

## Antimicrobial Activity of Garlic and Thyme Essential Oils Against Coliform Bacteria in Poultry Meat

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### ABSTRACT

In the current study, the antimicrobial result of garlic oil (G), and thyme oil (T) was investigated against coliforms in chicken meat. It absolutely was found that everyone essential oils used had intensive lead to decreasing coliforms count. Sensory analysis indicated important advantages in pattern garlic and thyme oils with chicken meat. Additionally, very important variations ( $P < 0.05$ ) between the varied oils were noticed. Also, results indicated that the being counts decrease as a result of the concentration of the oil can increase since the concentration (1.5%) provides the best effectiveness. The medicine activities of the accessory essential oils followed the order of thyme oil then garlic oil. The sensory properties of otherwise treated chicken samples throughout cold storage (4°C) were increased by increasing the concentrations of oils compared to the untreated (control) samples at zero, 2nd, 4th and 6th day of the storage amount. Generally, samples containing one.5% thyme and garlic oils, severely incontestable the very best improvement of sensory attributes, whereas the samples treated with zero.5% garlic oil incontestable all-time low improvement.

**Keywords:** Coliforms; Chicken meat; Essential oils; Garlic; Thyme.

### INTRODUCTION

Chicken meat may be a supply of macromolecule with high biological worth, particularly if compared to vegetable proteins and their substance content, like A, thiamine, iron, phosphorus and vitamin B complex (Koblitz, 2011). Also, the low energy worth places chicken meat as healthy food, indicated to be used in healthy diets because of its reduced fat content, in addition as the next proportion of unsaturated fatty acids (PUFA), in comparison to alternative varieties of meat (Riovanto et al., 2012), factors that create the chicken meat production and consumption widespread worldwide. During this sense, the homogeneity of meat quality becomes a significant concern for the chicken market and

for client acceptance (Le Bihan-Duval et al., 2008). Compliment with all quality specifications is, beyond question, the most challenge for the meat business these days. On the opposite hand, monitor intrinsic quality patterns (physical and chemical) is very important (Li et al., 2016), in addition because the microbiological and sensory quality of chicken meat, whether or not to be ready to observe the incidence of anomalies, or to higher satisfy the consumers' preference, so making associate instrument of quality assurance (Koblitz, 2011).

Live birds are extremely contaminated with totally different microorganisms on their feathers, skin and internal organ tract. Consequently, the contamination of chicken

carcasses begins from the time of slaughtering, defeathering, evisceration, till the ultimate product storage and distribution (Capita et al., 2004). Most of the microorganism contaminants area unit nonpathogenic; but, poultry are noted to harbor an oversized variety of microorganism that area unit unhealthful to human .

Coliforms outlined as aerobic or facultative anaerobic, gram-negative, non-spore-forming rods capable of ferment lactose with the assembly of acid and gas at 32–35°C (Davidson et al., 2004). The observation of coliform microorganism in food was thought of a helpful indication of post-sanitizing contamination and representing poor hygiene throughout the process and storage of food (Leclerc, 2001).

Also microorganism contamination will precipitate major public peril and economic loss as illness and meat spoilage (Fernández–López et al., 2005). Consequently, rummage around for natural additives, particularly of plant origin, has notably enhanced in recent years found that the addition of natural food additives possessing each inhibitor and antimicrobial activities is also helpful for maintaining meat quality, extending period of time and preventing economic loss ( Mielnik et al., 2008).Essential oils of herbs and their elements, merchandise from the secondary metabolism of plants, had several applications in food flavouring and preservation conjointly the fragrance and pharmaceutical industries (Fabian et al., 2006). However, the sensible application of essential oils is proscribed thanks to flavor concerns, as well as, their effectiveness was moderate because of their interaction with food ingredients and structure (Skandamis et al., 2001).

Garlic (*Allium sativum*) has been used as spice and primitive medication. it's possessed antifungal, medicine, antiviral, antiparasitic, inhibitor and dilator characteristics (Hanieh et al., 2010). Garlic compounds could modification the permeableness of microbic cell walls and interchange the living thing materials with extracellular materials that may retard microorganism growing method (Sagdic and Tornuk , 2012).

