant proteins and peptides.
3) Encapsulation of microbial cells can also increase the cell- loading capacity and the rate of production in bioreactors.
4) A feline breast tumor line, which was difficult to grow in conventional culture, has been successfully grown in microcapsules.
5) Microencapsulated activated charcoal has been used for hemoperfusion [12].

Materials and Methods:

Extraction of volatile oil:

The cinnamon essential oil was extracted by using hydro distillation with the Clevenger type of apparatus with slight modification. About 30 gm of previously weighed of cinnamon bark powder has been put into 500ml distillation flask with four boiling chip and 300ml of distilled water was poured into the flask they were immersed for 1 Hr followed by heating at 100°C for 6 hr. Then distillate was transformed to a 250 ml conical flask. Then the volatile compounds were extracted from the water phase three times using dichloromethane and dehydrated over anhydrous sodium phosphate for 30 minutes and filter through a mid-speed filter paper. The cinnamon oil obtained was conc. and stored at 4°C for further analysis. [13, 14]

Preparation of microspheres:

Solvent evaporation method:

1) Solvent evaporation is one of the most widely used method for microsphere preparation.
2) For the preparation of microsphere, Cinnamon oil 1.5ml. (Hydrophobic) was used and further added 1.5gm starch as polymer to it. (Hydrophilic).
3) Then 100ml cold water was used as solvent. With continuous stirring further added the 0.5gm Acacia as an emulsifier.
4) Using magnetic stirrer, kept the solution rotating for 15 minutes at 700rpm and then increased the speed up to 1000rpm till 1:30 hour.
5) Observed the solution under microscope. Kept the solution still for 20 minutes until all the particles were settled down.

6) Discarded the upper layer of solution and filtered it. Kept the filtrate in the hot air oven for 1 hour at 60^0c.Observed the particles under microscope and evaluated it[6].

Results and Discussion:

Observations and calculations of cinnamon microspheres:

Particle size of cinnamon microsphere was measured by micrometric technique in laboratory.

Observations:

1×13=13	1×13=13	1×13=13	1×13=13	1×13=13
2×13=26	2×13=26	2×13=26	1×13=13	2×13=26
1×13=13	1×13=13	2×13=26	1×13=13	1×13=13
1×13=13	1×13=13	1×13=13	1×13=13	1×13=13
1×13=13	2×13=26	1×13=13	1×13=13	1×13=13

Calculation :[14]

1 division on eye piece = 0.01nm division on stage micrometre = 10 µm

10 divisions on eye piece =13 divisions on stage micrometre

10 divisions =13 × 10=130µm

1 division = x

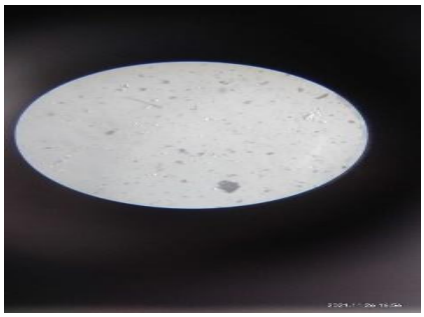
x = 130÷10

x = 13 µm

Mean=403÷25

=16.12µm

Therefore, one microsphere's diameter is 16.12 µm.



Cinnamon oil under microspheres ***Cinnamon oil microspheres***

Conclusion:

The Literature review shows that microspheres are prominent choice of delivery system because it decreases the dose frequency also shows enhanced the dissolution rate, bioavailability and stability. Additionally helps to deliver the Pharmaceutical ingredient to the desired sites in the body. In succeeding years the herbal microsphere novel drug delivery system which is efficacious in cancer therapy or in any other disease related to cardiac system, nervous system and pulmonary system. The herbal microsphere formulation shows more effectual results in in-vivo delivery system. Microspheres were evaluated for particle size and shape. The particle size was found to be 16.12 µm and shape was spherical. On the basis of our research, we concluded that the herbal microspheres of Cinnamon were prepared by the Solvent Evaporation Method could be help to researchers for further study.

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