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SYSTEMIZED ALKALINE PROTEASE MEDIATED BIODEGRADATION OF ALMOND OIL, MUSTARD OIL, JASMINE OIL AND OLIVE OIL DRIVEN *PEARL MILLET* AMYLASE CONJUGATED EMULSIFIED BSANPS

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ABSTRACT

Bovine serum albumin nanoparticles (BSANPs) are reported safe and biocompatible nanodevices that carried out effective site specific drug and gene delivery. Nanoparticles are found to be rapidly being developed to overcome several limitations of previously proposed conventional drug delivery systems employed for cancer treatment. Like, conventional chemotherapy is noted to possess some serious side effects including damage of the immune system and other vital organs due to nonspecific targeting and lack of suitable drug solubility with reduced dose and having low survival rate. So, nanotechnology has provided the new advanced opportunity to get direct access of the cancerous or tumours cells selectively with increased drug localization and improved cellular uptake. BSANPs are accounted a remarkable low-cost and non-toxic drug or desired biological component loaded nanodevices due to exhibiting very excellent easy and natural biodegradation or bioproteolysis. In this work, biodegradation of amylase loaded almond oil, mustard oil, jasmine oil and olive oil driven emulsified BSANPs was performed to carry out the controlled and sustained release of bound amylase in to delivery system when exposed to studied standard 35U of alkaline protease. Almond oil and mustard oil driven *Pearl millet* amylase conjugated emulsified BSANPs have soon excellent controlled and sustained releasing behaviours in the targeted delivery system. Influential results were drawn from this proposed study to get effective sustained and consistent release of loaded materials from BSANPs. So, this biodegradation or bioproteolytic study of amylase bound BSANPs can be attractive industrial and clinical applicability to carry out improved drug loading capacity for loaded bioactive molecules. And, BSNPS can be programmed for recognizing the targeted diseased cells or tissue and giving selective and accurate drug delivery interactions. As well as, proposed alkaline protease mediated biodegradation study may helpful to map the drug delivery path carried out by drug or gene conjugated emulsified BSANPs with the ease of keeping the concept of naturally occurring proteases in targeted host cells. It can prove effective therapeutic and diagnostic strategy considered in molecular medicine, nanomedicine and regenerative medicine.

KEYWORDS

Bovine serum albumin nanoparticles, BSANPs, Alkaline Protease, Biodegradation, Bioproteolysis and Amylase.

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INTRODUCTION

Recent outcome of developing novel nanomaterials and their use in biomedicine is going proved a potential and automotive tool. These nanotools are prepared of iron, carbon, gadolinium, gold, silicon catalysts and named as, nanostructures, nanotubes, nanocrystals, nanoballs, nanodiscs, nanorods, nanoscaffolds, nanodendrimers, nanospheres, nanoantennas or nanowires. These nanostructures had been used for the targeted drug and gene

delivery nonviral vehicle stem cell therapy and cancer therapy. And, these can be used to target antigens or as bio-markers or gene or specific desired protein that are highly specific to cancer cells or diseased cell that were subjected to antigen binding peptide ligands binding to these nanostructure. These bionanoactive complexs may play employed to achieved effective drug delivery systems to treat cancers, tumors and in nerve regeneration therapy[1,2]. These nano-sized objects were offered the ability to achieve improved interaction with complex cellular functions in advanced ways. These proposed nanoformulations may carry out more efficacy in treating solid tumors even in single dose of administrated vaccination and oral delivery of therapeutic proteins or antibiotics[3].

