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ANALYSIS OF BIO PLASTIC WRAPPERS DERIVED FROM FISH SCALE FOR WRAPPING CANDIES.

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Abstract: Despite disadvantages of plastic materials such as environmental pollution, toxic material accumulation, reasons such as elasticity, easy shape and cheap materials have been preferred. However, environmental pollution has increased due to the ease of transportation, single use in daily life and intensive use. Because of this, bioplastics have emerged as a solution and are thought to be more beneficial to the environment. Bioplastics are a form of plastic derived from renewable biomass sources, such as vegetable oil, corn starch, pea starch or microorganisms, instead of fossil fuel plastic derived from petroleum. Bio film that can protect microorganisms from environmental conditions such as extreme temperature and Ph, high salinity and pressure poor nutrients, antibiotics etc., by acting as bacteria. Recently, bioplastic production of fish wastes has been started. Bio plastic film made from fish scale become from popular in packaging industry to reduce the environmental pollution and petroleum-based plastics. In fish scales there are chitin and chitosan which has potential to be made into plastic, it has faster decomposition, smaller carbon footprint and reduce the fossil fuel resources. New products have been started to be evaluated by chemical or biological methods. Thus, the process called recycle of waste become environmentally friendly, economical, healthy. Also, it reduces the usage of petroleum derived product by using bioplastics instead of plastic. For all that reason's bioplastic usage increased in our life.

***Index Terms* - Bio plastic, Fish Scales, Fossil Fuel Resources, Chitin, Chitosan**

I. INTRODUCTION

The problem of fishery wastes has increased in the last years, becoming a global concern which is affected by several biological, technical and operational factors as well as socio-economic drivers [1,2]. The definition of "fish wastes" includes many fish species or by-catch products having no or low commercial value, undersized or damaged commercial species as well as species of commercial value but not caught in enough amounts to warrant sale. However, the use of fish as feed cannot be governed only by fishery market forces and, on the other hand, the need for responsible fisheries and aquaculture development has recently been underlined in order to preserve aquatic biodiversity [3].

It has been estimated that more than 50% of fish tissues including fins, heads, skin and viscera are discarded as they are considered "wastes". Every year discards from the world's fisheries exceed 20 million tons equivalent to 25% of the total production of marine fishery catch [2,4] and include "non-target" species, fish processing wastes and by-products. In the European Union, those discards represent a total of ca. 5.2 million tons per year [5].

Global production of fish and shrimp has been in a steadily increasing trend over the last decade and this trend is expected to continue. Of the estimated 131 million tonnes of fish produced in 2000 in the world, nearly 74% (97 million tonnes) was used for direct human consumption. The remainder (about 26%) was utilized for various non-food products, mostly for reduction to meal and oil. As a highly perishable commodity, fish has a significant requirement for processing. In 2000, more than 60% of total world fisheries production underwent some form of processing [6]

Food industry wastes are an important environmental contamination source. Research has been carried out to develop methods to convert these wastes into useful products [7, 12]. Probably, more than 50% of the remaining material from the total fish capture is not used as food and involves almost 32 million tons of waste [12].

The recovery of chemical components from seafood waste materials, which can be used in other segments of the food industry, is a promising area of research and development for the utilization of seafood by-products.

One important classification of plastics is by the permanence or impermanence of their form, they are: thermoplastics or thermosetting polymers. Thermoplastics are the plastics that, when heated, do not undergo chemical change in their composition and so can be molded again and again. Examples include polyethylene (PE), polypropylene (PP), polystyrene (PS) and polyvinylchloride (PVC) [13]. Common thermoplastics range from 20,000 to 500,000 amu, while thermosets are assumed to have molecular weight. Biodegradable plastics are plastics that degrade, or breakdown, upon exposure to sunlight or ultra-violet radiation, water or dampness, bacteria, enzymes, or wind abrasion. In some instances, rodent, pest, or insect attack can also be considered as forms of bio degradation or environmental degradation. Some modes of degradation require that the plastic be exposed at the surface (aerobic), whereas other modes will only be effective, if certain conditions exist in landfill or composting system (anaerobic) [14]. While most plastics are produced from petrochemicals, bioplastics are made substantially from renewable plant materials such as: cellulose and starch. Due to both the finite limits of the petrochemical reserves and to the threat of global warming, the development begins from an exceptionally low base and yet, does not compare significantly with petrochemical production [15]. Some companies produce biodegradable additives, to enhance biodegradation. Plastic can have starch powder added as a filler to allow it to degrade more easily, but this still does not lead to the complete breaking down of the plastic. Some researchers have genetically engineered bacteria to synthesize completely biodegradable plastics, such as Biopol; however, these are expensive at present [16].

