



Rapid Evaluation of Bentonite Quality Using Physicochemical Parameters to Predict Aflatoxin Binding Efficiency

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Abstract

Mycotoxin contamination in animal feed is a crucial challenge in livestock production due to its adverse effects on animal health, productivity, and food safety. Mycotoxin binders are commonly used as feed additives to adsorb fungal toxins in the gastrointestinal tract and to reduce their bioavailability. Their effectiveness depends on several physicochemical properties such as moisture content, pH, swelling index, fineness, particle size distribution, and adsorption capacity. Therefore, this study evaluated and compared the physicochemical characteristics and adsorption performance of two commercially available, feed-grade mycotoxin binders: T1 and T2. The present study evaluated moisture content, pH, swelling index, fineness, particle size distribution [In terms of geometric mean diameter (GMD) and geometric standard deviation (GSD)], and adsorption capacity. Complete randomized design (CRD) was used as the experimental design where, One-Way ANOVA was conducted to determine the differences between two binders. Moisture content ($P < 0.05$), pH ($P < 0.05$), swelling index ($P < 0.05$), fineness ($P < 0.05$), and adsorption capacity ($P < 0.05$) were differed between treatments. The moisture levels of both binders were within the recommended range, with T2 slightly closer to the optimum. T1 maintained pH within the acceptable range, while T2 slightly exceeded the upper limit. T2 revealed a significantly higher swelling index and adsorption capacity, indicating a greater adsorption potential. Both binders revealed high adsorption capacity (>200 mg MB/g), typical of activated bentonite adsorbents. Based on the F-test, the GMDs of both binders (GMD: T1=240.57 μ and T2=245.97 μ) were similar ($F = 1.022$; $P > 0.05$), indicating similar variability in particle size distribution. In conclusion, T2 demonstrates superior swelling and adsorption properties, while T1 excels in fineness and pH conformity. In overall, T2 presents a more effective profile as a mycotoxin binder for feed applications.

Keywords: Adsorption capacity, Feed additives, GMD, Mycotoxin binder, Particle size, Swelling index

