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SYNTHESIS AND CHARACTERIZATION OF GELATINE AND PVA COMPOSITE FILM WITH ANTIMICROBIAL ACTION

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ABSTRACT

The antimicrobial activity of the different leaf extracts of mint, also known as mentha, against one human pathogens *Escherichia coli*, of dried leaf of mint were tasted against three human pathogens strains such as *Escherichia coli, candida albinos* through the well diffusion and the poison plate method. The antimicrobial potential of mint leaf extract against *E.coli* showing best result. The mint objective of this investigation is to develop GELATIN AND POLYVINAYL ALCOHOL composite film. These GELATIN AND POLYVINAYL ALCOHOL composite film have good potential to be used as delivery vehicle for protein drugs. It is also used in packaging system and medicinal usage.

Keywords: Mentha, *E.coli*, polyvinyl alcohol, gelatine, Antimicrobial activity

1. INTRODUCTION: -

PVA is a linear polymer and it can easily cross linked by irradiation **[1]** or functional group contain chemical agent such as glutaraldehyde **[2]** boric acid and hex methyleneisocyanine **[3]**. Gelatine widely found in nature and is the major constituent of skin bones and a controlled hydrolysis of the fibrous in soluble protein, collagen **[4]**. The strength of the gelatine film is due to the presence of the triple helixes.The higher the triple helix content, the stronger the film is and the less it swells in water **[5]**. Despite their lower water vapour barrier, gelatine-based films have superior mechanical resistance in general **[6]**. Grafting gelatine with other polymers has been investigated in attempt to improve or modify gelatine's properties, as well as to

generate new materials that combine the desirable qualities of natural and synthetic polymers. Several attempts resulted in changes in the film's surface structure and surface energy.Among them physical treatment such as ionizing or non-ionizing radiation between natural and synthetic polymers and reduce the hydrophilic nature of the film. Surface modification of the films can be accomplished by exploiting the double bond of the monomer 1,4-butanediol acrylate (BDA) to promote cross-linking **[7-10]**. The photography, pharmaceutical, and food sectors all employ gelatine. since it is a protein that can be produced in abundance at relatively low cost and showing interesting functional properties **[11]**. Gelatine is a protein of animal origin obtained from collagen by acidic or alkaline hydrolysis **[12].** Poly (vinyl alcohol) PVA is normally a poor electrical conductor, it can become conductive upon blending with some polymer. The poor conducting nature of PVA is thought to be due to the high physical interactions between polymer chains via hydrogen bonding with hydroxyl groups as well as the complex formation **[13, 14]**.

1.1 MINT INTRO: -

Mint leaves are oval in shape with serrated edges and contain a lot of fragrant oil.And its stalks are purple. There are many species with commercial and medicinal purpose. Among them are mint (menthe spicatatuds) pepper mint (menthe arenas l or menthe x pipe Rita l) **[15]**. The essential oil of mint can have different composition and chemo types and this is why single or hybrid species can have distinct odours, and the essential oils of a species can be altered simply by changing the chemical structure of the monoterpens **[16]**. The essential oil is a mixture of many volatile compounds, which are influence by environmental factors (interaction between the genotype and environment, season and others) and processing parameters such as temperature, time, pressure and method of extraction **[17]**.

1.2 GELATIN: -

Gelatine is derived by partial hydrolysis of collagen hydrolysis can be done by alkali or acid pre-treatment of collagen during hydrolysis the cross-linkages between polypeftical chains bonds leads to the breakdown of fibrous structure of collagen yielding gelatine **[18]**·the source type of collagen and the processing condition influence the properties of gelatine different type of gelatine have varying thermal and theological properties such as bloom strength melting and yelling temperature. The hydrohobicity of a given gelatine is regulated by the chain length of the molecular weight distribution amino acid content, and the chain length of the thesis **[19]**. There are two types of gelatine:

type A- gelatine and type B- gelatine. is derived from acid treatment and has an isotonic point of pit 7.9 to 4 type-b is derived from the alkali treatment with isotonic point of ph 4.8 to 5.5 **[20]**. Gelatine is a tasteless and colourless solid substance that is water soluble. It is made up of high molecular weight polypeptides that are hydrocolloids in nature **[21]**.