Bioplastic production using fish waste is to reduce the pollution and safe environment. Compostable plastic originates from bio-based sources and disappear in the environment. In the fish scales there are chitin and chitosan potential to be made into plastic, It has faster decomposition, smaller carbon footprint and it reduces the use of fossil fuel resources[6].chitin is the second most abundant natural biopolymer after cellulose. However, chitosan, with its molecular structure like cellulose, is more critical than chitin. Fish scales contain chitin, organic material that can be transformed into chitosan. Chitosan has multiple applications for biomedicine, dietary supplements, and agriculture, for example. The most extreme applications include using chitosan as a repairing material for car paint coatings.

Polylactic Acid (PLA) has become a popular material due to its being economically produced from renewable resources. PLA is the second largest consumption volume of any bioplastic of the world [17]. PLA is most widely used plastic filament material in 3D printing. PLA can also be used as a decomposable packaging material cast, injection molded, or spun. Cups and bags have been made from this material. In the form of film, it shrinks upon heating [18]. PLA also has many potential uses, for example as upholstery, disposable garments, awnings, feminine hygiene products, and diapers, PLA have also found ample interest as a polymeric scaffold for drug delivery purposes [19].

Plastics contribute to approximately 10% of discarded waste. Depending on their chemical composition, plastics and resins have varying properties related to contaminant absorption and adsorption. Polymer degradation takes much longer as a result of saline environments and the cooling effect of the sea. These factors contribute to the persistence of plastic debris in certain environments [20].

