Resistance of Broiler Meat Through Exposure to Extremely Low-Frequency Magnetic Fields of 700 μT and 900 μT Intensities and Safety Risks to Health

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Abstract. That publicity to extremely Low Frequency (ELF) magnetic fields can save and suppress the increase and proliferation of pathogenic microorganisms, which have a vital role in the process of meal spoilage. This has a look at pursuits to have a look at the "Resilience of broiler meat thru exposure to extremely Low-Frequency magnetic fields and safety risks to fitness. The sample of this look was clean broiler hen meat as an awful lot as one hundred forty packs (@ 50 g) divided into seven businesses (@ 20 packs). One institution served as a control, 3 corporations were exposed to an intensity ELF magnetic field of seven hundred μT with a variant of publicity duration of 30 min, 45 min, and 60 min, and 3 groups were exposed to an ELF magnetic subject depth of 900 μT depth with a version in publicity period of 30 min, forty-five mins, and 60 min as a hallmark of the sturdiness of bird meat, pH, density, and physical condition observations had been completed, including texture, shade, aroma, and the advent of mucus in bird meat samples which have been saved for six hours, 12 h, 18 h, and 24 h after being uncovered to the field. ELF magnets. The study's results proved that the great chicken meat saved for 12 h after exposure to ELF magnetic fields with intensities of seven hundred μT and 900 μT become substantially better than the manipulation. The quality pleasant of bird meat at 12 h was in the pattern group, which became uncovered to an ELF magnetic area of 900 μT. The results of the take-a-look show that exposure to low-intensity ELF magnetic fields does not motivate toxic results on meals. ELF magnetic area intensity of 900 μT for 45 and 60 min can keep the first-rate bird meat at room temperature for up to 12 h in the garage and is safe for fitness.

Keywords: ELF Magnetic Fields · Broiler Chicken Meat Resistance · Safety Risk to Health

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1 Introduction

The Extremely Low Frequency (ELF) magnetic subject is part of ELF electromagnetic waves with a frequency of much less than 300 Hz, can penetrate almost all rely upon, and the outcomes generated are non-ionizing radiation and non-thermal. More and more research results report That exposure to ELF magnetic fields can boom cell proliferation, but until now, this is still the subject of discussion. Exposure to the ELF magnetic area at a depth of 100 μT for 5 min has been proven to be with a purpose to boom the proliferation of S. Thermophilus, L. Lactis, and L. Acidophilus bacteria inside the fermentation manner of making cream cheese [1]. Meanwhile, exposure to the ELF magnetic field with an intensity of 646.7μT for 30 min was able to suppress the proliferation of Salmonella typhimurium in Gado-Gado seasonings by up to 56% and up to 17% in Gado-Gado vegetables. It was proven to not affect the texture, taste, and color of vegetables in Gado-Gado [2].

Exposure to ELF electromagnetic waves (40 – 100 Hz) for 1 h can increase the growth of E. coli bacteria, but after 16 h of exposure, it has decreased [3]. ELF-EMF exposure with a frequency of 7 Hz can inhibit cell growth in Anabaena culture compared to controls. The longer the exposure time, the higher the ELF-EMF inhibitory effect on Anabaena growth and complete cell death was found in cultures exposed for 2 h [4]. Other researchers also suggested that exposure to ELF magnetic fields between 500 μT – 1,000 μT intermittently 20 min in step with day for seven days can increase mobile survival and proliferation, besides exposure to 1,000 μT intermittently forty minutes/day for seven days [5]. Based totally on the outcomes of this look, it can be said that publicity of the ELF magnetic field at a high intensity (≥ 500 μT) can inhibit the boom of microorganisms, however aside from the intensity of the magnetic subject, other dominant factors that affect encompass the length of exposure, frequency, and characteristics of the bacteria.

Inspired by the results of this research, it is hoped that this research can underlie the development of technology for utilizing ELF magnetic fields to improve food security, especially chicken meat. Chicken meat, especially broiler chickens, is straightforward to spoil, only surviving in the open air for about 6 - 8 h. Traders often carry various ways of preserving chicken meat, using chemicals such as formaldehyde or borax, which negatively impact health. Consequently, this study aims to look at exposure to ELF magnetic fields of the depth of 700 μT and 900 μT to grow the resistance of broiler chicken meat.

