



Abstract of Research Reports

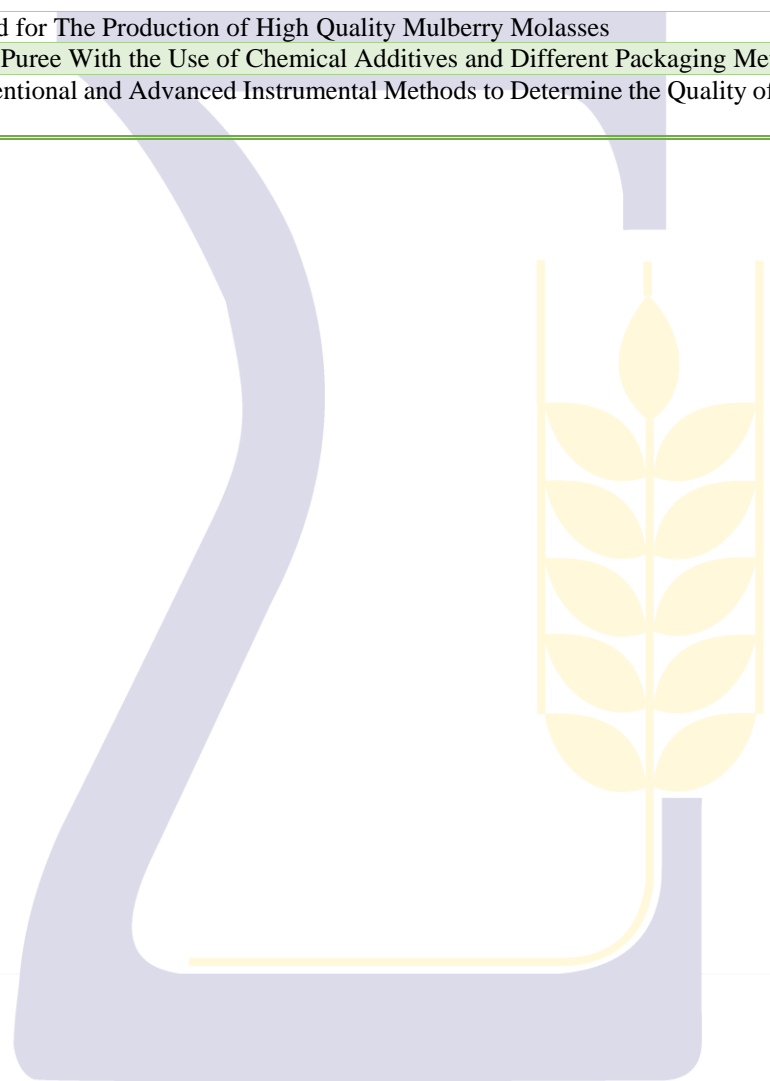
Food Industry & Postharvesting Technologies



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AERI

An analysis of garlic (*Allium sativum* L) production and postharvest care in Iran

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Abstract

The production of garlic in the countries of the world, including Iran, has been rising due to the growth of industrial, pharmaceutical and home use. In addition, the low water requirement of this product and the short period of its growth have been one of the important factors in the cultivation of this product in recent years. According to the latest statistics from the Food and Agricultural Organization, Iran with producing 54,000 tons of garlic generated a contribution of 0.11 percent in global production in 2016. Hamadan, Mazandaran and Zanzan provinces are the main areas of cultivation of this product in Iran. Despite the favorable potential for the garlic marketing, its production is facing barriers such as declining soil fertility and loss of garlic yield due to successive planting, high production costs, input restrictions and price fluctuations, and loss of international markets. In order to cope with these barriers, the garlic production process should be paid more attention and in addition to the issues before harvesting, including the provision of healthy and certified seed, the introduction of cultivars compatible with the garlic cultivation area, proper land preparation, garlic planting in high quality soils and the optimal and timely use of agricultural inputs are taken into harvesting and post harvesting. Timely harvesting has a remarkable effect on marketability and shelf life of garlic, and delays in harvesting of garlic lead to increased prevalence of damage from pests and diseases and increased physical damage to garlic bulbs. In the postharvest stage of garlic, three basic issues, curing, storage and packaging, are important for the final quality and marketing of garlic. This report analyzes the development and improvement of production and enhancement of marketing features of garlic so that it can change traditional methods and production costs and it is possible to gain more share in domestic and foreign markets.

AERI

Present and promotion an appropriate method for the production of high quality dried plum

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Abstract

Plum is one of the most important horticultural products in Iran, which is commonly used as fresh and dried fruit. The fresh plum is sensitive to injuries during transportation, so it is very difficult to export. Therefore, the drying of the plums will allow them to be exported and the markets for the consumption of this food will be expanded. In this research, two varieties of plum Bokhara (Santa Rosa) and Shams were provided from Kharve Nishabour). The samples were transferred to a Sahel Borj industry located in Neyshabur and stored at 4 °C. Plums were immersed in a solution containing 3% ascorbic acid, 3% citric acid and 2% meta bi - sulfite sodium for 3 minutes. After rinsing, the samples were placed in a special tray and dried at 60 °C until reaching to a moisture content of about 8%. Dried plum was vacuum packed in PVC. The specimens were then packed in PVC vinyl chloride packages and stored at room temperature for 6 months. The control sample was produced by the farmers with their traditional method. Chemical tests were performed every 3 months such as determination of total soluble solids TSS, acidity, pH and sulfur dioxide residual, salt, and microbial (total count and mold and yeast). The results showed that immersion of ascorbic acid and citric acid improved the taste, and color of the plum cultivars. The use of meta-bisulfite sodium improves the color and durability of the plum and has the potential of replacing with sulfur dioxide gas. Packing under vacuum conditions in polyamide packages is a good way to produce a high quality, with long shelf life of product.

Keywords: Ascorbic Acid, Citric Acid, Dried plum, Packaging, Sodium meta-bisulfite, Storage

AERI

Determination of Processing the Jam, Marmalad and Juice from Sapota Fruits

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Abstract

Sapota (*Achras zapota*) is a tropical fruit. The fruit has a sweet, soft, brown color in the juice and has about 16-19 sugar. In this research, suitable conditions for the preparation of jam, orange marmalade and fruit juice from Chico were investigated. To obtain the appropriate formulation, the jam was prepared using two formulas of chopped fruit and fruit pulp separately. To reduce pH, lemon juice (3% by weight) was used. The initial test of the taste and color of the resulting jam fruit showed that Chico chopped jam was superior to fruit jam fruit juice in terms of taste and color. The results of statistical analysis of qualitative properties after three months of storage of jam at ambient temperature (25-27°C) showed that during storage, the Brix did not change but pH of the jam was reduced. After two months, the acidity of the jams did not change same as the pH, and after 3 months, acidity increased. In order to obtain suitable formulation for marmalade, the amount of orange concentrate to Chico pulp was used in ratios (0, 5, 10%). The initial test of the taste and color of the product of the marmalade showed that marmalade with a concentration of 10 concentrates in terms of taste and color is better. Qualitative properties after three months of storage of marmalade showed Marmalade Brix did not change but pH has decreased like jam. To make fruit juice, Pulp and water were mixed in equal proportions (weight to volume). The juice was then heated for 120 minutes in a hot water bath for 60 minutes. The fruit juice was centrifuged and filtered. To reduce the pH of the fruit juice and to make the taste, 5 and 10 percent concentrations of orange concentrate were added to the juice and mixed. Chico's juice with 5 orange concentrate has the standard requirements of a fruit drink without gas.

Key word: Jam, Juice, marmalade, Sapota (*Achras zapota*)

AERI

Determination of most Suitable Post-harvest Management of Fresh Salicornia

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Abstract

Salicornia with low water requirement and resistant to drought and salinity is one of the halophyte plants that grows well in saline areas with high salinity and is an important source of nutrients, vitamins and antioxidants. Due to the physiological structure of this plant, its rapid corruption at post-harvest stages causes the destruction and degradation of its nutritional value and increases the post-harvest losses of this plant. Therefore, it is necessary to use appropriate post-harvest and processing treatments in order to increase the shelf-life and maintain the nutritional values of this plant. Since there has been no comprehensive research on the post harvesting technologies of Salicornia in order to increase the shelf-life and fresh quality of the product, processing and variety of its consumption, so, simultaneously with the development of cultivation and production of this plant in different parts of the country, the implementation of this project with the aim of investigating and introducing the most appropriate post-harvest management conditions of this plant was proposed. The use of appropriate post-harvest technologies (including harvesting and collecting correctly and on time, sorting, pre-cooling, temporary storage, packing and storage in appropriate conditions) has a significant effect on the shelf-life and quality of Salicornia compared to the current and usual conditions of the fields. Product storage at ambient temperature (25°C) showed that fresh Salicornia had a good appearance and marketability for up to 3 days. The appearance of Salicornia and its weight loss during storage were done. The results showed that at low temperature (4°C) and suitable relative humidity (90 to 95%), in comparison with temperature and environmental conditions, the apparent, physicochemical and, as a result, salicornia marketability, were better preserved and the product weight loss was lower. The effects of storage time, temperature and their interaction on Salicornia plant weight loss were significant ($P < 0.001$). Furthermore, except for acidity, storage time had a significant effect ($P < 0.001$) on moisture content, respiration rate, salinity and pH of the plant.