Thyme oils were accustomed have an effect on pathogens and autochthonous spoilage flora in meat, because of they cause initial reduction within the viable cell variety (Speranza and Corbo, 2010). in addition, as excessive use of thyme oils to decrease the natural microflora of chicken breast meat (Fратиanniet al. 2010). The aim of this study was to look at the medicine effectiveness of essential oils of garlic and thyme at varied concentrations on the standard of chicken meats throughout cold storage (4°C).

## **MATERIAL AND METHODES.**

A grand total of five sample of chicken breast were taken and essential oils of thyme and garlic (%v/g) were accessorial with totally different concentrations of 0.5 and 1.5% for every oil in two sides of meats mistreatment sterile small pipits to any or all of them except one sample was used as control . .

**1st sample:** was treated with 0.5% conc. of thyme oil.

**2nd sample:** was treated with 1.5% conc. of thyme oil.

**3rd sample:** was treated with 0.5% conc. of garlic oil.

**4th sample:** was treated with 1.5% conc. of garlic oil.

\*Phosphate buffer saline (PBS) was used for treatment of control (untreated) samples.

\*Each sample was packed in sterile synthetic resin bag, tagged and keep at 4°C.

### **1.Sensory analysis (Organoleptic analysis).**

The criteria used because the basis of the organoleptic assessment and also the scoring system are provided in (Patsias et al., 2006). A nine-point indulgent scale (1: poor; 9: excellent) was employed in the analysis (Pearson and Tauber, 1984).

### **2.Bacteriological examination.**

Coliforms count analyses were conducted when three hours and each day (48 hrs) intervals throughout storage, mistreatment the serial dilutions and unfold plate technique for every sample. Tests were performed in triplicate .

2.1.Preparation of serial dilution ( ISO, 1999).

Ten grams of every treated sample were homogenized during a liquidizer using homogenizer at 2000 r.p.m for 1-2 minutes to produce a material with sterile 90 ml of 0.1% peptone water for one minute. One ml of the clear material was mixed rigorously with 9 ml of buffered peptone water 0.1%, and so decimal serial dilutions (1:10) were ready.

## 2.2.Determination of coliforms counts APHA (1992).

.One ml from every dilution were transferred to a Petri dish, then add ten ml of Violet Red bile lactose Agar (at 48°C) and swirled to combine and permit medium to solidify before being incubated at 35°C for twenty four hours. Colonies of purple-red in color, 0.5 millimetre in diameter (or larger), encircled by a zone of precipitate bile acids counted.

## 2.3.statistical Analysis:

ANOVA was disbursed on data of the sensory, chemical and microbiological evaluations. data are expressed as mean + SE (Gomez and Gomez, 1984.)

## RESULTS

### Sensory properties of treated samples.

It is obvious from results obtained in table (1) and figure (1) that the sensory properties of various treated chicken meat samples throughout cold storage (4°C) were increased by increasing the concentrations of oils compared to the untreated (control) samples at zero, zero,2nd, 4thand 6thday of the storage period. Generally, samples containing 1.5% thyme and garlic oils, severally incontestable the very best improvement of sensory attributes, whereas the samples treated with 0.5% garlic oil incontestable all-time low improvement.

### Bacteriological examination.

The mean count value of coliforms in control sample at days zero, 2, 4 and 6 was 3.94+2.25, 4.88+2.76, 5.82+3.76 and 6.76+4.76 log CFU/g. however in samples inoculated with thyme oil 0.5% the mean count worth of coliforms at days zero, 2, 4 and 6 was 3.94+2.25, 4.76+2.95, 5.63+3.95 and 6.43+4.76 log CFU/g.