Various clinical scientists are commonly proposed natural biomolecules such as proteins are an attractive alternative to synthetic polymer in drug formulations because of having their safe applications with excellent ease of biocompatibility and biodegradability. Moreover, their defined primary structure, protein-based nanoparticles are observed to offer various possibilities to carry out easy surface modifications including covalent attachment of drugs and targeting ligands[4]. Many significant advances have been reported for the preparation and characterization of protein-loaded nanoparticles in pre-clinical practices over the past 20years. Protein-loaded nanoparticles can provide prolonged protein drug release after *in vivo* implantation following the protection of proteins from unwanted degradation to increase their stability and allow controlled release for a sustained period of time when injected in animal models[5]. These smart multifunctional nanodevices was reported to hold out the possibility of radically changing the practice of oncology allowing easy detection and then followed by effective targeted therapeutics at the earliest stages of the disease. The expected and accounted feasible biodegradation of these synthesized bioconjugated nanoparticles may play vital role for the achieving targeted drug delivery to treat cancerous cells as safe and low-cost anticancer drugs[6]. Previously, alkaline protease mediated biodegradation studies were carried out of amylase bound BSA and egg albumin conjugates and excellent results were shown for getting appreciable controlled release of bound components with studied sustained period of time duration[8-13]. As well as, proteolysis of *Pearl millet* amylase bound BSANPs[14, 16-21] and EANPs[15] was also proposed to get sustained and consistent release of bound enzymes form prepared nanoparticles by varying alkaline protease units[14-21]. This designed comparative biodegradation study of *Pearl millet* amylase conjugated almond oil[16], mustard oil[17], olive oil[18] and, jasmine oil[19] was carried out by following previous considerations with studied standard 35U of alkaline protease to interpret the controlled and sustained release of bound enzyme in to delivery system for 8 weeks.

MATERIALS AND METHODS

The Almond, Jasmine, Mustard and Olive oil driven chemically modified *Pearl millet* amylase conjugated BSANPs were used for this study that are prepared by Rani, K., *et al,* 2015[16]; Rani, K., *et al*,[17]; Rani, K[18] and Rani, S[19].

Amylase assay

Enzyme assay was done by using 1 % (w/v) starch solution in which 0.5 ml enzyme extract was added and incubated at 37°C for 20 minutes. 2 ml of dinitro salicylic acid was added and the mixture was boiled at 100°C for 5 minutes. Absorbance was taken at 570nm[14-21].

Alkaline Protease Mediated Biodegradation

2 mg *Pearl millet* amylase conjugated Almond, Jasmine, Mustard and Olive oil driven BSANPs were taken in test tubes with reaction solution of 35U of alkaline protease. The reaction solution was incubated overnight at 4°C. Next day, enzyme assay was done at 570nm using dinitro salicylic acid method and studied was designed to see sustained release of bound enzyme at scheduled every week for total consecutive 8 weeks with the follow up of previous observations[14-21].

RESULTS AND DISCUSSION

Biodegradation Study

Biodegradation/Bioproteolysis of *Pearl millet* amylase conjugated Almond, Jasmine, Mustard and

Olive oil driven BSANPs was performed with standard effective reported 35U of alkaline protease[14-21]. The study was carried out at scheduled every week for total consecutive 8 weeks with the follow up of previous observations to interpret effective controlled and sustained release of bound enzyme form prepared BSANPs (Figure No.1). And, it was observed with very clear results that enzyme bound almond oil and mustard oil driven BSANPs had shown best controlled and sustained releasing behaviour in delivery system with standard proposed 35U of alkaline protease as compared to jasmine oil driven followed by olive oil driven enzyme conjugate BSANPs with the studied consecutive 8 weeks (Figure No.1). These biodegradation observations were noted to be better comparable and shown improved releasing behaviour than the previous findings[14-21].

