IJASRM

International Journal of Advanced Scientific Research and Management, Volume 9 Issue 3, April 2024

www.ijasrm.com

ISSN 2455-6378

Development of Eco-Friendly Herbal Eye Mask Using *Solanum Tuberosum* Peel Extract

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Abstract

To improve our overall quality of sleep by blocking artificial light, eye mask is essential. While eye masks offer several advantages, potential issues should be considered. Discomfort or pressure on the eyes and face can arise from poorly designed or ill-fitting masks, impacting overall sleep quality. Heat accumulation is another concern, especially in warmer environments, potentially causing sweating and discomfort. Allergic reactions may occur due to the materials used, emphasizing the importance of choosing hypoallergenic options. Careful consideration of comfort, materials, and usage patterns is essential to maximize the benefits while minimizing potential drawbacks. This study objects to create an eye mask with natural substantial. The primary goals of this work is to create an organic herbal eye mask by exploring, material selection, herbal essence infusion, finishing and ergonomic product design concepts. This study aims to produce an environmentally friendly herbal eye mask with the source of almond gum and *Solanum tuberosum (*potato) peel, which has cooling and therapeutic effects on the eyes.

Keywords: Allergic, Eye mask, Ecofriendly, natural substantial, Solanum tuberosum peels, Prunus Amygdalus gum.

1. INTRODUCTION

Exposure to excessive or improper light can lead to various eye problems. Prolonged exposure to bright screens may cause digital eye strain, while exposure to intense sunlight without protection can contribute to conditions like cataracts and macular degeneration. It's important to manage screen time, use proper lighting, wear sunglasses to protect your eyes from harmful UV rays and also wearing eye mask during sleeping also helps in maintain healthy eyes and sight.

It's possible that the dry air in your bedroom may cause damage to the eyes while sleeping. when you wake up may causes your eyes to get dry. No matter how much you plan or try to adjust to a new schedule while traveling, uninterrupted sleep is hard to come by on the go. Eye masks can offer a sense of normalcy and sound sleep in new environments. “Since sleep masks are portable and, they lead to better sleep while traveling,” Applying intense herbal sleep mask for dry eyes might improve your eyes' natural moisture production.

It could be conceivable to make eye-covering sleep masks more effective in preventing light from entering. During the day and night, would be a better way to put it. It would be more accurate to say that eye masks help to shut out this artificial light by serving as a shield. These masks may have been named so because they function by forming a barrier over the skin surrounding the eyes and producing a screen between the pores and skin.

Tencel is a popular fabric for beds and clothes because of its versatility. Tencel is an extremely breathable textile that helps keep you cool in hot weather. It is created from renewable wood products that are sourced sustainably, which usually use less water and pesticides than cultivating cotton. Tencel lyocell is typically regarded as a particularly sustainable material because of the harmless chemical processing and recycling used to

https://doi.org/10.36282/IJASRM/9.4.2024.1936

make it. This also adds further versatility to the fabric and helps maintain and control body temperature. Tencel, derived from wood pulp, particularly sourced from eucalyptus trees, is recognized for its sleekness and durability. It is favored as an alternative to cotton bed linens, known for its cooling properties and boasting a velvety texture. Tencel effectively regulates temperature by wicking away moisture and allowing breathability. Tencel is considered more sustainable than traditional cotton, requiring less water and fewer pesticides, with the production process carefully monitored for sustainable wood sourcing. Advancements in rayon, such as the latest generation of lyocell, utilize a benign solvent instead of hazardous chemicals, contributing to environmental sustainability by recovering 99% of the solvent for future use.

The perennial nightshade Solanum tuberosum yields the starchy, tuberous potato, a widely consumed vegetable worldwide. The potato is grown in 80% of the countries of the world (FAO 1999). It is second only to maize in terms of the number of producer countries, and fourth in global tonnage, after wheat, maize and rice. Today, the potato is produced in 132 of 167 independent countries of the world and more than 3.5 billion people, about 80% of the world's population, inhabit underdeveloped or developing countries that produce potatoes (Woolfe 1987). Fresh potatoes are losing popularity in favor of processed ones like puree, chips, and fries. In health aspect, the human heart is supported by the fiber, potassium, vitamin C, vitamin B-6, and low cholesterol found in potatoes. The primary by-product of the potato processing business is potato peels, which provide a significant waste disposal issue for the sector in question. The potato business is consequently interested in upgrading this by-product to value-added products. Numerous nutritionally advantageous components found in peels can be employed in a variety of ways. For example, peel extract can be used as a natural antioxidant in meals. Furthermore, the phenolic chemicals are especially helpful in the prevention of cancer as well as the treatment of a few chronic illnesses. The thick periderm of potato skins contains varying levels of potassium, iron, riboflavin, folate, and vitamins. Certain minerals were found to be more concentrated in the skin of the tuber than in the flesh. [7,8,9]

