P3TIR/P.64/2000

PENGEMBANGAN MAKANAN SIAP SAJI DENGAN PROSES RADIASI : AYAM OLAHAN

Z.Irawati, M.Maha, N.Ansori,C.M.Nurcahya, and F.Anas

PENGEMBANGAN MAKANAN SIAP SAJI DENGAN PROSES RADIASI: AYAM OLAHAN.

Z.Irawati , M.Maha, N. Ansori, C.M.Nurcahya dan F. Anas.

Pusat Penelitian dan Pengembangan Teknologi Isotop dan Radiasi, Badan Tenaga Nuklir Nasional, Jl. Cinere Ps. Jumat, PO Box 7002 Jakarta 12070.

ABSTRAK

PENGEMBANGAN MAKANAN SIAP SAJI DENGAN PROSES RADIASI: AYAM OLAHAN. Pengembangan makanan siap saji perlu dilakukan selain untuk mengurangi ketergantungan fasilitas pendingin selama penyimpanan adalah juga untuk memenuhi kebutuhan pasien rumah sakit yang memiliki tingkat kekebalan tubuh rendah. Studi ini dilakukan untuk mengembangkan metode pengawetan makanan siap saji dari ayam olahan dengan teknik sterilisasi radiasi sinar gamma. Ayam segar dipotong-potong kemudian dicuci dengan air kran, dicampur dengan bumbu dan didiamkan selama 2 jam. Potongan ayam tersebut kemudian dibungkus dengan daun pisang, dan dikukus pada suhu 120°C selama 1 jam, lalu ditiriskan dan selanjutnya diangin-anginkan pada suhu 28±2°C. Persiapan yang dilakukan pada pembuatan opor, semur dan kare ayam agak berbeda dengan pembuatan pepes ayam. Pepes, opor, semur dan kare ayam setelah dikemas vakum dalam kemasan laminasi kemudian dibekukan semalam di dalam lemari pendingin, lalu diiradiasi dengan dosis 45 kGy pada suhu rendah. Hasil yang diperoleh menunjukkan bahwa produk steril yang dikemas secara vakum dalam kantong laminasi PET/adh/Al-foil/ LLDPE lalu disimpan selama 18 bulan, dan produk ayam yang dikemas di dalam kemasan pembanding PET/Adh/Methalized PET/ LLDPE kemudian disimpan selama 12 bulan dapat diterima oleh panelis. Hasil pengujian secara objektif terhadap parameter kadar air, kadar protein, kadar lemak, pH dan vitamin pada sampel yang diamati tidak menunjukkan perbedaan yang berarti selama penyimpanan. Daun pisang sebagai bahan pembungkus bagian dalam pada pembuatan pepes ayam dengan dosis sterilisasi radiasi berperanan penting sebagai penahan bau radiasi yang akan pindah ke dalam produk ayam tersebut baik segera setelah iradiasi maupun selama penyimpanan.

Kata kunci : ayam olahan, makanan siap saji, sterilisasi radiasi.

DEVELOPMENT OF SHELF-STABLE FOODS THROUGH IRRADIATION PROCESSING : CHICKEN DISHES

Z.Irawati, M.Maha, N.Ansori, C.M.Nurcahya, and F.Anas

Centre for Research and Development of Isotopes and Radiation Technology
National Nuclear Energy Agency, Jakarta.

ABSTRACT

Development of safe-shelf stable foods are necessary to reduce dependence on refrigeration facility during storage. This study was conducted to develop preparation of the shelf-stable chicken dishes using γ-radiation sterilization technique with the minimum dose of 45 kGy under cryogenic condition. Chicken was cut into pieces then washed with tap water, mixed with seasoning and kept for 2 h. Chicken pepes was individually wrapped with banana leaf, steamed at 120°C, drained and cooled down at (28± 2°C) then kept in a freezer over night. Preparation of chicken opor, semur and curry casserole differed slightly from pepes. All chicken dishes were finally packed in a laminate packaging materials prior to irradiation. The results revealed that the sterile samples vacuum packed in a dry lamination slitting-three-sealed bag making of PET 12μ /LDPE adh.2μ /Al-foil 7μ /LDPE adh./LLDPE (C_4) 50μ and a comparative laminate of PET 12μ /PE 20μ /Alu-Metalized PET 12μ /adh/LLDPE (C_8) 50μ pouches and stored at room temperature (28± 2°C) up to 18 and 12 months respectively, were still acceptable by the panelists. No significant changes on objective assessments, i.e., moisture content, total protein content, fat content, pH, and vitamins were found in all sterile samples during storage. Banana leaf as inner wrapper packaging material for making radiation sterilized chicken pepes plays an important role in order to prevent radiation-odour moving in the products both immediate after processing and during storage.

