Original Research Article

Washing of Fabric having Strains of Nail Paints of "Chamber Geneva, Revlon, Deborah Milano, Givenchy" with Prepared Bio-active Amylase bound Detergent BSA-Nano-Additives

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Abstract: Amylase is known for the breakdown of glycosidic linkages present in starch into low molecular weight products such as glucose, maltose, maltotriose units, limit dextrins. Due to this property of amylase has been exploited in textile and detergent industries for desizing and stain vanishing. Upon immobilization, its thermal and storage stability was also found to be increased. It was also immobilized onto bovine serum albumin (BSA) to prepare its BSA bound nanoparticles. In present study, extracted amylase of Pearl millet seedlings was immobilized in BSA nanoparticles with four different emulsifier namely, Almond Oil, Jasmine Oil, Mustard Oil, and Olive Oil. These nanoparticles were used as bio-active detergent laundry additives with 40U of alkaline protease and different detergents; Ariel matic, Surf excel liquid, Active wheel and Tide plus to test their stain removal competency. In this study, Chosen strains were comprised of cosmetic strains of nail paints of some of popular international brands, namely; Chamber Geneva, Revlon, Deborah Milano and Givenchy. These cosmetics stains are tough to wash off from clothes and often require pre-washing practices. Hence, from this study, an effective washing analysis was carried out and strains are found to be very well wash off if when washed with chosen detergents with bio-active prepared amylase bound nanoparticles solution as compared to when washing was done with chosen detergents only. Among them, Ariel matic detergent with enzyme loaded bovine serum albumin nanoparticles was found to be have best washing results as bio-active system compared to other chosen detergent samples, followed by Surf excel liquid, Tide plus and the least effective was found to be Active wheel. Among the prepared enzyme bound BSA nanoparticles, Almond and Olive oil driven nanoparticles was showed excellent washing competency when mixed with Ariel matic and Sruf excel liquid while mustard oil nanoparticles with Ariel matic also showed comparable good washing results. As well as, good results were also observed when stained cloth was washed with Almond and Olive Oil driven nanoparticles with Surf Excel liquid followed by Active wheel and tide plus. Least washing efficiency was found to be reported for Jasmine oil and mustard oil driven BSA nanoparticles bio-active additive mixture.

Keywords: Chamber geneva, Revlon, Deborah Milano; Givenchy; strains; Almond oil; Olive oil; Jasmine Oil; mustard oil; BSA nanoparticles; Detergents

INTRODUCTION

Amyalses have been significantly utilized in food, fermentation, textile, paper, detergent, pharmaceutical, leather and chemical industries [1, 2, 3]. The application of amylase was found to be significant in brewing, liquefaction, sacchrification, bio-fuel production, desizing of fabrics [4, 5, 6, 7]. In, textile industries, use of amylases can never be ignored and used in starch processing [8.9]. Use of amylase was found to be very excellent enzyme in fabric desizing and washing as compared to other chemicals such as persulphate and alkali or bromide which sometimes lead to damage of fibers during processing [10, 11, 12]. Mostly 30% of the enzymes is produced industrially and used in the detergent industries worldwide due to having good thermal stability, required less amount of water and energy during processing and reduce labor

cost when bound onto eco-friendly biocompatible, non-toxic, non-allergic and non-corrosive supports [13,14,15,16]. Immobilization of enzyme is reported to be cost effective method to increase the storage stability and thermal stability as compared to native form [17, 18, 19]. 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. And, it also has improved storage, pH operational, thermal and conformational stabilities [20, 21, 22, 23]. In our study, we have used the Pearl millet amylase loaded BSA nanoparticles to wash the stained cloth pieces with 40U of alkaline protease solution and chosen detergents samples to compare their washing results with detergent washing powder only. Chosen stains were washed to test for the washing efficacy of bio-active laundry additive Nano preparation. Chosen

strains were grouped in cosmetics strains of nail paints of Chamber Geneva, Revlon, Deborah Milano and Givenchy international brands. These strains are very tough to wash upon drying. Chosen detergents were used in this study; Active Wheel, by Hindustan Unilever Ltd. (HUL) containing less than 10% active ingredient sodium alkyl benzenesulphonate. Ariel Matic, by Procter and Gamble containing approximately 16% active ingredient and 63, 95 detergency. Surf Excel Liquid by Hindustan Unilever ltd and Tide Plus manufactured by Procter and Gamble having 9.90% detergency and alkalinity at 22% [13, 24].

