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## **FIRST STUDY OF THE EFFECT OF THE SYRIAN NATURAL ZEOLITE ON THE INDOOR AIR BACTERIA POLLUTION IN BROILER BARNs**

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**Abstract.** *From the field of agriculture, broiler production, public health and environmental protection in broiler farms point of view, in view of absence studies concerned with the effect of the natural zeolite on the total airborne bacteria concentrations in the indoor air of broiler farms in the Syrian Arab Republic, locally, regionally and globally in summer season. This study was conducted for the first time. By finding new method to control high levels of the air biological contamination in broiler farms.*

*This article describe the effect of three different levels of the Syrian natural zeolite  $Tz_1$  (25%),  $Tz_2$  (50%) and  $Tz_3$  (75%) on the air bacterial load concentrations in broilers farms. And the recommendations needed to further researches in this field, adding different levels of natural zeolite to the broiler litter.*

**Keywords:** *Airborne bacteria, Broiler, Natural zeolite, Staphylococcus.*

**Introduction:** Litter is one of the most important sources of bio pollution, and considered as the main container of birds' manure and wastes. The quality of the litter used, and its management, temperature, the acidity, all of these factors are responsible for increasing the concentration of the airborne bacteria in the air of the

broiler farm during the fattening period. Moreover, with the increase in the age of the birds, and as the age and weight of the bird increases, this leads to an increase in the number of airborne bacterial loads. In total, this pollution negatively affects the health and production of birds when spread in the litter and in the atmosphere of the barn, which may lead to health risks when released to the outdoor environment [1,2].

The air in the broiler farms are considered as a reservoir of pathogenic microorganism, such as *Staphylococcus* spp. is considered a general indicator of total airborne bacteria content in the air of the broiler house, and accounted for up to 90% of the total content of the air microorganism. And contribute to about 5-34% of the total indoor air pollution [3].

It is known that prolonged or repeated exposure to high concentrations of airborne microorganisms causing infections such as emergence of respiratory system can lead to increased risk of upper respiratory symptoms, and infections ranging from coughing to wheezing and shortness of breath, causing respiratory damage, and intestinal diseases, and the allergic and poisoning effect. Which are considered a source of danger and are harmful to both birds and people working in these facilities, and have negative effects on health and production [4].

Over the last few years, several strategies have been suggested for the control of air and litter quality in broiler farms. Hence, it was concluded that the use of alternative management strategies necessitates the research on natural alternatives for safe use in broiler litter. And in recent years, there was a new interest in use of the natural zeolites and has received great attention in broiler industries.

Because, the natural zeolite have great potential for the mitigation and waste control processes produced by the broiler farms. Moreover, it is environmentally friendly and economical, and it is have unique physical and chemical characteristics that may be used as litter additive, due to its moisture absorption characteristics as a means of reducing litter moisture, acidifier (pH), and mitigation of the gaseous pollutant such as air ammonia (NH<sub>3</sub>) concentrations from broiler houses. All of these attracted the interest of researchers to use it in the field of agriculture and broiler production, public health and environmental protection in broiler farms [5,6].

The source of the Syrian natural zeolite in this study dates back to the Al-Sis area of Tell Mkehelat, 170 km southeast of Damascus.

The general chemical composition of the Syrian natural zeolite ore (table 1).

*Table 1*

Components	Si <sub>2</sub> O	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MnO	MgO	CaO	TiO	P <sub>2</sub> O <sub>5</sub>	Na <sub>2</sub> O	K <sub>2</sub> O
wt %	38.26	10.2	10.86	0.14	9.90	11.94	1.78	0.56	2.44	1.03

We obtained data on the general chemical composition of the Syrian natural zeolite ore from [7].



**Figure 1 the Syrian natural zeolite.**

Figure 1 shows the Syrian natural zeolite.

**Results:**

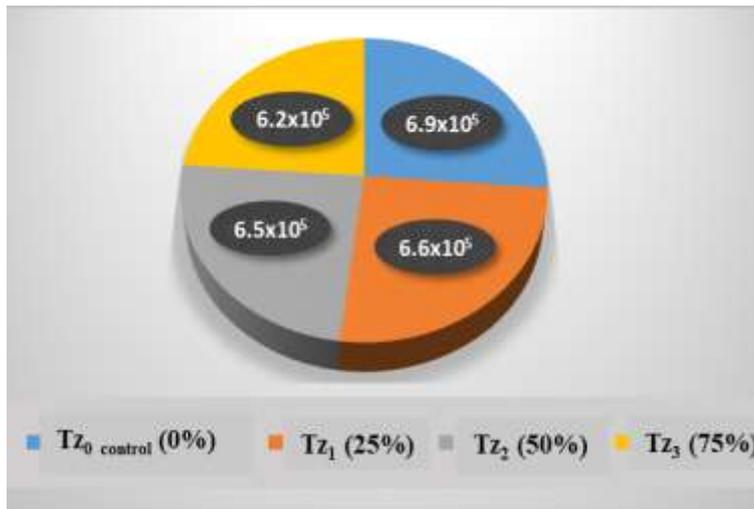
Data on the averages of the total airborne bacteria concentrations (CFU/m<sup>3</sup>) in the indoor air before and after adding the Syrian natural zeolite to the broiler litter during summer (Table 2).