While samples inoculated with thyme oil 1.5% the mean count worth of coliforms at days zero, 2, 4 and 6 was 3.94+2.25, 4.62+2.76, 4.75+2.76 and 5.40+3.7 log CFU/g. additionally samples inoculated with garlic oil 0.5% the mean count value of coliforms in zero day was 3.94+2.25, in second day was4.83+2.95, in fourth day was 5.76+3.76 and in sixth day was 6.57+4.76 log CFU/g. The samples inoculated with garlic oil 1.5% the mean count value of coliforms in zero day was 3.94+2.25, in second day was4.79+2.76, in fourth day was4.83+2.76 and in sixth day was5.72+3.76 log CFU/g, results summarized in table (2) & figure (2).

In table (3) and figure (3), each Eos of thyme and garlic at totally different concentrations showed no important distinction ( $p < 0.001$ ) as medicine activity against coliforms altogether treated poultry meat samples throughout storage amount. In the current study, the antimicrobial effect of garlic oil (G), and thyme oil (T) was investigated against coliforms in chicken meat. It was found that each one essential oils used had extensive result in decreasing coliforms count. Sensory analysis indicated vital benefits in mistreatment garlic and thyme oils with chicken meat. In addition, extremely vital variations ( $P < 0.05$ ) between the various oils were noticed. Also, results indicated that the microorganism counts decrease because the concentration of the oil will increase since the concentration (1.5%) provides the simplest effectiveness. The antibacterial activities of the additional essential oils followed the order of thyme oil then garlic oil. The sensory properties of differently treated chicken samples during cold storage (4°C) were enhanced by increasing the concentrations of oils compared to the untreated (control) samples at zero, 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> day of the storage period. Generally, samples containing 1.5% thyme and garlic oils, respectively demonstrated the highest enhancement of sensory attributes, while the samples treated with 0.5% garlic oil demonstrated the lowest enhancement.

## DISCUSSION

The addition of essential oils to food could alter the sensory characteristics of

food (Seydim and Sarikus, 2006). These results were almost like obtained by (El-Desouky, et al., 2006), (Mielnik et al., 2008) and (Salem-Amany, 2010). As shown in tables (2 and 3), it may well be determined that the management samples had the very best counts of coliform at any time of cold storage compared to different treatments. Conjointly the count of coliform was developed all told treated samples from high to low count parallel to concentrations of Eos from low to high concentrations with some variations within the potency. The distinction within the potency is also because of the variation of oil composition and interactions between the oil elements and also the meat elements (De Oliveira, et al., 2013). The medicament activity of the Eos at a coffee concentration zero.5% caused right smart reduction of coliforms, though it didn't fully eliminate it. In general, the studies conducted on plant volatile oil have disclosed that the volatile oil prolong microorganism lag part and retard the expansion in log part. Their action is a lot of related to their accumulation in supermolecule bilayer of cell wall and its decomposition (Valero and Giner, 2006). it absolutely was clear that thyme and garlic oils at concentration one.5% had robust effects against the expansion of coliforms, and because the concentration of those essential oils will increase, the counts of coliform were reduced particularly at the fourth and sixth days of cold storage. The thyme zero, 5% and 1,5% simpler than garlic zero,5% and 1,5%.

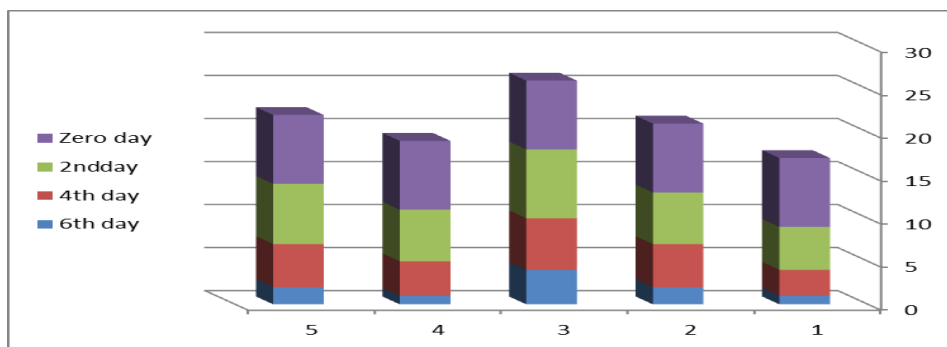
The essential oils can cause Associate in Nursing intermediate reduction of the microorganism population (Seydim and Sarikus, 2006) and can be simpler against foodborne pathogens and spoilage microorganism once additional directly on foods able to be used, containing a high super molecule level at acidic hydrogen ion concentration, as well as, lower levels of fat or carbohydrates (Gutierrez et al., 2008). The medicament activity of thyme oil has been investigated by (Ozcan et al., 2006 and Mielnik et al., 2008) and located to move against food borne and spoilage flora (Solomakos et al., 2008). This important rate of antimicrobial activities is usually because of the phenoplast compounds (carvacrol) and to the hydrocarbons which may be biological process or germicidal in keeping with their effective concentration (Bozin et al., 2006 and Yassin, et al., 2007). Sagdic and Tornuk (2012) investigated that garlic compounds could alter the porousness of microorganism cell walls and interchange the animate thing materials with living thing materials that may retard microorganism growing method.