Key Words: Cold storage, Packaging, Salicornia, Physico-chemical Properties, Storage conditions

AERI

Postharvest Processing and Storage of Salicornia

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Abstract

Salicornia with low water requirement and resistant to drought and salinity is one of the halophyte plants that grows well in saline areas with high salinity and is an important source of nutrients, vitamins and antioxidants. Its rapid corruption at post-harvest stages causes the destruction and degradation of its nutritional value and increases the post-harvest losses of this plant. Therefore, it is necessary to use appropriate post-harvest and processing treatments in order to increase the shelf-life and maintain the nutritional values of this plant. This project was carried out with the aim of investigating the physico-chemical characteristics and introducing the most suitable storage and processing conditions for this plant. So, firstly, during the field visit, Salicornia's post-harvest management was examined. Then, during studying the amount of mineral elements, metal contaminants and anions on the samples, the effects of storage conditions, packing with modified atmosphere and thermal process on survival and some physical, chemical and microbial properties of Salicornia were studied. The results showed that the use of appropriate post-harvest technologies has a significant effect on the shelf-life and quality of Salicornia compared to the current and usual conditions of the fields. Product storage at ambient temperature (25°C) showed that fresh Salicornia had a good appearance and marketability for up to 3 days. The appearance of Salicornia and its weight loss during storage were done. The results showed that at low temperature (4°C) and suitable relative humidity (90 to 95%), in comparison with temperature and environmental conditions, the apparent, physicochemical and, as a result, salicornia marketability, were better preserved and the product weight loss was lower. The assessment of plant respiratory intensity showed that this plant was considered as a high respiration vegetable group and it seems that MAP technique is a suitable method for increasing the shelf-life of this plant. The concentration of all heavy metals studied in plant organs was significantly and considerably less than the water and soil of the site. Therefore, the use of green aerial parts does not pose a risk to the health of the consumer and can be used as a source of calcium, iron, zinc and magnesium. The examination of different thermal process conditions also showed that $F_0 = 8$ is suitable for Salicornia canning.

Key Words: Salicornia, Cold Storage, Packaging, Thermal Processing, Physico-chemical Properties, Heavy Metals

Shelf Life Extension of *Salicornia Bigelovii* Plant via Properly Packaging Method

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Abstract

Salicornia, is an annual plant (biennial, in some species) from *Chenopodiaceae* plants family, which has the highest salinity resistance in these family. This plant grows on the coast of the seas and lakes, riversides, springs and saline streams, and saline wetlands. Salicornia is perishable, with short shelf life under ambient conditions. Thus, a modified atmosphere packaging (MAP) system developed to extend its shelf life, in this project. Therefore, *Salicornia bigelovii* were packaged in two types of low-density polyethylene and silicon nano-polymer bags with two gas mixtures (3% O₂ + 5% CO₂ + 92% N₂ and 3% O₂ + 15% CO₂ + 82% N₂). They were then refrigerated at 4°C temperature for about one month. Some quantitative and qualitative indices such as moisture content, weight loss, respiration rate, salinity, pH and acidity were measured with 10 days intervals. The obtained data were analyzed with factorial experiment in a completely randomized design using multivariate analysis of variance. The results showed that with respect to Salicornia plant as a leafy vegetable, this plant is considered as a high respiration vegetable group. Considering the respiratory rate, which is one of the most important indicators for determining the packaging method, it seems that MAP is a suitable method for increasing the shelf life of this plant. Measuring other quantitative and qualitative indicators also confirmed this. In terms of the type of packaging film, the nano film has better results than the polyethylene film. Regarding the means compare of all treatments, packaged Salicornia in the silicon nano-polymer film contain a mixture of 3% O₂ + 5% CO₂ + 92% N₂ gas with 10 days of storage is suggested as the best treatment.

Key Words: Modified Atmosphere Packaging, Quality Characteristics, Salicornia.

AERI

Use of Sweet Sorghum Syrup as a Sugar Substitute in the Formulation of Biscuit and Sweet Bread

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Abstract

Today, the use of natural sweeteners in flour products are especially important. Sorghum syrup as a nutritious sweetener can be a good alternative to sugar, especially in sweet flour products. In this research, the possibility of replacing sweet sorghum syrup (KFS2 cultivar cultivated at Gorgan research station) in biscuits and sweet bread were investigated. Therefore, different ratios of sugar replacement with sweet sorghum (0, 25, 50, 75 and 100) in their formulation were used. The data from treatments were done in a completely randomized design with a mean of data analysis using Duncan's multiple range test. The results showed that replacement of more than 50 % of sorghum syrup caused the spread factor, lightness, yellowness and specific volume reduction and increasing thickness value, redness intensity and firmness of biscuits and sweet bread. The sensory evaluation test also showed that samples of biscuits and sweet bread containing 100% of sorghum syrup had the lowest score and samples containing to 50 % of sorghum syrup had the highest score in terms of color, flavor, texture and overall acceptance ($p < 0.05$). In 50 % replacement of sweet sorghum syrup, the spread factor and thickness of biscuits were 10.77 and 5.40 mm and firmness, volume, brightness, redness yellowness and the overall acceptance were 34.14 and 184.35 N, 805.1 and 684.2 cm³/g, 55.4, 10.35, 20.25 and 50.36, 8.35, 25.15 (L^* & a^* & b^*) and a total score of 4.23 and 4.1 in biscuits and sweet bread, respectively. Based on the results, sorghum syrup has the ability to replace up to 50 % sugar in biscuits and sweet bread formulas.

Key words: Physico-chemical Characteristics, Sensory Evaluation, Sweet Flour Products, Sweet Sorghum Syrup

AERI

Investigation and Comparison on the Effect of Sourdough and Bakery Improver Containing Emulsifier and Enzyme on Improvement Qualitative Properties of Pita Bread

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Abstract

Pita bread is the one of the flat breads in the world. In recent decades, consumer demand for healthy and natural bread without chemical ingredients. This project was done in two separate phases. In the first phase, the effect of two type sourdough (dry and wet) with two rest times (2 and 4 hours) was evaluated on physicochemical, texture and sensory properties. In the second phase 8 improvers containing SSL and E472 (in two levels 0.1 and 0.2 %) and amylase enzyme (in two levels 0.05 and 0.1%) were produced and used in the best Pita formulation in the first phase. The results of first phase showed the wet sourdough with both rest times and dry sourdough with the highest rest time (4 hours) had the highest moisture. The water activity of treatments didn't show significant difference. Also, the sample was produced by wet sourdough had the lowest firmness and the highest L* and a*. The results of the second phase indicated the moisture and aw increased by the both of emulsifiers and enzyme. The emulsifier and enzyme increased L* and a* respectively. Finally, the samples containing 0.1 SSL, 0.1 E471 and both levels of enzyme had the lowest firmness and the highest overall acceptability.

Key words: Color Values, Emulsifier, Enzyme, Improver, Pita Bread, Sourdough

AERI

Production and Packaging of Fresh Cut Potato

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Abstract

Potato is the fourth most important food crop in the world after rice, wheat and maize, and is the only major food crop that is a tuber. Demand for fresh-cut fruit and vegetables have been increasing in recent years, mainly because consumers look for freshness and convenience when they purchase these commodities. The purpose of this investigation has been to study the effect of anti-browning treatments (solution 1 (citric acid and Ascorbic acid) and solution 2 (L-cysteine) on Mass (moisture and weight), texture (maximum force at rupture point) and color changes (L^* , a^* , b^* parameters). In this research, Potatoes were hand-peeled and washed with sterile deionized water. Then, Fresh-cut potatoes are dipped within ozonated water (4 minutes), and immediately after that dipping them in the treatment solution (3 minutes). Potatoes samples (under treatment and control) were vacuum packaged and stored at 4 °C. Quality characteristics (moisture, weight, texture and color) were evaluated initially and after 5, 11 and 14 days. Result indicated that weight variations of samples during this period are not significant ($P < 0.05$). The moisture content of formula 1 and control was higher than formula 2. However, about texture, treatment and control don't show significant difference but all samples become softer during storage. Both treatment solutions (specifically Formula 2) have inhibitory effect on color changes and thus PPO activity.

Keywords: Browning, Fresh-cut, Minimal processing, Potato, PPO

AERI

The Optimization of nonthermal Extraction Processes of Nepeta Extract and the Effect of Microencapsulation on its Functional

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Abstract

The aim of this study was to investigate the effect of ultrasound, pulse electric and microencapsulation on antioxidant, antifungal and effective component protection of the nepeta extract (*Nepeta binaludensis*) during storage, and it was done in several steps. The purpose of the first step was to determine the optimum conditions for the extraction of ethanolic extracts with the aid of ultrasonic process with a frequency of 24 kHz (time: 5, 10, and 15 minutes; intensity: 0, 20, 60 and 100%; temperature: 25 , 35 and 45 °C and acoustic cycles: 0.2, 0.6 and 1 percent) and with the aid of pulses electric field (voltages 2000, 4000 and 6000 volts and the number of pulses 40, 50 and 60) in comparison with conventional method (maceration technique). The design of the experiment was carried out using the response surface methodology software with the central composite design. The amount of extraction efficiency, total phenolic compounds (TPC), scavenging activity of DPPH (DPPH), ferric reducing-antioxidant power (FRAP) in extract was determined. After statistical analysis, the amount of extraction efficiency, phenolic compounds and antioxidant properties of ethanolic extract from novel methods had difference significantly with the control sample and the novel methods improved the extraction of the effective compounds. The optimal extraction conditions with the aid of pulse electric field was 6000 Volts and Pulse Number 60. Under this condition, the amount of extraction efficiency, TPC, FRAP and DPPH were 11.36%, 417.85 mg/g, 1688.53 $\mu\text{mol Fe}^{2+}/\text{l}$ and 0.32 mg/l. The extraction and analysis of the extract at the optimum conditions was confirmed these results. In the second phase, the antifungal activity (*Aspergillus Niger*) and anti-bacterial (*Staphylococcus aureus* and *Escherichia coli*) of extracts (in optimal conditions) were compared with the synthetic preservative potassium sorbate (0.1% concentration). The results showed that extract with 4% concentration had more anti-fungal and antibacterial properties than potassium sorbate. In the third phase, the effect of the type of wall composition (maltodextrin with dextrose equivalent 7 and 20, and Arabic gum using one-way network design with upgraded points in the mix design) and the method of drying (freeze drying and spray drying) on physicochemical properties of microcapsules and their phenolic compounds stability were evaluated at different humidity percentage (52 and 75%) and different temperature (4 and 25 °C) during 35 days of storage. The results showed that the microcapsules prepared with walls