MATERIALS AND METHODS

The Almond, Jasmine, Mustard and Olive oil driven chemically modified Pearl millet amylase BSA nanoparticles were used for this study prepared by Rani K, *et al.;* 2015 [15, 25, 29, 30]. These bio-active detergent additives with proteolytic enzyme, alkaline protease was used in washing of dry stained cloth pieces with selected detergents such as Ariel matic, Surf excel liquid, Active wheel, and Tide plus. Selected strains were of cosmetics and festive of nail paints of expensive international brands namely, Chamber Geneva, Revlon, Deborah Milano and Givenchy to strain the cloth pieces(Fig-1). These strained cloth pieces were soaked in reaction mixture of 2 mg of prepared enzyme loaded BSA nanoparticles with 40U of alkaline protease solution and 1ml of selected detergent solution in petri plates [15, 25, 29,30]. Each sample of stained cloth piece was washed with chosen detergents only and with the combination of above mentioned reaction mixture of Almond, Jasmine, Mustard and Olive oil driven amylase loaded BSA nanoparticles. Then, their washing was carried out to study its comparative washing observations to get washing efficacy of our prepared nanoparticles as bio-active detergent additives.

Fig-1: Chosen expensive cosmetics strains namely, Chamber Geneva, Revlon, Deborah Milano and Givenchy strains for staining the fabric pieces to be tested for washing study.

RESULTS AND DISCUSSION

Almond, jasmine, mustard and olive oil driven emulsified bovine serum albumin nanoparticles of encapsulated Pearl millet (Pennisetum glaucum) amylase were subjected to study with four detergent solutions of Active wheel, Ariel matic, Surf excel liquid and Tide plus to remove stained cloth pieces of nail paints of Chamber geneva, Revlon, Deborah Milano and Givenchy. Generally, these kinds of tough strains are usually not removed in one wash and require tedious pre-treatment practices e.g. rigorous wash-brushing, long hour of soaking period in warm water and use of strain dissolving agents like potash alum or vinegar etc. Therefore, amylase bound chemically modified bovine serum albumin nanoparticles were made bio-active by using 40U alkaline protease to release of bound amylase from nanoparticles for their controlled release in reaction mixture. Alkaline protease was also reported efficient enzyme which can resist in harsh condition of washing [27, 28]. Then, this bio-active enzyme bound nanoparticles mixture was used with selected detergents for washing and it was lead to enhance the washing efficacy of detergents. Previously, the washing applications of nanoparticles of encapsulated amylase was reported which were prepared by coconut oil as emulsifier [8, 16, 18]. Washing was performed with chosen samples of detergent solutions of Ariel, Surf excel, Wheel and Tide to remove rust, gel ink pen, grease, chocolate, coffee, tea, pomegranate and turmeric stains for clothes [8, 14, 15, 16]. Presently, it was carried out that advanced detergents solutions like Ariel matic, Surf excel liquid, Active wheel and Tide plus were used along with amylase bound nanoparticles using four different emulsifier Almond, jasmine, mustard and olive oil to remove various cosmetic stains along with 40U of alkaline protease solution. Among the four samples of detergent solution, Ariel matic and Surf excel liquid detergent with bio-active amylase bound BSA nanoparticles was found to be effective washing bio-active detergent system as compared to Tide plus and Active Wheel (Table 1). Previously, Ariel matic with amylase bound BSA nanoparticles has shown better washing results as compared to other chosen detergents which are similar to our washing data [15, 23, 24, 28]. It was followed by Ariel matic detergent, Surf excel liquid with amyalse loaded BSA nanoparticles having good observations [22, 28, 29] (Fig 2, 3, 4, 5). Therefore, our combative washing data was confirmed that the four different samples of prepared different

emulsifiers derived bovine serum albumin nanoparticles; Almond and Olive oil driven emulsified nanoparticles along with Ariel matic detergent and Surf excel liquid had excellent washing efficacy as compared to Jasmine and Mustard driven emulsified nanoparticles. Also, Almond and Olive oil driven emulsified nanoparticles were shown good results with Surf excel liquid and tide plus followed by fairly good washing results with Active wheel. And, Mustard oil and Jasmine oil driven emulsified nanoparticles were found to be least washing observations efficient bio-active system with Tide plus and Active wheel detergent as bio-active detergent additives [24, 26, 29] (Fig 2, 3, 4 & 5).

