Efficacy of Peroxsil vs Formaldehyde

Hatching Egg Disinfectant

STUDY RESULTS

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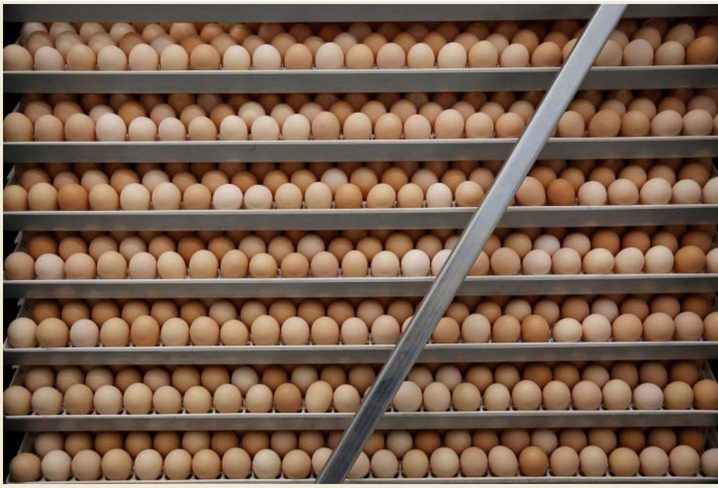

Silver as an Effective Disinfectant:
Silver possesses natural antimicrobial properties due to its ions binding to the DNA of viruses, fungi and bacteria, preventing their replication. When combined with (unstable) hydrogen peroxide, which corrodes cell walls, silver forms a stable product with dual action. This results in a highly effective disinfectant that is not only biodegradable but also eco-friendly.

Keywords:
Silver ions; Hydrogen peroxide; Eggs; Eggshell strength;
Microbiological quality, Viruses, fungi, bacteria preventing
High-quality chicks, Hatcheries, Eggshell sanitation, Eco-friendly

Introduction:

Over recent years poultry hatchery operations have increased in size. This change has prompted increased expectations of improved hatch abilities, lower chick mortality, and better broiler performance. An effective hatchery sanitation program is critical to achieve a high level of hatchability and to ensure the production of high-quality chicks.

Traditionally, formaldehyde has been widely used as a disinfectant for hatching eggs due to its effectiveness and ease of application (Funk and Irwin, 1955). However, concerns about its toxicity, environmental impact, and potential residues have prompted researchers to seek alternative solutions.

Furthermore, the South African Poultry Industry could face similar changes to that of the United States Environmental Protection Agency who have recently moved toward regulating the use of formaldehyde under the Toxic Substances Control Act (Anonymous, 1984).

In South Africa, there is a growing possibility of formaldehyde being banned for use in eggshell sanitation. The hatchery industry is now evaluating the cost implications and safety requirements related to formaldehyde handling. Our research focuses on a silver-stabilised hydrogen peroxide (Peroxsil®) as a viable replacement for formaldehyde in egg disinfection.

In a study by Sheldon and Ball (1986), it was found that 75% of microorganisms isolated in a hatchery air quality survey were of respirable size (< 5 μm) and could be linked to avian respiratory disease outbreaks. To explore microorganisms associated with early chick mortality, they referred to earlierreviews by Magwood (1964a, b), Ernst et al. (1980), and Gardner et al. (1980).

Maintaining a clean and safe environment is crucial for the well-being of chick populations. Unfortunately, the hatchery environment often harbours various microorganisms that pose a risk. These contaminants can spread easily due to employee movement and air currents.

Airborne microbes find their way into the setters and hatchers through the ventilation system. Moreover, newly hatched chicks are vulnerable to infections. They can acquire diseases from other hatching eggs or from surfaces within the hatcher.

Hydrogen peroxide (H_2O_2) has been widely used as a disinfectant for many years, particularly in industrial and commercial sanitation programs. It is effective for the rapid in-line sterilisation of packaging materials in the food and pharmaceutical industries due to its ability to decompose into water and oxygen, leaving no residue or unpleasant odour, and posing minimal safety risks when handled properly (Spaulding et al., 1977).

H_2O_2 is less expensive than ozone and chlorine dioxide because it doesn't require on-site generation, is effective at low concentrations, and has similar bactericidal activities. When considering a disinfectant to replace formaldehyde, its impact on hatching potential must be evaluated. Surface-active agents like H_2O_2 can alter the eggshell's cuticle, which is crucial for regulating respiration, water loss, and preventing microbial invasion (Brake and Sheldon, 1990). Thus, any potential effects of H_2O_2 on eggshell permeability and hatchability must be examined.

Objective:

The objectives of the current study were to assess the biocidal effectiveness of a silver stabilized hydrogen peroxide (Peroxsil®) as an eggshell surface disinfectant and to evaluate its impact on eggshell permeability and hatchability. Beyond eggshell sanitation, we will also assess the effectiveness of this biocide in preventing chick diseases.

