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EFFECTS OF SOME SELECTED HERB PLANTS IN NEUTRALIZING FEED CONTAMINATED WITH RAT FAECES

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***Abstract**: Feed contamination by faecal matter, particularly from rodents, poses a significant risk to livestock health, affecting growth rates and productivity. This study investigates the potential of selected herb plants in neutralizing feed contaminated with rat faeces. The herbs evaluated included Moringa oleifera, Allium sativum, and Azadirachta indica, all known for their antimicrobial and detoxifying properties. Contaminated feed samples were treated with aqueous extracts of these plants, and the effects on microbial load, toxin levels, and overall feed quality were assessed. Results showed a significant reduction in microbial contamination and potential toxins, with Moringa oleifera demonstrating the highest efficacy. The study suggests that these herb plants can serve as an effective natural agent in neutralizing contaminated feed, ensuring better livestock health and productivity.*

***Keywords:** Contamination, Detoxification, Faeces, Feed, Herb, Plants.*

Introduction

Rodent contamination of animal feed is a widespread issue in both commercial and smallholder livestock farming systems. Rodents, particularly rats, are notorious for contaminating stored feed with their faeces, urine, and saliva. This contamination can introduce harmful pathogens, parasites, and toxins, leading to significant health risks for livestock and ultimately impacting animal productivity (Krijger, 2020; Gwenzi *et al*., 2021). Among the most common pathogens introduced by rodent faeces are *Salmonella spp*., *Escherichia coli*, and various mycotoxins, which can lead to diseases, reduced growth rates, and even death in some cases and causes serious economic losses to the farm (Gourama *et al.,* 2020).

Traditional methods of feed decontamination often involve chemical sanitizers, but these chemicals can leave harmful residues, affecting animal health and product safety (Wales *et al.*, 2010; Temba *et al*., 2016). As an alternative, there is growing interest in using herbal plants to neutralize the harmful effects of faeces. Herbal plants are known for their antimicrobial and detoxifying properties, as natural agents to neutralize contaminated feed (Abd El-Hack *et al*., 2018; Awuchi *et al*., 2021. This study focuses on evaluating the effectiveness of three selected herbal plants: *Moringa oleifera* (Moringa), *Allium sativum* (garlic), and *Azadirachta indica* (neem), in neutralizing feed contaminated with rat faeces.

Materials and Methods

Plant Selection

The herbal plants were chosen based on their known medicinal and antimicrobial properties. *Moringa oleifera* is widely recognized for its high antioxidant and antimicrobial activity (Tekle *et al*., 2015), while *Allium sativum* has been shown to possess antibacterial and antifungal properties (Fufa, 2019; Bhatwalkar *et al*., 2021). *Azadirachta indica* is another herb plant that is known for its wide range of bioactive compounds and has demonstrated efficacy against various microbial pathogens (Wylie & Merrell, 2022).

Feed Contamination

Fresh rat faeces were collected from a controlled environment (the rats were put in a cage). The faeces were mixed with commercial poultry feed at a contamination ratio of 1:10 (faeces by weight). This ratio was chosen to simulate typical levels of contamination encountered in practical farming conditions.

Preparation of Herbal Extracts

Aqueous extracts of *Moringa oleifera, Allium sativum, and Azadirachta indica* were prepared by softening the plant leaves (Moringa), bulbs (garlic), and seeds (neem) in distilled water overnight and filtering the mixture through cheesecloth. The concentration levels of inclusion of the extracts used were 10%, 20%, and 30%, the levels were obtained based on preliminary trials and literature recommendations (Heinrich *et al*., 2022).

Experimental Design

The contaminated feed was divided into four treatment groups, T1 is the control which was free from faecal contamination while the other treatments were replicated three times each according to the levels of contamination as presented below;

- Control group (T1)**:** Feed contaminated with rat faeces, no herbal treatment.
- Treatment 1 (T2)**:** Feed contaminated with rat faeces, treated with *Moringa oleifera* extract at 10%, 20%, and 30%, respectively.
- Treatment 2 (T3): Feed contaminated with rat faeces, treated with *Allium sativum* extract at 10%, 20%, and 30%, respectively.
- Treatment 3 (T4): Feed contaminated with rat faeces, treated with *Azadirachta indica* extract at 10%, 20%, and 30%, respectively.

Each group was prepared in triplicates, and the samples were incubated at room temperature for 48 hours to allow the herbal extracts to interact with the contaminated feed.

