EFFECTS OF GAMMA IRRADIATION IN THE CONTROL OF MICROBIAL QUALITY IN REFRIGERATED OSTRICH MEAT IN IRAN.

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Key words: ostrich meat, microbial analysis, gamma irradiation, refrigeration

Introduction:

The ostrich meat is an important protein and Iron source. It contains low amount of cholesterol and high unsaturated fatty acid and it's consumption is useful for heart-sick, athletes, pregnant women, children and elders. Irradiation is commended as a safe and effective food processing method that can reduce the risk of food poisoning and preserve foods without detriment to health and with minimum effect on nutritional quality. (Lacroix et al, 2000) recognized and reported that gamma irradiation in low doses, below lo KGy, kill most organisms without deterioration of food quality. A combination of hurdles can ensure stability, microbial safety of food. The most important hurdles used in food preservation are temperature (high or low), water activity (aw), pH, rodox potential, preservatives and irradiation. The possibility of combining the antimicrobial effects of irradiation and refrigeration storage has shown promise with ground chicken breast on the some pathogens. (Spoto et al, 2000) In this study the effects of gamma irradiation (0,2,4,6 KGY) in ostrich meat and it's effect on extending shelf life in refrigerator condition ($4 \pm 1^{0}c$) on (0,10,20,30 days) storage were examined. And set out to evaluate the possibility of using irradiation to control food borne pathogenic bacteria.

Material and methods

Black neck ostriches at 10-14 months and male were slaughtered in local abattoir (Golbarg Tooba Farm, Saveh, Iran) and meat samples (120 ± 3gr) were select and packaged in polyethylene pouches, which where rapidly sealed by heat and transported for irradiation. Gamma irradiation was carried out in cobalt-60 irradiator (Gamma cell, PX-30, dose rate= 0.55 Gy/S, Atomic Energy of Iran, Karaj Nuclear Research center for Agriculture and Medicine, Karaj-Iran). The dose rate was stablished using ferrous sulfate/cupric sulfate dosimeters.The experimental design including a control (0) and 3 doses of gamma radiation (2,4,6, KGY) along with 4 periods of storage under refrigeration (0,10,20,30 days) with 3 replicates in each treatment.At the time of microbiological analysis, 10 gr of ostrich meat samples were removed aseptically from each pouches to prepare of 10 fold serial dilution in 0.1% peptone water. Colony forming units of total aerobic mesophilic and psychrophilic bacteria were determined by surface plating on Nutrient Ager at 35°C/1-2days and 7°C/1-2days respectively (AOAC). Coliform count was done by pourplating method on melted violet red bile agar at 37°C/1-2days (AOAC). Count and detecting of Ecoli were determined with Brilliant Green Lactose Bile broth and peptone water at 44°C/1-2days and confirmed by covaks indicator (AOAC). For staphylococcus aureus count were used Baird parker Agar at 35°C/1-2days and confirmed by coagulase test (vanderzant and splittstrosser) At last for isolation of salmonella spp was carried out using preenrichment media (Loctose broth37°C/1-2days) selective enrichment in (selinate broth 37°C/1-2days and tetrathionate borth44°C/1-2days respectively), then, the cultures were streaked on enrichment media (Brilliant Green Agar and Salmonella- Shigella Agar 37°C/1-2days) and the colonies were biochemically examined in Triple Sugar Iron Agar and Lysine Decarboxylase Broth (Iso 1978).

Results and discussion:

According to the ANOVA analysis, the number of aerobic plate count and psychophilic bacteria decreased with increase of irradiation dose. In the way that, during storage and at 4,6 KGY these microorganisms significantly ($P<0.05$) decrease in compared with control. (table 1). Pervious work by katta et al (1991) appeared that an irradiation dose of 2 KGY or more inactivated %99 of microbial loads on chicken carcass. On the other hand, irradiation at 1.5 and 3 KGY significantly reduced the counts of aerobic mesophilic bacteria, psychrophilic bacteria and molds and yeast and prolonged the refrigerated shelf life of samples to 12 and 21 days, respectively, compared to non irradiated control (Badr, 2004). In present study irradiation at 2,4,6 KGY significantly ($p<0.05$) reduced the counts of coliform and S.aureus in ostrich meat samples in compared with control treatment during the orange (fig 1,2). Finally, salmonella was found in two non-irradiated samples and also Escherichia coli in all control samples was positive, however at irradiated samples wasn't salmonella or E.coli observed. Low dose between 2 and 3 KGY are extremely effective in reducing salmonella levels in poultry (Katta, etal 1991). In study of Grolichova et al (2004) radiation treatment at doses of 2-7 KGY can effectively eliminate potentially pathogenic non-spore-forming bacteria such as salmonella, S. aureus and Ecoli. Also, the dose of 2KGY was

sufficient to eliminate the coliform and Ecoli and 4 KGY was sufficient for staphylococcus spp in raw meat ball. In spoto et al (2000) study, the increased radiation dose and period of storage under refrigeration caused a reduction of s.aureus, Ecoli and sal. typhimorium and dose of 6 KGY kept the chicken breast within the microbiological limits, for up to 28 days under refrigeration (Yildirim et al 2004).

