8.4%, respectively in air fried samples compared to 43-54% and 71-74%, respectively for oil fried samples. PUFA/SFA ratio increased in oil fried samples whereas it did not differ in air fried samples. A better n3/n6 ratio was observed for air fried sample compared to oil fried sample. Air frying offers advantages that food products can be fried without using oil, preserving its natural colour, appearance and taste. Use of air frying helps in improving the health status of consumers and also improves the useful fatty acid profile of fish like tilapia.

Synthesis and characterization of seaweed extract based bioplastic reinforced with silver nano particles

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Majority of the modern-day packaging materials are composed of fossil-based polymers which are hazardous for the environment. Biopolymers provides an excellent alternative to petroleum-derived polymers as they are environmental friendly, biodegradable, naturally available, renewable and comparatively cheaper. The importance of the biopolymer packaging material increases as they not only act as barriers to oxygen and carbon dioxide, but also provide a platform for incorporating a wide range of additives such as, antimicrobial agents, antifungal compounds, colourants and other desirable nutrients. In the recent past, biopolymers from different natural resources such as cellulose, starch, lignin, soy protein, whey protein, wheat gluten, etc. have been extensively tried for development of ecofriendly biodegradable packaging materials. Though biopolymer-based films can be prepared from proteins, carbohydrates and lipids, carbohydrate-based films are the most preferred ones, because of their colloidal properties and better film forming ability. This has created a new avenue for seaweed polysaccharides such as agar, carrageenan, alginates etc. Agar is a hydrophilic colloidal polysaccharide extracted from red algae (Rhodophyceae) and is composed of alternate repeating unit of D-galactose and 3, 6 anhydro-β-galactopyranose. Agar is known for its excellent gel forming ability, biocompatibility, thermo-plasticity and hence, it has been tested as an alternative source for the petroleum-based plastic packaging materials. Due to the biocompatibility and blending properties of agar, various materials such as cellulose, carrageenan, nano clay, banana powder, *Aloe vera* extract, metallic nano particles etc. have been blended with it to improve its mechanical and functional properties. The nano reinforcement of the bioplastic packaging films with antibacterial function is believed to be a promising intervention to maintain the food quality and extend the shelf life. In the present study, agar film reinforced with silver nano particles was prepared using a solution casting method and their properties were characterized. The FT-IR spectra (Fig. 1) reveals typical agaran peaks, the peak around 2925 cm^{-1} was associated with C-H stretching vibration. The peak near 1638 cm^{-1} corresponds to the stretching vibration of the conjugated peptide bond formation by amine and acetone groups. The bands at 1073 and 1045 cm^{-1} indicates C-O stretching group of 3, 6-anhydro-β-galactopyranose and the peak at 892 cm^{-1} was assigned to C-H stretching vibration of β-galactose. However, there were no changes in the position of peaks after the addition of AgNPs in the film matrix, which indicates that there was no chemical interactions formed between polymer matrix and AgNPs, though it could have made physical integration. Scanning electron microscopy (SEM) (Fig. 2) revealed the proper integration and uniform distribution of nano particles in film