containing maltodextrin with dextrose equivalent 7 and 20 and Arabic gum had better physicochemical properties than microcapsules prepared with a single wall. Also, the microcapsules prepared by freezing drying method had more favorable properties than spray drying microcapsules. The amount of phenolic compounds of the microcapsules was reduced during 35 days, but microcapsulation improved the stability of the effective compounds at different humidity and temperature conditions. The results showed that the microcapsules containing combined wall material at relative humidity of 52% and temperature of 4°C had the least reduction in phenolic compounds and were introduced as optimal treatments. In the fourth step, the effect of free extract (with concentration of 1 and 3%) and microcapsulated extracts with different drying methods and by mixing the optimal walls (with concentrations of 1 and 3%) compared with the addition of synthetic preservative of potassium sorbate 0.1% and the control sample (without any additive substance) on the sensory properties (aroma or taste, smell and overall acceptance), total phenolic and microbial contamination (the total number of mold and yeast) of dough were evaluated. The results showed that the microcapsulated extract was able to control the growth of mold and yeast by maintaining the sensory and phenolic characteristics in the Dough. The lowest growth yeast and mold were observed in samples containing 3% microcapsulated extract with wall material containing maltodextrin with Dextrose equivalent 7 (16.66%), Arabic gum (16.66%), and maltodextrin (66.77%) that prepared with the both of drying methods after 28 days of storage at a refrigerated temperature that was approximately equivalent with the effect of chemical preservative potassium sorbate.

Key words: Antifungal, Antioxidant, Dough, Extraction, Microencapsulated, *Nepeta Binaludensis*, Phenolic Compound, Pulse Electric Field, Sonication



AERI

Study of Physicochemical Properties of Pomegranate Fruit During Cold Storage of Mehrshahr Food Industries Company

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Abstract

The pomegranate fruit with the scientific name, *Punica granatum* has attracted the attention of many researchers in recent decades due to its diverse and useful compounds that make it health and well-being. Anthocyanins and phenolic compounds are known as antioxidant effects in pomegranate, which undergoes many changes during the growing season. In the last few years, the loss of the edible part of the fruit has caused softening, discoloration, deformity and altering the taste and aroma of the seeds. The damaged fruit is not suitable for consumption; while there are no apparent signs of abnormality in the skin and the shape of the fruit. On the other hand, the presence of many microorganisms and molds in the environment, and the lack of attention to the issues of harvesting and handling pomegranate, which leads to scratches and damage to the product, reduces the shelf life of pomegranates. Hence, in the present study, for evaluation and control of the above issues, pomegranates were transferred from the cold storage of Mehrshahr Food Industries Company to the Agricultural Engineering Research Institute (AERI) almost every two weeks. Quantitative and qualitative tests included evaluation of apparent characteristics of pomegranate fruit and seed, physical evaluation (moisture and weight loss), chemical evaluation (titratable acidity, total soluble solids, anthocyanin content, pH) of pomegranate seeds, physiological (respiration rate) pomegranate fruit test, and microbial evaluation of pomegranate fruit and seeds was performed. The results of evaluating the appearance of fruit and seeds of pomegranate showed that the most pomegranate problem was the presence of mold pollution from the crown and stamens, the location of traps and cracking of pomegranate fruit that may increase during cold storage period. The aril browning of pomegranate was observed in a significant proportion of pomegranates. The average weight loss test results also showed that during the study period, the samples had a weight loss of 1.44%, which is an acceptable data. The results of other tests indicate that the mean of the obtained data from different tests is within the accepted range of standards and shows that pomegranate keeping conditions in the cold storage are appropriate.

Key Words: Aril browning, Cold storage of Mehrshahr Food Industries Company, Pomegranate

Study of Nutritional Properties and Baking Quality of Morvarid Wheat Affected by Optimal Use of Micronutrient Fertilizers Iron, Zinc and Manganese Sulfates

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Abstract

According to increasing use of micronutrient fertilizers in wheat under cultivation in the world, determination of the level of consumption of these elements for increasing the yield and improving the nutritional value and quality of each wheat cultivar is very important. In this research, in order to determine the optimal use of micronutrient elements an experiment was conducted in the form of a central composite design with iron, zinc and manganese fertilizer treatments as main variables of iron sulfate sources (40-40 kg.ha⁻¹), zinc sulfate 20-40 kg.ha⁻¹) and manganese sulfate (10-30 kg.ha⁻¹) of soil application at planting time and foliar application of micronutrients (at a concentration of 0-5 gr l⁻¹) of wheat were evaluated in of Morvarid cultivars. Using regression models, variations of characteristics such as yield, seed 1000-weight, hectoliter weight, physical density, protein, wet gluten, zeleny sedimentation values and pelshenke number, iron, zinc, manganese, some rheological properties of dough and bread volume and height affected by the treatments were evaluated. The results showed that increasing foliar application of micronutrients concentration increased the yield, improved qualitative characteristics and especially increased iron, zinc and manganese content of wheat but this increase was not significant in concentrations higher than 3.75 gr l⁻¹ (P<0.05). The results showed that the use of soil application with foliar application of micronutrients, yield of wheat (6,55 kg.ha⁻¹as compared to control) seed 1000-weight (4.75 gr), hectoliter weight (1.7 kg L⁻¹), protein content (3.13%), wet gluten (3.4%), zeleny sedimentation values (2.1 ml) and amount of iron, zinc and manganese minerals (33.5, 17.02 and 12.20 mg kg⁻¹, respectively) were increased (P<0.05). The optimum use of micronutrient fertilizers, in addition to increasing the yield of wheat, increased the rheological properties of the dough and the baking characteristics in terms of bread volume and height. Optimization of the conditions with an index of desirability of 0.983 showed that to achieve higher yields and better quality wheat flour, the use of foliar application at a concentration of 3.2 gr l⁻¹ and the use of soil application with 31 kg.ha⁻¹ iron sulfate, 39 kg.ha⁻¹ zinc sulfate, 25 kg.ha⁻¹ manganese sulfate (according to the results Soil test) can be recommended.

Keywords: Baking Characteristics, Micronutrients, Physicochemical Properties, Wheat, Yield

Effect of Farsi Gum Coating on The Quality of Ready-to-Eat Pomegranate Arils Rabab Cultiver

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Abstract

Providing ready-to-eat pomegranate arils into the market is an innovative and appealing method in the current societies. Due to the high perishability of pomegranate arils, coating will increase shelf life and maintain their marketability. Soluble part of Persian gum in 1 % (W/V) concentration along with cinnamon oil in 0.25, 0.5 and 0.75 % (V/V) concentrations were used for coating pomegranate arils of Kazeroon Rabab variety. After storage of coated arils in refrigerator (5 °C), chemical (total phenol, total anthocyanin, ascorbic acid, acidity, water content and total soluble solids), physical, (color factors: L*, a*, and b*; and texture strength), sensorial properties, and microbial spoilage of arils were evaluated at seven-day intervals. Data were analyzed based on a full factorial experiment with time (first, second and third week) and cinnamon oil concentration (0.25, 0.5 and 0.75 %) factors in a completely randomized design. The effects of essential oil concentration on acidity and total anthocyanin were significant ($p < 0.01$), while the effect of storage time at 5 °C was significant only on texture strength and ascorbic acid content ($p < 0.01$). Over time, a significant decrease in vitamin C was observed in all concentrations of cinnamon oil ($p < 0.05$). Total anthocyanin content decreased from first day to third week of the storage ($p < 0.05$) and 0.75 % concentration of cinnamon oil caused more reduction in anthocyanin in comparison to 0.25 %. Moisture content decreased (around 1 to 2 %) over time ($p < 0.05$). Increasing storage time reduced acidity and 0.75 % essential oil caused significant reduction in acidity in comparison to 0.25 and 0.5 % ($p < 0.05$). Texture strength of the arils increased from first day to third week ($p < 0.05$). Total soluble solids, lightness (L*), yellowness (b*), and total phenol of the arils did not change noticeably in all the samples ($p > 0.05$). Increasing the essential oil from 0.25 to 0.5 % caused the increase of redness (a*), while increasing from 0.5 to 0.75 % resulted in a reduction of the redness ($p < 0.05$). On the other hand, redness did not change over time. There was not any remarkable difference among the samples in respect of acceptability of taste and odour ($p > 0.05$). Shelf life, marketability and nutritional quality of pomegranate arils can be maintained at an appropriate and significant level, by suitable coating of pomegranate arils and selecting optimum concentration of cinnamon oil or similar substances.

Key words: Anthocianin, Ascorbic Acid, Cinnamon Oil, Coating, Persion Gum, Pomegranate Arils

Introducing an Appropriate Method for Producing Pastille and Lavashak from Samanu

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Abstract

Samanu is one of the traditional desserts in Iran that has a lot of nutritional value. This homemade product is currently produced in the country traditionally. In this project, in order to introduce a new product and promote people to consume this valuable material, the formulations for the production of pastille and lavashak from Samanou have been optimized. For this purpose, different percentages of sugar, gelatin, and guar were used for the production of pastilles and various percentages of starch, sugar, gelatin and guar were used for the production of samanou lavashak in the formulation. The physicochemical and sensory properties of the produced samples were measured. The data were analyzed using response surface methodology based on a central composite design. Appropriate models were obtained to predict various properties. Ultimately, numerical optimization was carried out to obtain the best formulation for the production of pastilles and lavashak from Samanou. Finally, formulations containing 22% sugar, 9% gelatin and 69% samanou with brix 30 were obtained as optimal formulation for the production of samanou pastilles with a desirability of 78.8%. For samanou lavashak, the optimum formulation included 5% starch, 2.47% gelatin, 10.95% sugar, and 0.54% guar, with a desirability of 75.6%.

