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To cite this article: A.A. Al-Azzami *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **761** 012120

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# Effect of Rhizome's Extracts of (*Alpinia officinarum*) in Oxidation Characteristics of Chicken Meat Stored in Cold

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**Abstract.** In the current report, we explored the impact of applying ethanol and petroleum ether extracts of rhizome (*Alpinia officinarum*) on the consistency and shelf life of chicken meat during refrigerated storage (10 days at 4 pm). The findings revealed that both forms of *Alpinia* rhizomes extracts played a clear function as antioxidants for chicken meat samples. These extracts contributed in a significant decrease ( $P < 0.01$ ) in the value of thiobarbuturic acid TBA, and this provides evidence of the role of the extract in maintaining the quality of chicken meat by reducing oxidation processes. The findings have showed that the incorporation of (*Alpinia officinarum*) extracts led to a slightly decreased ( $P < 0.01$ ) percentage of free fatty acids formed during the storage time. The findings demonstrated a positive function for the extracts in decreasing the risks of meat oxidation and spoilage by reducing the peroxide value during the cold storage time.

## 1. Introduction

Food-borne pathogens remain a significant concern for food consumers. When consumers moved away from the use of artificial pesticides and preservatives that had a harmful impact on their health, natural suppliers continued to be involved in protecting their food and their shelf-life. Recently, interest and emphasis on natural sources rich in antimicrobials and antioxidants such as tocopherol vitamins and phenolic compounds such as flavonoids, phenolic acids and voltaic compounds has increased. [1], [2]. These molecules are capable of inhibiting the function of many biomolecules that cause cell damage or death [3]. Spices and herbs are safe sources that have been using as antimicrobials and antioxidants over long periods of storage. Herbs have been use in food for a long time not only as spices but also as preservatives by their antimicrobial and action against some pathogens [4] and antioxidant characteristics [5] and as therapeutics diverse for various diseases [6] and about 80% of the world's population depends on it for traditional treatments and health care [7]. *Alpinia* is one of the herbs that offers good alternative methods in the area of food preservation. *Alpinia* belongs to the Zingiberaceae family, which contains about 50 genera and 1,300 species worldwide [8]. Its roots have a heavy aromatic scent with dark reddish brown on the outside[9], it is often used as an aromatic plant or as a kind of spice, and its rhizomes can be used as medicinal products particularly in Southeast Asia and China. The aromatic oils and resins in *Alpinia* tubers are the most effective substances for their antimicrobial and antioxidant activity [10]. Several researchers report that the most common compounds present in *Alpinia* are 1, 8-cineole,  $\alpha$ -fenchyl acetate,  $\beta$ -farnesene,  $\beta$ -bisabolene [11]. A lot of research Noted that the alcoholic extract of *Alpinia* tubers appear as a free radical and superoxide and anion scavenger in addition as a chelating agent for iron ions [12]. Another marketed that the ethanolic extracted of *Alpinia* tubers had an antioxidant roll in food due to its mild order [13]. The antioxidant activity of phenolic compounds depends mainly on the redox properties that allow them to act as a reducing agent and hydrogen donors and singlet oxygen quenchers, as well as they have a chelating agents that hold metals [14].



## 2. Materials and Methods

This study was completed in the laboratories of the department of food sciences of the College of Agriculture University Of Anbar, for a period of three weeks.

### 2.1 Preparation the rhizomes

Rarhizomes of *Alpinia* (*Alpinia galangal*) were purchased from local markets in Anbar City in May 2018. The rhizomes were cleaned under a stream of water to remove dust and soil. The rhizomes were thinly cut, then smashed by a coffee grinder [15]. Two solvents were used to extracted the *Alpinia's* rhizomes powder (Ethanol and petroleum ether) then the extracts were added at It is preferable to write the parameters as follows: The extracts obtained from the solvents ethanol and petroleum ether were distributed as follows: 50 mg / kg (T1, T4); 75mg / kg (T2, T5); 100mg / kg (T3, T6) respectively, and mixed with chicken meat samples well by hand and using sterile medical gloves for the purpose of homogeneity in the distribution of the extracts, while the control treatment was left without additives (T7). All Samples were distributed in transparent plastic boxes and kept in the refrigerator at 4°C for 10 days. Samples were withdrawn for examination at 0, 4, 7 and 10 days.