2 Method

Studies is a laboratory experimental take a look at the usage of an entire randomized layout with publicity treatment to ELF magnetic fields with intensities of 700 μT and 900 μT. This research sample was 140 packs (@ 50 g) of broiler chicken breast in fresh condition, and the sample was divided into 7 groups. One organization served as a control, and three companies were uncovered to an ELF magnetic discipline of 700 μT intensity, respectively 30 min, 45 min, and 60 min, and 3 groups were exposed to an ELF magnetic area intensity of 900 μT, each for 30, 45 and 60 min according to the studies layout as follows (Fig. 1).

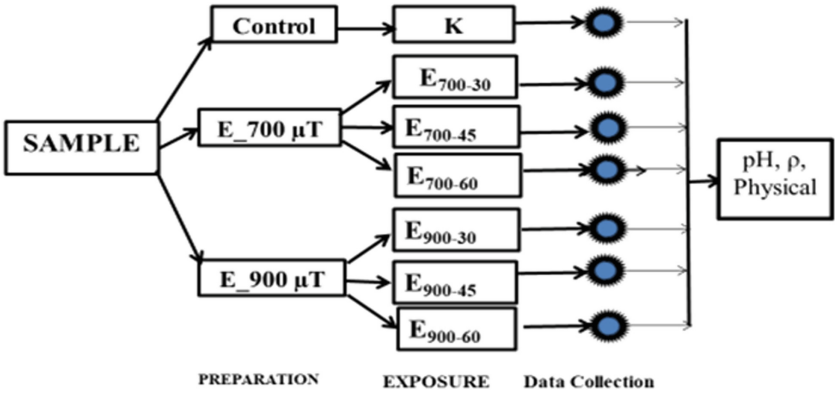

Fig. 1. Studies layout

Information:

K: control group, not exposed to ELF magnetic discipline.

E700–30, E700–45, E700–60: The pattern group becomes uncovered to a 700 μT ELF magnetic field for 30, 45, and 60 min.

E900–30, E900–45, E900–60: The pattern group becomes uncovered to a 900 μT ELF magnetic field for 30, 45, and 60 min.

The ELF magnetic subject is generated through an ELF Electromagnetic area-producing machine Generator (EM ELF), as proven beneath (Fig. 2).

The technique of exposure to the ELF magnetic field on chicken meat samples was accomplished with the aid of placing the sample into the publicity chamber, then adjusting the modern-day electric electricity so that an ELF magnetic area exposure of intensity of seven hundred μT or 900 μT was produced inside the publicity area indicated by using the EMF-meter measuring instrument. Then set the length of exposure for 30 min, 45 min, and 60 min, according to the research design. Samples of chicken meat that had been uncovered to the ELF magnetic field and managed samples had been saved in a condition wrapped in plastic wrap at a temperature of around 26 °C. As an indicator of the durability of chicken meat, measurements of density, pH, and observation of physical

Fig. 2. ELF Electromagnetic Field Source Generator and EMF-meter

conditions (change in color, texture, appearance of foul odor, and the formation of slime) were carried out after the samples were stored for 6, 12, 18 and 24 h. The information of the results of this examination was analyzed using ANOVA analysis and supported by a qualitative analysis of the physical situations to determine the resistance of chicken meat because of publicity to the ELF magnetic area.

3 Results and Discussion

Research data include 1) the pH of chicken meat, 2) density, and 3) the physical condition (color and aroma) of chicken meat at storage for 6 h, 12 h, 18 h, and 24 h will be discussed as follows.

3.1 Change in the pH of Chicken Meat Due to Exposure to ELF Magnetic Fields of 700 μT and 900 μT

Potential hydrogen is an important indicator to determine the quality of chicken meat, closely related to the presence of microbes in chicken meat. The pH measurement of chicken meat samples was carried out before acquiring exposure to the ELF magnetic field (0 h) and after obtaining exposure to the ELF magnetic field for 6, 12, 18, and 24 h of storage. The pH value of chicken meat stored in plastic wrap will undergo an anaerobic decay process. Figure 3. Shows the pH value of chicken meat from fresh conditions (0 h). After 6 h, 12 h, 18 h, and 24 h of storage, it appears significantly ($p < 0.05$) decreased with storage time. This proves that the pH value of chicken meat undergoing an anaerobic decay process has decreased linearly with storage time. The decrease in pH is an indication of the continuous activity of lactic acid-producing microbes, which causes the acidity of chicken meat to increase so that the pH value decreases. This is because meat has a high nutritional content making it a good breeding medium for pathogenic microbes [6]. The results of previous studies proved that fresh meat has a pH of 7.2 after slaughtering livestock. There is a decrease in pH due to the accumulation of lactic acid in muscle tissue due to anaerobic glycolysis [7]. A comparison of the pattern of changes in the pH value of chicken meat that gained exposure to ELF magnetic fields with the intensity of 700 μT and 900 μT for 30 min, 45 min, and 60 min, and the Control is presented in Fig. 4 as follows.

