Volume 4 (1), 2016, Page-1025-1029
CODEN (USA)-IJPRUR, e-ISSN: 2348-6465

PHS Scientific House
PHARMAHEALTHSCIENCES

International Journal of Pharma Research and Health Sciences

Available online at www.pharmahealthsciences.net

Short Communication

Novel Washing Analysis of Stained Woolen Fabric (having Stains of Shoe Polish and Hair Color Dye) with Olive Oil Driven Amylase Loaded BSANPs as Bio-active Nano-Wool Shampoo Additives

Kirti Rani *

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

ARTICLE INFO

Received: 01 Feb 2016
Accepted: 28 Feb 2016

ABSTRACT

Amylase has been exploited in textile, leather, paper and detergent industries for washing and desizing of fabrics. Previously, it was reported to immobilized on to various compatible matrices by adopting various modified methods to increase its thermal and storage stability. Its immobilization onto bovine serum albumin (BSA) was found to be very significant to prepare its non-toxic and low-cost BSA loaded nanoparticles (BSANPs). In present designed study, *Pearl millet* amylase loaded olive oil driven BSA nanoparticles (BSANPs). These prepared nanoparticles were made bio-active with standardized 35U of alkaline protease for their biodegradation to allow the controlled release bound amylase. Then, these bio-active enzyme-BSANPs were used as nano-woolen shampoo additives with chosen woolen shampoo named, Wool Shampoo for Sheepskin and Wool Products 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 shoe polish and hair color dye cream named, Cherry Blossom shoe polish Black and Garnier Nutrisse Nourshing color crème Black respectively. Sometimes, these stains are very difficult to wash off from the woolen fabric or required couple of pre-washing practices. So, keeping this domestic or industrial washing issue, chosen stains are selected very thoughtfully. And, from this study, an effective washing analysis was carried out to wash off the selected stains form woolen fabric when washed with chosen wool shampoo along with bio-active prepared olive oil driven amylase bound BSANPs solution as compared their washing with chosen wool shampoo alone.

Keywords: Cherry Blossom Shoe Polish Black; Garnier Nutrisse Nourishing Color Crème Black; BSANPs; Bovine serum albumin nanoparticles; Olive oil; Wool shampoo; Cashmere Fabric

1. INTRODUCTION

Previously, amylases were proposed to be used in food, fermentation, textile, paper, detergent, pharmaceutical, leather and chemical industries. They have significant role in brewing, liquefaction, sacchrification, bio-fuel production, fabric desizing and processing of starch [1, 2].

Corresponding author *
Dr. Kirti Rani
Amity Institute of Biotechnology, Amity University, Uttar Pradesh, Noida (UP), India
Email: krsharma@amity.edu

In textile, rubber and paper industries, amylases have key role in starch processing to fabricate or desized the fibers as per the requirement of the garments designing and formulation [3-5]. Amylase was also found to be very excellent and safe enzyme in fabric desizing and washing as compared to other chemicals such as persulphate and alkali or bromide which lead to damage of fibers during the opted various fibers processing strategies [6-9]. It has been reported that 20-30% of industrially produced enzymes are exploited in the textile and detergent industries worldwide due to having good thermal stability, low requirement of water and energy and labor during the fibers processing [10-12]. It has been also reported that amylase immobilization into various eco-friendly biocompatible, non-toxic and non-corrosive supports made it more industrially viable to widen the application of bound amylase as compared to its free form [13-15]. Immobilization of amylase was found to be more safe and low-cost method to increase the storage stability and thermal stability as compared to its native form [16-18]. Immobilization was lead to enhance its stability, easy recovery, easy separation of reactant and product, repeated or continuous use to reduce labor and overhead costs. Immobilized enzyme has improved storage, pH operational, thermal and conformational stabilities after immobilization [19-21]. In this designed washing practice, bio-active olive oil driven *Pearl millet* amylase loaded BSANPs were used to wash the stained woolen fabric pieces with chosen woolen shampoo named, Wool Shampoo for Sheepskin and Wool Products to compare the washing results of chosen wool shampoo alone.