It has been established that essential oils have several therapeutic uses. Medical experts have been employing them since the Middle Ages. Lavender essential oil is linked to several health advantages, such as its antibacterial, anxiolytic, anti-inflammatory, antinociceptive, and antioxidant properties. The use of lavender-infused herbal essential oils will benefit the patients in many ways. Lavender-infused essential oils may help with problems like drug addiction, invasive medical procedures, adverse drug reactions, and antibiotic resistance. With the use of essential oils and proper skin care, the appearance of scars can be reduced. They work by mending the broken cells in the skin. Additional oils can improve skin health and minimize the visibility of scars. Essential oils balance skin tone, reduce inflammation and redness, and promote healthy skin. Furthermore, this oil has wound-healing properties that may help to inhibit the growth of scar tissue. [10]

Acetic acid, the active component of vinegar, is produced by fermenting apple sugars, which is how apple cider vinegar (ACV) is manufactured. Antibacterial qualities may also be present in apple cider vinegar. According to a source, apple cider vinegar effectively eradicates the bacteria that causes staph infections, *Staphylococcus aureus*, and *Escherichia coli*. This sort of vinegar has a murky look because it indicates the presence of proteins, enzymes, and friendly microorganisms. It is possible to make flavored cider vinegar with different fruits; typically, apples are used as the base and other fruits, like raspberries, are added during the manufacturing process. Vinegar is an antimicrobial that has long been used as a food preservation.

Thus, reducing eye strain and dark circles is the aim of creating this herbal sleeping eye mask. In addition, it has a cooling effect, adds moisture, and lessens eye redness. Standard testing for the developed product, including SEM analysis, FTIR, and antimicrobial testing, done to assess the prospective attributes of the eye mask before a subjective study, was conducted among minimal population.

2. MATERIALS AND METHODS

2.1 SELECTION AND COLLECTION OF FABRIC

Tencel is a naturally breathable and moisture-wicking fabric, making it an ideal option for hot sleepers in search of cooling sheets. Have been procured from online market as 2meters of length, 60" width and measured 160 GSM.

Fig 1: Tencel Fabric

https://doi.org/10.36282/IJASRM/9.4.2024.1936

IJASRM
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2.2 SELECTION AND EXTRACTION OF HERB

Solanum tuberosum peel

Peels have the potential to contain chemicals even in the face of waste issues. Suggested application in bread production to provide 40–50% dietary fiber for nutritional purposes. phenolics are abundant in peels. High in vitamins, including B6, riboflavin, ascorbic acid, and folic acid [8]. These potato peels are collected from house hold wastes, grinded and filtered for its extract as shown if fig 2 a & b.

Fig 2: (a) Potato peel (b) Potato peel extract

2.3 *PRUNUS AMYGDALUS* (ALMOND) GUMS

Extracted from almond trees, Badam Pisin (Almond Gum) is a widely available almond supplement used to treat ulcers, spasms, offering various health benefits. *Prunus Amygdalus* (Almond) gum is a nutrient-rich food. Contains 2.4% proteins, 92.3% carbohydrates, and 0.8% fat. Abundance of minerals: calcium, potassium, iron, sodium, and magnesium. Supports weight loss and reduces body heat. This gum is procured as 50gms from hypermarket in Coimbatore district. Composed of natural components and free from artificial coloring and preservatives (fig 3).

Fig 3: (a)Almond gum (b)Almond gel

2.4 LAVENDER ESSENTIAL OIL

Numerous therapeutic benefits of essential oils have been documented. Since the Middle Ages, medical professionals have been using them. Numerous medical benefits, including antibacterial activity, anxiolytic, anti-inflammatory, antinociceptive, and antioxidant qualities, are associated with lavender essential oil. Herbal solutions such as essential oils containing lavender have the potential to address issues related to drug addiction, invasive treatments, side effects, and antibiotic resistance. This oil is used for this study is procured from the online market as 15ml pure essence mostly castoff for aroma therapy.