Keywords: Jelly Products, Lavashak, Pastille, Snack Foods, Samanou

AERI

The Effect of Precooling (Cool Water and Air) and Coating by Local Gums (*Basil*, *Lallemantia Royleana* and *Lepidium Sativum*) on Shelf Life of Cherry and Red Apple

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Abstract

In this project, apple and cherry were pre-cooled. Also, Basil, *Lallemantia Royleana* and *Lepidium Sativum* seed gums were used as coating of these fruits. The results showed the physicochemical properties of pre-cooled fruits were the least changes during storage. Positive effect of cold air was more than cold water on control of spoilage. The effect of coating on moisture and weight loss was positive. In the first month, acidity and Brix were increased and pH was decreased. In the second and third months, acidity and Brix were decreased and pH was increased. Coating with 1% concentration of gums was more effective on firmness and weight loss. Positive effect of *Lallemantia Royleana* and *Lepidium Sativum* seed gums on physicochemical properties of both fruits especially apple was more than Basil gum. Pre-cooling and coating were increased L* and decreased a* of apples. The effect of these treatments on color of cherries was different. Pre-cooling and coating were increased a* of cherries. Also, the result showed *Lepidium Sativum* was negative effect on odor and taste of fruits. Finally, it is suggested, air pre-cooling and coating with 1% concentration of *Lallemantia Royleana* are useful for apples and both pre-cooling methods and coating with 1% Basil or *Lallemantia Royleana* are effective on physicochemical properties of cherries during storage.

Key word: Apple, Cherry, Coating, Local gums, Pre-cooling

AERI

Application of Waste from Onion Processing Industry for Producing Anti-fungal Compounds

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Abstract

The present study was conducted with the aim of optimizing the use of yellow onion by-products as agricultural by-products, the extraction of its bioactive compounds (antioxidant and antimicrobial agents). Optimization condition of watery extraction effective compounds were determined with assisted microwave extraction, power(300,500,700 w), time(10,15,20 S) and ethanol concentration(40,60,80 Percent) and MDG extraction, power(300,500,700 w), time(10,15,20 M) with the response surface method. On extraction, assayed yield of extraction, total phenolic, quercetin, the antioxidant activity. Then, the best treatment that have the highest yield of extraction, the antioxidant activity, and studied anti-fungal properties by MIC. Extraction in food model, as a nature antifungal compound in food environment (kialbassa) compared with treatment with nitrate during 45 days and results assayed with using design expert software. The results showed that the onion extracted by-products ,in MDG extraction, toward assisted microwave extraction method in optimum condition have highest antioxidant activity with DPPH(37.60),FRAP(542.09) and can control yeast and mold groth with MIC(10 Percent) against *Aspergillus Niger* in chicken kielbasa.

Keywords: Antioxidant, Extraction, Microwave, Onion By-products, Microwave Diffusion and Gravity

AERI

Extraction and Microencapsulation of Functional Compounds from By-products of Juice Industry and Application Them in Food Industry

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Abstract

In the present study, the aim of optimization and microencapsulation of effective compounds from pomegranate, red grapes and oranges by- product of fruit juice factories and their optimal use in food industries using the response surface method. At first, pigments and polyphenolic compounds of pomegranate peel and red grape pomace were extracted using water, ethanol and 70% methanol solvents for 1, 12 and 24 hours. The results showed that extraction with 70% methanol solvent for 24 hours had the highest efficiency of extracting effective compounds. In order to optimize the extraction of the effective compounds, the ultrasonic process with intensity of 20, 60 and 100%, and the process time of 5, 10 and 15 minutes were used. The natural essential oil of orange peel was extracted by using Kelvenger-Ultrasound with 20, 60 and 100% sound intensity; the process time was 15, 35 and 55 minutes, and the process temperature was 35, 50 and 65 °C. Extraction efficiency, total phenolic compounds, FRAP and free radical free radicals of the extracts were determined. Based on the results of the optimal conditions for extraction of extract of essential oil of orange peel, pomegranate peel extract and aqueous extract of grape pomace in all three cases, 60% intensity and 35 ° C, and the duration of the process were 19, 8.32 and 8.78 min. were determined. Then, the antioxidant properties of extract in optimal conditions, at concentrations of 1, 2, 4 and 6% with hydroxybutylicolone with a concentration of 10 ppm in soybean oil and antifungal properties of aqueous extraction of pomegranate peel at concentrations of 0.3% and essential oil of orange peel at a concentration of 0.1%, with a synthetic preservative of sorbent-potassium with a concentration of 0.1%, was compared to the growth of *Aspergillus niger* mold. The results showed that all the concentrations of the extracts had antioxidant activity, and the diameter of the *Aspergillus Niger* growth inhibition was approximately equal to the antifungal activity of potassium sorbate. The extracts from pomegranate and red grape pomace were obtained by using maltodextrin with a hydrolysis level of 19.5 and 0.1% calcium alginate at 5, 10 and 15% concentrations, with a ratio of 1: 5 (extract: wall) and extract essential oil from orange peel was microencapsulated by emulsion and caseinat sodium and beta-cyclodextrin in 5% and 10% concentration with freezing drying. The stability of phenolic compounds and their antioxidant properties were evaluated at 52 and 75% moisture and 4 ° C and 25 ° C. The results showed that the microcapsules with maltodextrin wall with 15% concentration had more anthocyanins and larger particles and the least reduction in physical and

chemical properties in relative humidity was 52.89% and 4° C. Generally, microencapsulation increased the stability of the effective compounds of the microcapsules under different moisture and temperature conditions. Also, essential oil prepared with 10% Betacyclodextrin walls had better physicochemical properties than other walls.

Keywords: Microencapsulation, Orange Peel, Pomegranate Peel, Red Grape Pomace, Ultrasound



AERI

Monitoring and Comparing of Minerals, Heavy Metals, Nitrate and Nitrite Accumulation in Different Parts of *Salicornia Spp.* in Major Areas of Planting

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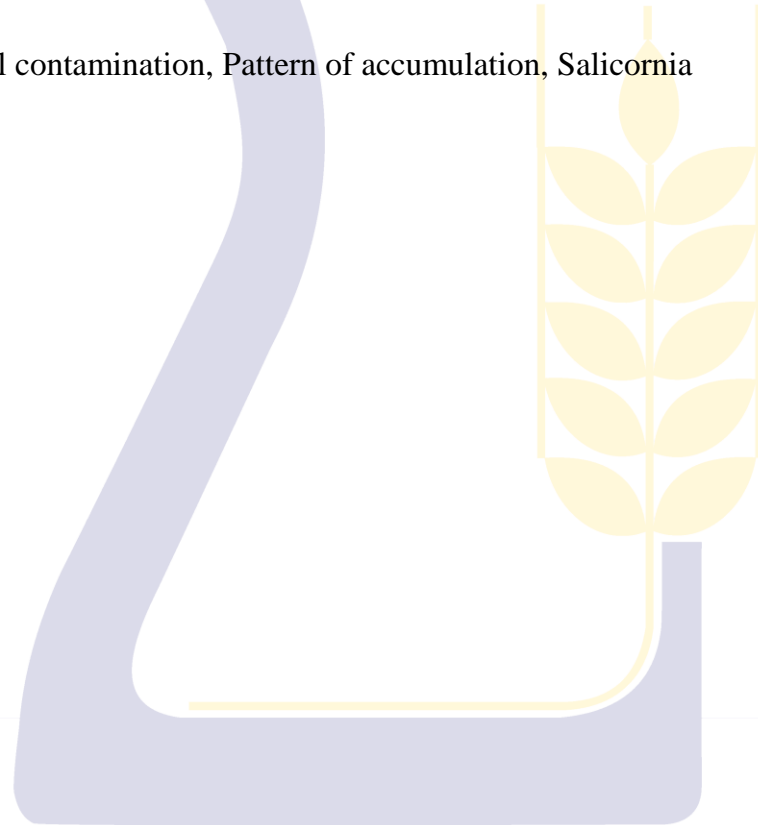
Location: Alborz, Urumieh, Tehran and Golestan Provinces