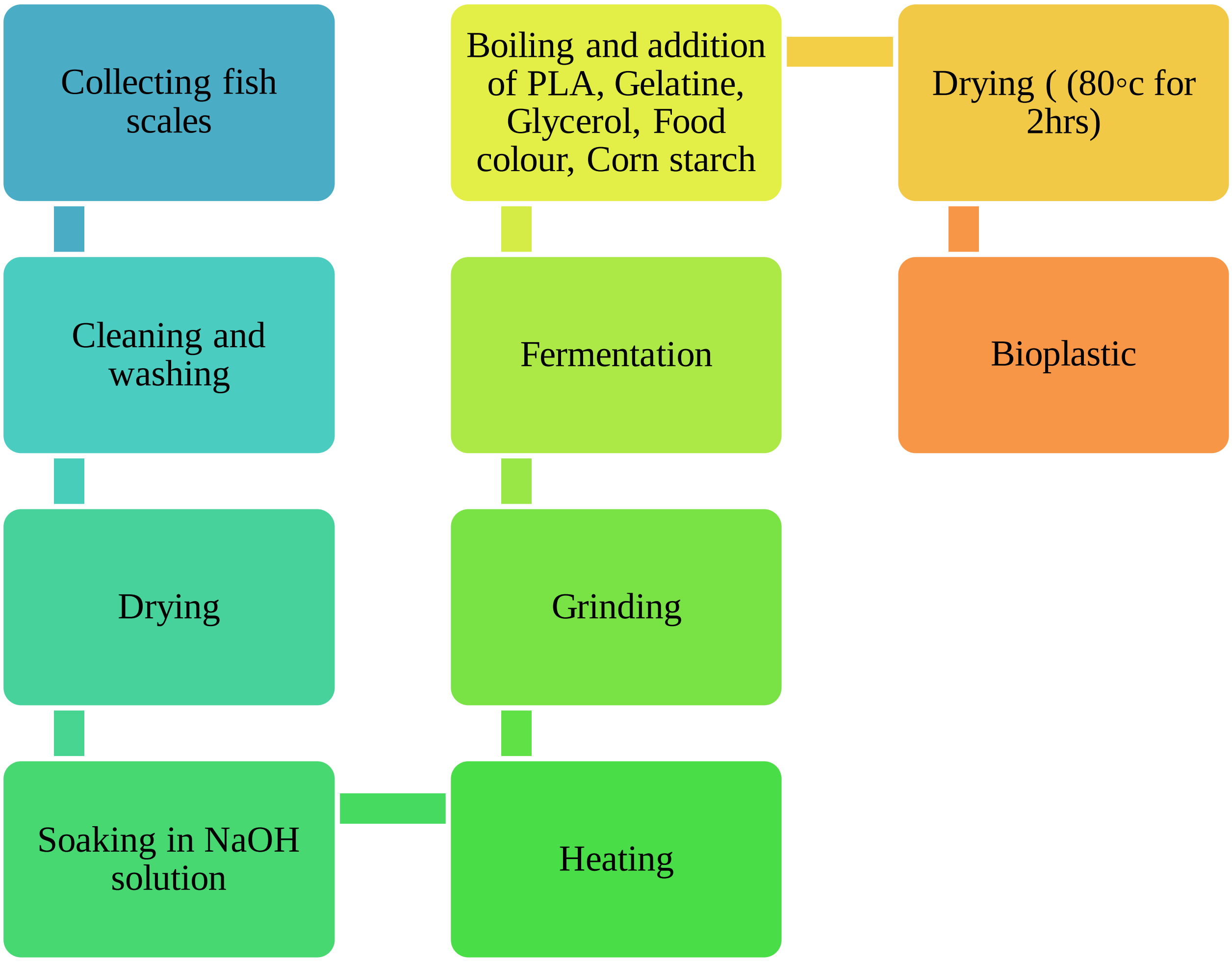
Methods:

As first fish scales are collected directly from the market. the fish scales are cleaned, washed, and dried in in the sun for 2 to 3 days. then 200g of fish scales are then soaked in the sodium hydroxide with the normality of 0.1 for 2 days. After filtration, the fish scales soaked in the NAOH heated at high temperature for 10 minutes. Then the fish scales are allowed for the grinding process. The grinded fish scales are allowed for the fermentation for a short period of time. After fermentation the mixture is boiled with the addition of gelatin, glycerol was used as a plasticizer. Corn starch and allowed to boil and stirred continuously to obtain the mixture. The mixture is allowed for the drying process in the hot air oven, drying was done at high temperature, and dried.

Materials:

Sodium Hydroxide, Glycerol, Gelatin, Corn Starch, Polylactic Acid (PLA).

Methodology:



Result and Discussion:

Sample	Process	Observation
Dried fish scales	The fish scales are collected and cleaned in fresh water to remove the waste then the fish scales are dried in the sun for the period of 2 to 3 days. The dried fish ate then grinded but then the scales have not grinded.	The fish scales were not grinded after the sun drying, after grinding it got shrinked.
Dried fish scales	The sun-dried fish scales are dried in hot air oven at 180-degreeCelsius for about 30 minutes and the dried fish scales are grinded to obtain in powder form, but it was not obtained	The fish scale was dried in the hot air oven to remove the moisture present in it. Then grinding process has been done but the fish scales were shrinked
Dried fish scales, NAOH solution with the normality of 0.1	The dried fish scales are soaked in the sodium hydroxide (NAOH) with the normality of 0.1N for 2 days and then the scales can boil for about 10 to 15 minutes. The obtained fish scales are grinded, and the mixture is obtained. Then the mixture is allowed for the fermentation for a short period of time for the microbial growth. Then the mixture is boiled with the addition of gelatin, glycerol and then the mixture is tray dried. The biofilm was not obtained. It has been obtained in the powdered form.	The fish scales were soaked in the NAOH solution for 2 days then allowed to boil for some time and then the fish scales were grinded the mixture is obtained and allowed for fermentation and addition of gelatin, glycerol, corn starch and heating and stirring of the mixture and then the mixture is allowed for drying in the dryer
Dried fish scales, NAOH solution with the normality of 0.1	The dried fish scales are soaked in the sodium hydroxide (NAOH) with the normality of 0.1N for 2 days and then the scales are allowed to boil for about 10 to 15 minutes and the fish scales are grinded and the mixture is obtained. Then the mixture is allowed for the fermentation for a short period of time for the growth of bacteria. Then the mixture is boiled with the addition of gelatin, glycerol and then the mixture is dried in hot air oven.	The fish scales were soaked in the NAOH solution for 2 days then allowed to boil for some time and then the fish scales were grinded the mixture is obtained and allowed for fermentation and addition of gelatin, glycerol, corn starch and heating and stirring of the mixture and the then the mixture is sheeted and dried to form the film.

