



International Conference on Food Science and Technology VI

BOOK OF ABSTRACTS

Editors in Chief

Biansheng LI, Junpeng CAI, Shujuan YU, Lin LI



South China University of Technology Press



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South China University of Technology

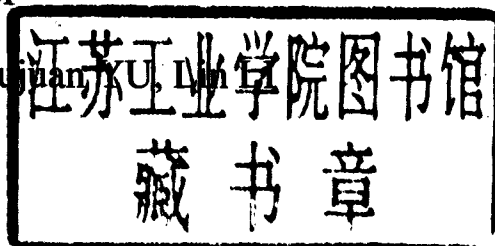
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Preface

The International Conference on Food Science and Technology (ICFST) was initiated and has been organized for five consecutive times by Southern Yangtze University and University of California, Davis since 1991. Thanks to their unending efforts, unwavering determination and dedication, as well as immense support from relevant organizations both from China and the USA, it has blossomed into a major international biennial event with ever-increasing participations from both the scientific community and industry around the world. ICFST, which is second to none in China in terms of importance and influence, has since become a well-known forum for high-caliber scientists, technologists and students alike to report their new findings, improve their understandings on topics of their interests, share thoughts and exchange ideas, strengthen ties with existing partner(s) and/or develop collaborative relationships with new partner(s) and make new friends with people from other countries. It has also been maturing into an ideal setting for food and beverage industry to exhibit their products.

Since the last conference which was held in Wuxi, Jiangsu Province, China in 2003, we have seen a great deal of development and change occur, not just in our daily lives, but also in food science systems and industry. Hence, This conference is a great opportunity for food scientists, technologists, students and business people to improve their understanding of key topics that impact the development of products and food processes for health and well-being.

Over the past 9 months, ICFST VI has collected over 400 high quality abstracts and 200 full papers from over 20 countries/regions including China (mainland, Hong Kong, Taiwan), USA, Canada, Australia, UK, Ireland, Holland, Czech, Turkey, Japan, Korea, Indonesia, Thailand, India, Sri Lanka, Bangladesh, Iran, and as far as Ethiopia, covering the following 9 topics: A) Food Processing and Preservation, B) Food Packaging, Materials and Equipments, C) Beverage and Fermentation Technology, D) Food Safety, E) Functional Food and Bioactive Factors, F) Food Nutrition and Evaluation, G) Food Chemistry and Biotechnology, H) Food Sensory and Flavours, I) Food Texture and Rheology. This has fully demonstrated the great importance of this conference attached by food scientists and technologists from around the world. To better serve our delegations in this conference, we have compiled a formal book of abstracts with an ISBN code. This book could be used as a guide for this 3-day conference and of course, can also be used as reference points to start new researches. This book could also be treated as a reference book and be kept in the personal or public libraries.

Lastly, we wish you a very pleasant stay in SCUT, Guangzhou.

Secretariate
of the ICFST VI
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Keywords

CONTENT

Topic

A Food Processing and Preservation.....	1
B Food Packaging, Materials and Equipments.....	44
C Beverage and Fermentation Technology.....	53
D Food Safety.....	65
E Functional Food and Bioactive Factors.....	88
F Food Nutrition and Evaluation.....	118
G Food Chemistry and Biotechnology.....	128
H Food Sensory and Flavours.....	187
I Food Texture and Rheology.....	199
Author Index.....	213

A Food Processing and Preservation

A50102

Study on Submerged-culture Condition of *Flammulina velutipes* Liquid Strain in the Fermentation Cylinder