Abstract

The targeted development of *Salicornia* cultivation as a non-susceptible plant to salinity and arable crop in Iran would be very important for ensuring food security, especially in the coming years, which will have more problems in the agricultural sector due to water scarcity. *Salicornia* is able to accumulate various salts with a considerable variation of organic and metallic bases in different parts of the plant including the root, the shoot and the seed. The purpose of this study was to monitor and compare the accumulation of iron, copper, zinc, magnesium, manganese, sodium, potassium and calcium, heavy metals including lead, nickel, chromium, cadmium, arsenic, mercury, as well as measurement of nitrate and nitrite anions in Water, soil (depths 0-30 cm and 30-60 cm) and different organs of *Salicornia* plant in four main cultivating areas in the country. Sampling from four provinces of West Azarbaijan (Urumieh), Golestan (Gorgan), Tehran (Varamin), and Alborz (Rud shur Mardadabad Karaj) was isolated in root, shoot and seed. Measurements of heavy metals were performed using atomic absorption and Inductively Coupled Plasma Mass Spectrometry) ICP-Mass (and nitrite and nitrite measurements were performed by spectrophotometric method. The concentration of the most heavy metals studied in the plant organs was significantly less than the water and soil of the site. The amount of ash dry basis percent in Karaj, Varamin, Gorgan and Urumieh were 14.75 ± 1.6 , 22.95 ± 0.49 , 37.58 ± 0.43 and 32.94 ± 1.96 respectively. The cumulative pattern of sodium, potassium, useful mineral elements, heavy metals and nitrite and nitrate anions are investigated separately for each region and in different organs of the plant. In general, it can be said that the amount of elements and anions in the root, shoot and seed of the *Salicornia* were significantly different in the studied species ($p < 0.05$). The amount of sodium in *Salicornia* plants were 4.78 ± 0.008 , 4.9 ± 0.04 , 9.2 ± 0.008 and 7.6 ± 0.007 in Karaj, Varamin, Gorgan, Urumia on dry weight basis, respectively. The highest amount of potassium was measured in the *salicornia* of Karaj (1.34%). In terms of cumulative pattern, in most cases, the essential elements were absorbed by the root and transferred to higher organs. In the case of heavy metals, in addition to this, another pattern was observed in which the major amount of heavy metal was fixed in the root zone and did not transferred to higher organs, as a protective mechanism of the plant. This was the case for cobalt and nickel in karaj and lead in Urmia, for example. The arsenic aggregation pattern in terms of more arsenic accumulation in seeds was different from the cumulative pattern of other heavy

metals. Based on the results of this study, *Salicornia* could be used as sources of calcium, iron, zinc and magnesium. The concentration of lead in *Salicornia* spp. in the four regions, especially in Karaj and Gorgan, was higher than the national standard of Iran for the maximum limit of heavy metals of fresh leafy vegetables (0.2 mg / kg dry weight). Considering the amount of nitrate in the plant shoot in different regions, this plant in Karaj and Gorgan could be categorized as low nitrate vegetables (between 200 and 500 ppm) and in Varamin and Urmia as very low nitrate vegetables (less than 200 ppm). It is also recommended to be planted in controlled environments for placement in the food basket.

Keywords: Food safety, Lead, Metal contamination, Pattern of accumulation, *Salicornia*



AERI

Introducing the Suitable Method of Date Pastilles Production and Evaluate its Physicochemical Characteristics

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Abstract

Dates are one of the most important agricultural products in Iran. Due to the importance of dates in the agricultural economy of the country, it is necessary to develop their postharvest industries. Dates despite the high cultivation area and the country's prestigious position in its production, but it had not a significant variation in the processing industries. Pastille production as an intermediate moisture food, can be one of the suitable strategies for date processing industries. So, in this research, we have attempted to determine the most suitable formulation of fruit pastille by the concentrated extract of dates. Therefore, the effects of various types and masses of hydrocolloids (starch, guar and carboxy methyl cellulose) and different amounts of sucrose mass were evaluated on the qualitative and quantitative characteristics of date pastille. The results of this study showed that with increasing sucrose, the color parameter (L^*) increased, and the stiffness and shear strength of the tissue decreased. Finally, as a result of studies done, the sample of 1% carboxymethylcellulose and 3% sucrose, and also 0.25% guar and 3% sucrose, were identified as the best formulations.

Keywords: Date physicochemical Properties, Hydrocolloids, Pastille, Sensory Characteristics

AERI

Effect of Aloe Vera and Alginate Coating on Physicochemical Properties and Shelflife Extension of Stone Fruits (Nectarin, Apricot and Sweet Cherry)

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Abstract

The objective of this study was to evaluate the effectiveness of edible coating (aloe vera and sodium alginate) to improve qualitative and quantitative characteristics and shelf life of stone fruits. The fruits (sweet cherry "shiahe-mashad" ; nectarin "kiota" and apricot "shahroodi") were harvested in commercial maturity stage and unwounded and uniform fruits were selected. The fruits were coated with aloe vera (1, 2, 3 and 4 g/l) and sodium alginate (1% and 2% w/v) in two separate phases. After coating by alginate the fruits immersed in 1% Calcium chloride solution to induce crosslinking reaction. In both phases there were positive control (fungicide solvent) and negative control (distilled water). Then fruits preserved in cold storage (temperature: 0°C; relative humidity: 90-95%). A flesh characterization was carried out in fresh fruits. Immediately after harvest and after (sweet cherry: 6, 12 and 18 days; nectarin: 6, 12, 18 and 24 days; apricot: 6, 12 and 18 days), chemical (total soluble solids, titrable acidity, pH, vitamin C, Total phenol content (TPC), Ferric reducing activity of plasma and scavenging radical activity of 2,2-Diphenyl-1-picrylhydrazyl radical (DPPH)) and physical (color, texture and weight loss) characterization of fruits were measured. Microbial and sensory tests were done at the end of preservation time. Analytical data were subjected to analysis of variance for each coatings and each fruits in total 6 phase. In each phase two factor factorial adopted completely randomized design was used and selected treatment was subjected to economic analyses. Totally in respect to results of chemical, physical, sensory and microbial tests and economic issues it was concluded that sodium alginate 1% and aloe vera 3 g/l were effective in extending shelflife of stone fruits.

Keywords: Aloe Vera Gel, Apricot, Nectarin, Sweet Cherry, Sodium Alginate

AERI

Formation of Nano-Fibrils from Whey Protein using Hydrodynamic Cavitation and Investigating its Functional Properties in a Food Formulation

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Abstract

Protein nanofibers are obtained through heating the globular proteins above their denaturation temperatures under acidic condition. These structures have a length of about 1 μm and a diameter of about 1 to 10 nm and are very anisotropic. The main objective of this study was to produce nanofibers from whey protein isolates, optimize their formation and stability and evaluate the functional properties of nanofibers in order to use them as food ingredients. Initially, protein nanofibers were prepared by heating whey protein isolate under acidic conditions at 20, 40 and 60 mg mL^{-1} concentrations. The structural properties showed that increasing protein concentrations led to an increase in the production of stable nanofibers. X-ray diffraction analysis and thermal properties of freeze-dried nanofibers showed that the nanofibers had a semi-crystalline structure and were in the glassy state at ambient temperature. Then, protein nanofibers were prepared at 80 and 90 $^{\circ}\text{C}$ at the concentration of 20 mg mL^{-1} . Stability and functional properties of protein nanofibers were evaluated at three pH levels of 2, 4 and 6. The results obtained by atomic force microscopy and Thioflavin T (ThT) fluorescence spectrophotometry showed that the rate of fibril formation increased by increasing temperature. On the other hand, by increasing pH, the stability and the beta sheet content of the produced nanofibers decreased. Moreover, nanofibers produced at 90 $^{\circ}\text{C}$ showed better functional properties. Protein nanofibers at higher pH values showed higher foam and emulsion capacity and stability, higher solubility percentages and a lower water and oil absorption capacity. Nanofibers also showed better functional properties compared to the non-treated protein ($P < 0.05$). In this way, protein nanofibers can be commercially suggested as an additive to improve functional properties of food products. The production and stability of protein nanofibers treated by nanocavitation showed that applying nanocavitation before fibrillization resulted in less fibril formation. Likewise, using nanocavitation after fibril formation may cause degradation and breaking down of fibrils. Overall, desirable functional characteristics of nanofibers provides the possibility of their application to improve the qualitative properties of food products and as digestible functional ingredients in foods for patients and elderly people and dietary and low-calorie foods.

Keywords: Functional Properties, Functional Food, Nanocavitation, Protein Nanofiber, Whey Protein Isolate, Yogurt

The Effect of Extraction Methods (Solvent and Ultrasonic Assisted) on Antioxidative and Antimicrobial Activities of Saffron Corm Extract

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Abstract

With the development of saffron cultivation in the country, large quantities of saffron corms are produced every year, part of which is reused and most of it is wasted or consumed in animal feed. Saffron corm contains valuable bioactive compounds that the extraction of them, with the highest efficiency and quality is the purpose of this research. In this research, the saffron corm waste was prepared, dried and completely grounded. Extracting was performed using solvent (80% methanol, 80% ethanol and water) and ultrasound assisted (amplitude of 100% and 0, 20 and 40 minutes at room temperature). The extracts were dried. In each case, the extraction efficiency, minimum inhibitory concentration (MIC) and Minimum Bactericidal concentration (MBC), phenolic compounds, the reducing power of Fe III, and free radical scavenging were determined. The statistical method was completely randomized design with three replications. The results showed that ethanol solvent extracted 85.84 mg.ml⁻¹ of phenolic compounds and showed the highest iron inhibitory capacity (594.75 μmol.ml⁻¹) and radical receptivity (59.42%). The ultrasound process at amplitude of 100% and 40 minutes the most amount of Phenolic compounds (82.23 mg.ml⁻¹) was extracted. Minimum inhibitory and inhibitory concentrations for *Staphylococcus aureus* in solvent extraction were 75 and 300 mg.ml⁻¹, respectively and in microwave assisted extraction were 150 and 300 mg.ml⁻¹, respectively.