Fig 4: Lavender essential oil

2.5 APPLE CIDER VINEGAR

Fermenting apple sugars produces acetic acid, the active component of apple cider vinegar (fig 5). Apple cider vinegar may possess antibacterial qualities, effectively eradicating bacteria causing staph infections, including Staphylococcus aureus and Escherichia coli. The murky appearance indicates the presence of proteins, enzymes, and friendly microorganisms.

Fig 5: Apple cider vinegar

2.6 METHOD OF HERBAL FINISHING ON FABRIC

The potato peel, or *Solanum tuberosum* skin was collected as 25 grams, and the skin was finely ground and filtered for pure extract. *Solanum tuberosum* extract was then combined with five grams of almond gel (almond gum+ aqueous). A mixture of 5ml of apple cider vinegar and 2ml of lavender essential oil was then added to the prepared extract. The core foam layer is infused with the extract packed in by two layers of Tencel fabric for the product development as eye mask (fig 6). The aromatic properties of lavender oil are used to reduce the mental stress.

Fig 6: Herbal Finishing of fabric

2.7 EVALUATION OF FINISHED FABRIC

2.7.1 SEM Analysis

Scanning Electron Microscopy (SEM) is a test process that scans a sample with an electron beam to produce a magnified image for analysis. The method is also known as SEM analysis and SEM microscopy, and is used very effectively in microanalysis and failure analysis of solid

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inorganic materials. Electron microscopy is performed at high magnifications, generates high-resolution images and precisely measures very small features and objects.

2.7.2 FTIR Analysis

Fourier Transform Infrared Spectroscopy, also known as FTIR Analysis is an analytical technique used to identify organic, polymeric, and, in some cases, inorganic materials. The FTIR analysis method uses infrared light to scan test samples and observe chemical properties. This technique is useful for analysing the chemical composition of smaller particles, typically 10 -50 microns, as well as larger areas on the surface.

2.7.3 EVALUATION OF ANTIMICROBIAL ACTIVITY

Preparation of the Bacterial Inoculum

The careful maintenance of stock cultures at 4°C on nutritional agar and potato dextrose agar slopes is outlined. The initiation of an active culture for experimentation involves transferring a loop full of cells from the stock cultures into test tubes containing 50ml of nutrient broth. Distinct incubation conditions are specified, with fungal cultures requiring three to five days at 27°C, and bacterial cultures cultivating for twenty-four hours at 37°C in a shaking incubator. Following this, test organism suspensions are meticulously spread onto nutritional agar and potato dextrose agar media. Incubation periods are reiterated, emphasizing the unique needs of fungal and bacterial cultures. Single-colony nutrient agar medium slants and potato dextrose slants undergo specified incubation periods at 37°C and 27°C, respectively. The integrity of the culture medium, stored at 4°C, is diligently maintained. In preparation for experiments, each test organism undergoes a structured process involving transfer into a loop and subsequent placement into 50ml of nutrient broth, allowing for bacterial culture over 18–20 hours at 37°C.

Well Diffusion method

The antibacterial and antifungal activity of crude extracts was assessed using the Well Diffusion method (Bauer et al., 1996). Bacterial inoculums were swabbed on MHA plates, and paper discs soaked in plant extract were placed in wells. After incubation, the zone of inhibition was measured in mm. Similar assays were performed on Muller-Hinton agar and potato dextrose agar. For antibacterial activity, the agar diffusion method (Van der Watt et al., 2001) was employed with E. coli and Candida albicans. Extract-treated and untreated cloths were incubated, and the inhibition zone diameter was noted in cm. Overall, the extracts showed antibacterial activities against tested microorganisms in both methods.

Fig 7: Analysis of Anti-Microbial Efficacy (a.*E.Coli and b.Candida albicans*)

2.8 DESIGN AND DEVELOPMENT OF PRODUCT

Layer 1-Tencel fabric
Layer 2- Herbal finished Tencel fabric infused with potato peel extract composite along almond gel and lavender oil, sandwiched with foam sheet.
Layer 3-Tencel fabric

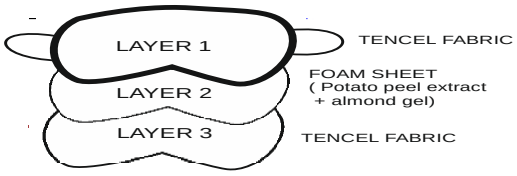

Fig: 8 Layers of Designed and Developed Product Herbal Eye Mask

Procedure to develop the designed product herbal eye mask:
Step 1: Mark the measurements on the selected fabrics and draft the pattern.
Step 2: Cut the drafted pattern of the eye mask
Step 3: Stitch the three cut layers of the fabrics with single needle lock stitch attached with elastic lock or back threads for knotting. (Fig 9b)
Step 4: Trim and make the jointed layers with even edge finish.
Step 5: Completed the eye mask by giving overlock at the edges of the mask. (fig 9c)
Step 6: Trim the extra threads for neat finishing.

