



International Journal of Research in Pharmacy and Life Sciences

Journal Home Page: www.pharmaresearchlibrary.com/ijrpls



Research Article

Open Access

Washing of Stained Woolen fabric with Bio-active Almond Oil Driven Amylase Loaded BSANPs-Wool Shampoo Additives

Kirti Rani

Amity Institute of Biotechnology, Amity University Uttar Pradesh, Noida, Sec-125, Noida-201303 (UP), India

ABSTRACT

Amylase is starch-degrading enzyme and exploited in textile, leather, wood, paper and detergent industries for desizing and washing of fabrics. Previously, it has been immobilized on to various compatible supports by several techniques to increase its thermal and storage stability. Its immobilization onto bovine serum albumin (BSA) was found to be very significant to prepare its BSA loaded nano-particles. In this study, Pearl millet amylase loaded almond oil driven BSA nanoparticles (BSANPs) were used and made bio-active with 35U of alkaline protease for their biodegradation. Then, bio-active enzyme-BSA bound nanoparticles was used as nano-active detergent additives with chosen wool shampoo named, Pure Nature WOLL-Shampoo to test their stain removal efficacy from stained woolen fabric without affecting the delicacy and softness of the chosen fabric. In this study, chosen stains were comprised of daily routine stains of boot polish and hair color dye cream named, Cherry Blossom Black and Garnier Nutrisse Black respectively. Sometimes, these stains are very difficult to wash off from the woolen fabric/cashmere/ merino/ mohair fabrics and require couple of pre-washing practices. So, keeping this domestic or industrial washing issue, selected stains are chosen very thoughtfully. Hence, from this study, an effective washing data was carried out to wash off the selected stains form woolen fabric when washed with chosen wool shampoo along with bio-active prepared amylase bound BSANPs solution as compared their washing with chosen wool shampoo alone.

Keywords: Cherry Blossom Black; Garnier Nutrisse Black; BSANPs; Bovine serum albumin nanoparticles; Almond oil; Wool shampoo.

ARTICLE INFO

CONTENTS

1. Introduction	02
2. Materials and Methods	02
3. Results and discussion	02
4. Conclusion	03
5. References	04

Article History: Received 15 March 2016, Accepted 21 April 2016, Available Online 24 May 2016

*Corresponding Author

Kirti Rani
Amity Institute of Biotechnology,
Amity University Uttar Pradesh, Noida,
Sec-125, Noida-201303, U.P, India.
Manuscript ID: IJRPLS2896



PAPER-QR CODE

Citation: Kirti Rani. Washing of Stained Woolen fabric with Bio-active Almond Oil Driven Amylase Loaded BSANPs-Wool Shampoo Additives. *Int. J. Res. Pharm, L. Sci.*, 2016, 4(1): 01-04.

1. Introduction

Amylases were utilized in food, fermentation, textile, paper, detergent, pharmaceutical, leather and chemical industries [1,2]. Amylase have significant role in brewing, liquefaction, sacchrification, bio-fuel production, fabric desizing and processing of starch [3-6]. In textile industries, amylases were found to be reported in starch processing to fabricate the fibers as per the requirement of the garments designing and formulation [7-9]. Amylase was found to be very excellent enzyme in fabric desizing and washing as compared to other chemicals such as per sulphate and alkali or bromide which lead to damage of fibers during processing [10,11]. Mostly 30% of industrially prepared enzymes are used in the detergent industries worldwide due to having good thermal stability, low requirement of water and energy and labor during the processing [11-13]. It has been also reported that its immobilization on to eco-friendly biocompatible, non-toxic and non-corrosive supports made it more industrially viable to widen the application of bound amylase [13-15].

Immobilization of amylase was found to be more cost effective method to increase the storage stability and thermal stability as compared to its native form [16-18]. Immobilization was lead to increase its stability, easy recovery, easy separation of reactant and product, repeated or continuous use to reduce labor and overhead costs. It also has improved storage, pH operational, thermal and conformational stabilities after immobilization [19-21]. In this proposed study, biochemically active Pearl millet amylase loaded BSANPs were used to wash the stained cloth pieces with chosen wool shampoo named, Pure Nature WOLL-Shampoo to compare the washing results of chosen wool shampoo alone.