Table 1: Washing results of nail paint stained clothes (nail paints of Chamber geneva, Revlon, Deborah Milano and Givenchy) strains with chosen detergents and different samples of prepared emulsifiers driven bovine serum albumin nanoparticles by Rani K, *et al.;* 2015 [15, 25, 29, 30]

Emulsifier ➡ Detergent ⬇	Almond	Jasmine	Mustard	Olive
Ariel matic	Excellent	Very good	Very good	Excellent
Surf excel liquid	Excellent	Good	Fairly good	Excellent
Tide plus	Very good	Good	Fairly good	Very good
Active Wheel	Fairly good	Good	Good	Fairly good

A)Washing results with Almond Oil driven nanoparticles

(B) Washing results with Jasmine Oil driven nanoparticles

(C) Washing results with Mustard Oil driven nanoparticles

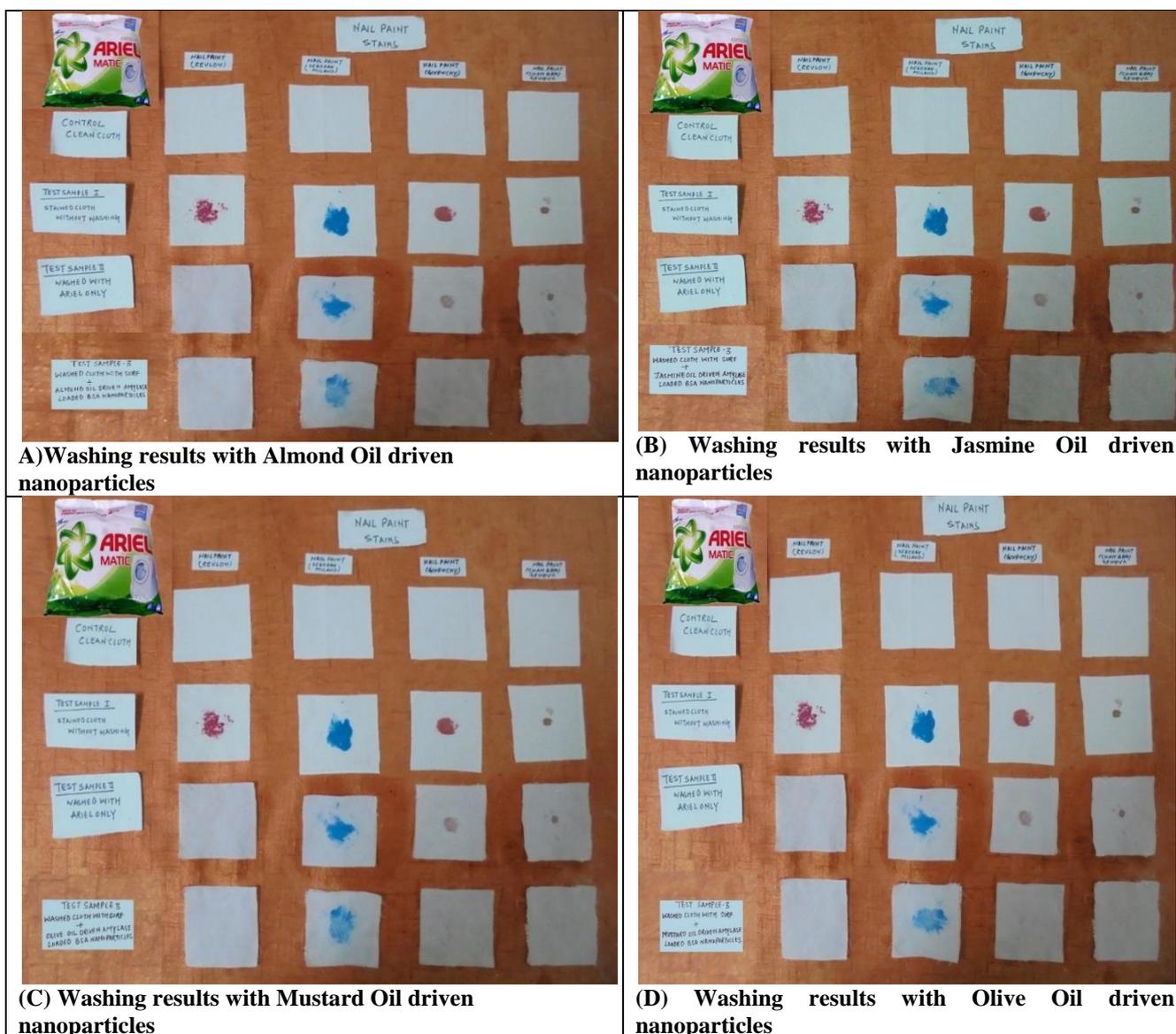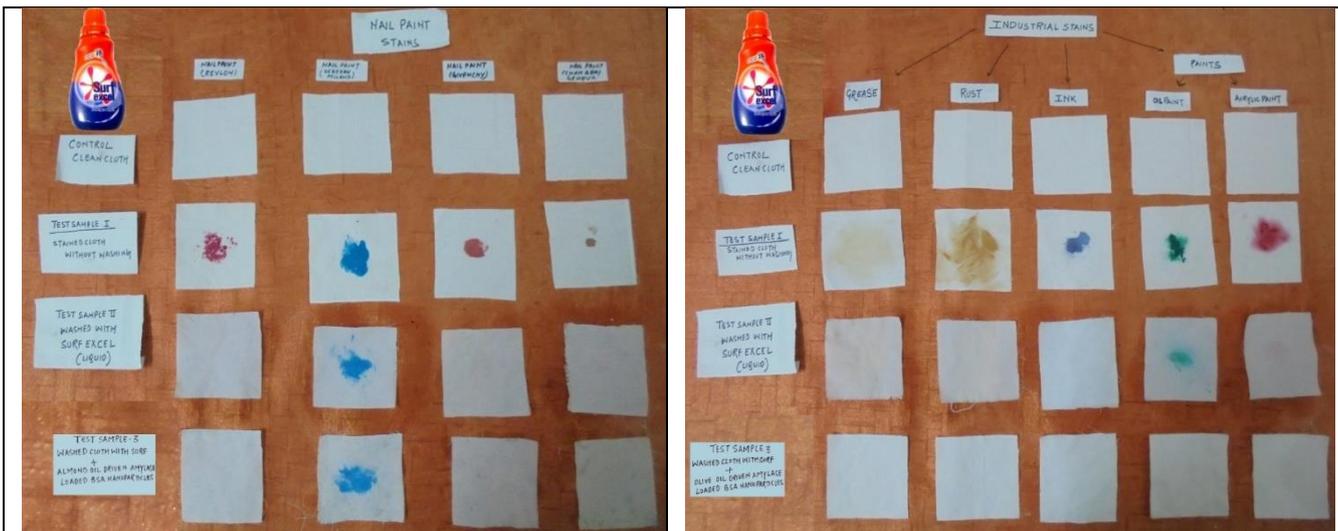**(D) Washing results with Olive Oil driven nanoparticles**