Figure 3 indicates an alternate in the pH of hen meat uncovered to an ELF magnetic area of 700 μT intensity for 30 min, forty-five mins, and 60 min (determine three) additionally shows a decrease but was appreciably higher ($p < 0.05$) as compared to the pH price of chook meat in the manipulate institution at either 6-h, 12-h, 18-h, or 24-h garage. This proves that publicity to the ELF magnetic area of seven hundred μT depth can hold the pH value of chicken meat.

The sample of adjustments in the pH of chicken meat affected by an ELF magnetic discipline of 900 μT depth for a half-hour, 45 min, and 60 min turned into appreciably better ($p < 0.05$) than the management, each at 6 h, 12 h, 18 h, and 24 h of a garage. Clock (discern five). This indicated that exposure to the ELF magnetic discipline with an intensity of 900 μT could resist and suppress the proliferation of lactic acid-generating microorganisms. It can be seen that the pH of fowl meat that become uncovered ELF

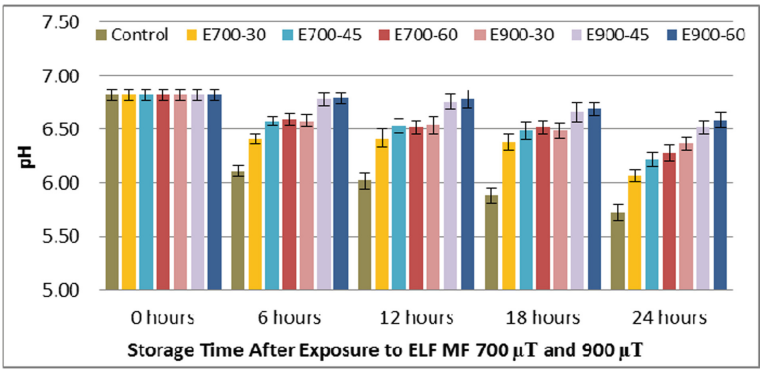

Fig. 3. Changes in the pH of Chicken Meat after Exposure to ELF Magnetic Fields

magnetic area with a depth of 900 μT for forty-five minutes and 60 min can survive around 6—eight to 12 h in a garage.

This situation might be due to inhibiting the proliferation of lactic acid-producing microorganisms due to ELF magnetic discipline with a depth of seven-hundred μT and 900 μT. This truth is supported by using previous proof that exposure to an ELF magnetic field with a depth of 646.7μT for 30 min has been shown to suppress Salmonella Typhimurium proliferation by as much as 56% [2]. The inhibition of the proliferation of lactic acid-generating microorganisms changed inhibited, resulting in the pH price of chicken meat exposed to an ELF magnetic discipline depth of seven-hundred μT and 900 μT appreciably higher than the manipulation until 24 h of a garage.

Previous evidence shows that exposure to a magnetic discipline for 2 h can inhibit the growth of microorganisms and affect pH [8]. Electromagnetic fields cannot simplest have an effect on hydrogen bonding in aqueous solutions. However can also disrupt the balance of the gasoline/liquid interface, produce a few oxygen species, and probably induce CO2 hydration, which adjustments the pH of liquid structures [9]. Fresh meat has a pH of 7.2 after slaughtering livestock, and there is a decrease in pH due to the accumulation of lactic acid in muscle tissue due to anaerobic glycolysis [7]. Low pH values in chook meat can stimulate protein denaturation, increasing the quantity of water content material. Low pH reasons the oxidation of myoglobin (pink color) and myoglobin oxygen (pink shade) to meta myoglobin (brown meat coloration) [10].