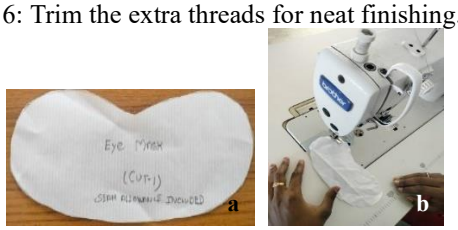

Fig:9 (a) Pattern making and drafting (b) Cutting, Machining and Trimming

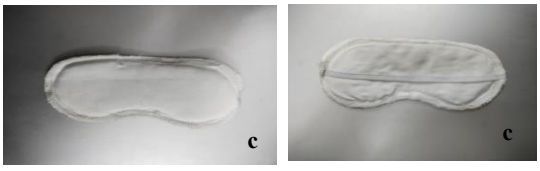

Fig 9: (c) Final Product front and back

https://doi.org/10.36282/IJASRM/9.4.2024.1936

IJASRM
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www.ijasrm.com
ISSN 2455-6378

2.9 Costing of the product

Table 1: Costing of the Developed Product Eye Mask

Components	Particulars
Tencel lyocell fabric	Rs.75
Herbs & Finishing	Rs.80
Production cost	Rs.125
Total cost	Rs.280/per eye mask

According to calculated amount shown in table 1 for raw materials used and in developing the eye mask, the cost per eye mask is Rs.280. The product is affordable. When the product is produced in large amount, the cost can be economical.

2.10 SUBJECTIVE ANALYSIS

A group of twenty-eight people who are prone to eye problems were participated in a physical evaluation of the developed product. Based on the use of eco-friendly products and reusable eye mask, a google form questionnaire was created. Reviews from customers are considered to be the most important factors, and additional information such as the product's positive and negative feelings are also questioned below.

3. RESULTS AND DISCUSSION

3.1 SEM Analysis

The surface morphology of treated and untreated fabrics was established by using scanning electron microscope (SEM) were compared (fig 10). The image photographs were taken as 5µm.

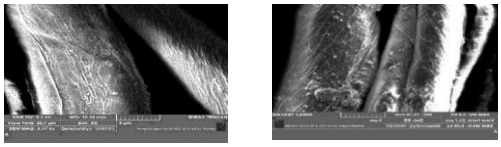

Fig 10: SEM analysis for the (a)untreated and (b)treated Tencel fabric

From the above images (fig 10) it is well clear that the herbal particles were bonded to the surface of the fabric which were absent in the untreated Tencel fabric (shown in fig 10 a & b). The herbal particles coted on fabric surface are known for its antimicrobial efficacy and cooling property.

3.2 FTIR Analysis

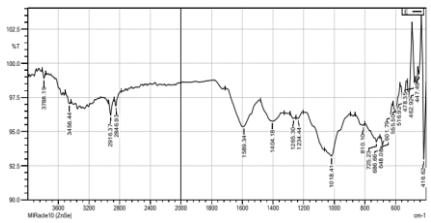

Fig 11: FTIR Analysis for the herbal finished Fabric

The above figure 11 shows the functional group of the active components present in the herbal extract through the peak values in the IR radiation.

Table 2: FTIR Analysis for the herbal finished Fabric

S.no.	Frequency Range	Functional Groups
1.	3788.19	OH groups of amide
2.	3456.44	Alcohol and phenols of – OH stretching
3.	1589.34	Alkanes and alkyl groups
4.	1265.30	C-H waging of alkyl halides

The above table 2 pertains the resultant peaks of the given herbal sample. The seven Peaks obtained are representing the active sites or active components are preset in given extract. At 3788.19 range O-H groups of amide, phenols were present, at 1589.34 range Stretching Vibration presence of alkenes and alkyl groups, at 1265.30 range C-H waging of alkyl halides out of plane aromatic band were present.