Fig-2: Washing results of nail paints strained fabric pieces (nail paints of Chamber geneva, Revlon, Deborah Milano and Givenchy) Ariel matic alone and Ariel matic with amylase loaded nanoparticles prepared with different emulsifiers- Almond Oil, Jasmine Oil, Mustard Oil and Olive Oil

(A)Washing results with Almond Oil driven nanoparticles

(B) Washing results with Jasmine Oil driven nanoparticles

(C) Washing results with Mustard Oil driven nanoparticles

(D) Washing results with Olive Oil driven nanoparticles

Fig- 3: Washing results of nail paints strained fabric pieces (nail paints of Chamber geneva, Revlon, Deborah Milano and Givenchy) with Surf Excel alone and Surf Excel with amylase loaded nanoparticles prepared with different emulsifiers- Almond Oil, Jasmine Oil, Mustard Oil and Olive Oil

(A)Washing results with Almond Oil driven nanoparticles

(B) Washing results with Jasmine Oil driven nanoparticles

| (C)Washing results with Mustard Oil driven nanoparticles | (D) Washing results with Olive Oil driven nanoparticles |

Fig-4 : Washing results of nail paints strained fabric pieces (nail paints of Chamber geneva, Revlon, Deborah Milano and Givenchy) with Tide Plus alone and Tide Plus with amylase loaded nanoparticles prepared with different emulsifiers- Almond oil, Jasmine Oil, Mustard Oil and Olive Oil

| (A)Washing results with Almond Oil driven nanoparticles | (B) Washing results with Jasmine Oil driven nanoparticles |
| (C) Washing results with Mustard Oil driven nanoparticles | D) Washing results with Olive Oil driven nanoparticles |

Fig-5: Washing results of nail paints strained fabric pieces (nail paints of Chamber geneva, Revlon, Deborah Milano and Givenchy) with Active Wheel Alone and Active Wheel with amylase loaded nanoparticles prepared with different emulsifiers- Almond oil, Jasmine Oil, Mustard Oil and Olive Oil

CONCLUSION

Hence, form the present designed washing experiments, it was confirmed that use of Pearl millet extracted amylase loaded BSA nanoparticles with alkaline protease solution and different selected detergents was found to be cost-effective and time saving practice with improved washing efficacy as compared to normal washing practice. The prepared bio-active amylase bound BSA nanoparticles mixture was eco-friendly bio-active detergent additives. It was decreased washing labor and water consumption which was quite helpful to maintain mild condition for fabric as well as for skin without causing any skin irritation during the washing. In many low-income countries e.g. Indonesia, Malaysia, Bangladesh, Vietnam, Thailand, Asia, Cambodia, Shrilanka, Bhutan, Nepal, Taiwan etc., textiles, wood, rubber. Leather and detergent industries are prevailing industires for national economic growth as well as very popular at international trading productivity and collaboration in low-income countries. So, this new designed washing practice might be proved a landmark to cut down the cost of industrial processing procedures to save time and energy during fabric, paper and leather processing.

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