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The effect of study on submerged-culture condition of *Flammulina velutipes* liquid strain in fermentation cylinder is to find a way that can provide a scientific theory for the industrialized production of *Flammulina velutipes*. *Flammulina velutipes* 908 was cultured in fermentation cylinder. During the process, changes of mycelial numbers, pH, reducing sugar content, amino nitrogen content, enzymatic activity of cellulose, starch, laccase and proteinase were measured. By changing inoculum concentration, temperature and soluble oxygen concentration, we got the best fermentation conditions. The numerical value of pH was measured by pH instrument. Reducing sugar and enzymatic activity of cellulose were determined with 3, 5-double nitryl salicylic acid method. Formaldehyde titration method was used to measure amino nitrogen content. The enzymatic activity of laccase was determined by using spectrophotometer to measure OD numerical value. Proteinase was measured by using Worthington method. The suitable cultivated condition is determined that the culture temperature 24~25°C, pH5.5~7.0, inoculum concentration 15%, in the first 24h, vvm1.0, the stirrer rotation speed 180r/min, within the time of 24~60h, vvm1.2, the rotate speed of cradle 200r/min. The logarithmic growth phase of strain is limited in 24~60h. The experimental result is determined: the mycelial numbers 720/mL, contents of reducing sugar 5.96g/100mL, amino nitrogen 9.54mg/100mL, enzymatic activity of cellulase 1.85u, starch 2.38u, laccase 0.092u, proteinase 0.184u at the end of logarithmic growth phase.

Acknowledgements: The support of Shaanxi University of Science and Technology is acknowledged.

Keywords: *Flammulina velutipes*, liquid strain, fermentation cylinder, submerged-culture, physiological characters

A50106

Effects of Different Storage Conditions on Chemical and Physical Properties of Mushrooms after Vacuum Cooling

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Vacuum cooling is a rapid cooling technique extensively used for cooling some agricultural and food products. Also vacuum cooling had been used as a rapid cooling method for mushroom. In the current study, experiments were carried out to evaluate the effects of different storage conditions on weight loss, the respiration rate, soluble solid content, membrane permeability and degree of mushroom browning. To investigate the influence of storage conditions on the chemical and physical properties of mushroom after vacuum cooling, mushroom were stored for 15 days under three specific circumstance: (1) cold room, (2) hypobaric room (mushrooms were stored hypobarically in air at 20~30 kPa total pressure), and (3) modified atmosphere packaging (MAP, 5±1% O₂ with 3±1% CO₂ and sealed in 25µm low-density polyethylene (LDPE) membrane). Storage temperature was (4±1)°C and relative humidity was about 75%. And the cooling processes of mushroom were also investigated. The results show that the modified atmosphere packaging (MAP) was the most suit for the mushrooms stored after vacuum cooling among the three storage conditions. And the results also indicated that weight loss, the respiration

rate, soluble solid content, membrane permeability and degree of mushroom browning had significant difference from that stored under hypobaric room and cooling room.

Keywords: mushrooms, vacuum cooling, storage condition

A50110

Pulsed Electric Fields Processing Effects of Cloudy Ginkgo (*Ginkgo biloba* Linn.) Juice: Microbial Destruction and Changes in Physico-chemical Characteristics

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This study was carried out to evaluate microbial inactivation in neutral ginkgo cloudy juice by pulsed electric fields (PEF) treatment. The influence of the electric field strength, the treatment time and temperature on microbial inactivation by PEF was investigated. Microbial inactivation increased with the electric field strength, the treatment time and temperature. The optimum treatment parameters were determined, pulse duration was 3 μ s, the electric field strength was 25kV/cm, the treatment time was 260 μ s and the water bath temperature was 45°C. PEF treatment caused 7.6 -log cycles reduction of Coliforms and 6.2-log cycles total plate counts reduction. The thermal contribution during PEF treatment was investigated, heat processing corresponding to PEF treatment of 45°C caused Coliforms and total plate counts 4.30-log cycles and 3.54-log cycles reduction, respectively. PEF treatment was more effective in inactivating microorganisms than heat alone. PEF, the temperature and the induced heat had synergistic effects to microbial inactivation in cloudy ginkgo juice. Physico-chemical characteristics of juice by PEF treatment such as colour, brown index and suspension stability had no significant change.