*Table 2*

Birds age (weeks)	Treatments			
	Tz <sub>0</sub> control (0%)	Tz <sub>1</sub> (25%)	Tz <sub>2</sub> (50%)	Tz <sub>3</sub> (75%)
1	1.5×10 <sup>5</sup>	1.3×10 <sup>5</sup>	1.2×10 <sup>5</sup>	1.0×10 <sup>5</sup>
2	3.9×10 <sup>5</sup>	3.6×10 <sup>5</sup>	3.4×10 <sup>5</sup>	3.3×10 <sup>5</sup>
3	1.6×10 <sup>5</sup>	1.4×10 <sup>5</sup>	1.2×10 <sup>5</sup>	1.1×10 <sup>5</sup>
4	2.3×10 <sup>5</sup>	1.8×10 <sup>5</sup>	1.6×10 <sup>5</sup>	1.4×10 <sup>5</sup>
5	5.2×10 <sup>5</sup>	5.0×10 <sup>5</sup>	4.6×10 <sup>5</sup>	4.4×10 <sup>5</sup>
6	6.9×10 <sup>5</sup>	6.6×10 <sup>5</sup>	6.5×10 <sup>5</sup>	6.2×10 <sup>5</sup>

<sup>a,b,c,d</sup> Means in the same row with significant differences among averages (p≤0.05)

We obtained data on the averages of the total airborne bacteria concentrations, from private commercial broiler farm in the Lattakia Governorate, Syria. The commercial broiler hybrid (Roos 308) were used with a total number of three thousand (3000). During the period of (2022-2023) in summer season (from July to August) for six weeks, presented them graphically and obtained the following results.



**Figure 2 Averages of the total airborne bacteria concentrations (CFU/m<sup>3</sup>) in the indoor air before and after adding the Syrian natural zeolite to the broiler litter during summer.**

Figure 2 shows the averages of the total airborne bacteria concentrations (CFU/m<sup>3</sup>) in the indoor air before and after adding the Syrian natural zeolite to the broiler litter during summer.

The averages of the total airborne bacteria at the end of experiment at the 6<sup>th</sup> week, the highest concentrations were noted in the control treatment Tz<sub>0</sub> control (0%) 6.9 × 10<sup>5</sup> (CFU/m<sup>3</sup>).

At the three different levels of the Syrian natural zeolite treatments the values were as the following:

The first treatment Tz<sub>1</sub> (25%) 6.6 × 10<sup>5</sup> (CFU/m<sup>3</sup>).

The second treatment Tz<sub>2</sub> (50%) 6.5 × 10<sup>5</sup> (CFU/m<sup>3</sup>).

The lowest value recorded at the third treatment Tz<sub>3</sub> (75%) 6.2 × 10<sup>5</sup> (CFU/m<sup>3</sup>), with superior effect to Tz<sub>3</sub> treatment.

**Conclusions:** In general, airborne bacteria present in indoor air of broilers farms at all times during the six weeks.

The results concluded that the addition of Syrian natural zeolite to the broiler litter resulted in significantly ( $p \leq 0.05$ ) decrease of airborne bacteria concentrations in the three treatments, to which Syrian natural zeolite was added into the litter compared; to the control treatment, at the end of experiment with superior effect to the third treatment Tz<sub>3</sub> (75%).

Moreover, this result obtained in this study provides a guide to the optimal use of the different ratios of the Syrian natural zeolite, and development of new way to reduce the airborne microorganism in the broiler farms. For that reason, its positive effect and unique physical and chemical characteristics, had contributed to an effective management practice, capable of reducing biological pollution to ensure healthy and productive conditions and less significant damages and losses caused by bio pollution in the broiler industry.

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### **THE EFFECT OF USING DIFFERENT COLORS OF LED LIGHTS ON SOME BEHAVIORAL INDICATORS OF BROILERS**

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