## CONCLUSION

The result over that thyme volatile oil more practical than garlic volatile oil in reduction of coliform count with tow concentration (0.5 and 1.5%). There is would like for mistreatment of essential oils as feed additives rather than antibiotics to avoid the multidrug resistant phenomena.

Table (1): Sensory evaluation of inoculated chicken meat breast with garlic and thyme essential oils.

Groups		Zero day	2 <sup>nd</sup> day	4 <sup>th</sup> day	6 <sup>th</sup> day
<b>Control positive</b>		8	5	3	1
<b>Thyme oil</b>	<b>0.5%</b>	8	6	5	2
	<b>1.5%</b>	8	8	6	4
<b>Garlic oil</b>	<b>0.5%</b>	8	6	4	1
	<b>1.5%</b>	8	7	5	2

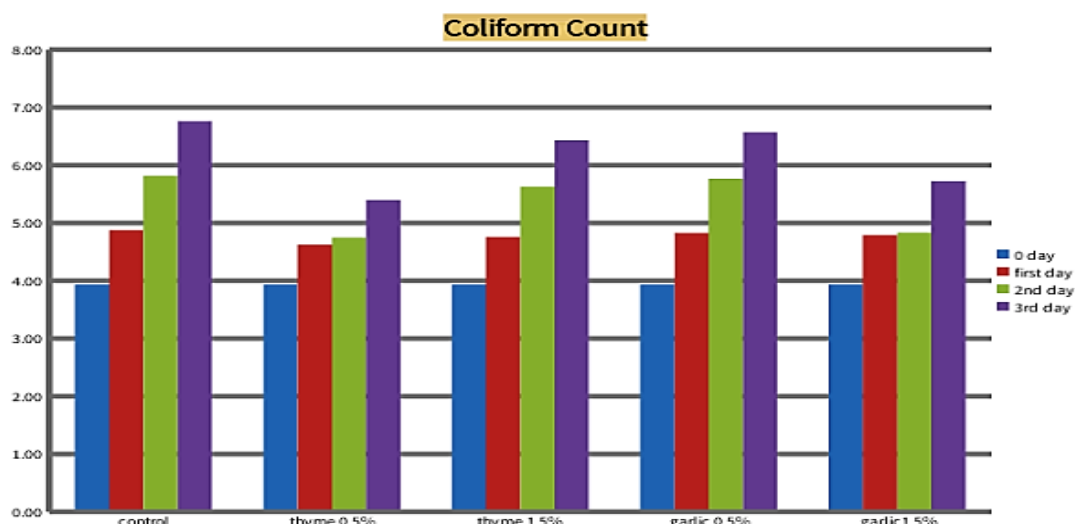


**Fig. (1):** Sensory evaluation of inoculated chicken meat breast with garlic and thyme essential oils. 1: Control 2: Thyme 0.5% 3: Thyme 1.5% 4: Garlic 0.5% 5: Garlic 1.5%

**Table (2):** Statistical analytical results of coliforms count (Log cfu/g) of the effect of different concentrations of thyme and garlic on coliforms count artificially inoculated in chicken meat breast:

Groups	Zero day	2 <sup>nd</sup> day	4 <sup>th</sup> day	6 <sup>th</sup> day
	Mean $\pm$ EM	Mean $\pm$ SEM	Mean $\pm$ SEM	Mean $\pm$ SEM
Control positive	3.94 $\pm$ 2.25	4.88 $\pm$ 2.76	5.82 $\pm$ 3.76	6.76 $\pm$ 4.76
Thyme0.5%	3.94 $\pm$ 2.25	4.76 $\pm$ 2.95	5.63 $\pm$ 3.95	6.43 $\pm$ 4.76
Thyme 1.5%	3.94 $\pm$ 2.25	4.62 $\pm$ 2.76	4.75 $\pm$ 2.76	5.40 $\pm$ 3.76
Garlic 0.5%	3.94 $\pm$ 2.25	4.83 $\pm$ 2.95	5.76 $\pm$ 3.76	6.57 $\pm$ 4.76
Garlic 1.5%	3.94 $\pm$ 2.25	4.79 $\pm$ 2.76	4.83 $\pm$ 2.76	5.72 $\pm$ 3.76

SEM: Standard error of mean



**Figure (2):** Statistical analytical results of coliforms count (Log cfu/g) of the effect of different concentrations of thyme and garlic on coliforms count artificially inoculated in chicken meat breast.

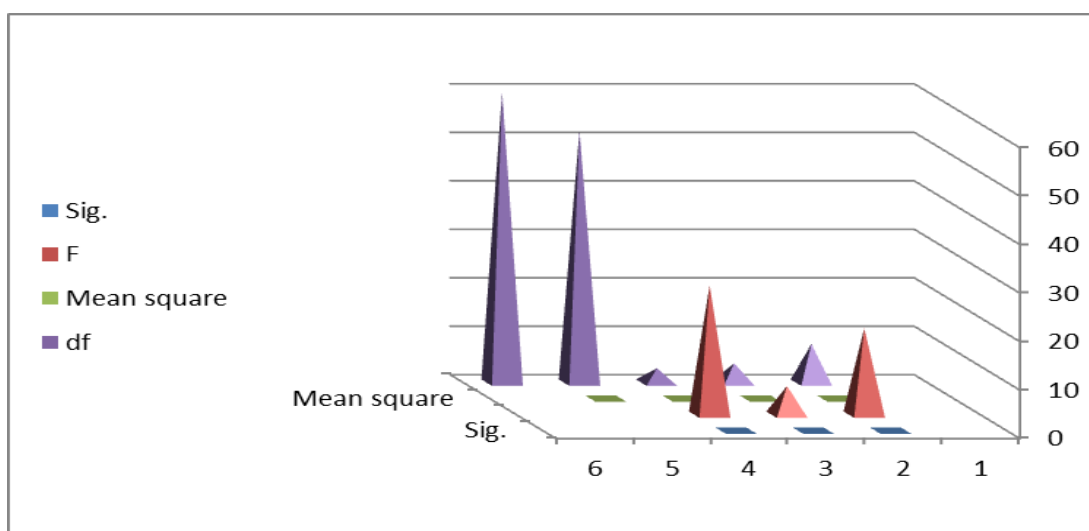
**Table (3):** Analysis of variance (ANOVA) of coliforms count in artificially inoculated chicken meat breast samples with thyme and garlic.

Source of variance	D.F	M.S.	F. value	Sig.
<b>Model</b>	8	1.54 x10 <sup>13</sup>	17.9	(0.000)**
<b>Concentration</b>	4	5.04x10 <sup>12</sup>	5.9	(0.001)**
<b>Day</b>	3	2.29x10 <sup>13</sup>	26.7	(0.000)**
<b>Error</b>	52	8.59x10 <sup>11</sup>		
<b>Total</b>	60			

D.F.: Degree Of Freedom S.S.: Sum Square

M.S.: Mean Square

Sig.: Significance

**Fig. (3):** Analysis of variance (ANOVA) of coliforms count in artificially inoculated chicken meat breast samples with thyme and garlic.

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