POST–DEHYDRATION SHELF LIFE EXTENSION OF FRUITS AND NUTS

Abdus Sattar, Muhammad Wahid and Mohammad Jan

(Nuclear Institute for Food and Agriculture, Peshawar, Pakistan)

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ABSTRACT

Post– dehydration storage life of fruits and plant nuts such as apricot, raisin, date, fig, almond, peanut, pinenut and walnut, was studied. The results showed that radiation dose of 1.0 kGy completely inhibited insect infestation. Low dose radiation (0.25kGy) plus 20°C and vacuum extended the storage life for 6 and 12 months in dry nuts and fruits respectively without affecting nutritional quality except ascorbic acid. Packaging in opaque pouches under vacuum proved better than other treatments in maintaining nutritional and sensoric quality.

Keywords: Radiation Fruits Plant nuts Post– dehydration

I. INTRODUCTION

Historically, dry fruits and plant nuts played a prominent role in the feeding of man and beasts in many countries. They are considered as a major source of income and foreign exchange in many countries. they are an important food for peoples in Northern areas of Pakistan, and useful during space and other military missions. Post– dehydration storage losses of fruits and plant nuts are considered to be well over 15– 20% in Pakistan[1]. They are a concentrated food and widely consumed by people throughout the year. These plant foods are spoiled primarily due to insect infestation, colour deterioration and chemical changes during storage. Radiation treatment had been reported to inhibit insect infestation[1–3]. It was aimed to reduce post– dehydration losses in fruits and nuts during storage using combination methods.

II. MATERIALS AND METHODS

The dry fruits and nuts were obtained from a local wholesale dealer. The material had been imported fresh from Afghanistan. the samples were cleaned, sorted and graded before irradiation and subsequent treatments. In each experiment these foodstuffs were evaluated at regular intervals during storage for insect infestation, biochemical analyses and sensory tests. All the physico– biochemical and sensoric evaluations were made according to standard procedures[4]. The data for each set of experiment were statistically analysed for measuring variation and significance generally at probability of 0.05. Sensory tests were conducted according to Larmond[5]. Simultaneous determination of Cd, Cu, Pb and Zn was carried out in the acid digest by the potentiometric stripping technique[6].

Ⅲ. RESULTS AND DISCUSSION

Initially influence of irradiation doses (0– 1.0 kGy) on the quality of apricot, raisin, fig, date, almond, peanut, pinenut and walnut, was investigated. It was observed that a dose of 1.0 kGy completely inhibited insect infestation without affecting major nutrients and sensoric value (Table 1). Among vitamins, ascorbic acid was found to be radiosensitive. These experiments were followed by temperature dependent studies. The results revealed that post– irradiation storage at 20°C significantly enhanced the storage life of these food materials ($P<0.05$). Nutrient quality of the samples was also well maintained[7].

Table 1

Effect of irradiation on insect infestation

Fruit/nut	Dose (×10 Gy)					Insects
	0	25	50	75	100	
Apricot	100	80	40	20	0	C.cephalonica
Raisin	58	20	10.	5	0	T.castaneum
Date	32	18	12	8	0	T.castaneum
Fig	100	25	17	7	0	C.cautella
Almond	45	40	30	0	0	C.cautella
Peanut	65	50	40	10	0	P.interpuncella
Pinenut	100	80	60	20	0	T.castaneum S.cerealella
Walnut	100	100	100	15	0	T.castaneum S.cerealella

Storage period = 6 months

Table 2

Effect of packaging materials on peroxidation (POV/DAY) of dry nut oils during exposure to fluorescent light

Package	Peroxide value/day (meq/kg)			
	Almond oil	Peanut oil	Pinenut oil	Walnut oil
Exposed	0.82	1.02	1.30	1.57
Unexposed	0.11	0.08	0.20	0.15
Clear class	0.43	0.63	1.02	1.20
Amber glass	0.15	0.10	0.22	0.19
CV	86.8	99.1	81.8	92.3

Initial POV[9] = almond oil 2.8, peanut oil 2.7, pinenut oil 2.6, walnut oil 3.4 meq/kg

Since fresh fruits and nuts are generally dried under sunlight, influence of light and different packages on biochemical quality during storage, was studied. The data showed that opaque packages protected the overall quality better than transparent and translucent wrappers in the cases of dry fruits and nuts as well as dry– nut oil. Light was found have damaging effects on their quality (Table 2). Oxidation of these plant foods results in degradation of vitamins, discoloration and development of oxidized taste. During these reactions, often trace metals are heavily involved as

catalysts. these samples were therefore analysed for selected essential and toxic metals (heavy metals).

Table 3

Concentration of heavy metals in dry fruits and nuts.(μ g/g)[8]

Dry fruits/nuts	Cadmium	Copper	Lead	Zinc
Almonds	0.25	6.19	1.02	22.9
Walnuts	0.113	7.74	0.19	22.2
Pinenuts	0.116	3.93	0.43	8.8
Groundnuts	0.09	2.60	0.49	19.8
Dates	0.08	18.0	0.12	3.9
Apricots	0.10	25.5	0.32	4.8
Raisins	0.02	14.9	0.19	1.7
Figs	0.09	3.9	0.19	2.7

The means of triplicate determinations are shown in Table 3. Plant nuts generally contained higher levels of Zn and Cd than dry fruits while dry fruits had relatively more of Cu. The data for essential trace metals were comparable to those reported in the literature[8]. The joint FAO/WHO expert committee has set tolerable weekly intake limits for Pb and Cd as 3 mg and 315– 330 μ g respectively per person. These results indicated that dry fruits and nuts widely vary in their essential and toxic metal contents. Among nuts and oils, the order of peroxidation was in the order; walnut pinenut peanut almond[9,10]. It was then considered worthwhile to test the controlled atmosphere storage (CA storage) on shelf life of these foodstuffs. The samples after irradiation (1.0 kGy) were kept under air, N_2, CO_2 and vacuum. As a result, it was found that vacuum storage proved better for extending the shelf life than other treatments tested. It was finally concluded that irradiation (1.0 kGy), packaging in light impervious wrappers or containers and subsequent storage at 20°C increased the storage life of dry fruits and plant– nuts for 12 and 6 months respectively.

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