Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.6, No.12 2016
www.iiste.org

The Study of Polyurethane Modified with (Peel the Garlic , Cooked Tea Leaves and Ash Firewood) as Antibacterial Polymer

Hamed A. Hamdi[1] Um Albneen A.A. Ali[1] Kassim H. Khalf[2]
1.Basrah University, College of Education/Qurna , Biology Department
2.General Hospital/Qurna. Basrah , Iraq

Abstract:
In this present paper, experimental results on anti-bacterial efficacy of poly urethane foam added to various contents of Peel the garlic , Cooked tea leaves and Ash firewood) as anti-bacterial agents, were reported. All the results were obtained after 24 hours of microbial growing .The ratio of doping with Peel the garlic , Cooked tea leaves and Ash firewood) was 1 to 17 W%. The size of egg shell foils used in this study was (< 400) µm. We compared the initial adhesion and growth of positive and negative gram bacteria . Bacteria brought from microbiology laboratory in Qurna general hospital after insuring them by tests like Gram stain test ,Catalas test ,Manitol test, Urease test, H2S and Citrate tests Coagulase test, Indol test, Mthyl red and Oxidase tests. The obtained results showed that the gram positive bacteria had a limited inhibition zone. Furthermore the obtained results were explained according to the bacterial cell wall and it's liquid contents.

1-Introduction

Man-made materials completely lack defence against microbial growth. Thus, microbial cells attached to any artificial surface in a moist environment can survive and proliferate. While the cell number increases on the surface the microbial cells usually start to build up a biofilm, which consists of a polysaccharide matrix with embedded. Such biofilms allow microbial cells to survive under harsh conditions and the embedded cells are up to 1,000 times less susceptible to most antibiotics and other biocides which may affect the safety of people [(1)].

In recent years antimicrobial polymers have gained interest from both academic research and industry because of their potential to provide high-quality life and safety benefits to people[(2)] . Antimicrobial polymers are the up and coming new class of disinfectants, which can be used even as an alternative to antibiotics in some cases. Interestingly, antimicrobial polymers can be tethered to surfaces without losing their biological activity, which enables the design of surfaces that kill microbes without releasing biocides[(3)].

Antimicrobial polymers have been known since 1965, when Cornell and Dunraruma described polymers and copolymers prepared from 2-methacryloxytroponones that kill bacteria[(4)].

Several modifications have been developed with the aim of discouraging microbial adhesion to polymers where micro-organisms tend to adhere strongly to surfaces at the onset of formation of a complex adhering microbial community, called a biofilm [(5-10)].

Metals, such as copper and silver, can be extremely toxic to bacteria at

exceptionally low concentrations. Because of this biocide activity, metals have been widely used as antimicrobial agents in a multitude of applications related with agriculture, healthcare, and the industry in general[(11)].

Antimicrobial polymers therefore are highly demanded as a strategy to avoid HAIs and they can be prepared either by embedding a biocide agent into the polymer bulk, for instance, during their processing or by applying surface coatings [(12–16)].

The aim of this study was to compare the initial adhesion and surface growth of positive and negative gram bacteria on modified polyurethane foam doped with local additives.

2-Experimental Work:

Pure polyurethane prepared by reacting a liquid isocyanate with a liquid blend of polyols where a mixing for a minute is required where the weight ratio (1:1) is used . The modified polyurethane is prepared by adding various contents ratios(1 gm , 3 gm , 5 gm , 10 gm and 17gm) of (Peel the garlic , Cooked tea leaves and Ash firewood) where the addtion process invoved during mixing inatial components of polyurethane foam. Both pure and modified polyurethane foam have been prepared in the shape of disc by using the preparing method mentioned in reference (10), where all preparation processes were made in biology depart ments labratories with the help of polymer research center in Basrah university). The radius of these discs was 5 mm . All addtives were obtained from local houses, the average egg shell size used in this work was (< 400) µm. Table (1), . After that, nutrient agar was prepared and 20 ml was spread on each Petri dish, where the radius of these Petri dishes was 90 mm. This step is followed by inoculation with 0.1 ml of suspension with optical density (OD) on 540 nm by spectrophotometer. Pure and modified polyurethane discs are subjected to be attacted by by gram positve bactera(staphylococcus aureus) and Gram negative bactera (E. Coli). These bacteria have been provided by microbiology laboratory in Qurna general hospital after insuring them by biological diagnostic tests (Gram

stain test, Catalas test, Manitol test, Urease, test, H2S test, Citrate test, Coagulase test, Indol, Mthyl red test and Oxidase test). All Petri dishes were left for almost 15to 30 minutes until dried and by that time all polyurethane discs were distributed in Petri dishes and kept in incubator under 37 C º for 24 hours. All Petri dishes were taken out from the incubator in order to study both bacterial adhesion and growth on polymeric discs along 24 hours. Figure(1) shows modified foam dopped with the three types ofadditives were a difference in morphology appears according to the added maetrial.

Figure(1) The modified polyالوurethane foam and the added materials

3-Results and Discusion:

In many applications, the object that needs to be protected from microbial infestation is subjected to be attacked

by more than one variety and species of microorganisms[17] , thus, two opposit types of bacteria were used to test the adhesion and growing of bacteria on the rough surface of poly urethane discs which were involved in this study. All measurements have been obtained as a function of doping ratio with Peel the garlic , Cooked tea leaves and Ash firewood.

