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Research Article

Comparison of Different Methods of Disinfection of Chicken Feed (Pellets, UV, Formalin) Supplementation of Organic Acids (Propionic Acid, Acetic Acid, and Linoleic Acid) And Their Effect on Reducing Microbial Count

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Abstract

Today, food pathogens have a significant effect on changing the conversion ratio. Given that today's poultry industry has a significant share in the economy and nutrition, this study was conducted to investigate the effect of various feed disinfectants. The issue of disinfection is different from the issue of food on which the disinfection process is performed and used in the transfer phase because the food transport equipment must have the ideal and standard conditions of the disinfected feed to have an impact. In this study, we compared the disinfectants of samples containing formalin, organic acids, ultraviolet rays, and pellets with the control samples, and the level of contamination was investigated by the Total Kant test. In this experiment, 30 kg of mixed and homogeneous grain was prepared before the disinfection and pelleting process, and 1 kg of pelleted grain was prepared, in which the pellet compounds were prepared as homogeneous and uniform grain. Based on the results, the level of infection in the control group compared to other groups showed a significant difference ($P < 0.05$), and the highest level of infection was observed in the control group.

Keywords: Formalin, Organic Acids, Ultraviolet Radiation, Pellet

Introduction

Today, with the ban on the use of growth-promoting antibiotics in some societies, the use of alternatives to antibiotics has been considered. Nano-silver is a disinfectant compound that affects the composition of bacterial membranes and leads to deformation and consequent death of microorganisms. Susceptibility and instability of E. coli, Staphylococcus aureus, and Bacillus subtilis to nano-silver (2). This substance causes the death of bacteria by disrupting the respiratory enzymes and electron transfer system (8). The antimicrobial activity of silver is revealed by blocking the electron transfer system, altering the function of

the bacterial membrane, and preventing DNA replication. Interaction between silver ions and thiol groups in enzymes and proteins plays a significant role in the antimicrobial activity of silver ions, although other cell compounds such as hydrogen bonds may also be involved (10). Research has also shown that silver nanoparticles significantly reduced the total count of bacteria and gram-negative bacteria in different parts of the gastrointestinal tract except for the cecum (9).

Also, in another study, the use of nano-silver in food had a more significant effect than its use in water. This decrease in microbial count was associated with increased yield (weight of egg mass-produced) in birds (11). There are also differences in the two methods of using nano-silver; nano-silver has a better performance in feed than in water. Research has indicated that the use of nano-silver at the levels of 0.8 and 1.6 ppm does not affect broilers' performance and carcass characteristics (12). Today, two types of physical forms of flour and pellets are common for feeding poultry. The essential factor in preparing pellets is the grinding process and its conditions, which cause smaller particle size and increase the surface to volume ratio. As a result, temperature and humidity penetrate deeper into the food. Temperature conditions bind nutrients essential for forming solid pellet bonds (7); the count of Gambaro antibody in pelleted diets is minor than flour diets (4). The lower weight and acidity of the gills in pellet diets have been attributed to less mechanical stimulation in the gills and the secretion of hydrochloric acid. Also, the survival rate and prevalence of Salmonella typhimurium are affected by the physical form of the feed (6). Today, poultry salmonellosis is one of the biggest economic problems of the poultry industry internationally (5). As a result, it limits microorganisms such as Escherichia coli that are active in the higher range of pH. The addition of probiotics helps alter the microflora of the gastrointestinal tract to colonize beneficial bacteria and effectively inhibits pathogens such as Escherichia coli and Clostridium (4). Formaldehyde is known as an antimicrobial additive, especially for the removal of Salmonella from the diet. Formaldehyde can be used as an animal feed preservative (3). Formycin is a commercial compound made from propionic acid, formaldehyde, sodium bentonite, and ammonia that kills most microorganisms. This product has a strong antimicrobial effect on Salmonella, Streptococcus, Campylobacter, and Clostridium species in animal feed raw materials (1).

1. Method

This operation was performed according to the sampling method of National Standard of Iran No. 1445 (revised in 2017) that the samples must be completely homogeneous and uniform and transferred to the laboratory without damage. In this experiment, 30 kg of mixed and homogeneous grain was prepared before the disinfection and pelleting process, and 1 kg of pelleted grain was prepared; The pellet compounds were prepared in a homogeneous and uniform manner; the same compounds prepared for the rest of samples.