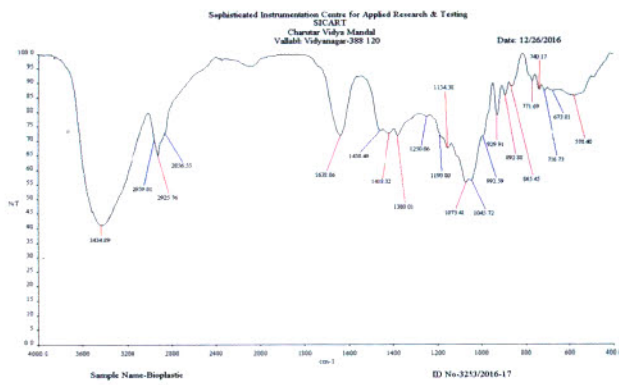

Fig. 1. FTIR analysis of film

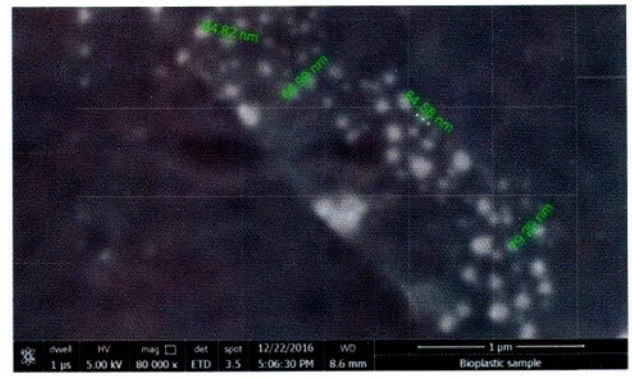

Fig. 2. Scanning electron microscopy showing the size of the nano particles

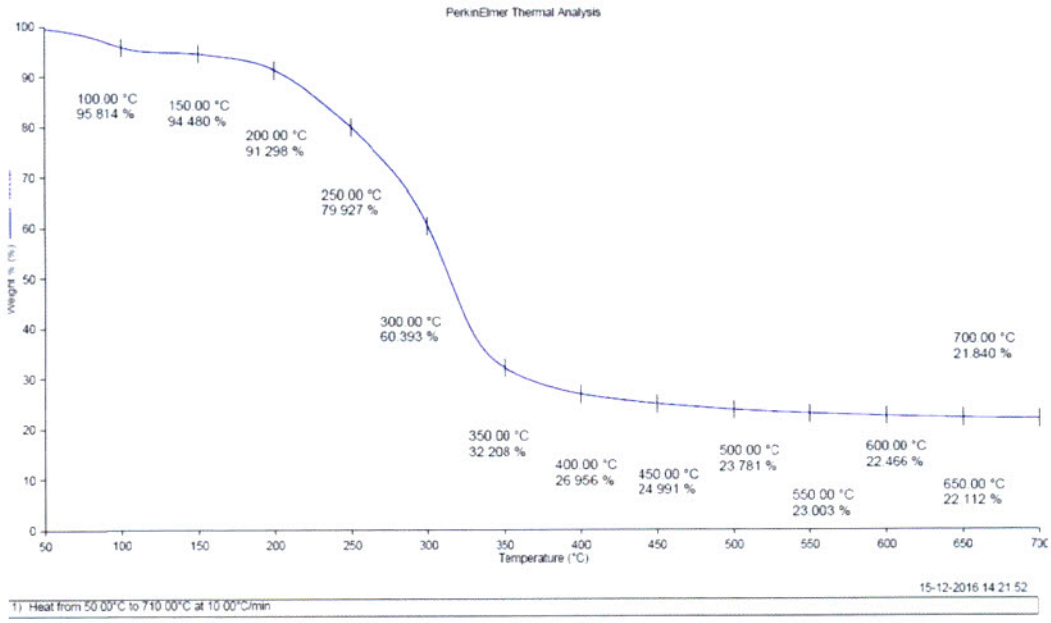

Fig. 3. TGA analysis showing thermal degradation pattern of film

matrices. It also confirmed the particle size of nano silver lied between 66 nm to 84 nm.The TGA thermograph (Fig. 3) showed two events of weight loss and the initial weight loss event was from 90°-100 °C where the film looses 4.2% of weight. The initial weight loss event was attributed to the evaporation of the moisture trapped in the polymer matrix. The second and major weight loss event was observed in the range of 200°-350 °C which is mainly due to the degradation of polymers and glycerol. The overall result of TGA analysis showed the stability of the biopolymer up to a reasonable temperature range. The nano particle incorporated agar film also exhibited a distinctive antimicrobial activity. The microbial analysis showed that the silver nano particle incorporated agar films has strong inhibition towards *Staphylococcus aureus* (ATCC 25923 and ATCC 43300) as well as emerging pathogen like MRSA (Fig. 4).

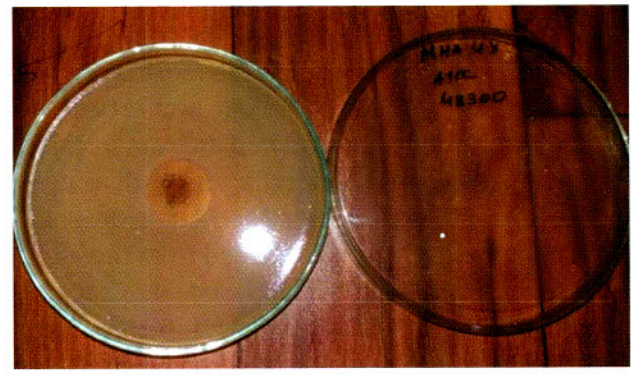

Fig. 4. Antimicrobial activity of film against *S. aureus*