USE OF GELATIN: -

- Gelling ingredient in shampoos
- Body lotions
- Face cream
- Hair prays
- Sun screens and bath salts

1.3 (PVA) Polyvinyl Alcohol: -

Molecular formula: - (C2H4O)

Density :- 1.19-1.31 g/cm

Melting point :- 200 c (392 F, 473 k)

Solubility :- soluble in hot water

Polyvinyl alcohol is a water-soluble synthetic polymer PVA formula is [ch2ch(oh)]n PVA is a one kind of heavy polymer which is usually a white or slight yellow floccules, flake, granular, or powdery in appearance PVA is a non-toxic synthetic polymer PVA is not prepared by polymerization of the corresponding monomer as the monomer, poly vinyl alcohol is thermodynamically unstable with respect to its tautomer acetaldehyde **[21, 22]**.·In terms of microstructure it is composed mainly of 1,3 diol linkages but a few percent of 1,2 diols occur. Depending on the condition for the polymerization of the vinyl ester precursor **[22]**. PVA is low degradation rate in some environments such as in soil along with relatively high cost and poor water resistance owing to the presence of hydroxyl group in repeating units of PVA **[23, 24]**. PVA is popular biopolymer has received great attention as the alternative to general synthetic polymer due to the good flexibility.

USESOF PVA: -

Widely in industry such as

- pharmaceutical formation
- Drug delivery
- Cosmetics
- Biosensors

2. MATERIALS: -

- Gelatine
- The Synthetic Polymer PVA (Polyvinyl Alcohol)
- Molecular weight, (72000)

3. METHODS: -

Collected PVA in beaker and dissolved in hot water hitting this mixture aproxymetry 25-30 min (PVA=15gm, water=100ml)In the prose's collected Gelatine 85gm in 100ml hot water continue staring with glass rod and dissolved Gelatine after completely dissolve Gelatine We put the mixture cool Down this prose will continue dissolve Gelatine in water approx. (20-25 min)In the poses will continue to mixture both of

solution PVA & GELATIN mixture after mixing this solution continue in beaker 1.5ml PVA & GELATIN the solution were blended in water mixture to 40-45 min. In lab we collected small glass plate and put this mixture (PVA& GELATIN) In Aluminium foil on aluminium foil carry to this mixture and preferring to films in room temperature for todays. This mixture is carried to specific 4mm GELATIN & PVA layer.

Figure 1: Composite film of PVA/GELATINE

4. CHARACTERIZATION: -

4.1 ANTIBACTERIAL ACTIVITY: -

The zone inhibition method is used of evaluate microbial activity of plant extract. Prepare nutrient agar with distilled water (100ml). Sterilizer the media, pipette, tip, Petri, etc. After sterilization of media allow to room temperature and add 0.1ml of test organism. Mix well and pour in to sterile Petri dish. Allow in to solidify the plate using sterile cork borer of 6mm diameter. One hole was drilled with the help of sterile cup borer and insert small part of **GELATIN/PVA/MINT EXTRACTION** Film and incubate at for 24 hours. And observe zone of inhibition next day.

4.2 FT-IR SPECTROSCOPY: -

Fourier transform infrared (FTIR) Spectroscopy was used to confirm the presence of functional groups in sample of GELATIN/PVA composite film. Film composed of 2% each polymer solution was prepared for analysis by drying at room temperature for 24 h. each spectrum is between 4000 to cm-1

4.3 X-RAY DIFFERACTION (XRD): -

For characterising crystalline materials, X-RAY diffraction is a potent non-destructive technique. Structures, phases, preferred crystal orientations, and other structural metrics such as average gain size, crystalline, strain, and crystal defects are all included.

5. RESULT & DISCUSSION: -

5.1 ANTIBACTARIAL ACTIVITY: -

The antibacterial activity test result of film by disc method it was found that the mint leaves, extract was performed against *E.coli*. the antibacterial activity of method extract of all extract was optimum result against with zone inhibition 11mm. the result of antibacterial activity was suggested that the presence of bioactive compound in the extract of medicinal plant. Maximum activity against *E.coli* was obtained using the technique extract of mint leaves **(Figure 2)** which was shown.

5.2 FT-IR: -

The FTIR spectrum of gel/pva is characterization by strong at 3424.28, 1626.50, 1100.77, and 600.09 cm-1, which are consistent with reported band position of gelatine and polyvinyl alcohol (PVA). The bands at 1100.77 and 600.09 cm-1 are attributed to the asymmetric and symmetric stretching vibrations of c-o, respectively. The bands at 3424.28 and 1626.50 cm-1 are endorsed to O-H stretching vibration, respectively. The FTIR spectrum of GEL/PVA is similar to that of GEL/PVA, but the band position of O-H, C=C, AND C-O are shifted to lower wave number. The shift in band position observed for O-H,C=C, and C-O group in GEL/PVA composite films is attributed to formation of the co-ordination bond between AG atom and oxygen of however, the pick of O-H stretching in gelatine 1111.11 cm-1 disappeared and it might attributed to the interaction with PVA . The peaks of C-O and stretching from both polymers near 1100 and 600 cm-1 respectively were combined and for med new stronger peak at the same region **(Figure 3)**.