Key words : chicken dishes,. irradiation, shelf-stable foods, sterilization.

INTRODUCTION

Chicken pepes, and other chicken casserole dishes like opor, semur and curry are the name of ethnic dishes which are popular in certain parts of Indonesia. Chicken pepes are mostly popular in West Java, and traditionally pepes is prepared by mixing chicken with seasoning or spices mixture, wrapped in banana leaf, then cooked until well-done or up to bone softning. Basically, type of seasonings used for chicken casserole dishes are the same as for pepes, but the preparation are different. An emulsifier, xanthan, and coconut milk are added into each type of chicken casserole dishes during process then cooked until well done. As the moisture content is high, i.e., 60-70%, these products spoil very fast at room temperature. The seasoning used in different places may differ in composition, but usually it contains candle nut or shredded coconut. Some ethnic dishes producers of home and industries level have asked about the possibility of using irradiation for extending the shelf-life of these products. A previous study conducted at the Centre indicated that goldfish pepes irradiated at 7.5 kGy can be stored for more than 15 days at room temperature (1). Irradiation at higher doses caused significant effect on the sensory properties of the fish, since the product was air packed and irradiated at room temperature. Irradiation in vacuum pack at cryogenic temperature using sterilization dose to produce shelf-stable foods had been developed successfully by several investigators (2,3,4 and 5, and 6).

Development of safe shelf-stable foods are necessary to reduce dependence on refrigeration facility during storage, marketing and distribution of perishable food products, which is relatively very costly for developing countries. Sterile shelf-stable foods are urgently needed for hospital patients treated in sterile condition (7), in addition to various outdoor use, such as for pilgrimage, hiking, camping, boating and emergency packs.

This study was done to develop preparation of shelf-stable chicken dishes using radiation sterilization technique, in order to promote the product to be marketed and distributed widely without refrigeration under tropical condition.

MATERIALS AND METHODS

Materials

Undebones chicken meat purchased from local market was used as material for chicken dishes preparation such as pepes, opor semur and curry. The quantity of chicken used for each type of dishes was 10 kg or about 120 pieces. The packaging materials used were banana leaf as inner-liner, for chicken pepes only, aluminium foil laminate PET 12μ /LDPE as adh.2μ/Al-foil 7μ /LDPE as adh./LLDPE 50μ , was used as outer pack. As a comparative, other type of laminate PET 12μ /PE 20μ /Alu-Metalized PET 12μ /adh//LLDPE 50μ was used during the study and the individual pouch size was 21 x 17 cm^2 .The ingredients need for seasoning per 1 kg of chicken for pepes, opor, semur and curry respectively is presented in Table 1.Styroform boxes used for irradiating chicken dishes were uniform in outside size : height x width x length = 33.75 x 36.25 x 51.25 cm^3. A pressure cooker used during the work was an Inoxpran, with a special sandwich bottom for heat diffusion pan. Vacuum seal machine used was a Multivac Type/Model A-500/12 under 800 mBar.

Sample Preparation and Treatments

Chicken pepes

Chicken was cut into pieces, washed with tap water, mixed with seasoning and kept for 2 h. After soaking in the seasoning (Table 1) chicken cutting were individually wrapped in banana leaf, 2 pieces/pack, steamed in a pressure cooker (1 h, 120°C), drained and cooled at room temperature (28-30°C), then kept in a freezer (13°C) overnight. The frozen chicken pepes was then individually vacuum packed in PET/Al-foil/LLDPE laminate pouch and PET/Metalized-PET/LLDPE laminate pouch then kept in styrofoam box filled with dry ice, sealed overnight prior to radiation exposure. The irradiation was carried out at a 45 kGy minimum dose. Sterilization dose of each food item was determined according to the AAMI (Association for the Advancement of Medical Instrumentation) or ISO/DIS 11137.2 (8) methods based on its bioburden. Temperature during irradiation was maintained under the cryogenic condition. Irradiated samples were stored at room temperature during storage.

Microbial assessments and sterility test

Microbial assessments were done in each step of the process to determine the microbial load of chicken cuttings, tap water and the ground seasoning. Microbial load was enumerated in Tryptic Soya Agar media after incubation at 30°C for 7 days.

Sterility test of chicken dishes were done by putting the sample aseptically into sterile Thyo Glycolate Broth, then incubated at room temperature up to 212 days. Sterility test was carried out on the sample before and after storage.

Moisture content

Moisture content was determined gravimetrically by drying the samples in an oven at 105°C for 1.5 h. Total protein content was measured by means of spectrophotometry using biuret method. Determination of fat content was done by extraction using petroleum benzene (60-80°C) as solvent for 5 h. The pH was measured using a Microcomputer pH meter LEC 60.