### 2.2 Extraction

For methanol extraction each 100 gram of rhizomes powder were mixed with 200 ml of methanol in a rotary shaker for 12 h. Then the mixture was filtrated through watman No.1. Then the supernatant was concentrated under vacuum at 35°C by rotary evaporator until dried. The yield of methanolic extract was estimated as milligram of extract per gram of *Alpinia* calculated. For petroleum ether extraction 100 gram of *Alpinia* dry powder mixed with the 100 ml of petroleum ether For 3 days. Then the extracted was concentrated in vacuum evaporator at 40°C to dryness [16].

### 2.3 Antioxidant activity

Antioxidant effect of *Alpinia* have ben determent according to procedure described by [17]. It based on measuring the amount of Malondialdehyde, which is a product of the lipid oxidation process in different tissues, by estimating the value of thiobarbutyric acid (TBA), Crush 10 g of the chicken's meat sample with 25 ml of a solution containing trichloroacetic acid (20%concentration) (Trichloroacetic acid, TCA) dissolved in 2M of phosphoric acid for 2 minutes, then transfer the mixture to a 50 ml volumetric flask. The volume was completed to the limit with distilled water and the mixture was shaken, 25 ml was taken from it and centrifuged at 3000 rpm for 30 minutes. The mixture was filtered through Whatman filter paper (No. 1), then 5 ml of the filtrate was transferred to a test tube and added 5 ml of TBA reagent solution (0.005 M) dissolved in distilled water, and the control solution (Blank) was prepared by mixing 5 ml of distilled water with 5 ml From TBA reagent solution. The contents of the test tubes were well mixed and tightly closed, and kept in a dark place for 15 - 16 hours at room temperature. The absorbance measurement (A) of the resulting color at a wavelength of 530 nm was performed using a spectrophotometer and the TBA value was calculated by multiplying the absorbance value by the parameter 5.2. The value of TBA was expressed on the basis of mg malone dialdehyde / kg flesh and according to the following equation [17]:

$$\text{TBA value (mg MDA / kg chicken's meat)} = A \times 5.2 \text{ (dilution factor)}$$

### 2.4 Preparation of chloroform extract for chicken's meat samples

To prepare the chloroform extract for chicken meat, 20 gm of meat was mixed with 50 ml of 99% chloroform; the mixture was mixed well for 2-3 minutes and then filtered through filter paper (watman no.1). Then the extract was kept at a temperature of 4°C until its use to free fatty acids and Peroxide value determination.

### 2.5 Free fatty acid determination

Free fatty acid (FFA) in the samples have been determined according to procedure described by [18], it prepared by adding 5 drops of phenolphthalein reagent (previously prepared) to 50 ml of ethyl alcohol (99.9%). Then 10ml of chloroform pre-prepared was mixed with 10ml of ethyl alcohol solution. The mixture was titrated against NaOH (0.1 N) until the pink color appears. The percentage of free fatty acids was calculated as oleic acid according to the following equation:

$$\text{Percentage of FFA as Oleic acid\%} = \frac{\text{ml of NaOH} \times 0.0282}{\text{Weight of sample (gm)}} \times 100$$

### 2.6 Peroxide value determination

Peroxide value in chicken meat samples was estimated according to the method mentioned by [18], by adding 10 ml of a previously prepared chloroform solution were to 15 ml of glacial acetic acid, then 0.5 ml of saturated potassium iodine was added to it. The mixture was left for one minute, then 12 ml of distill water was added to it. The mixture was titrated against of sodium thiosulfate (0.01 N) in the presence of starch reagent until the white color appears. Then the value of P.V. was calculated According to the following equation:

$$\text{Peroxide value (P.V.) Meq /Kg} = \frac{\text{ml of sodium thiosulfate} \times 0.01}{\text{weight of sample (gm)}} \times 1000$$

### 2.7 Statistical analysis

The data were analyzed using completely randomized design, and the differences between the averages of the different treatments were compared using the Duncan test using the ready-made statistical program [19].

