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In Vitro Evaluation of Toxin Binder's Binding Capacity in Commercial Broiler Feed

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Abstract: ***This research delves into the intricate assessment of Ran Livtox, a specialized toxin binder, aiming to comprehensively understand its efficacy in alleviating the adverse effects of mycotoxins. Employing a sophisticated in vitro model coupled with the thin - layer chromatography analysis technique, we systematically quantified free mycotoxins, specifically focusing on aflatoxin B1, ochratoxin, and T - 2 toxin (T - 2). The comprehensive evaluation of Ran Livtox (0.2%) extended to individual and combinatory scenarios, with meticulous scrutiny at varying pH levels of 4.5 and 6.5 within the context of poultry diets. The outcomes of our investigation revealed a substantial and statistically significant ($p < 0.05$) elevation in binding affinity for Aflatoxin (94.71%). Furthermore, the binder exhibited robust binding efficacy for T - 2 (84.28%) and Ochratoxin (93.13%). Intriguingly, this superior binding was notably accentuated at a pH of 6.5 compared to the pH 4.5 environment. This study not only underscores the impressive efficacy of Ran Livtox in binding Aflatoxin but also sheds light on its notable performance concerning T - 2 and Ochratoxin. The pH - dependent variations in binding efficacy underscore the intricate interplay between Ran Livtox and mycotoxins within the complex gastrointestinal environment of poultry. These findings contribute significantly to our understanding of Ran Livtox as a potential solution in combating mycotoxicosis in poultry, laying the groundwork for further exploration and application in real - world scenarios.***
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Keywords: Ran Livtox, Aflatoxin, Ochratoxin A, T - 2 toxin, binder, in vitro. RAN

1. Introduction

In contemporary poultry production, ensuring the safety and nutritional quality of animal feed is paramount for maintaining optimal health and productivity. The presence of molds, particularly at different stages of the food chain, poses a persistent challenge due to their propensity to produce mycotoxins. These toxic metabolites, including Aflatoxin, Ochratoxin, and T - 2 toxin, can exert deleterious effects on broiler chickens, leading to compromised well - being and reduced productivity, especially when these mycotoxins co - occur.

While the detrimental impact of individual mycotoxins is well - established, recent research has underscored the heightened concern surrounding the synergistic effects of multiple mycotoxins in poultry diets. The intricate interplay between various mycotoxins can result in a cumulative adverse impact on the overall health and performance of broiler chickens. Consequently, the search for effective and holistic solutions to counteract mycotoxicosis in poultry has intensified.

In this context, the current study seeks to explore and elucidate the nuanced in vitro binding ability of Ran Livtox, a toxin binder produced by Rivansh Animal Nutrition Pvt Ltd Company. This herbo - mineral combination is purported to not only bind mycotoxins effectively but also contribute to liver protection. Understanding the multifaceted nature of mycotoxin contamination in poultry diets, Ran Livtox emerges as a potential candidate for addressing the challenges posed by both individual and combined mycotoxin exposure.

2. Materials and Methods

The methodology employed in this study adhered to rigorous standards to ensure the precision and reliability of the results. The mycotoxin binding efficacy of Ran Livtox was evaluated in toxin - contaminated feed under simulated in situ gastrointestinal tract conditions. Aflatoxin B1 (400 ppb), Ochratoxin (0.5 ppm), and T - 2 (2 ppm) were selected as representative mycotoxins for individual and combined studies, both with and without the inclusion of the binder (0.1%).

The experiments were meticulously conducted at two distinct pH levels, namely 4.5 and 6.5, replicating the physiological conditions of the avian gastrointestinal tract. The mycotoxins employed in the study were produced using solid substrate fermentation, a well - established method in mycotoxin research. The content of mycotoxins in the culture material was determined with precision using the thin - layer chromatography method, following the guidelines outlined by the Association of Official Analytical Chemists (AOAC).