2. MATERIALS AND METHODS

Olive oil driven chemically modified *Pearl millet* amylase BSANPs were used for this study that was prepared by Rani, K., 2015 [15]. This bio-active amylase bound BSA nano-wool shampoo additives with 35U of alkaline protease were used in washing of stained fabric pieces with selected woolen shampoo named, Wool Shampoo for Sheepskin and Wool Products. This chosen wool shampoo is very much internationally popular in many textiles and detergent industries for washing of expensive woolen and cashmere fabrics as well as to be used to taking care of sheepskins and it is very famous German wool shampoo brand with the registered German owned company name title," Rittlings Performance Horse Gear" . Chosen stains were of Cherry Blossom Shoe Polish Black and Garnier Nutrisse Nourishing Color Crème Loreal Black that are very popular shoe polish and hair color dye crèmes brands worldwide respectively [Fig 1]. These selected stains were used to stain the woolen fabric pieces. Then, strained woolen fabric pieces were soaked in reaction mixture of 1-2 mg of prepared olive oil driven amylase loaded BSANPS with 350U of alkaline protease solution and 2-3ml of selected woole shampoo in petri plates [13, 16-18, 20-21]. Each sample of stained woolen fabric pieces was washed with only chosen woolen shampoo with the combination of above mentioned reaction mixture of alkaline protease mediated olive oil driven amylase loaded BSANPs. Then, their washing analysis was carried out to study its comparative washing results to know the washing efficacy of propped prepared BSANPs as bio-active amylase bound BSA nano-woolen shampoo additives.

A: Chosen woolen shampoo

B: Chosen stain of Shoe Polish

C: Chosen stain of Hair colour

Fig 1: A: Chosen wool shampoo, Wool Shampoo for Sheepskin and Wool Products which was used for washing of stained woolen fabric; B: Chosen stain of shoe polish named, Cherry Blossom Shoe Polish Black (Sample A); C: Chosen stain of Hair color dye crème named, Garnier Nutrisse Nourishing Color Crème Black (Sample B) which were used for staining the woolen fabric pieces to carry out the washing study.

3. RESULTS AND DISCUSSION

Olive oil driven Pearl millet (*Pennisetum glaucum)* amylase BSANPs were subjected to carry out the washing study with chosen wool shampoo named, Wool Shampoo for Sheepskin and Wool Products to remove the stains of chosen stains of shoe polish and hair color dye crème. These stains are very tough to remove in single wash or required many tedious pre-treatment practices such as long hour of soaking period in warm water and sometime, need the use of stain dissolving agents like potash alum or vinegar etc. These prewashing practices were lead to harm the texture of woolen fabric especially smoothness, delicacy and softness of expensive woolen and cashmere fabrics. Moreover, olive oil driven amylase loaded BSANPs were made bio-active by using standardized 35U alkaline protease to carry out the controlled release of bound amylase from BSANPs in reaction mixture. And, alkaline protease was also good chosen and previously standardized proteolytic enzyme and found to be an efficient enzyme which can resist in harsh condition of fabric washing or desizing practices [13, 16-20]. Then, this prepared bio-active olive oil driven amylase loaded BSANPs reaction mixture was used with selected woolen shampoo for washing of stained 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 or washing practices to remove the stains without affecting the delicacy and softness of woolen fabric before they become so tough and hard to be removed from the expensive woolen and cashmere fabrics. And, this designed washing study was found to be more effective to enhance the washing efficiency of chosen wool shampoo when used with prepared bio-active olive oil driven amylase BSANPs as compared to washing observations of chosen woolen shampoo alone to wash the strained woolen fabric pieces (Fig 2 & 3). In this proposed washing study, that popular chosen wool shampoo named, Wool shampoo for Sheepskin and Wool Products was used to wash the selected stained woolen fabric pieces with 35U alkaline protease derived olive oil driven amylase loaded BSANPs. And, it was found that bio-active olive oil driven amylase loaded BSANPs act as excellent bio-active amylase bound BSA nano-wool shampoo additive when used with selected woolen shampoo to wash off the chosen stains of shoe polish (Fig 2) and hair color dye crème (Fig 3) from the woolen fabric pieces. Very clear, visible and noticeable observations were confirmed that these prepared bio-active olive oil driven amylase bound BSANPs were lead to enhance the washing efficiency of chosen wool shampoo as nano-wool shampoo additives as compared to results of chosen wool shampoo alone (Fig 2 & 3). As well as, it was also noted that there was no affect on the delicacy and softness of woolen fabric upon touching after the designed washing practice. And, these washing observations of bio-active olive oil driven amylase bound BSA-nano-woolen shampoo additives were also found to be very similar with previous findings [16-21].