The potential hydrogen value of chicken meat uncovered to an ELF magnetic field intensity of 900 μT for 45 min and 60 min after 6 h of storage, 12 h, was not significantly different ($p > 0.05$) compared to the pH of fresh chicken meat (at 0-h measurement). This proves that exposure to the ELF magnetic field intensity of 900 μT for 45 min and 60 min is effective in maintaining the pH of chicken meat until the 12th hour.

3.2 Modifications in the Density of Chook Meat by Using Publicity to the ELF Magnetic Area

The density of chicken meat stored in plastic wrap will experience anaerobic decomposition. Figure 5. Shows the density of chicken meat from fresh conditions (0 h), after 6

h, 12 h, 18 h, and 24 h of storage, significantly ($p < 0.05$) decreased with storage time. This proves that the density of chicken meat that has undergone an anaerobic decay process has decreased linearly with the length of storage. The process of meat decomposition caused by bacterial activity can affect organic materials intensively, such as causing smelly gases, which affect the decrease in the nutritional content of meat [11]. The process of natural chicken meat spoilage is caused by increased microbial activity and the release of intracellular and extracellular microbial enzymes, such as extraintestinal pathogenic Escherichia coli strains [12]. Foodstuffs that are contaminated with pathogenic bacteria can endanger health. E. Coli bacteria in poultry meat can cause meningitis and Pepsis in the human body [13]. The emergence of gas in the decomposition of chicken meat during storage for 6 h, 12 h, 18 h, and 24 h will affect the volume so that the density decreases along with the storage time.

The density of fowl meat after being uncovered to the ELF magnetic field depth of 700 μT and 900 μT for 30 min, forty-five mins, and 60 min was reduced linearly with storage time, starting at zero hours (fresh situation), 6 h, 12 h, 18 h, and 24 h. The results of the one-manner ANOVA evaluation proved that the density cost of fowl meat exposed to an ELF magnetic area depth of 700 μT for a half-hour, 45 min, and 60 min become notably ($p < 0.05$) higher than the manipulation at 6 h, 12 h, 18 h, and 24 h of a garage.

Figure 5 explains that the density of hen meat exposed to an ELF magnetic area with a depth of 900 μT for 30 min, 45 min, and 60 min become extensively ($p < 0.05$) higher than the sample institution uncovered to an ELF magnetic discipline with a depth of 700 μT for 30 min, 45 min, and 60 min as properly as compared to the ControlControl. It may be visible that the density of the chicken meat pattern group, which became exposed to a 900 μT magnetic area for 60 min, had the highest fee until the twenty-fourth hour of storage. The value of the density of chicken meat uncovered to the ELF magnetic subject depth of 900 μT proved to be better. This illustrates that the extent of chicken meat has not accelerated due to bacterial activity, and the advent of excess mucus doesn't always follow this lower. Oxidative processes in proteins, fats, pigments, and vitamins harm meat quality, including changes in color, texture, aroma, reduced nutrient content, and the formation of toxic compounds [14]. As a result, the decomposition process will result in a softer texture and increased water content, increasing the volume of chicken meat while decreasing its density.

The effects of this examination proved that publicity to an ELF magnetic discipline intensity of 900 μT for 45 min and 60 min become capable of keeping the density of chicken meat till the 18th and twenty-fourth hours, respectively, notably ($p > 0.05$) better than the manipulate pattern. The mechanism of resistance to the density of chook meat uncovered to an ELF magnetic subject with a depth of 900 μT is an idea to be due to the inhibition of the proliferation of spoilage bacteria so that the activity of the chicken meat putrefaction process is hampered.

The sample of changes within the density of chicken meat uncovered to the ELF magnetic subject with intensities of seven hundred μT and 900 μT for 30 min, 45 min, and 60 min, as compared to the management as an entire, is presented inside the graph in determine 6 as follows.

