EFFECT OF GAMMA IRRADIATION ON SOME MICROORGANISMS CONTAMINATING ANIMAL FEEDS

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Abstract

Microlrial determination in animal feeds produced in Egypt or fish meal imported from abrood was carried out Gamma irradiation with the dose 20KGY sterilized the pathogens, while 5 KGY destroyed them all. The microbes experimented were sporeformers, yeast and molds, *Staphylococcus owreus* and *Streptococcus feacalis.*

INTRODUCTION

The need for animal feeds has iricreased with the expansion of animal farms and the deficiency in animal protein production in Egypt. It has been reported howerver that animal feeds and their components especially fish, meat-bone and blood meals are the main factors of contamination with pathogenic microorganisms. These pathogens can cause diseases in poultry and other animals (Smith, 1970). For this reason great attention must be given to high quality animal feed.

Sterilisation of this feed can be achieved by heating which might also cause destruction of feed components (vitamines and/ or proteins). Also, it is not always easy or feasible to destroy pathogenes in horn meal and crushed bones (Egyum, 1969). Fumigation by chemicals also causes health hazard to workers and toxings still remained. Gamma irradiation was found to require low energy in comparison with heating (Hansen, 1966; Ley *et al.*, 1969).

(*) : National Centre for for Rediation Rearch & Techonlogy, Atomic Energy Authority, Cairo-Egypt.

Farag (1982) found that the initial microbial counts were $4.4X10^5$, $2.1X10^4$ and $7.0 X 10^3$ cells / gm for blood, meat andfish meals, respectively . El-Zawahry *et al.* (1985) found that total bacterial counts ranged between $2.2X10^3$ and $2.1X10^4$ cells / gm for 3 examined poultry feed samples. The isolate species belonged to families *Bacillaceae, Micrococcaceae, Pseudomonadaceae and Entrobacteriaceae.*

Farage, (1982) found that irradiation dose of 5.0 KGY reduced the initial bacterial counts of blood meal by 2 10g cycles, by one log cycle for the counts of meat, and destroyed all the counts of fish meal. El-Zawahry et al. (1985) reported that 20 KGY were required for complete inhibition of poultry feed flora.

MATERIALS AND METHODS

Samplin

Soybean meal was secured from the Egyptian Company for Poultry. Fish meal was imported. Meat-bone meal was secured from th eMechanical Slaughter, Gerco Company (El-Basatein). Blood meal was obtained from the organic Fertilizers Company. Three samples from the aforementioned types were left for comparison. The samples were exposed to the dosages 5.0, 10.0 , 12.5 and 20.0 KGY of gamma irradiation, and the dose rate of the source was 0.08 KGY/SEC. The irradiation facility used was the Egyptian Industrial Mage Gamma Irradiation.

Microbiological estimations

30 g of ground sample were homogenized in 270 ml of 0.1% peptone water for 5 mimutes in a strile blender jar. Serial dilutions up to 10^8 of the homogenate were used. Aerobic plate count and aerobic sporeformers after pasteurisation at 80°C for 15 minutes were done on stanard plate count agar and incubated at 37°C for 48 h. Yeast and mold were coundted on malt extract agar (Difico Manual, 1977) at 25°C for 5 days. *Staphylococcus aureus* was grown on staphylococcus medium No. 110 (Difico, 1977) and Strep. faecalis on Kanamycin aesculine azide agar (Oxoid Manual, 1982). Both species were grown at 37°C for 24 h.

RESULTS AND DISCUSSION

Data tabulated in Table 1 show that the dose of 5.0 KGY gamma irradiation had reduced thae initial total bacterial counts between one and three log cycles. The

highest reduction accurred in meat-bone meal, wile intermediate reduction occurred in blood and fish meals. Counts in soybean however, had shown the highest resistance to this dose. Increasing the dose to 10.0 KGY increased the reduction by nearly 1-2 log cycle, while the dose 12.5 increased the reduction by two log cycles. The dose 20.0 KGY completly reduced microles detected in the intial counts. This is in agreement with the findings of Aziz (1982) and El-Zawahry *et al.* (1985) who reported a reduction by 1-210g cycle for 5.0 KGY and a severe reduction with the doses ranging between10.0-20.0 KGY.

Table 1 indicates that the aerobic sporeforming bacteria was the most resistant species among the other examined microorganisms. This is in accordance with the results of Ito *et al.* (1985). The reduction by different doses almost showed the same trend observed with the total bacterial counts, since the application of 12.5 KGY nearly had a lethal effect with aerobic sporeformers.