5.3 X-RAY DIFFRECTION (XRD):

The identification of materials based on their diffraction pattern is one of the most common applications of XRD analysis. XRD provides information on how the actual structure differs from the ideal one due to internal tensions and flaws, in addition to phase identification.

X-rays are waves of electromagnetic energy, whereas crystals are regular arrays of atoms. The interaction of incident X-rays with the electrons of crystal atoms scatters incident X-rays. Elastic scattering is the name for this phenomenon, and the electron is the scattered. A regular array of scatters to create a regular array of spherical waves **[13]**. Due to destructive interference, these waves cancel each other out in most directions, but they add constructively in a few select directions, as indicated by Bragg's law **(Figure 4)**.

Figure 2: Antibacterial activity of mint leaves extract

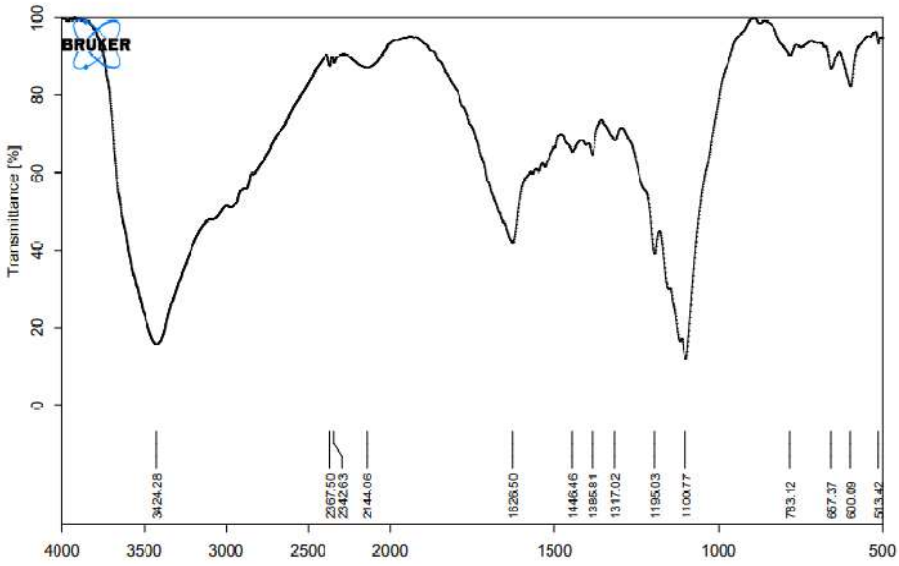

Figure 3: FTIR spectra of PVA/GELATINE composite film

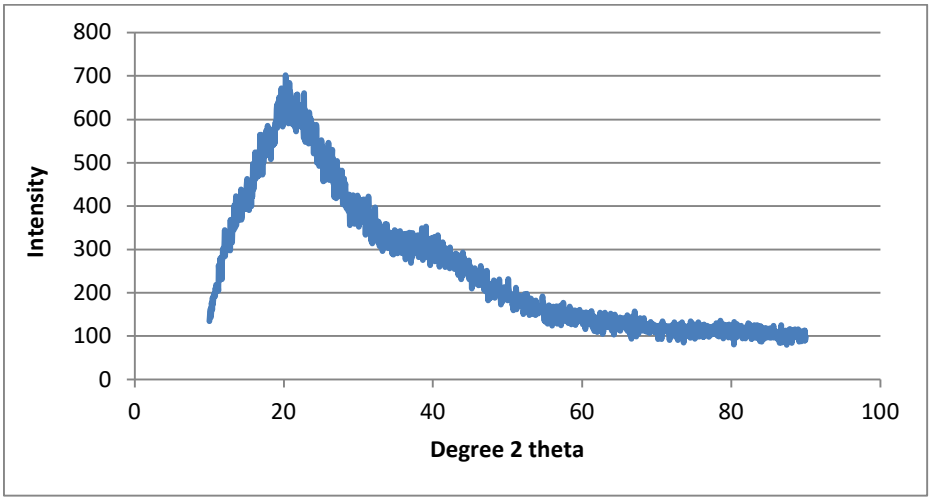

Figure 4: X-ray diffraction of PVA/GELATINE composite film

6. CONCLUSION:

I have synthesis Mint extract loaded Gelatine/PVA composite film which found very good antibacterial activity again *E.coli* and Pseudomonas by FTIR spectra we can find out Gelatine/PVA are present in composite film. I also performed a X-ray diffraction [XRD] for identify the type of material as well as its phase and crystalline properties.In this research.

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