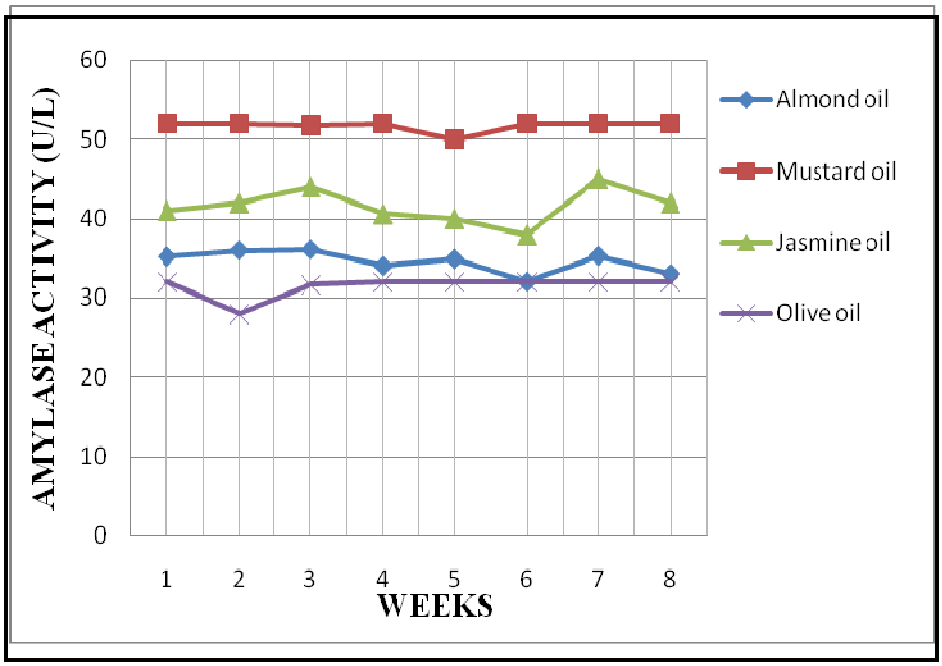

Figure No.1: Biodegradation/Bioproteolysis of *Pearl millet* amylase conjugated Almond, Jasmine, Mustard and Olive oil driven BSANPs with systemized 35U of alkaline protease