Treatment of publicity to ELF magnetic fields with intensities of 700 μT and 900 μT for 30 min, 45 min, and 60 min objectives to boom the resistance of fowl meat because it is

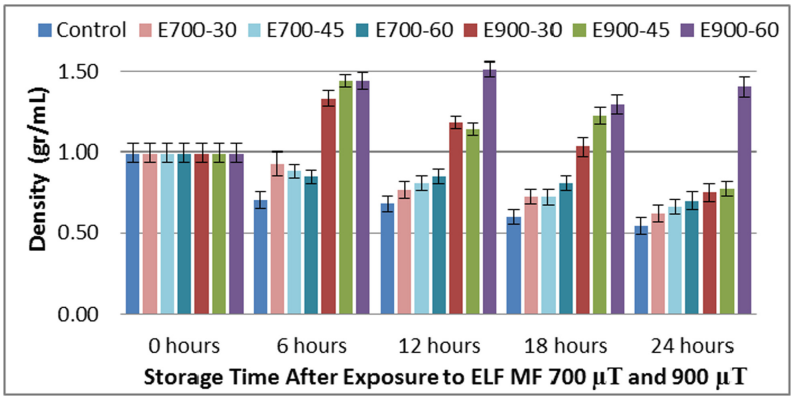

Fig. 4. Change in Density of Chicken Meat Due to Exposure to ELF Magnetic Fields of 700 μT and 900 μT

believed that high-intensity ELF magnetic fields (> 500 μT) can inhibit bacterial boom. Giving microorganisms a magnetic discipline can affect their activity and metabolism [15]. The physical condition of the chicken meat in the control group sample of this study showed that, at the 12th hour, a foul and slimy odor had begun to appear, the amount of mucus was increasing, the stench was more pungent, and the texture condition was getting softer at the 18th and 24th hours compared to other groups. This is caused by the proliferation of putrefactive bacteria during the putrefaction process, which produces odors, slime, and changes in texture, resulting in an increase in the volume of chicken meat while its mass remains relatively unchanged. This condition causes the density of chicken meat to get smaller and smaller. Colonies of -hemolytic Streptococcus in fermented culture media decreased when exposed to magnetic fields of 1200 and 1500 T [16]. Therefore, exposure to an ELF magnetic field intensity of 700 μT. The effects of this observation imply that exposure to the 700 μT ELF magnetic subject can grow the sturdiness of hen meat until the 18th hour.

This fact is supported by previous research on the effect of the ELF magnetic field on inhibiting bacterial growth. The provision of an ELF magnetic field with a frequency range of 1–15 Hz at 20 °C can affect the survival and morphology of E.Coli and Saccharomyces cerevisiae bacteria. At a frequency of 3 and 13 Hz, the growth of S. cerevisiae bacterial cells became significantly more inhibited. In contrast, the survival of E.coli bacterial cells was much smaller than that of S. cerevisiae bacteria [17]. The ELF magnetic field causes changes in the physicochemical properties of Gram-positive and Gram-negative bacteria [11].

3.3 Changes in the Physical Condition of Chicken Meat by Exposure to ELF Magnetic Fields

Assessment of the physical condition of chicken meat in this study used color and aroma indicators in the Indonesian National Standard (SNI) in Table 1.

Table 1. Indonesian National Standard (SNI) for the Color and Aroma of Chicken Meat [18]

Score	Color	Fragrance	Texture
5	Fresh white, slightly yellowish	fresh chicken meat	Chewy not slimy
4	pale white, slightly yellowish	fresh chicken meat	A bit chewy, not slimy
3	Fresh white with a yellowish color	Rather fishy	A bit chewy, a little slimy
2	Pale white	Fishy	Somewhat soft slimy
1	Very Yellow	Very fishy	Soft slimy

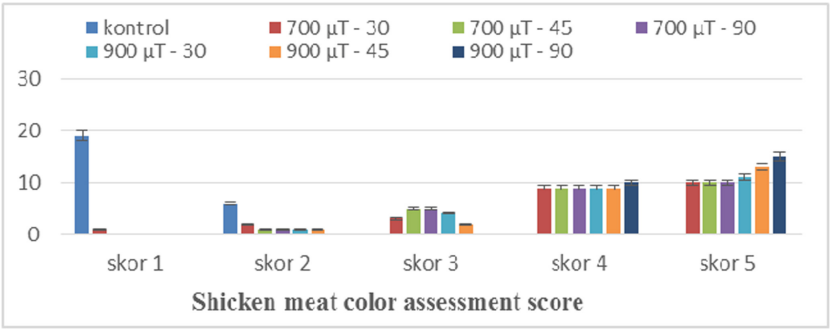

Fig. 5. Color Change Pattern of Chicken Meat After Exposure to 700 T and 900 T ELF Magnetic Fields Compared to Control