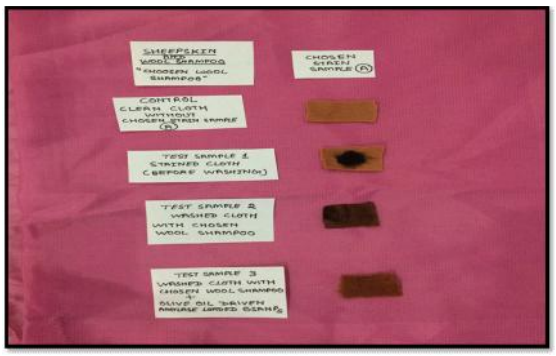

Fig 2: Washing results of stained woolen fabric pieces having chosen stain sample A of shoe polish (Cherry Blossom Shoe polish Black) with chosen wool shampoo named, Wool Shampoo for Sheepskin and Wool Products and prepared bio-active olive driven amylase loaded BSANPs[15]

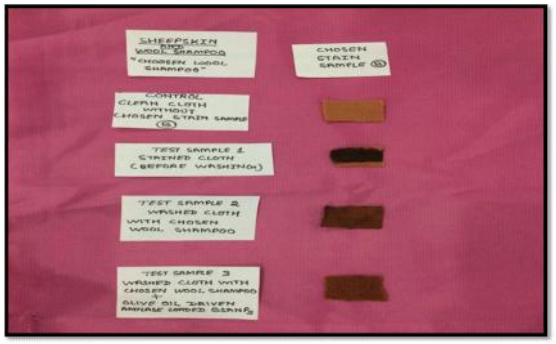

Fig 3: Washing results of stained woolen fabric pieces having chosen stain sample B of hair color dye crème (Garnier Nutrisse Nourishing Color Crème Black) with chosen wool shampoo named, Wool Shampoo for Sheepskin and Wool Products and prepared bio-active olive oil driven amylase loaded BSANPs[15]

4. CONCLUSION

Form this proposed washing study, it was concluded that use of *Pearl millet* amylase loaded olive oil driven BSANPs with standard 35U of alkaline protease with selected wool shampoo was found to be cost-effective and time saving practice. And, it was lead to improved washing efficiency as compared to normal washing practices without harming the delicacy and softness of fibers of woolen and cashmere fabric pieces. These prepared bio-active olive oil driven amylase loaded BSANPs washing mixture was found an eco-friendly, green and low-cost bio-active nano-wool shampoo additives. It was also showed the zero requirements of other required washing labor practices, minimizing the water and energy consumption which was proved quite helpful to maintain mild condition for expensive woolen and cashmere fabric as well as for skin of hands without causing any hassles during the designed washing practices. In many Indo-Asian countries e.g. Indonesia, Malaysia, Bangladesh, Vietnam, Thailand, Asia, Cambodia, Srilanka, Bhutan, Nepal, Taiwan etc., where textiles, wood, rubber, leather and detergent industries are most prevailing industries for national economic growth and endorsed for international trading productivity worldwide. So, this designed washing practice of woolen fabric may prove helpful to cut down the cost of various procedures of expensive fabrics, paper and leather processing/desizing processing strategies to save time and energy.

5. REFERENCES

1. 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.
2. Kirti R. Comparative study of kinetic parameters of bacterial and fungal amylases. J Bio-Innovation, 2012; 3: 48-57.
3. 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.
4. Rani K. Extraction and study of kinetic parameters of variety of sprouted pulses β-amylases. Int J Pharm and Life Sci 2012; 3(8): 1895-1898.
5. Aiyer PV. Amylases and their applications. Afri J of Biotechnol 2005; 4(13): 1525-1529.
6. Rani K. Immobilization of Vigna mungo β-amylase onto NaCl and NaNO3 treated woven Bombyx mori silk fabrics. Asian J Biol & Life Sci, 2012; 1(2): 96-100
7. Arica, Y., Bayramogflu, G. and Yilmaz, M., Immobilization of a thermostable α-amylase onto reactive membranes: kinetics characterization and application to continuous starch hydrolysis. Food Chem 2004; 84: 591-599.

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. Kumar G C, Malik R K, Tiwari M P, Novel Enzyme based detergents- An Indian perspective, Curr Sci, 1998; 75(12) :1312-1318.
10. Park D., Haam S, JangK.,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 B-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, 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.
14. 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.
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 Addictive, World J Pharm and Pharmaceutical Sci. 2014; 3(12): 924-936.
17. Kirti R, Vartika M, 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. 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.
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, 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 Pharm and Pharmaceutical Sci. 2014; 3(12): 924-936.
21. Khetrapal M, Comparative Study of Detergents in India-A Step towards More Sustainable Laundry, DU J Undergraduate Res and Innov 2015; 163-172.

Conflict of Interest: None

Source of Funding: Nil