3.3 Analysis of Antimicrobial Efficacy

Table 3: Analysis of Antimicrobial Efficacy

Organisms	*E.Coli*	*Candida albicans*
Herbal Finished Tencel Sample fabric	1.3 cm	1.5 cm
Standard (Bacteria-Chloramphenicol) (Fugues-Fluconazole)	1.5 cm	1.5 cm

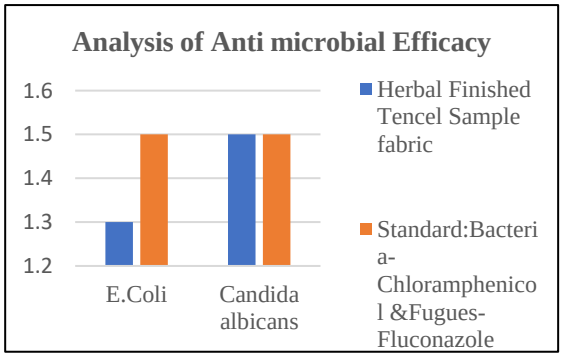

Fig 12: Analysis of Antimicrobial Efficacy

The result shown in table 3 & fig 12 demonstrate the given eye mask herbal and gel finished sample having antimicrobial activity against the *E.Coli* bacteria and *Candida albicans* fungus by

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IJASRM
International Journal of Advanced Scientific Research and Management, Volume 9 Issue 3, April 2024
www.ijasrm.com
ISSN 2455-6378

measuring the zone of inhibition. The gram negative bacteria *E.Coli* measures 1.3cm while compare with standard yields 1.5cm. The fungus *Candida albicans* measures 1.5cm same as compare with standard yields 1.5cm. The result shows the given product shows excellent anti-fungal property and very good antibacterial property.

3.4 SUBJECTIVE ANALYSIS GRAPH WITH QUESTIONNAIRE FOR THE FINAL PRODUCT.

Subjective responses collected through google form link for final product usage tabulated and represented with graphic bar chart are as follows.

Table 4: Subjective Analysis for product usage responses

S.no	QUESTIONS	YES	NO
		Population responses among 28nos.	
1	Do you Know about Eye Mask.	17	11
2	Does the eye mask protect you from sunlight or excess light rays.	24	04
3	Is the frequency of usage in day is high than night time.	21	07
4	Have you here about cooling eye mask.	07	21
5	Is the developed herbal eye mask comfortable for wearing.	24	04
6	Do you feel any irritation while using it.	26	02
7	Do you satisfy with the size, colour and cooling property of the herbal product.	25	03
8	Will you recommend this eye mask to every one	27	01

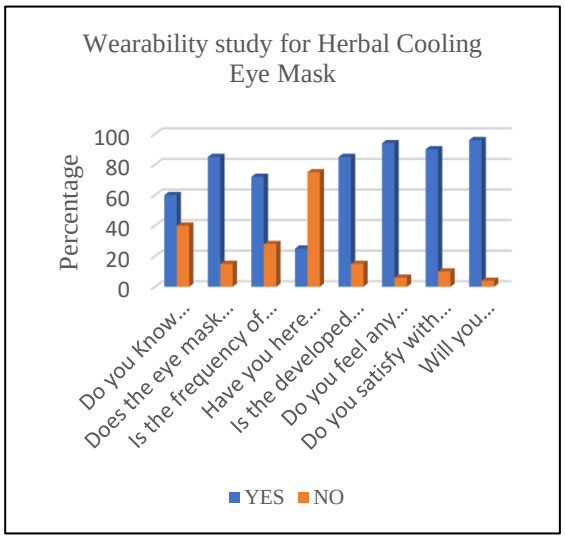

Fig 13: Subjective Analysis of the Developed product Herbal cooling Eye mask

The above questions (google form) and their responses were recorded as graph shown in table 4 and fig 13 gives product performance by wearability test result among people. In the 1st and 2nd question 60% of people were aware and 85% of them are using the eye mask product agree to prevent excess light projection. The response for 3rd question pertains 72% of people use eye mask in day time and other 28% use higher in night time. 4th questions is 75% of people are aware of cooling eye mask and 25% of them are not. The response for 5th question is 85% of people feel comfort with the developed herbal eye mask and 15% are feel some development needs. 6th question response pertains 94% of the population are satisfied with the size, colour and cooling property of the developed product and other 6% need development. In the following 7 and 8th questions the people responded as they are highly satisfied with the comfort and usage of the developed product as nearly 90% and 96% of them reported as they will recommend this product to others.