2. Materials and Methods

The Almond oil driven chemically modified Pearl millet amylase BSANPs were used for this study that was prepared by Rani K., *et al*, 2015 [20]. These bio-active nano-wool shampoo additives with 35U of proteolytic enzyme, alkaline protease were used in washing of stained fabric pieces with selected wool shampoo named, Pure Nature WOLL-Shampoo which is very much internationally popular in many textiles and detergent industries for washing of woolen fabrics. Selected stains on the woolen fabric pieces are of Cherry Blossom Black Boot Polish and Garnier Nutrisse Black that are very popular boot polish and hair color dye crèmes brands worldwide respectively [Fig 1]. Then, strained woolen fabric pieces were soaked in reaction mixture of 1-2 mg of prepared almond oil driven amylase loaded BSANPs with 35 U of alkaline protease solution and 2-3ml of selected wool shampoo in petri plates [16-18, 20-21]. Each sample of stained woolen fabric pieces was washed with only chosen wool shampoo with the combination of above mentioned reaction mixture of alkaline protease mediated Almond driven amylase loaded BSANPs. Then, their washing was

carried out to study its comparative washing results to know the washing efficacy of propped prepared BSANPs as bio-active nano-wool shampoo additives.



Figure 1: **A:** Chosen wool shampoo, Pure Nature WOLL-Shampoo; **B:** Chosen stain of Boot polish named, Cherry Blossom Black (Sample A); **C:** Chosen stain of Hair color dye crème named, Garnier Nutrisse Black (Sample B) which were used for staining the woolen fabric pieces to carry out the washing study

3. Results and Discussion

Almond oil driven Pearl millet (*Pennisetum glaucum*) amylase BSANPs were subjected to designed washing study with chosen wool shampoo named, Pure Nature WOLL-Shampoo to remove the stains of chosen boot polish and Hair color dye crème. These stains are very tough to be removed in one wash or required many tedious pre-treatment practices such as brushing, long hour of soaking period in warm water and use of strain dissolving agents like potash alum or vinegar etc. Therefore, almond oil driven amylase loaded BSANPs were made bio-active by using 35U alkaline protease to carry out the controlled release of bound enzyme from nano-particles in reaction mixture. Previously, alkaline protease was found to be an efficient enzyme, which can resist in harsh condition of fabric washing or desizing [16-18, 20-21].

Then, this prepared bio-active enzyme bound BSANPs reaction mixture was used with selected wool shampoo for washing of trained woolen fabric pieces whose fibers became strained due to increase in their weight and size by absorbing the chemical/biochemical ingredients of chosen stains with the time. These strained woolen fabric pieces are needed to subjecting them to good desizing practices to cut off or wash off the stains before they become so tough and hard to be removed from the expensive fabrics without affecting the delicacy and softness of woolen fabric. And, this designed washing practice was found to be effective to enhance the washing efficacy of chosen woolen shampoo when used with prepared almond oil driven enzyme bound BSANPs as compared to washing observations of chosen wool shampoo alone used for washing of strained woolen fabric pieces (Table 1, Fig 2&3). In this washing experiments, that most popular wool shampoo named, Pure Nature WOLL-Shampoo was used to wash the selected

strained woolen fabric pieces with 35U alkaline protease derived almond driven amylase loaded BSANPs. And, it was found that almond oil driven amylase loaded BSANPs act as excellent bio-active nano-wool shampoo additive when used with selected wool shampoo to wash the chosen stains of boot polish (Fig 2) and hair color dye crème (Fig 3) from the fabric (Table 1).

The improved noticeable washing interpretations were also obtained for combined washing analysis of chosen wool shampoo with bio-active almond oil driven amylase loaded BSANPs to remove the both of chosen stain samples with excellent efficiency (Table 1 and Fig 4). As well as, it was also observed that there was no affect on the delicacy and softness of woolen fabric upon touching. These washing observations are found to be comparable with previous reports [16-21].

