

The Effects Of Ultrasonic Application For The Microbiological Quality Of Bulk Cooking Oil

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Abstract: Radiation is one of natural phenomenon that often discussed in light, atomic reaction, nuclear application and electromagnetic wave (especially in gamma ray, X ray, and UV light). Commonly, we usually think that they are negative, deadly, and dangerous for living creatures. Radiation may be correlated with thermal phenomenon, but this reasearch was applied to get audio phenomenon and radiation, especially ultrasonic radiation. Sound is a particle of vibration that propagates through medium and transmitted as longitudinal wave in which the displacement of the medium is parallel to the propagation of the wave. Radiation is the emission of waves in all directions in space, by vibratory sources (transducers) form small balls or knob [2][3][4], this study were irradiating (exposing) to bulk cooking oils. The bulk cooking oil was treated by the ultrasonic exposure (1.5 hours and 3 hours) and 24-hour incubation that it showed no aerobic colony. And besides, the untreated bulk cooking oil showed a few aerobic colonies. And also, the untreated used bulk cooking oil showed more some aerobic colonies. The research results shows that ultrasonic exposure at 48 kHz for 1.5 hours can enhance the microbiological quality of bulk cooking oil for 10 day storage.

Keywords: microbiological quality, ultrasonic, exposure, radiation, bulk cooking oil, knob, aerobic colony.

1. Introduction

Einstein's Theory of dualism exposes that light has the properties of photonic particles (Newton) and also waves (Huygens). This theory can be applied in a disintegration process of atom and nuclear with the existence of alfa beta particles and gamma wave. This research was conducted to prove particles collision in a ultrasonic radiation of liquid media, and a natural phenomenon of to and fro sang [1]. Particle collision will occur continuously by a high-speed propagation in liquid media [5], such as knob [2]. The microbiological quality of Bulk cooking oil was enhanced with Ultrasound radiation treatment which has longitudinal wave radiation at more than 20 kHz frequencies, and scattering particles all direction (space) and propagating wave in the parallel medium. Many potential microbial organisms can contaminate the bulk cooking oil such as Enterobacter sp, Bacillus sp, Proteus sp, Micrococcus sp, Staphylococcus aureus, Aspergillus niger, A. flavus, A fumigatus, Candida sp, Mucor sp, Ana Penicillium sap [7]. The microbiological quality criteria of ready-to-eat food consumption consist of three components: aerobic colony count (ACC), hygiene indicator organisms – E. coli and Enterobacteriaceae, and specific foodborne pathogens [6].

2. Material and method

Twelve (12) tin Knobs were used in ultrasonic radiation process are 2.5 – 3.0 mm in diameter. Each of them was connected to piezoelectric speaker type 40 T – 16 B using 3 cm long-fiber wire.

Those speakers transmitted sound to knobs, and scatter to all direction in the liquid chemical tube which are 1.34 cm diameter and 10.3 cm length. The equipment was used as vibration source VOM VFG-hh 3020 DDS Function Generator / Counter (TFT) at 48 kHz frequency, intensity 5 Vpp and electric current 5 Vdc. The other equipments were used such as analytical balance; erlenmeyer; autoclave; beaker glass; petridish; oven; matt pipet; hot plate; cotton; rubber bulb; and volumetric flask. Materials of research are bulk cooking oil; used bulk cooking oil; nutrient agar media; aquadest. First, the researchers prepared all tools and materials. Next, the researchers sterilized laboratory equipments including volumetric flask, four (4) petridishes, measuring pipette, two (2) chemical tubes, and two (2) transducers containing 12 knobs by using alcohol. The researchers set function tool at a frquency of 48 KHz, intensity 5 Vpp and electricity flow 5 Vdc. The researchers poured oil cooking into beaker glass with matt pipet about 3 ml for two test tubes. The researchers inserted knob to each tube and set the function generator. The researchers connected probe positive - negative cable in generator with speaker piezoelectric to a tube; and observed the process for the results (1.5 hours and 3 hours). The researchers were preparing nutrient agar liquid media in partikular quantity.

$$\frac{\text{massa on label}}{\text{volume on label}} = \frac{\text{required massa}}{\text{required volume}}$$