Table 1: Microbial means for control (0.00 KGY) and irradiated (2,4,6 KGY) Ostrich meat during refrigerated storage (0,10,20,30 days)

Variable type								
	Total aerobic mesophilic count (cfu/g) (Mean ± SE)				**coli form count (cfu/g) (Meant ± SE)**			
	0.0	**2**	**4**	**6**	**0.0**	**2**	**4**	**6**
Irradiation Dose (KGY)								
Time (days)								
0	**4.68±0.49**	**0**	**0**	**0**	**2.77±0.27**	**0**	**0**	**0**
10	**6.79±0.38**	**2.19±0.22**	**2.88±1.68**	**2.92±1**	**5.25±0.34**	**1.90±0.67**	**0**	**0**
20	**8.81±0.11**	**7.81±0.12**	**6.72±0.43**	**5.94±0.11**	**6.43±0.22**	**2.96±1.12**	**0.92±0.93**	**0.61±0.62**
30	**9.28±0.26**	**8.05±0.18**	**8±0.93**	**7.06±1.09**	**7.44±0.4**	**3.72±1.42**	**3.28±1.34**	**3.81±0.77**

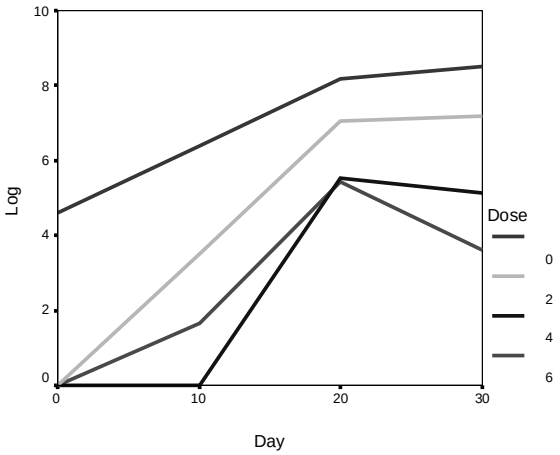

Fig 1: Psychrophilic count for control (0.00) and irradiated (0,2,4,6, KGY) ostrich meat during refrigerated storage (0,10,20,30 days).

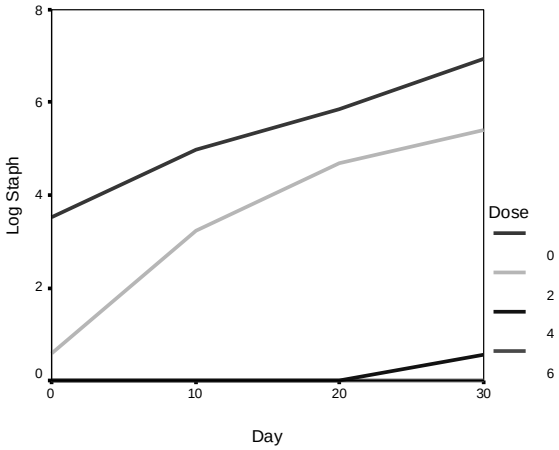

Fig 2: S. aureus count for control (0.00) and irradiated (0,2,4,6, KGY) ostrich meat during refrigerated storage (0,10,20,30 days).

Conclusion:

In conclusion; low irradiation dose of 2 KGY can be effective to control bacterial pathogens such as S.aureus, salmonella, Coliform, Ecoli; and 4 KGY can be effective to eliminate total aerobic mesophilic bacteria and psychrophlic bacteria in ostrich meat through the refrigeration storage (0,10,20,30 days).

References

1. AOAC (1995) Official methods of analysis (16th ed). Arlington: Association of official analytical chemists.
2.Badr, H.M(2004) Use of irradiation to control foodborne pathogens and extend the refrigerated market life of rabbit meat. Meat science 67 (4), 541-548.
3. Farkas, J(1998) Irradiation as a method for decontamination food. Internationl Journal of food microbiology (44): 819-204.
4. Grolichova, M; Dvorak, P and Musilova, H (2004) Employing ionizing radiation to enhance food safety. Acta vet. BRNO. (73): 143-149.
5. Katta, S.R, Rao, D.R, Sunki, G.R and Chawan, C.B (1991) Effect of gamma irradiation of whole chicken carcasses on bacterial loads and fatty acids. Journal of food science. 56(2), 371-372.
6. Lacroix, M and Quattara, B (2000) Combined Industrial process irradiation to assue innocuity and preservation of food products-a review. Food Research International. (33): 719-724.
7. Leistener, L. (2000) Basics aspects of food preservation by hurdle technology. International Journal of food microbiology. (55): 89-96.
8. Spoto, M.H.F; Gallo, C.R; Alcarde, A.R; Guragel, M.S.A; Blumer, L; Walder , M.M; Domarco, R.E (2000) Gamma irradiation in the control of pathogenic bacteria in refrigerated ground chichen meat. Sci.agric. 3 (57):1-
9. Vanderzant, C. and splittstroesser, D.F (1992) Compendium of methods for the microbilogical examination of foods. 3 ed. Washington: American public Health Association, 1219 p.
10. Yildirim, I; Uzunlu, s and Topuz, A (2004) Effects of gamma irradiation on some principle microbiological and chemical quality parameters of raw Turkish meat ball. Food control. (16): 363-36