The obtained results for polyurethane fomas moddified with both Peel the garlic showed that Both negative and bositive bacteria growing was normal around discs . No noticeable changes of this grwoing with the increasing of doping ratio with peel the garlic. No inhibtion zone for all doping ratio.

Same results was obtained for polyurethane foam modified with ash firewood.A small inhibtion zone obtained with discs of polyurethane modifed with cooked tea leaves with the diameter (0.5 – 1) cm.

The last result can be explained in terms the compositions of tea leaves which contains polyphenols , anti-oxidant called Balafs where it has the ability to fight viruses such as Alanfelonzha, dysentery, hepatitis, and also contains a compound called (theophylline.Also the tea leaves are rich in vitamins and minerals such as magnesium, potassium, zinc and some tannin polyphenols and essential antioxidants such as tannin and Alkuanin, purine, xanthine.

The vanishing of inhibition zone around other polyurethane discs due to theincrement of the attachment of both microbes used in this study were this attachement depends on several parameters such as flexibility, surface morphology and the existing voids in polymeric matrix where these voids are a suitable place for bacterial growing

Figure (2) shows the stages of the growth of both (E.coli) and (staphylococcus aureus) bacteria on modified polyurethane foam added with Peel the Garlic , Cooked Tea Leaves and Ash Firewood

Figure(2): The modified polyuretahne discs as antibacterial polymer

4- Conclusion :

The obtained results showed that the growing of (staphylococcus and E. Coil) was different from one Petri dish to another according to the filler contents and the type of (peel the garlic , cooked tea leaves and Ash Firewood) in addition to the cell wall weither positive or negative and how much it contains lipids where these lipids play a big role in the interaction between bacteria and the polarity of the components of of (peel the garlic , cooked tea leaves and Ash Firewood). A limited inhibtion zone is obtained were this imitation is a function of the physico-chemical properties of the microbial and biomaterial surfaces .

5- References:

1-Mah, T.-F.; Pitts, B.; Pellock, B.; Walker, G.C.; Stewart, P.S.; O'Toole, G.A. A genetic Basis for Pseudomonas Aeruginosa Biofilm Antibiotic Resistance. Nature 2003, 426, 306-310.[

2-A. Varesano, C. Vineis, A. Aluigi and F. Rombaldoni, Science against microbial pathogens: communicating current research and technological advances.

3- Felix Siedenbiedel and Joerg C. Tiller , Polymers 2012, 4, 46-71.

4- Cornell, R.J.; Donaruma, L.G. 2-Methacryloxytroponones. Intermediates for Synthesis of Biologically Active Polymers. J. Med. Chem. 1965, 8, 388-390.

5-Gottenbos, B., Van der Mei, H. C. & Busscher, H. J. (1999).Models for studying initial adhesion and surface growth in biofilm formation on surfaces. Methods Enzymol 310, 523–534.

6- G.L.Y. Woo!, M.W. Mittelman, J.P. Santerre, Biomaterials 21 (2000) 1235}1246.

7- Modak SM, Sampath L, Fox CL, Benvenisty A, Nowygrod R,Reemstmau K. A new method for the direct incorporation of antibiotic in prosthetic vascular grafts. Surgery, Gynecol and Obstetrics 1987;164:143}7.

8- Trooskin SZ, Dontetz AP, Harvey RA, Greco RS. Prevention of catheter sepsis by antibiotic bonding. Surgery

1985;97:547}51.
9- Bach A, Schmidt H, BoK ttiger B, Schreiber B, BoK hrer H, Motsch J, Martin E, Sonntag HG. Retention of antibacterial activity and bacterial colonization of antiseptic-bonded central venous catheters.
J Antimicrob Chem 1996;37:315}22.
10- Abdullah Alamri, Mohamed H El-Newehy and Salem S Al-Deyab, Alamri et al. Chemistry Central Journal 2012, 6:111
11- Humberto Palza , Int. J. Mol. Sci. 2015, 16, 2099-2116.
12- Damm, C.; Munstedt, H.; Rosch, A. The antimicrobial efficacy of polyamide 6/silver-nano- and microcomposites. Mater. Chem. Phys. 2008, 108, 61–66.
13- Kenawy, E.R.; Worley, S.D.; Broughton, R. The chemistry and applications of antimicrobial polymers: A state-of-the-art review. Biomacromolecules 2007, 8, 1359–1384.
14- Zhang, W.; Zhang, Y.H.; Ji, J.H.; Zhao, J.; Yan, Q.; Chu, P.K. Antimicrobial properties of copper plasma-modified polyethylene. Polymer 2006, 47, 7441–7445.
15- Jones, D.S.; Djokic, J.; Gorman, S.P. The resistance of polyvinylpyrrolidone-Iodine-poly (ε-caprolactone) blends to adherence of Escherichia coli. Biomaterials 2005, 26, 2013–2020.
16. Yuan, Y.L.; Ai, F.; Zang, X.P. Polyurethane vascular catheter surface grafted with zwitterionic sulfobetaine monomer activated by ozone. Colloid Surf. B 2004, 35, 1–5.
17- Hameed A. Hamadi ,Nawres Nory jabber, Nadhim A. Abdullah Dhia'a A. Abd AL Amaem, Iraqi J. Polymers, Vol 13, No.1, 67-78, 2009.