The researchers weighed the culture media with analytical balance, put in a flask. The researchers closed the flask with cotton and wrapped with aluminum foil, twirled the flask gently, as wells as sterilized autoclave for 15 minutes at 121 °C. The researchers stored it in an oven at 40 – 50 °C. After bulk cooking oil was irradiated of ultrasonic (1.5 hours) remove from the chamber of biosafety - biosecurity then the tube was covered with cotton to avoid contamination. The researchers actually applied pipetting 3.8 ml nutrient agar media into 3 (three) petridishes. Petridish 1 contained 1 ml irradiated bulk cooking oil and 3.8 ml nutrient agar media. Petridish 2 contained the 1 ml untreated bulk cooking oil and 3.8 ml nutrient agar media. Petridish 3 contained the 1 ml used bulk cooking oil and 3.8 ml nutrient agar media. The researchers conducted 3-hour and 1.5-hour ultrasonic exposure. Second treatment was applying 3-hour ultrasonic

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exposure of bulk cooking oil and no storage. Third treatment was applying 1.5-hour ultrasonic radiation exposure of on bulk cooking oil with 10-day storage. Fourth treatment was applying 1.5-hour ultrasonic radiation exposure on bulk cooking oil and also observation of 2-month storage.

3. OBSERVATION AND TREATMENTS

3.1. First observation and treatment

First determination observation of the bulk cooking oil was exposed to ultrasound radiation. The researchers in observation did not find any aerobic colonies. Second determination observation was conducted the untreated bulk cooking. the untreated bulk cooking oil media had some aerobic colonies. Third determination observation of the used bulk cooking oil was conducted without any treatment. The used bulk cooking oil had some aerobic colonies.

3.2. Second observation and treatment

First, the bulk cooking oil media was irradiated for 3 hours and observed. Second, observation of the aerobic colonies were conducted to the untreated bulk cooking oil. The researchers had found 135 aerobic colonies on media. Third, observation of the bacteria were conducted the untreated used bulk cooking oil. the researchers had found 236 aerobic colonies on media.

3.3. Third treatment for 1.5-hour ultrasonic exposure and 10-day storage

All media was conducted to ten-day storage and 24-hour incubation. First, The observation was conducted to the untreated bulk cooking oil that it showed 28 aerobic colonies. Second, the bulk cooking oil was conducted ultrasonic radiation exposure. The irradiated media had shown no aerobic colony. Third, The observation was conducted on media without any the bulk cooking oil, and then media had 18 aerobic colonies.

3.4. Fourth Treatment for 1.5-hour ultrasonic exposure and 2-month storage

In fourth treatment, the researchers conducted 3 media such as media 1, media 2 and media 3. Media 1 is the bulk cooking oil. Media 1 was not treated with ultrasonic exposure but it was stored for 2 months. Media 2 is the used bulk cooking oil. Media 2 was not treated with ultrasonic exposure but it was stored for 2 months. Media 3 is the irradiated bulk cooking oil. Media 3 also was stored for 2 months. After 2-month storage all media had *Aspergillus niger* fungi.

4. DISCUSSION

In second and third treatment, the researchers observed that the radiation phenomena happened with the ultrasonic transducer knob, which have a diameter of 2.5 to 3.0 ml with source = 48 kHz, 5 Vpp, 5 Vdc. The researchers applied 1.5-hour and 3-hour exposure in air-conditioned laboratory room temperature (22 - 28 °C). Those treatments could make the bulk cooking oil to last longer than the others. The bulk cooking oil was irradiated by ultrasonic exposure in a particular time. The irradiated bulk cooking oil

can last for 10-day storage without any aerobic colonies. On the other and, The untreated bulk cooking oil could have a few aerobic colonies from 8-day storage. The once used bulk cooking oil could have aerobic colonies from 5-day storage. Vibration of ultrasonic exposure can resist aerobic colonies for 10-day storage. The three bulk cooking oil media were stored constantly for 2 months. The structure of the all bulk cooking oil media changed into mould. *Aspergillus niger* fungi had grown in them.

5. CONCLUSION

The research results shows that ultrasonic exposure at 48 kHz for 1.5 hours can enhance the microbiological quality of bulk cooking oil for 10 day storage in aerobic colony count (ACC) level.

6. ACHIEVEMENT (PARTICIPANTS)

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