CONCLUSION

From this designed study, it was concluded that alkaline protease mediated biodegradation study of *Pearl millet* amylase conjugated Almond, Jasmine, Mustard and Olive oil driven BSANPs was found to have appreciable observations. And, almond oil and mustard oil driven enzyme conjugated BSANPs have effective controlled releasing behaviour as compared to jasmine oil and olive oil driven amylase bound BSANPs with standard reported effective 35U of alkaline protease. This alkaline protease mediated biodegradation/ bioproteolytic study of prepared enzyme conjugated emulsified BSANPS can have effective therapeutic or diagnostics applications to map the controlled releasing behaviour of drug/ antibiotic/ chemical compound/spliced gene/ and biological components conjugated BSANPs for their sustained period of proposed and desired duration of time to load desired concentration of bound components in the targeted delivery system. So, this proposed work can be proved easy, low-cost, target specific and non-toxic alternative over other used costly and tedious chemical nanotechniques. And, it can be further employed to other innovative advancements to prepare low-cost and rapid almond oil and mustard oil driven drug or spliced gene conjugated emulsified BSANPs that may used further in drug and gene targeted delivery system.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Rani K, Chauhan C, Kaur H. Potential and automotive applications of nanomaterials in combating cancer and stem cell therapy: An informative overview on nanotherapeutics, *J Nanotech Smart Materials*, 1, 2014, 1-6.
2. Rani K, Paliwal S. A review on targeted drug delivery: its entire focus on advanced therapeutics and diagnostics, *Sch. J. App. Med. Sci.*, 2(1C), 2014, 328-331.
3. Singh R, James W, Lillard J R. Nanoparticle-based targeted drug delivery, *Exp. Mol.Pathol*, 86(3), 2009, 215-223.
4. Lohcharoenkal W, Wang L, Chen Y C, Rojanasakul Y. Protein Nanoparticles as Drug Delivery Carriers for Cancer Therapy, *BioMed. Res. Int*, Volume 2014, 2014, 1-12.
5. Panta P, Kim D Y, Kwon J S, Son A R, Lee K W, Kim M S. Protein Drug-Loaded Polymeric Nanoparticles, *J Biomed Sci Engg*, 7, 2014, 825-832.
6. Sinha R, Kim G J, Nie S, Shin D M, Nanotechnology in cancer therapeutics: bioconjugated nanoparticles for drug delivery, *Mol Cancer Ther*, 5(8), 2006, 1909-1917.
7. Rani K, A novel biodegradation study of toluene driven chemically modified egg albumin preparation for release of entrapped Glycine max amylase with alkaline proteases. *Int J Pharmaceutical Res.*, 6(4), 2014, 100-103.
8. Rani K. Immobilization of vignamungo amylase into chemically modified bovine serum albumin and its biodegradation. *Global J Biotechnol and Biochem Res.* 2(1), 2012, 17-20.
9. Sharma K R. Emulsified encapsulation of vignaradiata amylase into chemically activated bovine serum albumin and its application in detergents, *Int J Drug Targets*, 4(2), 2013, 135-140.
10. Rani K, Mehta V. Preparation, Biodegradation of Coconut Oil Driven Chemically Modified Bovine Serum Albumin Microparticles of Encapsulated *Cicer Arietinum* Amylase and Study of Their Application in Washing Detergents, *Int. J. Pharm. Sci. Drug Res*, 6(4), 2014, 351-355.
11. Williams D F, Zhong S P. Biodeterioration/biodegradation of polymeric medical devices in situ, *Int. Biodeter. Biodegradation.* 34, 1994, 95-130.
12. Rani K. Emulsified Entrapment of *Glycine Max* B-amylase into Chemically Modified Bovine Serum Albumin and Study its Applications in Detergents, *Int J Advan Biotechnol Res*, 3(2), 2012, 591-595.
13. Rani K, Pant N, and Chauhan C. Biodegradation of chemically modified egg albumin micropreparation for controlled release of bound vignamungo amylase and their application in fabric desizing as cost effective bio-active preparation, *Int J Pharma and Bio Sci*, 6(1), 2015, 1101-1111.
14. Sharma K R. Preparation of emulsified encapsulated nanoparticles of bovine serumalbumin of bound glucose oxidase and their application in soft drinks/non-alcoholic beverages, *Biotechnol and Biomaterials.*, 2(2), 2012, 1-4.
15. Rani K. Applicative biodegradation study of egg albumin nanospheres by alkaline protease for release of encapsulated *cicer arietinum* amylase in washing as bio-active detergent additive, *World J Pharmaceutical Res*, 4(1), 2015, 1-13.
16. Rani K, Gupta C, Chauhan C. Biodegradation of almond oil driven bovine serum albumin nanoparticles for controlled release of encapsulated Pearl millet amylase, *Am J Phytomedicine Clin Therapeutics.*, 3(3), 2015, 222-230.
17. Rani K, Goyal S, and Chauhan C. Novel approach of alkaline protease mediated biodegradation analysis of mustard oil driven emulsified bovine serum albumin nanospheres

for controlled release of entrapped *Pennisetum glaucum* (Pearl Millet) amylase, *Am J Advn Drug Delivery*, 3(2), 2015, 135-148.

18. Rani K. Novel Biodegradation Analysis of Olive Oil Driven Emulsified Bovine Serum Albumin Nanopreparation with Alkaline Protease for Controlled Release of Encapsulated *Pennisetum glaucum* Amylase, *J Chem Chemical Sci*, 5(6), 2015, 341-350.
19. Rani K, Kant S. Alkaline Protease Mediated Bioproteolysis of Jasmine Oil Activated Pennisetum glaucum Amylase Loaded BSA Nanoparticles for Release of Encapsulated Amylase, *Int J Chem Sci and Appl.*, 26(2), 2015, 56-63.
20. Rani K, Chauhan C. Biodegradation of *Cicer Arietinum* Amylase loaded Coconut oil driven Emulsified Bovine Serum Albumin Nanoparticles and their application in Washing Detergents as Eco-Friendly Bio-Active Addictive, *World J Pharmacy Pharmaceutical Sci.*, 3(12), 2014, 924-936.
21. Rani K, Chauhan C. Preparation of Cicer Artienium Amylase Loaded BSA Nanoparticles and their Bioproteolysis to be used as Detergent Additive, *Bioengg, and Biosci.*, 3(5), 2015, 72-82.

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