To assess the binding efficacy of Ran Livtox, a batch of compounded broiler grower feed was prepared with specific nutritional values (3000 Kcal/kg ME and 19.00% CP). Each feed batch, weighing 25 g, was placed into individual 250 ml Erlenmeyer flasks. The requisite amount of culture material was added to achieve the targeted concentration of mycotoxins. In the experimental flasks, Ran Livtox was introduced at a rate of 0.1%, while control flasks received untreated feed.

The addition of a citric acid - sodium phosphate buffer (100 ml) with the desired pH levels (4.5/6.5) to each flask simulated the physiological conditions of the avian gastrointestinal tract. Subsequently, all flasks underwent

incubation at a controlled temperature of 37°C for a precise duration of 3 hours. Following incubation, the contents of each flask were subjected to meticulous filtration and drying at 37°C for an additional 2 hours. The specific mycotoxin in each dried content was then extracted, quantified, and the recovery rate was expressed as a percentage.

To ascertain the efficacy of Ran Livtox, the percentage difference in mycotoxin content was calculated between the initial and final stages of the trials for both the treated and control flasks. The binding efficacy of the binder for each mycotoxin in different treatments was determined by subtracting the percentage difference in mycotoxin content of the control flasks from that of the treated flasks in their respective experimental groups.

3. Results and Discussions

The results obtained from this meticulous study demonstrated significant ($p < 0.05$) differences in the binding of Aflatoxin, Ochratoxin, and T - 2 among various dietary treatments. Higher binding affinity was consistently observed for Aflatoxin compared to Ochratoxin and T2 in diets with individual toxins. Notably, at pH 4.5, the highest binding percentage was recorded for Aflatoxin (90.68%), while at pH 6.5, Aflatoxin exhibited the highest binding percentage (94.71%).

The nuanced findings of this research contribute to our understanding of the complex interplay between mycotoxins and Ran Livtox in the avian gastrointestinal tract. Furthermore, the study suggests that Ran Livtox possesses broad - spectrum efficacy against tested mycotoxins, particularly aflatoxin, and is more effective at a higher pH (6.5). This insight is crucial in tailoring effective mycotoxin management strategies for poultry producers.

In essence, this research serves as a pivotal step forward in unravelling the intricacies of mycotoxin binding in poultry feed, presenting Ran Livtox as a potential solution to the multifaceted challenges posed by mycotoxicosis in contemporary poultry production.

Table 1: Toxin Binding In Vitro by Ran Livtox ™ Binder

Treatments	(pH 4.5)	(pH 6.5)	(Avg)
Aflatoxin	90.68%	94.71%	92.69%
Ochratoxin	90.53%	93.13%	92.43%
T - 2 Toxin	81.33%	84.28%	82.80%

4. Conclusion

The findings of this study underscore the potential of Ran Livtox as an effective mycotoxin binder, especially against Aflatoxin, within the complex milieu of the avian gastrointestinal tract. The observed pH - dependent variations in binding efficacy shed light on the dynamic interactions between Ran Livtox and mycotoxins, emphasizing the importance of considering physiological conditions in assessing binder performance. As the poultry industry grapples with the multifaceted challenges of mycotoxin contamination, Ran Livtox emerges as a promising tool for mitigating the adverse effects of mycotoxicosis, contributing to enhanced feed safety and improved bird health.

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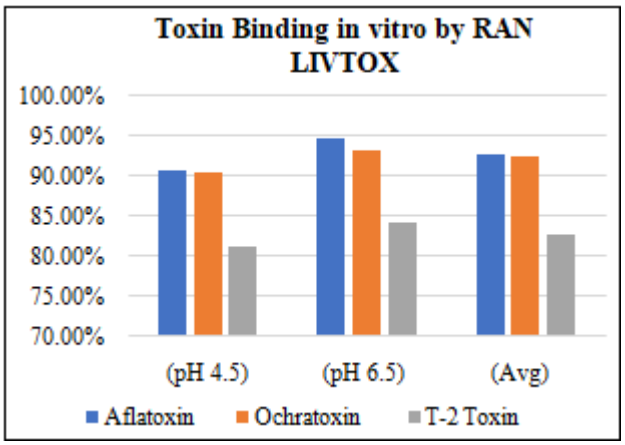

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