Materials and Methods:

Sample Collection:

The sample collection took place at the laying site, where entire trolleys were collected from a single house. During the trial, approximately 42,000 eggs were gathered, with 19,200 eggs treated with Peroxsil® and the remaining 22,800 eggs treated with Formaldehyde (HCHO).

Treatment Application:

The application of both Peroxsil® and formaldehyde treatments was confined to the laying site, excluding the hatchery. The Peroxsil® solution was administered using a knapsack sprayer until saturation was achieved (dripping), whereas the formaldehyde-treated eggs underwent fumigation in accordance with the standard industry protocol for this biocide in South Africa.

Leveraging data from international sources, our object and aim was to assess and conduct several pre-trial tests of different concentrations to determine the most efficient concentration. The goal was to determine the most efficient dilution ratio for eggshell hygiene before treating the entire batch of 19,000 eggs with Peroxsil®.

After careful analysis, we recommended a 0.5% dilution of Peroxsil®. Specifically, this involves adding precisely 100 ml of Peroxsil® 50% concentrate to 19.90 Liters of municipal water, resulting in a concentration of 3000 ppm. This specific dilution will be employed in our future trial.

Microbial Testing:

Following the trial, we conducted microbial load tests at the laying farm. For these assessments, 20 eggs treated with Peroxsil® were randomly selected and tested once they were dry. In contrast, microbial testing for the formaldehyde-treated eggs occurred immediately after the fumigation process. It is important to note that no application of Peroxsil® was performed at the hatchery.

The results indicated that the Peroxsil® treated eggs showed a significant improvement in cleanliness compared to the formaldehyde-sanitised eggs. Specifically, the Peroxsil® treated eggs demonstrated a 29% improvement in cleanliness, whereas the formaldehyde-treated eggs exhibited an 18% improvement.

However, several factors must be considered: the initial bacterial load may have differed slightly between the two groups, potentially influencing the results. Additionally, the sample size of 20 eggs might be insufficient for drawing definitive conclusions. The sampling method, particularly on the curved (as opposed to flat) egg surface, could have also impacted the outcomes.

Further studies are required to conclusively determine whether silver-stabilised hydrogen peroxide is equivalent to or outperforms formaldehyde fumigation in ensuring optimal egg hygiene for layers and hatcheries.

Hatchability:

Compared to eggs treated with formaldehyde, Peroxsil® significantly increased the hatchability of fertile eggs by 0.8%. This increase is likely attributed to a substantial reduction in the number of contaminated eggs and early embryonic mortality.

Internationally, research has also demonstrated that chickens hatched from eggs disinfected with silver-stabilised hydrogen peroxide exhibit lower mortality rates and significantly higher body weights during the initial 14 days of rearing compared to those from the alternative treatment groups (Brake and Sheldon, 1990).

Future Peroxsil® trials will further investigate whether similar benefits in terms of mortality rate reduction and weight gain can be achieved in South African hatcheries and broiler production.

Broiler Performance:

Chicks from both treatment groups were introduced into a broiler house with a capacity of 42,000 birds, where they were mixed with other non-treated flocks. As a result, specific broiler performance data over a period of approximately 30 days could not be conclusively determined.

Further independent studies focusing on broiler performance are required to obtain definitive results.

Results:

This study investigated the impact of varying concentrations of Peroxsil® as a disinfectant on eggshell microbial load, embryonic mortality, hatchability, and chick quality, particularly in comparison to formaldehyde. The results revealed that bacterial loads on the eggshell decreased with increasing Peroxsil® concentration.

Notably, the 3000-ppm concentration of Peroxsil® exhibited the lowest bacterial load. Additionally, hatchability in the Peroxsil® group exceeded that of the formaldehyde group.

Conclusion:

In conclusion, employing Peroxsil® at a concentration of 3000 ppm for disinfecting embryonated eggs effectively reduces bacterial load on the eggshell. Furthermore, the use of Peroxsil® enhances hatchability and chick quality.

Our data also indicates that Peroxsil® performs at least as well as, if not better than, formaldehyde under similar conditions.

Given the positive results, Peroxsil® presents itself as a viable alternative or replacement for formaldehyde in eggshell sanitation.

References:

An assessment of the influence of silver stabilised hydrogen peroxide on the eggshell condition:
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Emirates Journal of Food and Agriculture. 2018. 30(2): 131-136
doi: 10.9755/ejfa.2018.v30.i2.1605
http://www.ejfa.me

Effect of using colloidal silver in the disinfection of hatching eggs on some microbial, hatchability and performance traits in Japanese quail (Coturnix cot.japonica).
Einfluss der Verwendung von kolloidalem Silber zur Desinfektion von Bruteiern auf einige mikrobiologische, Brut- und Leistungsmerkmale bei der Japanischen Wachtel (Coturnix cot. japonica)
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Europ.Poult.Sci., 81. 2017, ISSN 1612-9199, © Verlag Eugen Ulmer, Stuttgart. DOI: 10.1399/eps.2017.211

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