## 3. Results and Discussion

The addition both types of *Alpinia* rhizomes extracts played a clear role as antioxidants for chicken meat samples. These extracts contributed to decrease in thiobarbutyric acid value after ten days of cold storage. Figure 1 shows that no significant differences ( $p > 0.01$ ) in thiobarbutyric acid (MDA (value between control and samples were treated with rhizome extracts of *Alpinia* rhizomes extracts in zero time. While the control treatment (T7) shows a significant superiority ( $p < 0.01$ ) in the value of (MDA) during the storage period that lasted 10 days. The figure also

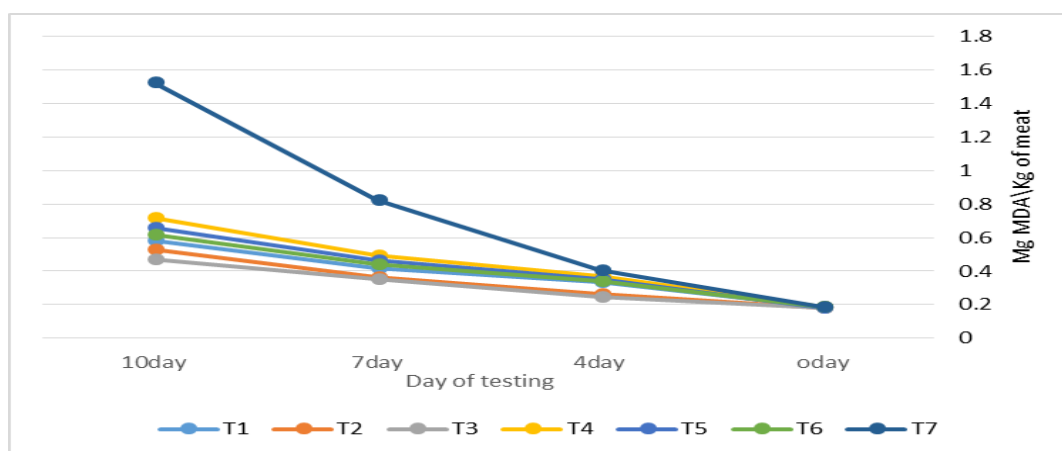


Figure 1. Effect of addition of different ratios of solutions extracted from *Alpinia* rhizomes on MDA value

shows that the lowest significant value ( $p < 0.01$ ) was for the T2, T3.

The decrease in MDV value is considered a positive indicator of the condition of the meat and its remaining within the exactable limits for oxidation of 2malonaldehyde / kg meat [20]. These results are agreement with what has been reported by [21]; [22] that the extracts of *Alpinia* rhizomes possess antioxidation activity, and this activity is due to the aromatic oils of these rhizomes which containing many phenolic compounds and flavonoids compounds with antioxidant. These results also agree with what was indicated by [13] that the *Alpinia* rhizomes alcoholic extract has antioxidant activity due to its content of many compounds like  $\alpha$ -tocopherol and butylated hydroxyanisol, and the major antioxidants in the ethanolic extract were 1'-acetoxycavichol acetate and catechin.

The results in figure 2 showed there is no significant differences ( $P > 0.01$ ) in (FFA) between the control and another meat samples were treated with rhizome extracts of *Alpinia* in zero time. While the table indicates that (FFA) value of control surpassed significantly ( $p < 0.01$ ) on another treatments during the storage period. (FFA) value was 0.400, 0.550 and 0.703 on the fourth, seventh and tenth days respectively. While the treatments 2 and 3 showed the lowest significant value ( $p < 0.01$ ) of (FFA) compared with other treatments, it was 0.333, 0.360 and 0.4000 in treatment 2 after 4, 7 and 10 day respectively, while it was 0.310, 0.326 and 0.373 in treatment 3 after the seam period respectively. The treatment of meat samples with rhizome extracts of *Alpinia* had a significant effect on controlling fat oxidation and reducing the formation of (FFA) during the storage. This was due the reducing of microbial contamination of the samples were treated with the extract and reducing the amount of microbial enzymes oxidizing the fat, and this was clearly demonstrated in the seventh treatment (control treatment) in which the value of (FFA) increased during the storage period due to the absence of the plant extract, These results agree with what Lopez and his group indicated about the role of *Alpinia* extract in limiting the growth of micro-organisms in chicken meat, which has a role in maintaining the quality and sensory characteristics and increasing consumer acceptance [23]

