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Effect of the Interaction Between the Level of Water Dilution, Fermentation Time of Chicken Feed, and the Level of Addition of the Iraqi Biostimulant on the Microbial Count of Bacillus subtilis and Saccharomyces cerevisiae

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Abstract

This study aimed to demonstrate the effect of using feed fermented with Iraqi probiotic and water on chicken feed and to study the effect of fermentation on the microbial count of Lactobacilli and Bifidobacterium bacteria. Four concentrations of Iraqi probiotic were added: 2.5, 5.0, 7.5, and 10/kg feed. The feed was diluted with water at ratios of 0.5, 1.0, and 1.5 liters of water/kg feed. The feed was placed in an incubator at 37°C for different periods: 24, 48, and 72 hours. The goal of the experiment was to select the best concentration of Iraqi probiotic , along with the best water addition and the most appropriate fermentation time. All fermentation treatments resulted, There was a significant increase ($P \leq 0.05$) in the logarithmic numbers of all types of bacteria and yeast, and the best results were in favor of the 100% fermented feed prepared with a concentration of 10 g of probiotic/kg feed, diluted with water at a rate of 1 liter of water/kg feed, and fermented for 48 hours compared to the rest of the treatments.

I. Introduction

The poultry industry is considered a fundamental pillar in achieving food security for the world's populations, as it provides two food sources: eggs and meat (Nagi et al., 2009). The gap that occurred between the production of eggs and poultry meat and population growth has led to improvements in cultural, health, and economic levels, as well as changes in social traditions, on the one hand, and rising prices for red meat, on the other. The development of chicken breeds has led to rapid growth, weight gain, and high feed conversion efficiency (Nagi, 2006). Poultry farming is centered on three pillars: breed, management, and nutrition. The latter is an important pillar in establishing poultry projects, as it constitutes 70% of the cost of these projects (Nagi et al., 2007). Therefore, it has become necessary to focus on methods that improve physical, chemical, and microbial characteristics, as well as feed conversion efficiency, to achieve a significant increase in meat or egg production. Among these methods is the adoption of techniques that improve the availability of nutrients. Such as thermal and chemical treatments and fermentation, the process of fermenting chicken feed with beneficial microbial cultures, while providing suitable conditions for fermentation, including humidity, temperature and the time required for this process, will enhance the production of organic acids, reduce the pH values of the digestive tract, make the medium acidic and inhibit pathogenic bacteria E. coli and Salmonella, which are characterized by their intolerance to high acidity (Surawicz et al., 1989) and the doubling of beneficial bacteria at the expense of harmful ones (Kho, 2006). The feed fermentation process will lead to an increase in the availability of nutrients in the feed, such as increasing the

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percentage of available phosphorus due to the activity of the phytase enzyme produced by the beneficial microorganisms used in fermentation, in addition to increasing the effectiveness of the endogenous enzymes present in grains such as wheat and barley. Birds do not benefit from two-thirds of the phosphorus contained in them due to the lack of phytase secretion in their digestive system (Uchewwa and Onu, 2012).

Effect of the Interaction Between the Level of Water Dilution, Fermentation Time, and the Level of Addition of the Iraqi Biostimulant on the Microbial Count of Bacillus subtilis

Table 1 shows the effect of the interaction between the level of water dilution, fermentation time, and the level of addition of the Iraqi Biostimulant on the Microbial Count of Bacillus subtilis. The results indicate a significant increase ($p<0.05$) in the number of Bacillus subtilis bacteria in feed fermented for 48 and 72 hours and supplemented with the Iraqi Biostimulant at ratios of (0.25, 0.50, 0.75, 1.0) g/kg feed at all ratios of the Iraqi Biostimulant, with an increase The percentage of the Iraqi probiotic in the fermented feed and for all levels of water dilution of the fermented feed, which are (1.5, 1.0, 0.5) liters of water/kg dry feed, compared to the number of bacteria in the feed fermented for 24 hours and containing the same percentages of the Iraqi probiotic and water dilution levels. The same table also indicates that there were no significant differences in the number of Bacillus subtilis bacteria between the two treatments of fermented feed for 48 and 72 hours, with an increase in the percentage of water dilution from 0.5 to 1.5 liters of water/kg dry feed, and in all percentages of the Iraqi probiotic added to the fermented feed.

Table 1: effect of the interaction between the level of water dilution, fermentation time, and the level of adding the Iraqi bio-enhancer on the microbial count of Bacillus subtilis bacteria.