Keywords: Antioxidative Ability, Antimicrobial Power, Reducing Power of Feⁱⁱⁱ, Saffron Corm

AERI

Study the Effect of Different Treatments to Control Browning Reactions in Intermediate Moisture Fig (cv. Sabz, Estahban) Fruits

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Abstract

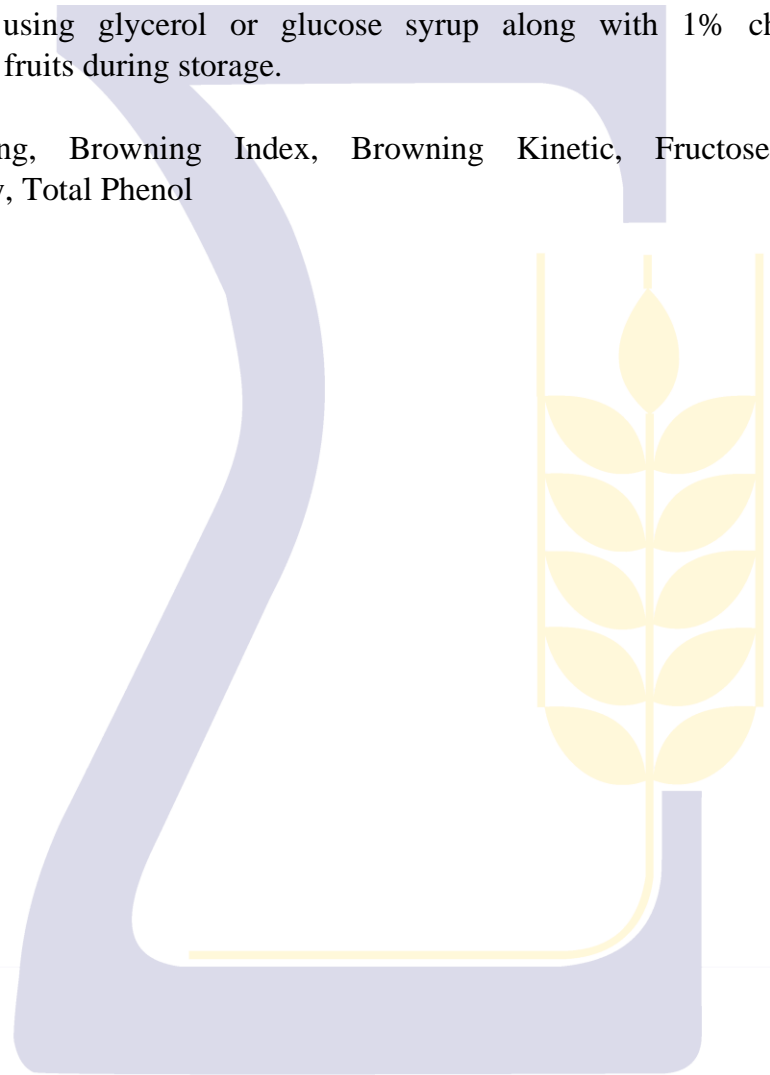
The main problem with intermediate moisture fig is the rapid change of color after production which caused the product failure and may have a negative impact on the marketability and consumer acceptability of this valuable agricultural commodity. Thus, research on control and prevention of its browning and improving the product quality in line with national production and increasing its export has considerable importance. The objective of this study is to investigate the kinetics of browning reactions by different treatments under different storage conditions. This study was performed through 4 different projects. In the first project, To investigate the influence of allowed additives on color parameters of intermediate moisture fig, citric acid (0.5, 1, 2 and 3%), calcium chloride (0.6, 1, 1.5 and 2%), cysteine (0.05, 0.07, 0.2 and 0.5%) and sodium meta bisulfite (500, 800, 1000 and 1200 ppm) in the optimum temperature and time of immersion (4 min at 60°C) were used in preparing intermediate moisture fig samples. Addition of 1, 2 and 3% citric acid and 1.5 calcium chloride caused a decrease in L*, a* and b* values. In the next step, the interaction effect of different additives on color parameters was investigated using a central composite randomized design (CCRD). It has been shown that only the interactive effect of calcium chloride and citric acid on L* and b* were significant and highly significant and those of calcium chloride and cysteine and also calcium chloride and sodium meta bisulfite on a* were highly significant. The runs number 16 (450 ppm, 2.25%, 0.45% and 1.5%), 22 (300 ppm, 3%, 0.3% and 1%) and 24 (9600 ppm, 1.5%, 0.3% and 1%) including sodium meta bisulfite, citric acid, cysteine and calcium chloride showed the least total color difference (ΔE). In the next step to study the kinetics of browning reactions, different additives (including 1% citric acid, 1.5% calcium chloride, 500 ppm metabisulfite and 0.07% cysteine at 60 °C/4min) were used. Then the following intermediate-moisture figs were stored at 4, 15, 25 and 35 °C and at regular time intervals the kinetic of color, browning index, total phenols, HMF and sugars were determined. Using the first-order kinetic model to study the following changes showed that, in all

treatments, with increasing storage temperature from 4 to 35 °C, the kinetic rate constant of L-value, Hue, total color difference, browning index, HMF and total phenols significantly increased and this increase was stronger at higher temperatures. This implies that in all treatments the storage temperature, even more important than additives, has the major role in controlling browning reaction in intermediate-moisture figs. Lower values of activation energy and Q10 calculated for the parameters L-value, Hue, total color difference, browning index, total phenols and HMF in the samples treated with additives compared with control samples represents that intermediate-moisture figs treated with additives have significant lower temperature sensitivity of color changes, HMF and browning index. Using 1% citric acid, 1.5% calcium chloride and lower storage temperatures resulted in the least color changes. In the second project, the kinetics of browning reactions were studied by different plasticizers including glycerol 50% (g glycerol/g water) and glucose syrup 50% (g glycerol/g water) at 60 °C/25min. Then the following intermediate-moisture figs were stored at 4, 15, 25 and 35 °C and at regular time intervals the kinetic of color, browning index, total phenols, hydroxyl methyl furfural (HMF) and sugars were determined. Using the first-order kinetic model to study the following changes showed that, in all treatments, with increasing storage temperature from 4 to 35 °C, the kinetic rate constant of L*, h*, ΔE , browning index, HMF and total phenols significantly increased and this increase was more stronger at higher temperatures. These results implied that in all treatments the storage temperature even more important than plasticizers, had the major role in controlling browning reaction in intermediate-moisture figs. Comparison of kinetic rate constant of L*, h*, ΔE , browning index, HMF and total phenol of treated samples with the control one at a constant temperature showed a significant decrease in the samples treated with glycerol and glucose syrup, respectively. These results indicated the significant influence of glycerol and glucose syrup plasticizers in preventing browning at examined temperatures (35, 25, and 15 °C). Lower values of activation energy and Q10 calculated for the parameters L*, h*, ΔE , browning index, total phenols and HMF in the samples treated with glycerol and glucose syrup compared with control samples represented that the treated samples had lower temperature sensitivity of color changes, HMF and browning index ($p < 0.05$). In the third project, intermediate moisture figs were obtained by adding different plasticizers of sucrose syrup at concentrations of 25, 50 and 75% (W/V), glucose syrup at concentrations of 25 and 50% (W/V) and glycerol at two concentrations of 25 and 50% (V/V) and the effects of these plasticizers on browning kinetics and stability of fig with intermediate moisture content were investigated. All the samples were kept in airtight containers at three temperatures of 5, 25 and 35°C. Thermal properties of the samples were measured using differential scanning calorimetric (DSC). The results showed that the glass transition temperature (T_g) of the rehydrated fig with water (control) was lower than those of other plasticized figs, which shows that water is the most effective plasticizer for food systems. Then, color changes, browning index and firmness of the figs were measured at

specific time intervals for 4 to 6 months. Firmness of the control fig was lower than those of other samples and the flesh firmness increased gradually in all the samples and control over the whole storage period. Browning index and the values of color differences rose significantly during storage time. Furthermore, by increasing storage temperature, the values of browning index and color differences increased significantly. The values of color differences were higher for the control compared to the other plasticized samples and control figs were darker than treatments over the whole storage time. Regression analysis showed that a combinational model was better than the first order model for describing the experimental data for browning index and color differences of plasticized figs. Finally, the shifted temperature parameter ($T-T_g$) was used to account for the effects of storage temperature (T) and plasticizers (through T_g) on the changes of fig browning index. The overall results showed that 50% glucose syrup and 50% sucrose syrup are the most effective treatments to control the browning of fig fruit. In the fourth project the effect of biodegradable coatings (chitosan, pectin, and glycerol) on color and texture changes was studied. Treatments included: control samples, fig coated with pectin 3%, fig coated with chitosan 1%, fig coated with pectin%+ 50% glycerol and fig coated with chitosan 1%+ 50% glycerol. Colors parameters (L , a , b and ΔE), moisture and texture parameters were measured during storage and sensory analysis was done. Results showed that L^* , b^* and moisture content decreased while a^* value and firmness increased. In control samples and fig coated with chitosan 1%+ 50% glycerol, L value decreased from 73.09 to 40.33 and 71.16 to 57.24; respectively. Regression equations confirmed decreasing trend for L value while that of a value increased during storage period in all treatments ($P<0.01$). The highest and the lowest increase in a value was related to control samples and fig coated with chitosan 1%; respectively. Increasing and decreasing trends were observed in texture changes and moisture content; respectively ($P<0.01$). Sensory analysis showed that significant difference ($P<0.01$) was observed in color and texture parameters of all samples, while flavor and taste didn't show significant difference. Results indicated that edible coatings (pectin and chitosan) and glycerol improved color, texture and sensory attributes of intermediate moisture fig fruits and browning decreased. Chitosan coating improved the color, while pectin coating was more effective in maintaining the texture. Finally, the influence of calcium chloride (1, 1.5 and 2%) and citric acid (1.5, 2.25 and 3%), in combination with plasticizers (50% glycerol or 50% glucose syrup) was investigated on color preservation in intermediated moisture fig using a factorial design during 3-6 months storage at 4, 15, 25 and 35°C. It was found that application of calcium chloride and citric acid in combination with glycerol and glucose syrup didn't influence on color changes significantly; however, these treatments showed significant difference with control samples. Therefore, it is recommended using glycerol or glucose syrup in place of additives to control the browning reactions in samples. As a final summary of these four

projects, we may conclude that using glycerol or glucose syrup along with 1% chitosan coating may reduce color changes in intermediate moisture fig fruits during storage.