2-Procedure

2-1. Cultivation Preparation Steps

The most basic step for microbial work is sterilization of all equipment, work environment and culture medium. For culture, a typical agar medium was used, which was prepared according to the protocol written on the culture medium.

In this study, tubes containing 9 cc of distilled water, which were prepared for each sample of 6 tubes, were sterilized in an autoclave, then 6 Erlenmeyer tubes containing 45 cc of distilled water were sterilized in an autoclave. After complete settling, 1 cc of the supernatant was removed and in the pre-prepared tubes, 1 cc of the original count was poured into the count one tube and thoroughly mixed, then1 cc of the liquid was taken out from the count one tube, transferred to tube count 2 and this operation was performed up to tube count 6 and liquid was removed from tube count 6, and one cc of the contents of each tube was introduced into TSA culture medium with the same count; The culture media were then transferred to the incubator for 24 hours at 37 ° C. Bacteria were counted after 24 hours. Bacteria were counted according to the following method with CFU unit:

Volume of solution in the pellet × number of bacterial colonies counted on the pellet × photo of dilution rate

3. Findings

3-1. Contamination Rate of Samples

The highest level of contamination was observed in the control group, which shows a significant difference compared to other groups (P <0.05). Also, the lowest level of contamination was observed in the sterilized formalin group, which does not show a significant difference compared to other groups (P> 0/05), (Figure 1) (Table 1).

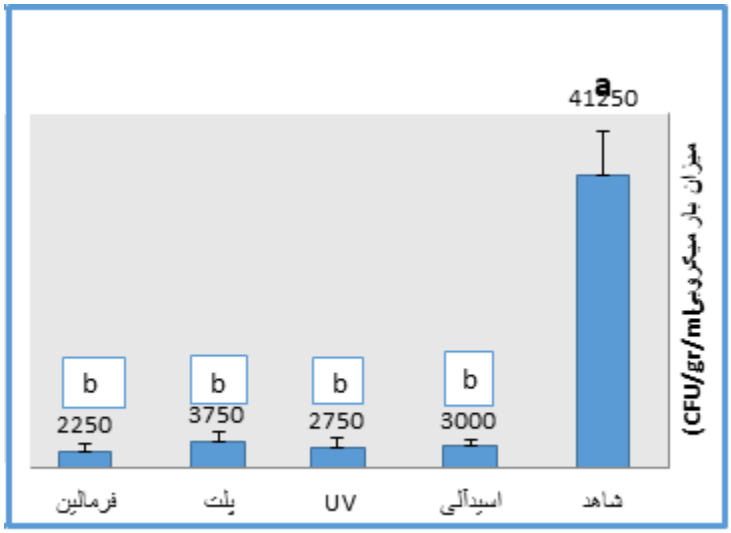

Figure 4-1. Contamination rate of samples

(Formalin, pellet, UV, organic acid, control, microbial count)

Table 1. Descriptive statistics and analysis of variance

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
control	4	41250	6344.289	3172.144	31154.82	51345.18	35000	50000
Organic acid	4	3000	816.497	408.248	1700.77	4299.23	2000	4000
UV	4	2750	1500.000	750.000	363.17	5136.83	1000	4000
Pellet	4	3750	1258.306	629.153	1747.75	5752.25	2000	5000
Formalin	4	2250	1258.306	629.153	247.75	4252.25	1000	4000
total	24	9291.67	14825.006	3026.142	3031.62	15551.72	1000	50000

According to the results, it was found that formalin is the best disinfectant. According to the same results, after formalin, UV, organic acid and pellet disinfectants showed their effect, respectively. Due to the chemical nature of formalin, which is a negative advantage for UV disinfection, and also formalin has a pathogenic effect in the gastrointestinal tract, compounds such as UV rays reduce the pathogenic effect. therefore, we can use UV rays, but formalin has a higher shelf life than UV rays because UV rays become ineffective after the isolation conditions are removed. This issue is significant when transporting feed from the processing site to the place of consumption, therefore, the conditions of transporting poultry feed must be examined in terms of isolation to use a disinfectant such as UV rays.

Table 2. mean data based on Duncan table

Duncan

group	N	Subset for alpha = 0.05	
		1	2
Formalin	4	2250	
UV	4	2750	
Organic acid	4	3000	
Pellet	4	3750	
control	4		41250
Sig.		.513	1.000

Means for groups in homogeneous subsets are displayed.