Water dilution level L/Kg	Fermentation time (h)	Probiotic percentage (%)				Significant
		0.25	0.50	0.75	1.00	
0.5:1	24	Cb $10^8 \times 49$	Bb $10^8 \times 69$	Bb $10^8 \times 77$	Ab $10^9 \times 27$	0.05
	48	Ca $10^8 \times 96$	Ba $10^9 \times 24$	Ba $10^9 \times 32$	Aa $10^9 \times 86$	0.05
	72	Ca $10^8 \times 99$	Ba $10^9 \times 28$	Ba $10^9 \times 35$	Aa $10^9 \times 88$	0.05
Significant		0.05	0.05	0.05	0.05	
1:1	24	Cb $10^8 \times 78$	Bb $10^9 \times 36$	Bb $10^9 \times 44$	Ab $10^9 \times 65$	0.05
	48	Cb $10^9 \times 58$	Bb $10^9 \times 90$	Ba $10^9 \times 97$	Aa $10^{10} \times 55$	0.01
	72	Ca $10^9 \times 63$	Ba $10^9 \times 95$	Ba $10^9 \times 96$	Aa $10^{10} \times 35$	0.01
Significant		0.05	0.05	0.01	0.01	
	24	Cb $10^8 \times 85$	Bb $10^9 \times 47$	Bb $10^9 \times 50$	Ab $10^9 \times 79$	0.05
	48	Ca $10^9 \times 60$	Ba $10^{10} \times 2$	Ba $10^{10} \times 5$	Aa $10^{10} \times 39$	0.05
	72	Ca $10^9 \times 66$	Ba $10^{10} \times 4$	Ba $10^{10} \times 7$	Aa $10^{10} \times 42$	0.05
Significant		0.05	0.05	0.01	0.05	

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The effect of the interaction between the water dilution level, fermentation time, and the level of probiotic addition on the number of baker's yeast (Saccharomyces cerevisiae). The results indicate that significantly increased ($p < 0.05$) the number of baker yeast in the feed fermented 48 hours and 72 hours and supplemented with the Iraqi probiotic in the ratios of 1.0, 0.75, 0.50 and 0.25 g/kg feed. This was done by increasing the proportion of the Iraqi probiotic in the fermented feed and at each water dilution level of 1.5, 1.0, and 0.5 liters of water/kg dry feed respectively compared to the number of this yeast in fermented feed 24 hours with the same proportions of this probiotic and water dilution levels. This table also indicates that no significant differences existed in the number of baker yeast in the control treatment of the two treatments; feed fermented 48 and 72 hours, and water dilution ratio increased with 0.5 to 1.5 litres of water per kg feed and all ratios. The fermented feed was supplemented with the Iraqi probiotic but the difference between the two was not significant. The results of this study were in line with those of Kimch et al. (2012), who offered the concept that the increase in the positive bacterial counts could be explained by the existence of the favorable environment to achieve the fermentation process such as the moisture and microbial concentration of the fermented feed and a shorter time of fermentation. This conforms to the observations of Canble and Jansen (2003) who found that population of the beneficial bacteria in fermented feed with high concentrations of probiotics and great concentrations of water increased highly compared with the fermented feed with low concentrations of probiotics and low concentrations of water. Kho et al. (2006) proved that long period feed fermented with a higher proportion of probiotics and water contained more beneficial microorganisms compared to short period fermented feed.

Table (2) Effect of the interaction between the level of water dilution, fermentation time, and the level of probiotic addition on the number of baker's yeast (Saccharomyces cerevisiae).

Water dilution level L/Kg	Fermentation time (h)	Probiotic percentage (%)				Significant
		0.25	0.50	0.75	1.00	
0.5:1	24	Db $10^8 \times 77$	Cc $10^8 \times 97$	Bb $10^9 \times 21$	Ab $10^9 \times 43$	0.05
	48	Da $10^9 \times 7$	Cb $10^9 \times 22$	Ba $10^9 \times 51$	Aa $10^9 \times 75$	0.05
	72	Da $10^9 \times 11$	Ca $10^9 \times 27$	Ba $10^9 \times 56$	Aa $10^9 \times 80$	0.05
Significant		0.05	0.05	0.05	0.05	
1:1	24	Ab $10^9 \times 99$	Bb $10^9 \times 82$	Cb $10^9 \times 61$	Db $10^9 \times 41$	0.05
	48	Aa $10^{10} \times 29$	Ba $10^{10} \times 7$	Ca $10^9 \times 80$	Da $10^9 \times 63$	0.01
	72	Aa $10^{10} \times 33$	Ba $10^{10} \times 10$	Ba $10^9 \times 84$	Ca $10^9 \times 69$	0.01
Significant		0.05	0.05	0.01	0.01	
	24	Cb $10^9 \times 46$	Bb $10^9 \times 65$	AB b $10^9 \times 86$	Ab $10^{10} \times 4$	0.05
	48	Ca $10^9 \times 67$	Ba $10^9 \times 86$	Aa $10^{10} \times 12$	Aa $10^{10} \times 33$	0.05
	72	Ca $10^9 \times 74$	Ba $10^9 \times 88$	Aa $10^{10} \times 13$	Aa $10^{10} \times 34$	0.05
Significant		0.05	0.05	0.01	0.05	

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