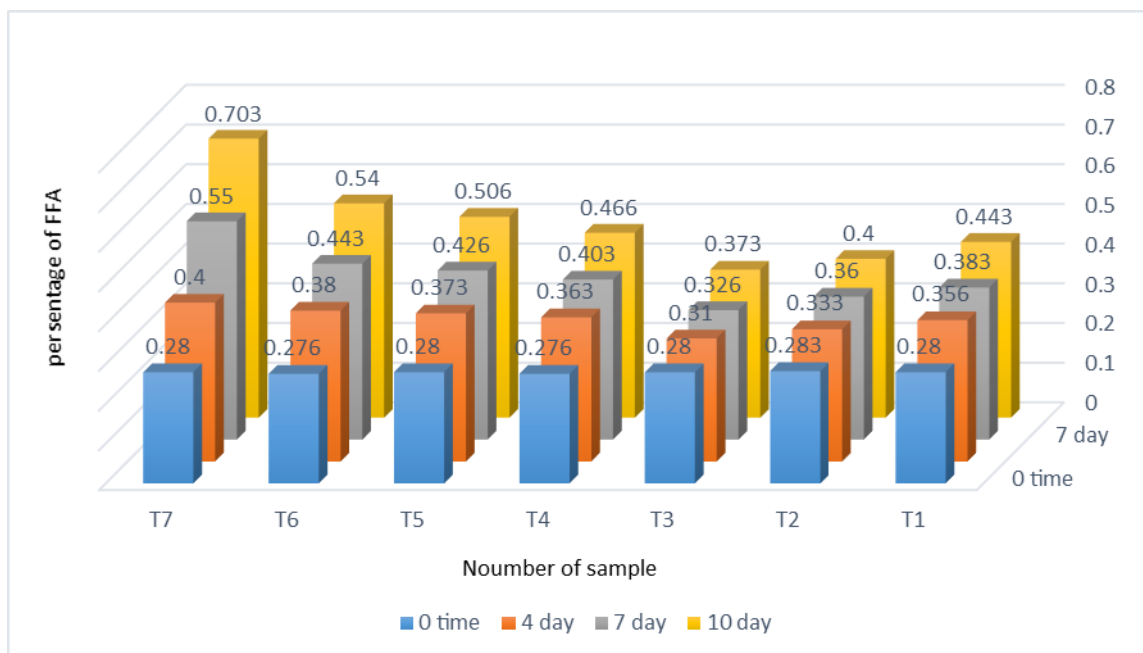


Figure 2. Effect of addition of different ratios of solutions extracted from *Alpinia* rhizomes on FFA percentage

Table 1. Effect of addition of different ratios of solutions extracted from *Alpinia* rhizomes on P.V value

Treatments	P.V. in Days			
	0	4	7	10
T1	1.056 ± 0.006*	1.186 ± 0.008 c	1.326 ± 0.008 cd	1.550 ± 0.005 bc
T2	1.056 ± 0.003	1.163 ± 0.003 c	1.290 ± 0.005 d	1.506 ± 0.008 bc
T3	1.056 ± 0.006	1.116 ± 0.008 d	1.220 ± 0.011 e	1.400 ± 0.005 e
T4	1.050 ± 0.005	1.196 ± 0.008 c	1.340 ± 0.005 bcd	1.566 ± 0.008 bc
T5	1.050 ± 0	1.243 ± 0.012 b	1.380 ± 0.005 bc	1.633 ± 0.012 bc
T6	1.056 ± 0.008	1.253 ± 0.012 b	1.393 ± 0.008 b	1.713 ± 0.012 b
T7	1.060 ± 0.005	1.366 ± 0.032 a	2.550 ± 0.047 a	4.136 ± 0.213 a
P-value	N.S.**	<.0001	<.0001	<.0001

Means ± Standard Error.

\*\* N.S.: Non-Significant.

a, b, c: means in the same columns with different superscripts differ significantly at probability value ( $P \leq 0.05$ ).

Table 1 indicates the effect of refrigerated storage on the P.V. value in chicken meat. The results show there are no significant differences ( $p > 0.01$ ) between all treatments in P.V. value at zero time. While the control treatment (No.7) shows a significant superiority ( $p < 0.01$ ) over the other treatments during the cold storage period, its P.V. value reached 1.186, 1.326 and 1.550 on the fourth, seventh, and tenth days, respectively. While the lowest value of P.V., were for the 3ed treatment, which reached to 1.166, 1,220 and 1,400 on the fourth, seventh and tenth days, respectively. In general, we can say that the addition of rhizome extracts of *Alpinia* contributed positively to reducing the P.V. value, which led to decrease the spoilage and oxidation of the meat during the storage period and keeping the P.V. value within the exactable limits [18].

#### 4. Conclusion

The role of extraction solvent was identified in the effectiveness of rhizomes (*Alpinia officinarum*) in the quality and shelf life of chicken meat during cold storage (10 days at 4°C). The addition of galangal extract played a role in controlling the TBA value in the meat samples during refrigerated storage, it also contributed to reducing the fatty acids formed, and it contributed to controlling the peroxide value, which improved the characteristics of the stored meat.

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