Discussion and Results

According to the results of the study, the factors that cause disinfection can significantly affect the microbial count of the feed and minimize its microbial count. This means that, despite antibiotic resistance, pathogens are no longer used in poultry diets.

In addition to the count of disinfection, the cost of disinfecting the treatments is also important. The cost of disinfecting each kilogram of treatment for the disinfectant was examined, the details of which are as follows.

Cost of disinfection with HBA: For 1kg of treatment for disinfection, we need 1gr of HBA or the same organic acid, which is 1kg of HBA with a base price of 38,000 Tomans; it costs 40 Tomans for disinfection of 1kg of treatment.

Cost of disinfection with formalin: for 1kg of treatment for disinfection, we need 5ml, which is 1L of formalin with a base price of 50,000 Tomans, and our cost for 1kg of treatment is equal to 250 Tomans.

Cost of disinfection with pellets: According to the factory where we prepared the pellet treatment, the cost for producing each kilogram of pellets is 100 Tomans.

Cost of disinfection with uv lamp: The lamp we are looking at is UV lamp, 55 w by Osram company, which was calculated according to the formula for calculating the cost of the time we used for one kilogram of treatment; as follows.

According to the tariff, each kilowatt is priced at 110 tomans, which we used for a total of five hours for disinfection, giving us the following formula for the count of kilowatts consumed:

5× 55×30 ÷1000 =8.25

number of kilowatts×110 = 907

907×30×0.25=108

Our consumption cost for uv lamp in five hours was 108, which can be considered for more than one kilogram due to the range of uv lamps. There was no significant difference between disinfection treatments, but there were differences in terms of microbial count reduction. Formalin had the best results in terms of reducing microbial count, however, because UV rays with less cost and greater coverage can disinfect more materials with the same range of effect, it is more economical and chemically not mixed with the treatment and the possibility of its pathogens is so low, and we eventually recommend UV radiation.

Conclusion

This study showed that the count of microbial count in grains can be minimized with disinfecting feed. Formalin disinfectant can be better than the other disinfectants.

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References

1.Anonymous (2005) Permix for micrbiologic control. IQF group [Online]. Available at: http//Www.Vb.Iqf.Group.

2.Atiyeh BS, Costagliola M, Hayek SN and Dibo SA (2007) Effect of silver on burn wound infection control and healing. Burns .139-148 :33

3.Bernardo, F. M., Machado, J. C. C. (1989) Prevalence of Salmonella in broiler carcasses in Portugal: epidemiological implication for man. Rev. Port. Cien. Vet. 84: 31-45.

4.Dhama K, Verma V, Sawant PM, Tiwari R, Vaid RK, Chauhan RS. Applications of probiotics in poultry: Enhancing immunity and beneficial effects on production performances and health, A review. Journal of Immunology and Immunopathology. 2011; 13: .1-19

5.Hinton, M., and Linton, A. H. (1988) Control of Salmonella infections in broiler chickens by the acid treatment of their feed. Vet. Rec. 123: 416-421.

6.Huang DS, Li DF, Xing JJ, Ma YX, Li ZJ, Lv SQ. Effects of Feed Particle Size and Feed Form on Survival of Salmonella typhimurium in the Alimentary Tract and Cecal S. typhimurium Reduction in Growing Broilers. Poultry Science. 2006; 85: 831–836

7.Kenny M, Flemming E (2006). Optimising broiler performance- the role of physical feed quality. Australian Poultry Science Symposium 25-29.

8.Percival SL, Bowler PG and Russell D (2005) Bacterial resistance to silver in wound care. Hosp. Infect. 60: 1-7.

9.Sawosz E, Binek M, Grodzik M, Zielinska M, Sysa P, Szmidt M. Influence of hydrocolloidal silver nanoparticles on gastrointestinal microflora and morphology of enterocytes of quails. Archive of Animal Nutrition. 2007; 61: 444–451

10.Sondi I and Sondi SB (2004) Silver nanoparticles as antimicrobial agent: a case study on E. coli as a model for gram-negative bacteria. Colloid Interf. Sci. 275: 77-182.

11.Taghizadeh F, Karmi Torshizi MA, Rahimi S. Comparison of nanosilver and in-feed disinfectants on layer performance and intestinal microflora and yolk cholesterol. Journal of Animal Production. 2011; 13: 49-58.

12.Zargaran Esfahani H, Sharifi SD, Barin A and Afzal Zadeh, A (2010) Influence of silver nanoparticles on performance and carcass properties of broiler chicks. Iranian J.