4. CONCLUSION

The greatest product for lessening inflammation and black spots in the eyes is an eye mask. The majority of people in today's globe spend more time on their cell phones computers and Laptops. As a result, their eyes will become inflamed and develop dark rings. They will find great relief from puffiness and dark circles under their eyes with the use of this sleeping herbal eye mask. Often usage of this medicated eye mask will reduce the irritations and majority eye problems face by the people no adays. Apart from its medicinal benefits this eye mask is nontoxic, sustainable product made with complete natural

https://doi.org/10.36282/IJASRM/9.4.2024.1936

materials. The test conducted to analyse and evaluate its efficacy demonstrated good result on the usage of this product.

REFERENCE

1. M Daneshmandi, F Neish (2012) "Effect of eye mask on sleep quality in patients with acute coronary syndrome" - Journal of caring.
2. M Arab, M Pilevarzadesh, M Amiri F Mashayekhi (2013) "Effect of eye mask on sleep quality in patients of coronary care unit -Sleep", Sleepscience.org.br.
3. AA Badr, A Hassanin, M Moursey-Alexandria (2016) "Influence of Tencel/cotton blends on knitted fabric performance" Engineering journal, Elsevier
4. Uzma Faroog, Pramod kumar Sharma and Rishabha Malvia, (2014), "Extraction and Characterization of Almond (Prunus dulcis) Gum as Pharmaceutical Excipient", American-Eurasian J. Agric. & Environ. Sci., 14 (3): 269-274.
5. Rezaei, A.; Nasirpour, A.; Tavanai, H. Fractionation and some physicochemical properties of almond gum (*Amygdalus communis* L.) exudates. *Food Hydroco.* **2016**, *60*, 461–469.
6. ScheieberAndreas., et al. (2008) "Potato Peels: A source of nutrition-ally and pharmacologically Interesting compounds- A Re-view". Global Science Books 2: 23-29.
7. Azadeh Samarin. "Phenolics in Potato Peels: Extraction and Utilization as Natural Antioxidants". Azadeh Samarin. World Applied Sciences Journal 18.2 191 195. 2012.
8. Lis-Balchin M, Hart S. Studies on the mode of action of the essential oil of lavender (Lavandula angustifolia P. Miller).1099-1573(199909)
9. Dagli N, Dagli R, Mahmoud RS, et al. Essential oils, their therapeutic properties, and implication in dentistry: a review. J Int Soc Prev Community Dent. 2015.
10. A Shaw D, Annett JM, Doherty B, et al. Anxiolytic effects of lavender oil inhalation on open-field behaviour in rats. Phytomedicine.;14(9):613–620, 2007.
11. Kritsidima M, Newton T, Asimakopoulou K. The effects of lavender scent on dental patient anxiety levels: a cluster randomised controlled trial. Community Dent Oral Epidemiol., 38(1):83–87, 2010.
12. S.Sarojini, Rubashree and B.Jayanthi, ―Formulation and characterization of Almond gum loaded cefopodoxime proxetilfloating microbeads‖, European Journal of pharmaceutical and medical research‖,3(5),pp.366-374, 2016.
13. S.Sarojini, Deepthi S.Kunam, R.Manavalan, Bangaru Jayanthi,‖Effect of natural almond gum as a binder in the formation of diclofenac sodium tablets‖, Int J.Pharm sci;Res,vol1, 2010.
14. Akyol H, Riciputi Y, Capanoglu E, Caboni MF, Verardo V Phenolic compounds in the potato and its byproducts: an overview. Int J Mol Sci. https://doi.org/10.3390/ijms17060835, 2016.
15. Samotyja, U. Potato Peel as a Sustainable Resource of Natural Antioxidants for the Food Industry. Potato Res. 62, 435–451 (2019). https://doi.org/10.1007/s11540-019-
16. Apple Cider Vinegar Medically Reviewed by Jabeen Begum, MD on July 07, 2023
17. Potato Peel as a Sustainable Resource of Natural Antioxidants for the Food Industry 08 April 2019 volume 62, pages.435–451, 2019.
18. Mohdaly AAA, Sarhan MA, Smetanskaa I, Mahmoud A Antioxidant properties of various solvent extracts of potato peel, sugar beet pulp and sesame cake. J Sci Food Agric 90:218–226, 2010.

https://doi.org/10.36282/IJASRM/9.4.2024.1936