3.3.1 Change in Color of Chicken Meat by Exposure to ELF Magnetic Fields

The color of chicken meat is one of the main attractions for consumers when assessing the quality of chicken meat. Figure 7 shows the assessment by 3 observers of the color of chicken meat after 24 h. Chicken meat without exposure to the ELF magnetic field gets the highest score of 1, with a yellow color indication. At the same time, the highest score was given to chicken meat with exposure to 900 µT with indications of fresh white and slightly yellowish chicken meat. Respondents' assessment of the color of chicken meat showed that chicken meat exposed to a magnetic field of 900 µT was better than the control class and followed SNI standards, so it was safe and healthy for consumption. The color of poultry meat is influenced by several factors, including storage, water content, and pH [19]. The pH value of chicken meat exposed to 900 µT was higher than that of the control group, both at 6 h, 12 h, 18 h, and 24 h of storage. This indicated that exposure to the ELF magnetic field with an intensity of 900 µT could suppress the proliferation of lactic acid-producing microorganisms.

3.3.2 Adjustments in Chicken Aroma by Using Publicity to ELF Magnetic Fields

The aroma of poultry meat is naturally formed through various processes, such as heating and chemical reactions. According to SNI standards, chicken meat has a distinct aroma

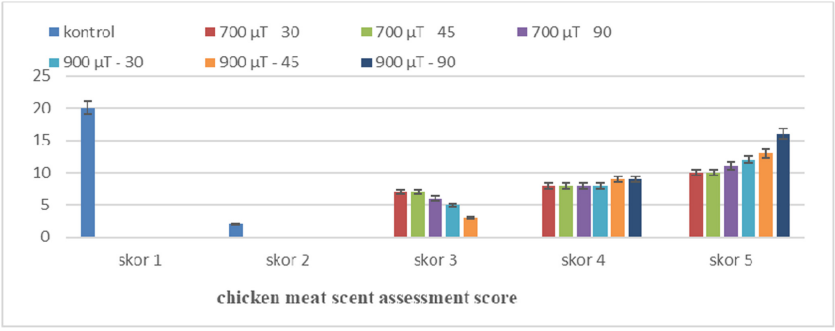

Fig. 6. Change of Chicken Aroma Pattern by Exposure to 700 µT and 900 µT ELF Magnetic Fields Compared to Control

that does not smell rancid or rotten, does not sting, and does not smell fishy [18]. The results of assessing the aroma of chicken meat after 24 h are shown in Fig. 6.

Score 5 indicates the distinctive fresh aroma of chicken given to chicken meat exposed to a 900 µT magnetic field. While score 1 is often chosen by respondents for chicken meat in the control group. Exposure to the ELF magnetic area can suppress the quantity of micro organism to carry out metabolic activities, so chicken meat exposed to a 900 µT magnetic field effectively maintains the quality of chicken meat that is healthy and safe for consumption according to established standards.

At 0 h, the physical condition of chicken meat is fresh, brightly colored, not slimy, and has a distinct chicken meat aroma. The effects of observations at the sixth hour, it has started to look slimy and yellowish red but has not smelled of rot and is still a bit chewy. Observations at the 12th hour had secreted more mucus, the texture was getting soft, the color was pale yellow, and it gave off an unpleasant odor. At the 18th hour, observations revealed that the animal had secreted mucus; the texture was soft, the color was paler; and it emitted a foul odor. Observation at 24 h had secreted a lot of mucus, the texture was soft, the color was pale, and it gave off a pungent, foul odor. Animal food ingredients such as chicken meat contain protein, which makes it a vehicle for pathogenic bacteria to grow and reproduce. Raw meat is a major source of infection with food-borne pathogenic bacteria [6]. Chemical reactions cause sensory changes in food ingredients caused by microbial activity. In decomposed food, there is an increase in the microbial population, which causes the nutritional content of the food to decrease [20]. The result of this damage is the formation of mucus, discoloration, change in smell, change in taste, and rancidity caused by the breakdown or oxidation of meat fat.

Fresh meat has a pH of 7.2. After slaughtering livestock, there is a decrease in potential hydrogen due to the accumulation of lactic acid in muscle tissue due to anaerobic glycolysis [7]. Low potential hydrogen or pH values in chicken meat can stimulate protein denaturation to grow the water content. Low pH reasons the oxidation of myoglobin (crimson shade) and myoglobin oxygen (crimson shade) to meta myoglobin (brown meat color) [10].