Keywords: Biodegradable Coating, Browning Index, Browning Kinetic, Fructose, Glass Transition Temperature, Glucose, HMF, Plasticizers, Stability, Total Phenol



AERI

The Extraction and Encapsulation of Hydro-alcoholic Extract from Apple Pomace and its Use in the Formulation of Oily Cake

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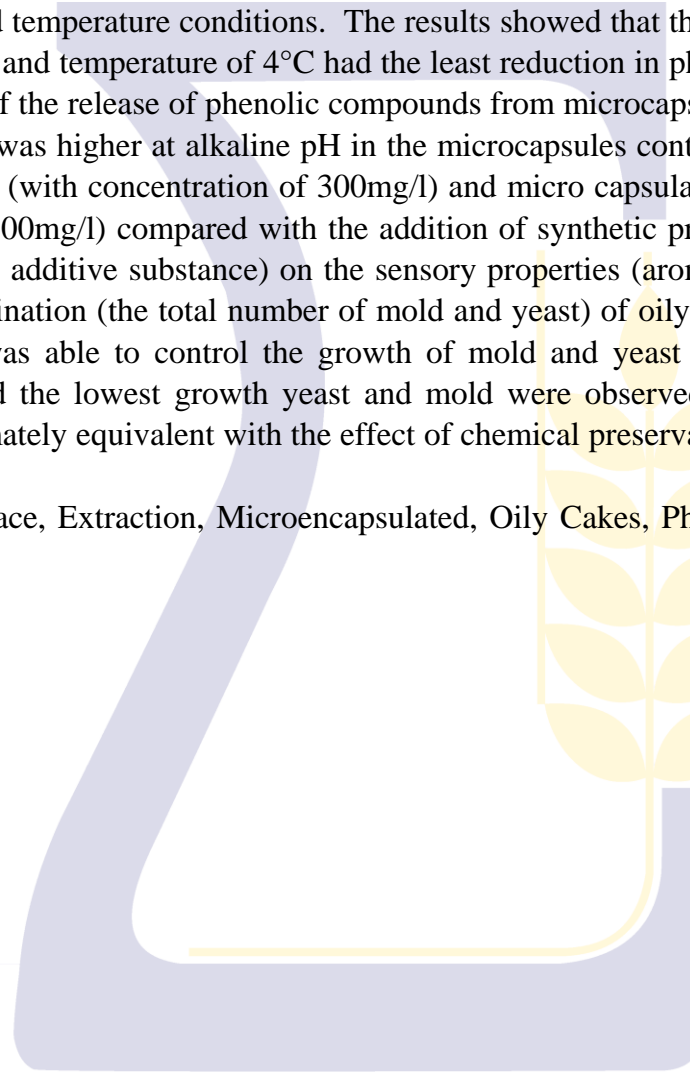
Location: Agriculture and Natural Resources Research and Education Center of Khorasan-e Razavi Province

Abstract

The present study was carried out in four stages with the aim of optimum use of apple pomace as agricultural residue and apple juice factories and extraction of bioactive compounds (antioxidant and antimicrobial). In the first step, the Box-Behnken design was used to optimize extraction efficiency, phenolic compounds and their antioxidant activity using new methods of extraction (ultrasonic-assisted extraction and subcritical water). The variables related to each extraction method include: extracting temperature (25, 40 and 55 °C), sounding time (15, 25 and 35 minutes) and sounding intensity (20, 60 and 100 %) in the ultrasonic-assisted extraction method; the extraction process temperature (120, 140 and 160 °C), the extraction time (20, 30 and 40 minutes) and the ratio of apple pomace to water (1:20, 1:40 and 1:60 g/ml) in the subcritical water method. Based on the obtained models, optimum extraction conditions were obtained for each ultrasonic- assisted method (ultrasound intensity: 56%, Time: 25 min and temperature: 32° C) and subcritical water (extraction temperature 137 ° C, extraction time 29.91 min, and Water-to-Pomace ratio was 31 ml / g) . From the comparison of different extraction methods, the highest extraction efficiency, phenolic compounds and antioxidant activity were obtained from the extracted extract using subcritical water method, and was introduced as the best method. In the second phase, the antifungal activity (*Aspergillus Niger*) and anti-bacterial (*Staphylococcus aureus* and *Escherichia coli*) of extracts (extract with subcritical method in optimal conditions) were compared with the synthetic preservative potassium sorbate (10 mg/100ml). The results showed that extract with 30 mg/100ml concentration had more anti-fungal and antibacterial properties than potassium sorbate. In the third phase, the effect of the type of wall composition (maltodextrin with dextrose equivalent 7 and 20, and pectin using one-way network design with upgraded points in the mix design) on physicochemical properties of microcapsules and their phenolic compounds stability were evaluated at different humidity percentage (52 and 75%) and different temperature (4 and 25 °C) during 42 days of storage. The results showed that the microcapsules prepared with walls containing maltodextrin with dextrose equivalent 7 and 20 and pectin had better physicochemical properties than microcapsules prepared with a single wall. The amount of phenolic compounds of the microcapsules was reduced during 42 days, but micro capsulation improved the stability of the effective

compounds at different humidity and temperature conditions. The results showed that the microcapsules containing combined wall material at relative humidity of 52% and temperature of 4°C had the least reduction in phenolic compounds and were introduced as optimal treatments. The evaluation of the release of phenolic compounds from microcapsules at different pH levels showed that the release rate of phenolic compounds was higher at alkaline pH in the microcapsules containing higher pectin concentrations. In the fourth step, the effect of free extract (with concentration of 300mg/l) and micro capsulated extracts with mixing the optimal walls (with concentrations of 3000 and 4500mg/l) compared with the addition of synthetic preservative of potassium sorbate 100 mg/l and the control sample (without any additive substance) on the sensory properties (aroma or taste, smell and overall acceptance), total phenolic and microbial contamination (the total number of mold and yeast) of oily cakes were evaluated. The results showed that the micro capsulated extract was able to control the growth of mold and yeast by maintaining the sensory and phenolic characteristics in the oily cakes and the lowest growth yeast and mold were observed in samples containing 4500 mg/l micro capsulated extract that was approximately equivalent with the effect of chemical preservative potassium sorbate.

Keywords: Antifungal, Apple Pomace, Extraction, Microencapsulated, Oily Cakes, Phenolic Compound, Sonication, Subcritical Water



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The Possibility of Intermediate Moisture Fig (Cv.Sabz, Estahban) Fruit Production using Plasticizers and Study the Kinetics of Browning Reactions

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Abstract

The main problem with intermediate moisture fig is the rapid change of color after production causing the product failure and may have a negative impact on the marketability and consumer acceptability of this valuable agricultural commodity. The objective of this study was to investigate the kinetics of browning reactions by different treatments under different storage conditions. To study the kinetics of browning reactions, different plasticizers including glycerol 50% (g glycerol/g water) and glucose syrup 50% (g glycerol/g water) at 60 °C/25min were used. Then the following intermediate-moisture figs were stored at 4, 15, 25 and 35 °C and at regular time intervals the kinetic of color, browning index, total phenols, hydroxyl methyl furfural (HMF) and sugars were determined. Using the first-order kinetic model to study the following changes showed that, in all treatments, with increasing storage temperature from 4 to 35 °C, the kinetic rate constant of L^* , h^* , ΔE , browning index, HMF and total phenols significantly increased and this increase was more stronger at higher temperatures. These results implied that in all treatments the storage temperature even more important than plasticizers, had the major role in controlling browning reaction in intermediate-moisture figs. Comparison of kinetic rate constant of L^* , h^* , ΔE , browning index, HMF and total phenol of treated samples with the control one at a constant temperature showed a significant decrease in the samples treated with glycerol and glucose syrup, respectively. However, the rate constant levels in samples treated with plasticizers, relative to the control sample, showed a significant decrease at 25 and 35 °C. Rate constant of samples treated with glycerol and glucose syrup showed a decrease of 4.7, 3.33 and 1.11 times and 2.97, 2.07 and 2.5 times at the temperatures of 35, 25 and 15 °C; respectively, compared to control. Investigation of carbohydrate changes over time showed that the glucose and fructose increased over time at 35 °C (in parallel to decreased area of sucrose curve) in the control and samples treated with plasticizers. However, at temperatures of 25, 15 and 4 °C, the glucose content decreased and the rate of reduction was faster at 15°C compared to 25°C. Lower values of activation energy and Q_{10} calculated for the parameters L^* , h^* , ΔE , browning index, total phenols and HMF in the samples treated with glycerol and glucose syrup compared with control samples represented that the treated samples had lower temperature sensitivity of color changes, HMF and browning index ($p < 0.05$).