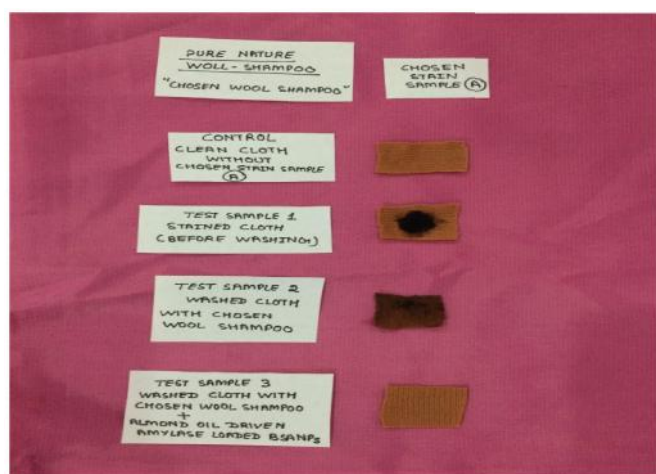


Figure 2: Washing results of stained woolen fabric pieces having boot polish stain of sample A (Cherry Blossom Black) with chosen wool shampoo named, Pure Nature WOLL-Shampoo and prepared bio-active almond oil driven BSANPs [20]



Figure 3: Washing results of stained woolen fabric pieces having hair color dye crème stain sample B (Garnier Nutrisse Black) with chosen wool shampoo named, Pure Nature WOLL-Shampoo and prepared bio-active almond oil driven BSANPs [20]

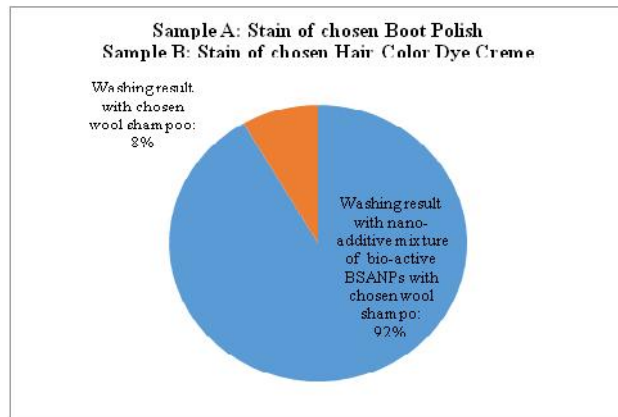


Figure 4: Observed combined interpretations of comparative washing efficacy of chosen wool shampoo named, Pure Nature WOLL-Shampoo and prepared bio-active almond oil driven BSANPs [20] to wash off the chosen stain sample A (Cherry Blossom Shoe Polish Black) and sample B (Garnier Nutrisse Black) as per designed experiments.

Table 1: Washing results of stained woolen fabric have stains of boot polish (Sample A) and hair color dye crème (Sample B) with chosen wool shampoo named, Pure Nature WOLL-Shampoo and bio-active almond oil driven amylase loaded BSANPs prepared by Rani K., *et al*, 2015 [20]

Chosen stains	Washing with Chosen shampoo	Washing with washing mixture of chosen shampoo with bio-active almond oil driven BSANPs
Boot Polish Stain: Cherry Blossom Shoe Polish Black (Sample A)	Poor	Excellent
Hair color dye crème Stain: Garnier Nutrisse Black (Sample B)	Poor	Good

4. Conclusion

Form this designed washing study, it was concluded that use of Pearl millet amylase loaded almond oil driven BSANPs with standard alkaline protease units with selected wool shampoo was found to be cost-effective and time saving practice. That had improved washing efficacy as compared to normal washing practice without harming the delicacy and softness of fibers of woolen fabric pieces. The prepared almond oil driven bio-active amylase bound BSANPs mixture was also eco-friendly bio-active nano-wool shampoo additives. It was lead to decrease in required washing labor practices, low requirement of water consumption and energy, which was quite helpful to maintain mild condition for fabric as well as for skin without causing hassles during the washing of chosen stains of boot polish and hair colour dye crème. In many Indo-Asian countries e.g. Indonesia, Malaysia, Bangladesh, Vietnam, Thailand, Asia, Cambodia, Sri Lanka, Bhutan,

Nepal, Taiwan etc., where textiles, wood, rubber, leather and detergent industries are prevailing industries for national economic growth and very popular for international trading productivity and their respective collaboration worldwide. So, the new designed washing practice of woolen fabric may prove promising for these to cut down the cost of fabric, paper and leather processing/desizing procedures to save time and energy.