Microbial Analysis

Microbial contamination was quantified using standard plate count methods. The total microbial load (bacteria and fungi) was assessed by culturing samples on nutrient agar and potato dextrose agar, respectively. The colony-forming units (CFU) were counted and expressed as log10 CFU/g of feed.

Mycotoxin Analysis

Mycotoxin levels were determined using high-performance liquid chromatography (HPLC) for common contaminants such as aflatoxin B1 and ochratoxin A, following the methodology described by Ekwomadu *et al*. (2021).

Statistical Analysis

All data collected were analysed using a one-way analysis of variance (ANOVA) with Tukey's post-hoc test for multiple comparisons. A significance level of $p < 0.05$ was considered for all analyses.

Results and Discussions

Microbial Load Reduction

The results revealed a significant reduction in microbial load across all herbal treatments. Feed treated with *Moringa oleifera* extract recorded the highest concentration (30%) and showed the most substantial reduction, with a decrease of 98% in bacterial load and 92% in fungal contamination as compared to the control group. *Allium sativum* values showed a close related, with reductions of 95% in bacteria and 89% in fungi at the 30% concentration. *Azadirachta indica* also demonstrated a positive effect, with reductions of 85% in bacteria and 81% in fungi at the highest concentration, the findings of the study conform with the results obtained by (Lima *et al*., 2021; Brar, 2022) while Habeeb *et al*. (2022) disagree with the finding of the study. Table 1 presents the effect of the herb plant on the bacterial and fungal count.

Table 1. Effect of herb plant on bacterial and fungal count

Treatment	Bacterial Reduction (%)	Fungal Reduction (%)
Control (T1)	0	0
Moringa (T2)	98	92
Garlic (T3)	95	89
Neem (T4)	85	81

Mycotoxin Degradation

HPLC analysis revealed that all herbal treatments significantly reduced the presence of aflatoxin B1 and ochratoxin A. The *Moringa oleifera* extract showed the highest reduction, with a 98% decrease in aflatoxin B1 and a 95% reduction in ochratoxin A. Garlic and neem extracts also exhibited significant reductions, with 92% and 87% reductions in aflatoxin B1, respectively (Table 2).

Table 2. Effects of herb plant on aflatoxin B1 and ochratoxin A

Treatment	Aflatoxin B1 Reduction (%)	Ochratoxin A Reduction (%)
Control (C)	0	0
Moringa (M3)	98	95
Garlic (A3)	92	89
Neem (N3)	87	82

The results of this study support the hypothesis that selected herbal plants can effectively neutralize feed contaminated with rat faeces. The high efficacy of ***Moringa oleifera*** in significantly reducing microbial load and mycotoxin levels aligns with previous studies highlighting its antimicrobial properties (Pinto *et al*., 2023). The presence of bioactive compounds like flavonoids and phenolics in Moringa may explain its superior performance in neutralizing pathogens and toxins (Hashem *et al*., 2023).

Allium sativum also demonstrated considerable antimicrobial activity, consistent with its well-documented effects on pathogens such as *Salmonella* and *E. coli* (Sharifi-Rad, 2016). This may be attributed to the presence of sulfur-containing compounds like allicin, which exhibit strong antimicrobial and detoxifying properties.

Azadirachta indica, while less potent than Moringa and Garlic, still showed significant activity, which is likely due to its broad spectrum of bioactive compounds, including azadirachtin and nimbolide, known for their insecticidal and antimicrobial properties (Ilyas et al., 2021).

The reduction in microbial contamination and mycotoxin levels suggests that these plants may not only help in cleaning up contaminated feed but could also contribute to improved animal health, as mycotoxins are known to have detrimental effects on the immune system and liver function (Sharma & Sumbali, 2022).

Conclusion

The study provides compelling evidence that herbal plants such as *Moringa oleifera*, *Allium sativum*, and *Azadirachta indica* can effectively neutralize feed contaminated with rat faeces by reducing microbial contamination and mycotoxin levels. Among the three, *Moringa oleifera* was the most effective, followed by *Allium sativum and Azadirachta indica*. These findings suggest that herbal treatments could offer a natural and safe alternative to chemical decontaminants, promoting healthier livestock and safer animal products.

Future research should explore the long-term effects of these herbal treatments on animal health and productivity, as well as the optimal application methods for commercial farming systems.

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