Vitamins analysis of chicken pepes

Vitamin B_1 and E of chicken pepes were measured chromatographically using μ-Bondapack C_{18} and silica columns respectively.

Sensory evaluations

Organoleptic test was done by 5-10 selected panelists using a 5-point hedonic scales. A score of 5 = excellent , 4 = good, 3 = fair, 2 = poor and 1 = extremely poor.

RESULTS AND DISCUSSION

Results of microbial assessments on tap water, ground seasonings of chicken dishes after each step of processing before and after sterilization is presented in Table 2. The data shows that all the materials used for chicken dishes contain microbes in the order of 10^2 - 10^4 cfu/g. Steaming and cooking for 1 h still contain microbes i.e., spore forming bacillus in order of 10^2 cfu/g. This result indicates that the presence of the bacteria will contaminate the chicken products quickly. The sterility test of irradiated all chicken dishes before and after 12 months of storage revealed that irradiation at 45 kGy could sterilize these products.

TABLE 1. THE INGREDIENTS NEED FOR SEASONING (g/1 kg CHICKEN) FOR PEPES,OPOR,SEMUR, AND CURRY

Type of ingredient/seasonings	Quantity (g)/1 kg chicken			
	Pepes	Opor	Semur	Curry
Alpina galanga	20	20	15	-
Bay leaf	2 pcs	2 pcs	-	-
Candle nut	40	5	2	-
Caraway sed	-	2	1.5	-
Chili (*rawit*)	10	-	-	-
Cinnamon	-	1 pcs	-	-
Citrus hystrix	2 pcs	-	-	-
Clover	-	1 pcs	-	-
Coconut milk	-	0.5 pcs	0.5 pcs	-
Coriander	-	10	5	-
Fragrant grass leaf	1	2 pcs	2 pcs	-
Garlic	10	10	10	30
Ginger	20	2	20	-
Javanese tamarind	-	0.5	5	-
Lemon	1 pcs	-	-	-
Nutmeg	-	-	-	1 pcs
Palm oil	-	20	-	-
Red chili	-	-	-	6 pcs
Salt	30	15	15	10
Shallot	50	20	20	50
Sweet soy sauce	-	-	120 cc	-
Tumeric	15	-	-	-
White pepper	-	5	10	-
Xanthan	-	5	5	10

TABLE 2. MICROBIAL LOAD OF TAP WATER, SEASONING CHICKEN MEAT AT EACH STEP OF PROCESSING

Sample	Total plate count (cfu/g)*	
	aerob	anaerob
Tap water (not portable)	3.90×10^2	1.86×10^2
Ground seasoning	2.30×10^3	1.15×10^3
Chicken meat after washing with tap water	2.68×10^3	1.60×10^3
Chicken meat after soaking in seasoning for pepes preparation	3.90×10^4	1.20×10^4
Chicken meat after soaking in seasoning for opor prepration	6.30×10^5	-
Chicken meat after soaking in seasoning semur preparation	2.80×10^5	-
Chicken meat after soaking in seasoning for curry preparation	3.90×10^4	-
Chicken meat after soaking then stored at freezer temp. overnight		
Chicken pepes	1.95×10^2	1.20×10^2
Chicken opor	1.04×10^2	-
Chicken semur	4.50×10^2	-
Chicken curry	2.10×10^2	-
Irradiated all types of chicken dishes as final product (TPC) without storage at room temperature	0	0

* Average of 3 replications

TABLE 3. RESULTS OF MOISTURE CONTENT, PROTEIN CONTENT, FAT CONTENT, AND pH MEASUREMENTS* OF RADIATION-STERILIZED CHICKEN DISHES STORED FOR 18 MONTHS AT ROOM TEMPERATURE

Chicken dishes	Duration (month)	Moisture content (%)	Protein content (%)	Fat content (%)	pH
Pepes	0	57.39	15.25	31.19	6.25
	6	57.20	15.35	32.25	5.95
	12	56.90	15.16	30.16	5.75
	18	56.40	15.15	29.85	5.25
Opor	0	59.84	17.75	9.07	5.75
	6	59.44	17.50	8.48	5.50
	12	58.60	17.45	8.45	5.00
	18**	-	-	-	-
Semur	0	49.79	17.60	6.49	5.35
	6	49.51	17.45	6.36	5.00
	12	48.47	17.40	6.30	5.00
	18	47.98	17.35	6.25	4.80
Curry	0	60.79	16.85	7.35	5.55
	6	59.84	16.80	7.10	5.25
	12	58.29	16.65	7.05	5.10
	18	57.67	16.50	7.10	4.75

* Average of 3 replications
** Package defect