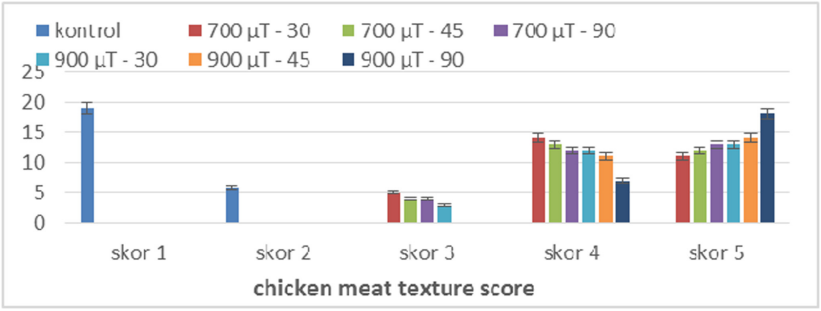

Fig. 7. Texture Change Pattern of Chicken Meat by Exposure to ELF Magnetic Field 700 µT and 900 µT compared to Control

3.3.3 Changes in Chicken Meat Texture by Exposure to ELF Magnetic Fields

The results of the respondent's assessment of the texture of chicken meat after the 12th hour are shown in Fig. 7.

The results of the observations of the control group proved that the texture of chicken meat at 12 h for all indicators got a score of 1. That is, it had a soft texture, secreted mucus, had a yellow/pale color, and gave off an unpleasant odor. While the chicken meat sample was exposed to a 700 µT ELF magnetic field, all indicators had a score of 4: slightly chewy texture, no mucus visible, no color change, and still smelling of chicken meat. Chicken meat samples exposed to a 900 µT ELF magnetic field had a chewy texture, no mucus was visible, no color change had occurred, and the smell of chicken meat was still felt.

Texture, aroma, and look are the maximum essential factors of meat, regularly due to volatile aromatic materials which include aldehydes, ketones, esters, phenols, alcohols, natural acids, and alkanes, among others. Consequently, the content material of different risky components and the presence or absence of those additives decide the aroma and taste traits [9]. Biologically, the damage to fowl meat is typical because of the boom of microorganisms and might, without delay, affect chicken meat's bodily and chemical high-quality [21]. Pathogenic microorganisms can reason meat spoilage by secreting lipase and protease, forming sulfide and trimethylamine (odorless), and secreting mucus on the body's floor [20].

Exposure to an ELF magnetic field intensity of 900 µT for 45 min and 60 min was proven to enhance the bodily excellent of broiler meat until the 12th and 18th hours, respectively. The underlying mechanism is that exposure to the ELF magnetic discipline can inhibit the proliferation of spoilage microorganism, resulting in a slowdown inside the procedure of chook meat spoilage. Static magnetic fields at 18 000 T and 20,000 T intensities for ninety minutes extensively reduced E. Coli microorganisms [22]. In comparison, ELF-EMF with an average intensity of 250 µT inhibited the growth of the bacterial species Serratia marcescens, while the static magnetic field was not statistically significant [23]. Administration of a magnetic field with an intensity of 107 µT for 30 min reduced the autoaggregation of the Escherichia coli E2348 / 69 bacteria and

modified its adherence pattern, with both events most likely related to changes in BFP expression [24].

The condition of chicken meat with an ELF magnetic field intensity of 900 μT for 45 min of exposure time was classified as a score of 5 because the physical condition appeared fresh and yellowish-white. Besides that, chicken meat with an intensity of 900 μT for 45 min of exposure gave off an aroma like chicken meat. So chicken meat exposed to an ELF magnetic field of 900 μT is still feasible and safe for consumption. However, in the control group, the chicken meat looked pale and dark and started to secrete mucus, causing an unpleasant/fishy smell. Mucus resulting from the activity of organisms causes chicken meat's physical condition to be more sticky.

Greater harm to chicken meat is due to the boom of microorganisms and might directly affect the physical and chemical quality of hen meat [21]. The changes that occur in rotting meat are: 1) odor, caused by the production of volatile end products, 2) color, caused by bacterial pigment production or natural oxidation of meat components such as myoglobin oxidation3) texture, the texture becomes soft due to proteinases, 4) gas accumulation, caused by the production of CO2, H2, H2S, 5) mucilage, caused by the production of dextran, exopolysaccharide, or the number of growing microbial cells, 6) liquid, caused by the breakdown of the hydration barrier structure in the meat. Microbes will experience growth during storage and produce enzymes that decompose food components such as proteins, fats, and sugars [6].