Keywords: Browning Index, Figs, Fructose, Glucose, HMF, Plasticizers, Total Phenol

Effect of Coating Containing Essential Oils and Packaging Type on Quality, Sensory and Microbial Characteristics of Fresh-cut Melon

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Abstract

The objective of this study was to evaluate the effectiveness of antimicrobials such as herbal essential oils and coating materials such as chitosan and sodium alginate to improve microbial stability of fresh cut melon. The melons “tashkandi” at commercial maturity were provided by the khorasan Razavi agricultural and natural resources research and education center and maintained at 10 °C until processing. Whole melons were washed with water, decontaminated with 200 ppm solution of sodium hypochlorite, then rinsed with tap water and dried in air. Each treatment included 14-15 melons. Peel and core removed and flesh cut to pieces using a sharp steril knife. The pieces were of 4 cm long and 9 grams weight. The fruit pieces from different melons were mixed to receive a random distribution of fruit samples. Fresh cuts were immersed in alginate solution (2 min), calcium chloride (2 min) and different solutions of chitosan (0, 1% and 2%) (2 min) and air dried at room temperature for 8 min. Thym essential oil (0, 0.25% and 0.5%) were incorporated in chitosan solutions. Coated fresh cuts and control were packed in modified atmosphere (10% CO₂) and PETE clamshell containers and preserved in 4 °C for 8 days. A flesh characterization was carried out in fresh fruit. Physicochemical characterization of the flesh melon (total soluble solids, titrable acidity, and color, texture and weight loss) were measured in 4 day intervals. Microbial and sensory tests were done at the end of preservation duration. Results showed that fresh cut melons treated by 1% chitosan had higher acidity and firmness. Color parameters redness (a*) and brightness (L*) were higher in this treatment in comparison with other treatments. Besides total counts, mould and yeast were lower in this treatment compared with other treatments. Furthermore fresh cut melons treated by 1% chitosan had higher acceptability. Results revealed that fresh cut melons treated with 0.5% Thym essential oil had lowest weight loss. Fresh cuts treated with Thym essential oils had lowest total count. Fresh cut melons treated with 0.5% thym essential oil had lowest O₂ in package. Results showed that fresh cuts packed in modified atmosphere had lower weight loss and more acidity compared with normal package. Modified atmosphere packaging of fresh cuts leads to lower redness (a*) and higher brightness (L*). In this package total count and mould and yeast were lower. Totally it was concluded that coating material consist of chitosan(1%)and thym essential oil (0.5%) and modified atmosphere packaging(10% CO₂) can be

evaluated as a safe and effective treatment that decreased microbial growth and maintain most qualitative parameters, color indices and sensory characteristics in fresh cut melons.

Keywords: Chitosan, Fresh Cut Melon, Modified Atmosphere, Thym Essential Oil



Evaluation of baking soda replacement on bread and bakery products

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Abstract

The aim of this study was replacement of baking soda by baking powder on Lavash bread and sugar bread. For this purpose, two types of baking powder were designed. Baking soda was replaced by the first baking powder (5.97% tartaric acid, 44.90% tartaric cream, 26.73% sodium bicarbonate and 22.40% corn starch) containing 0.3% SSL emulsifier or the second baking powder (13.28% mono-calcium phosphate, 19.92% sodium aluminum sulfate, 26.73% sodium bicarbonate and 40.70% corn starch) containing 0.3% SSL emulsifier on Lavash bread and sugar bread. The result showed the first and second baking powder was improved texture and sensory properties of Lavash bread and sugar bread. Also, the result indicated the second baking powder in a dose of 1.3 % improved firmness, porosity and color of Lavash bread. Technological and sensory properties of sugar bread were improved by the second baking powder in a dose of 1.1 %.

Keywords: Baking soda, Baking powder, Bread, Emulsifier



AERI

Thermal Processing of Salicornia

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Abstract

Salicornia's are juicy annual "halophytes", or plants that grow in saline environments, such as seacoasts and salt marshes. Salicornia have high mineral content useful for human consumption; can be consumed as salad either fresh or boiled. Growing time is few months starting from April to September; harvesting time differs in Iran due to geographical conditions. Aim of this study was to increase the storage stability and consumption time of salicornia by canning. Considering that this plant is not essential food for human conception, with optimal processing, it can be added to the daily diet. Due to low acidity an high pH value of salicornia plant in canning process, Target $F_0=8$ value was chosen for inactivation of anaerobic *Cl.botulinum*. Two different sterilization temperatures (118 and 121 °C) were used in A1 Tall can, F_0 value calculated at 121°C was 7.19 and F_0 value at 118 ° C calculated was 11.5 minutes. The pH value of caned salicornia incubation was found 6.0 ± 0.15 . Chemical, physical, sensory and microbiological analyses were applied on salicornia incubated can for 9 months, in order to investigate the quality changes. The results showed that canning at 121°C was better in terms of protecting the quality of the canned product as compared to the 118°C sterilization temperature. On the other hand, the 118 °C sterilized products were preferred due to the sensory evaluation.

Keywords: Canning, F_0 ·Z & D, Salicornia, Thermal processing

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Investigation on the Effect of Emulsifiers and Enzymes on Quality of Free Gluten Bread in Order to Production of Premix

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Abstract

In this study, 8 improvers containing SSL and E472 (in two levels 0/1 and 0/2 %) and amylase enzyme (in two levels 0/05 and 0/1%) were produced and used in the best Pita formulation in the first phase. The results of first phase showed the wet sourdough with both rest times and dry sourdough with the highest rest time (4 hours) had the highest moisture. The water activity of treatments didn't show significant difference. Also, the sample was produced by wet sourdough had the lowest firmness and the highest L* and a*. The results of the second phase indicated the moisture and aw increased by the both of emulsifiers and enzyme. The emulsifier and enzyme increased L* and a* respectively. Finally, the samples containing 0/1 SSL, 0/1 E471 and both levels of enzyme had the lowest firmness and the highest overall acceptability.

Keywords: Color Value, Emulsifier, Enzyme, Free-gluten, Improver, Pan Bread



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Introducing an Appropriate Method for the Production of High Quality Mulberry Molasses

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Abstract

In this project, three concentrating methods such as sunny (local method), condensation under normal conditions (old method) and vacuum concentration (industrial method) were used for concentration mulberry juice with desired brix of 65. Samples were packed in pet bottles and kept in a lab environment away from sunlight for 3 months. Physicochemical experiments such as pH, acidity, consistency, color, transparency, browning index and sensory properties such as flavor, aroma, concentration and total acceptance of samples were performed in two steps and the results compared each other. The results showed that the color factors L^* a^*b^* in traditional mulberry molasses were the highest and the browning index of the traditional mulberry molasses was the lowest (140.414). The most and the least of pH was belong to industrial and sunny samples respectively 4.84 and 4.61 and they decreased over time. The highest and the lowest transparency belonged to sunny and industrial samples were 1.57% and 0.804%, respectively and they increased over time. In terms of sensory properties, the taste and aroma of traditional sample with scores 3 and 2.916 and concentration of sunny sample with score 3.416 were the best samples. In conclusion, the traditional sample was selected, and the sunny sample was ranked second.

Key words: Mulberry, Mulberry Molasses, Physicochemical Properties, Sensory Properties

AERI

Increasing the Shelf Life of Onion Puree with the Use of Chemical Additives and Different Packaging Methods

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Abstract

Today, consumers are demanding healthy, natural and fresh foods that require minimal energy and time to prepare. The durability and reliability of health food products, ensuring the health of community. In this regard, the use of onion, which has many medicinal properties and cause health is essential. The purpose of this project is to provide methods of disinfection, packing and storage in a suitable heat onion puree. To do this, first, onion puree were treated with different disinfection methods: treatment 1 (chlorine + citric acid + ascorbic acid), treatment 2 (nisin+ citric acid), treatment 3 (acetic acid + menthol) , treatment 4 (sodium sulfate + ascorbic acid + citric acid + calcium chloride), treatment 5 (calcium chloride + ascorbic acid + citric acid + 80 c water) and treatment 6 (control, no pretreat ment) then with a density polyethylene were packed with two methods, under vacuum and normal atmospheric. It was packaged and stored in the refrigerator at 4 °C and -18°C for 28 days. The amount of soluble solids, acidity, total phenolic compounds, moisture, weight loss, the antioxidant activity and antimicrobial test (total microbial load, mold and yeast) was carried out on a sample weekly. Statistical analysis (using factorial test in a completely random design) showed that chemical characteristic over time maintenance and the total number of microbes and the total number of mold and yeast were increased, but treated the puree of onion for 1 minutes with a mixture solution containing 5% chloride calcium (weight/ volume), 1% ascorbic acid (weight/ volume) and 1% citric acid (weight/ volume) at 80 °C preserves chemical properties, phenolic compounds, antioxidant properties and minimum microbial growth rate. The results showed that the method of packing also maintain the quantitative and qualitative features, and microbial characteristics in the conventional atmosphere packing method was much higher than vacuum packing at -18 °C.

Keywords: Disinfectant, Microbial Contamination, Packing, Onion Puree

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Investigation on the Various Conventional and Advanced Instrumental Methods to Determine the Quality of Some Iranian and Foreign Brands of Olive Oils

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Abstract

The purpose of this project was to evaluate and compare different methods for determining the quality of olive oil and evaluation the efficiency of instrumental methods and comparing with conventional methods. Olive oil samples were obtained from different domestic and foreign brands. Acidity, peroxide, extinction coefficient, sensory evaluations, fatty acid composition, Fourier transform infrared (FTIR) spectroscopy, nuclear magnetic resonance (NMR) spectroscopy were performed. The results were compared for classification according to national and international standards of olive oil. The results of the fatty acid profile showed that the fatty acids composition of the olive oil samples was qualitatively similar and in all samples the predominant fatty acid was oleic acid, followed by palmitic and linoleic, respectively. The highest monounsaturated fatty acid (MUFA) belonged to the samples of Zanjan, Golestan, Qazvin (72.12-76.21%) with the lowest saturated fatty acid, SFA, (16.99-17.99%), polyunsaturated, PUFA (6.49-10.42%) and Cox index (1.49-1.84%). According to the studied quality factors, olive oil samples of Golestan, Zanjan and Qazvin provinces (Go1, Qa1 and Z1) were in the highest and Fars province (F) in the lowest quality class and were distinguished from other samples. In terms of the fatty acid composition, olive oil produced in the northern provinces of Iran was similar to the olive oil of Italy, Spain, and Portugal, and olive oil produced in other Iranian provinces was similar to Tunisia. The results of FTIR spectroscopy showed that extra virgin olive oil were separated from the rest of the samples, and in NMR spectroscopy all of the four categories of the olive oil including extra virgin, virgin, purified and mixed olive oil were separated. Therefore the NMR spectroscopy is more efficient than FTIR spectroscopy for olive oil classification.

Key words: Fatty Acid, FTIR, NMR, Olive Oil

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