5. References

- [1] Rani K. Extraction and study of kinetic parameters of variety of sprouted pulses -amylases. *Int J Pharm and Life Sci*, **2012**, 3(8): 1895-1898.
- [2] Van der Maarel MJEC, van der Veen B, Uitdehaag JCM, Leemhuis H, Dijkhuizen L, Properties and applications of starch converting enzymes of the -amylase family. *J. Biotechnol.* **2002**, 94: 137-155.
- [3] Mojsov K, Application of enzymes in the textiles industry : A review, II International Congress "Engineering, Ecology and Materials in the Processing Industry. *Appl Tech & Innov*, **2011**, 2(2): 40-46.
- [4] Valls C, Rojas C, Pujadas G, Gracia-Vallav S, Mulero M. Characterization of the Activity and Stability of Amylase from Saliva and Detergent. *Biochem Mol Biol Edu*, **2013**; 40(4); 254–265.
- [5] De souza PM, Magalhaes P deO. Application of microbial -amylase – A review. *Braz J Microbiol*, **2010**; 41(4): 850-861.
- [6] Maarel MJ, Veen B, Uitdehaag JCM, Leemhuis H and Dijkhuizen L. Properties And Applications of Starch-Converting Enzymes of The Amylase Family. *J. Biotechnol.* **2002**, 94:137–155.
- [7] Rani K, Immobilization of *Vigna radiata*, *Vigna mungo*, *Cicer arietinum* (white) and *Cicer arietinum* (Black) amylases onto variety of activated fabrics, *Int J Life Sci and Pharma Res*. **2012**, 1(3): 124-133
- [8] 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*, **2015**, 4(1): 1-13.
- [9] Aiyer PV. Amylases and their applications. *Afri J of Biotechnol*, 2005; 4(13): 1525-1529.
- [10] Park D, Haam S, Jang K, Ahn I S, Kim W S, Immobilization of starch-converting enzymes on surface-modified carriers using single and co-immobilized systems: Properties and application to starch hydrolysis. *Process Biochem.* **2005**, 40: 53–61.
- [11] Olsen HS, Felholt P. The role of enzymes in modern detergency. *J Surfact Detergents*, **1998**; 1(4): 555-567.
- [12] Rani K, Emulsified Entrapment of Glycine Max -amylase into Chemically Modified Bovine Serum Albumin and Study its Applications in Detergents. *Int J Adv Biotechnol and Res*, **2012**, 3(2): 591-595.
- [13] 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*, **2015**, 6(2): 56-63.
- [14] 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. *American J Advn Drug Delivery*. **2015**; 3(2): 135-148.
- [15] 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*, **2015**; 5(6): 341-350.
- [16] 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 Additive, *World J Pharm and Pharmaceutical Sci*. **2014**, 3(12): 924-936.
- [17] 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*. **2014**, 6(4): 351-355.
- [18] Khetrapal M, Comparative Study of Detergents in India-A Step towards More Sustainable Laundry, *DU J Undergraduate Res and Innov*, **2015**, 163-172.
- [19] Rani K, Gupta C and Chauhan C, Biodegradation of almond oil driven bovine serum albumin nanoparticles for controlled release of encapsulated Pearl millet amylase. *American J Phytomedicine Clin Therapeutics*. **2015**, 3(3): 222-230.
- [20] Rani K, Chauhan C, Preparation of *Cicer Artienium* Amylase Loaded BSA Nanoparticles and Their Bioproteolysis to be used as Detergent Additive. *Bioengg and Biosci*, **2015**; 3(5): 72-82.