As shown in Table 1, yeast and mold were completely destroyed with the doses 12.5 and 20.0 KGY. On the other hand 5.0 KGY was sufficient to destroy the examined pathogenes. This is in agreement with the findings of Ley *et al.* (1969), Ito *et al.* (1981).

Table 1. Effect of gamma irradiation on microbial counts of animal feed components (counts/gm)

Animal feed components	irradiation dose (KGY)				
	0.0	55.0	10.0	12.5	20.0
Total microbial counts					
Soybean meal	$7.9x10^6$	$3.5x10^5$	$1.5x10^3$	$4.8x10^2$	0.0
Fish meal	$4.5x10^6$	$2.6x10^3$	$2.0x10^2$	0.0	0.0
Meat-bone meal	$7.0x10^4$	$7.0x10^2$	$4.0x10^2$	0.0	0.0
Blood meal	$3.0x10^5$	$3.5x10^3$	$3.0x10^2$	0.0	0.0
Sporeformers					
Soybean meal	$1.3x10^6$	$3.6x10^3$	$6.0x10^2$	$1.5x10^1$	0.0
Fish meal	$2.0x10^4$	$1.0x10^3$	$1.0x10^2$	0.0	0.0
Meat-bone meal	$1.0x10^3$	$2.5x10^2$	$1.5x10^2$	0.0	0.0
Blood meal	$4.0x10^4$	$3.0x10^3$	$6.0x10^2$	0.0	0.0
Yeast & molds					
Soybean meal	$2.2x10^4$	$2.5x10^2$	$4.0x10^1$	0.0	0.0
Fish meal	$3.5x10^3$	$2.0x10^2$	$3.0x10^1$	0.0	0.0
Meat-bone meal	$2.0x10^3$	$2.0x10^2$	$2.0x10^1$	0.0	0.0
Blood meal	$3.0x10^3$	$1.5x10^2$	$2.0x10^1$	0.0	0.0
Staphylococcus aureus					
Soybean meal	$1.0x10^4$	0.0	0.0	0.0	0.0
Fish meal	$2.0x10^2$	0.0	0.0	0.0	0.0
Meat-bone meal	$2.0x10^2$	0.0	0.0	0.0	0.0
Blood meal	$3.0x10^2$	0.0	0.0	0.0	0.0
Staphylococcus faecalis					
Soybean meal	$1.0x10^5$	0.0	0.0	0.0	0.0
Fish meal	$2.0x10^2$	0.0	0.0	0.0	0.0
Meat-bone meal	$2.5x10^2$	0.0	0.0	0.0	0.0
Blood meal	$2.2x10^2$	0.0	0.0	0.0	0.0

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تأثير اشعة جاما علي الكائنات الحية الدقيقة الملوثة للاغذية الحيوانية

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أجريت دراسة تأثير اشعة جاما بجرعات ١٠,٥ ، ١٢,٥ ، ٢٠ كيلو جراي بمعدل ٠,,٨ كيلو جراي / ث بغرض ازالة الميكروبات الملوثة للاغذية الحيوانية سواء الميكروبات المرضية أو المتجرثمة او الخمائر او الفطريات وذلك لتقدير انسب هذه الجرعات. وقد تمت هذه الدراسة بهدف الحصول علي لحوم حيوانات او دواجن خالية من الميكروبات المرضية يسهل استخدامها بعد ذلك في الحصول علي منتجات مصنفة ذات جودة عالية. وكانت عينات مكونات الاعلاف المستخدمة الحبوب مثل مطحون فول الصويا ومخلفات المجازر مثل مسحوق عظام اللحوم ومسحوق الدم ومخلفات تصنيع الأسماك (مسحوق السمك).

وكانت الميكروبات المختبرة هي المتجرثمة الهوائية، والفطريات والخمائر ، والاستافيلوكوكس أوريس ، الاستربتوكوكس فيكاليس ، والعدد الكلي . وأظهرت النتائج ان الجرعة ٢٠ كيلو جراي والتي كانت اقل نسبيا في الفعالية لكنها أزالت تقريبا معظم المجموعة ماعدا الميكروبات المتجرثمة الهوائية ، وأزالت الجرعة ٥,٠ كيلو جراي تماما الميكروبات المرضية المختبرة.

وتظهر من الدراسة أن جرعة ٢٠ كيلو جراي لها تأثير معقم علي الميكروبات ويمكن استخدامها في الحصول علي عليقة نظيفة وبالتالي تحقيق لحوم خالية من الميكروبات المرضية.