Several Analysis has been done to obtain the bioplastic derived from fish scale table no 1.

As we have analyzed that the fish scales have got shrinked while in the grinding process and the powder was not obtained Fig no 3.As we have observed that after several trials and observation the fish scales were soaked in the sodium hydroxide solution with the normality of 0.1n and allowed it for some days to get soaked, fig no 4 ,and then the soaked fish scale are taken for the heating process and heated at 80 degree Celsius and allowed it to cool in the room temperature fig no 5 .Then the fish scales were grinded to obtain in the powder form fig no 6. The grinded fish scales were allowed for fermentation process for the microbial growth which helps for the decomposability of the film. After fermentation, the grinded fish scales were taken along with the corn starch, gelatin, poly lactic acid, glycerol. Then the mixture is obtained and the sheeted in the tray for the drying process fig no 7. The hot air oven is pre heated before drying process and the tray is placed in the oven for drying process at 70 degree Celsius for about three hours, the film made from fish scales is obtained, fig no 8.

Fig No: 1, Image of the fish scales after drying process

Fig No:2, Image of fish scales after grinding.

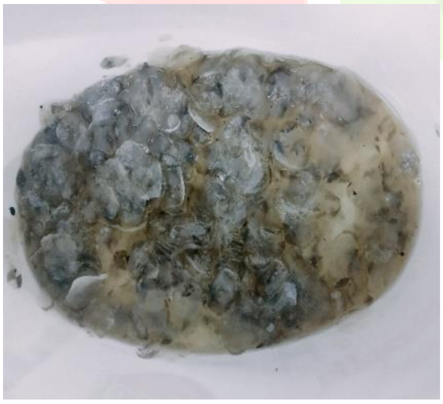


Fig No:3, Image of fish scales soaked in NaOH Soln.

Fig No:4, The Fishscales soaked in NaOH soln is then Heated.

Fig No:5, Mixture of Fishscales after grinding.

Fig No:6, Preparation of the Film.

Fig No:7, The Prepared Bioplastic is sheeted in the tray for drying.

Fig No:8, Bioplastic Film Obtained After drying

Fig No 9: Bio Plastic Film Obtained from Fish Scale is wrapped in a candy.

Functional properties:

Film thickness:
The determination of a film's thickness is important when estimating the barrier properties of a packaging system. The observed thicknesses of the bioplastic films obtained was ranged from 0.66–0.75 mm.

Biodegradable test:
Biodegradability test is used to the biodegradability of the material in the environment. For a period of three-week observation for any variation in weight loss, which provides direct evidence of film biodegradation. The degradation rate was showed increased by 50% within five days.

Conclusion:
Plastic is highly used in day today life and useful and cheap. Also, it exposes threat to the environment because of its nonrenewable nature, making it difficult to decompose. Bio plastic film made from fish scales can be used in packaging industry to reduce the environmental pollution and petroleum-based plastics. It also has faster decomposition, smaller carbon footprint and reduces the fossil fuel resources. Bioplastic film that can be used for single time. The cost for the manufacturing id the film is also economical and easy to produce. Thus, the fish waste is recycled and become economical and environment friendly.

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