Publicity to the ELF magnetic area depth of 900 μT for forty-five and 60 min became a concept to suppress the proliferation of spoilage bacteria in fowl meat so that the density and pH of the bird meat were appreciably ($p < 0.05$) better than the manage sample. The results of observations of bodily conditions also proved that the hen meat pattern institution, which was exposed to an ELF magnetic area with a depth of 900 μT for forty-five minutes and 60 min, respectively, confirmed the bodily resistance of hen meat (elastic, no longer slimy, and no rotten scent), until the 12th hour.

A number of the underlying studies' results, particularly publicity to ELF-EMF 4000 μT, 20 Hz for 6 h, have been able to inhibit the capacity to form CFU colonies compared to controls. Each inhibition turned 95.2% for S. Aureus and 85% for E. Coli [25]. A thousand μT ELF magnetic subject for 2 h brought on adjustments in the physicochemical residences of Gram-effective and Gram-bad micro organisms, and a slight decrease in bacterial growth became located [11]. Exposure to ELF magnetic fields with intensities of 730 μT and 880 μT each for 2 x 30' on fresh Exposure to ELF magnetic fields with intensities of 730 μT and 880 μT each for 2 x 30' on fresh milkfish, become proven with a purpose to suppress bacterial boom up to seventy three% and 62%, respectively at five hours after exposure in comparison to manipulate [26]. Theoretical effects can explain the magnetic sensitivity of E. Coli cells and show that intracellular enzymatic reactions are the primary magnetoreceptors in residing organisms [27]. Exposure to a 300 μT ELF magnetic field for 25 min significantly ($p < 0.05$) suppressed the proliferation of S. thermophilus, L lactic, and L. Acidophilus Log phase bacteria [1].

Based on the results of the research and review of the literature, it can be stated that exposure to the ELF magnetic field with an intensity of 900 μT is likely to be able to inhibit the proliferation of pathogenic bacteria so that the process of decomposition of chicken meat will be hampered, meaning that the resistance of chicken meat will increase. This was proven from the results of this study that exposure to a magnetic field intensity of 900 μT for 45 min and 60 min could maintain the physical condition of chicken meat until the 12th hour.

3.4 Food Safety Risk to Health by Exposure to ELF Magnetic Fields

The Extremely Low Frequency (ELF) magnetic field can penetrate almost any material but is non-ionizing radiation and non-thermal. But until now, there have been suspicions about the possibility of toxic effects from exposure to ELF magnetic fields. Several studies have been reported that prove that exposure to ELF magnetic fields does not cause toxic effects. The results of Sudarti's 2016 research proved that exposure to the ELF magnetic field with an intensity of 646.7 had no effect on changes in the texture, color, and taste of Gado-gado vegetables. Belyaev, 2011, also confirmed that exposure to ELF electromagnetic fields is a non-toxic substance. Meanwhile, exposure to 50Hz ELF-EMF at an intensity of up to 1000 μT has shown no neurotoxic effects [28]. Meanwhile, exposure to a 50Hz ELF magnetic field at an intensity of 2000 μT did not cause a genotoxin effect (DNA damage) [29].

Based on the effects of this examination, It proves that exposure to the ELF magnetic discipline does now not purpose poisoning in food, along with fowl meat. The results of this examination have temporarily proven that the bodily condition of hen meat uncovered to ELF magnetic fields meets SNI health standards with a score of 5 to 12 h. A rating of five manners that it meets the standards for a slightly yellowish, fresh white color and an exclusive clean aroma of chook meat. This indicates that fowl meat is suitable and meets the necessities for healthy food. This proves that publicity of the ELF magnetic subject can increase the resistance of chicken meat which is safe for health.

4 Conclusion

Publicity to a Very Low Frequency (ELF) magnetic subject with a depth of 900 μT can increase the resistance of hen meat by inhibiting pathogenic bacteria in fowl meat. ELF magnetic area radiation is an alternative technique to boom meal security that is secure for Resilience due to the fact it is demonstrated no longer to motivate toxicity to meal components.

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