Keywords: pulsed electric fields, microbial inactivation, neutral cloudy juice, ginkgo

A50111

Shaped Noodles

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Shaped noodles were produced by machine which simulated the man's action of traditional manual process, while considering the new types of food additives and humectant. The objective is to produce Chinese traditional noodles (Dao Xiao Mian) in commercial scale. As one kind of traditional steaming or boiling foods in North China, hand-made noodles have two main characteristics, that is, (1) they are cut into special shapes using knife by hand, and (2) they have distinctive flavours and physical properties. As required to develop the modern processing of cut-noodles, both nutrition and convenience were taken into account, and also a novel processor for shaped noodles was designed to enrich wheat protein and improve the taste as well. Following the development of modern technology of cutting flour, nutrition, convenience, we put forward novel simulation machine making noodles, enriching wheat protein which at the same time improving taste of noodles, and after bleaching and scalding in boiling water coating for humidity preservation and enriching the flavour of noodle bodies. Fresh cut-noodles have a large potential market as convenient-making foods in factories, canteens, and household. Based on the modern principles of food processing machines, nutrition science and food additive science, commercial production of shaped noodles can be realized by means of newly-developed machine with required quality indexes.

Keywords: nutrition, hand-made noodles, humidity preservation, simulation machine making noodles

A50117

Quality Changes in Smoked *Colisa fasciata* Obtained from the Markets of

Manipur, India during Storage

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The traditional smoking process adopted in the state of Manipur, India, is different from the smoking process adopted else where in the World. Fishes are not salted during the entire smoking process. The smoked fish *Colisa fasciata* obtained from the market were packed in polythene bags and evaluated for its quality during storage. The product had moisture content of 9.77 %, showed an increase ($P<0.05$) during storage whereas the crude protein and fat decreased ($P<0.01$) during storage. The total volatile base nitrogen and alpha amino nitrogen showed an increase ($P<0.01$) during storage indicating protein changes which is further confirmed by a increase in non protein nitrogen ($P<0.05$) and decrease in salt soluble nitrogen ($P<0.05$). The peroxide value and free fatty acid value increased during the storage period confirming fat degradation. The yeast and mold count were minimal during storage but the visible fungal colonies increased during later periods of storage. The fresh smoked fish had a brittle texture, golden yellow colour and high smoky odour and the sensory quality showed a decline during storage. The product was kept well for up to 120 days of shelf life under ambient storage conditions.

A50124

A Two-stage Convective Air and Freeze Drying Technique for Bamboo Shoots

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To reduce drying time and energy consumption and enhance product quality, combined drying technology in a two-stage or three-stage drying process is applied in some areas of dehydrated agricultural products. Among them, combined hot-airflow with vacuum freeze drying can be divided into two methods: (a) hot air drying followed by vacuum freeze drying (AFD), and (b) vacuum freeze drying followed by hot-airflow drying (FAD). The traditional convective hot-airflow drying (AD) has more advantages of lower energy consumption, easier controlled production condition and higher yield than other drying methods. However, there are a lot of shortcomings for AD products, for example, extremely hard texture, severe browning, low rehydration rate, low nutritive value etc. Vacuum freeze drying (FD) can preserve characteristics such as colour, aroma, taste and the shape of food and agricultural products greatly. However, high operating cost, high energy consumption, and low production yield make the FD process very expensive among the drying methods, which greatly restricts its application. Therefore, it would seem to be important to combine the above two drying methods, and to look for a suitable conversion point between AD and FD, in order to obtain a lower cost than for FD alone, and at the same time to keep the quality approximately equal to the FD products. The combination of hot-airflow and vacuum freeze drying has low cost characteristics due to hot-airflow drying, and high quality characteristics due to vacuum freeze drying. Thus, it eliminates the weaknesses of each of the single drying systems. For instance, hot-airflow drying makes the product shrink and change colour, causes case hardening, loss of desirable taste and reduces rehydration rate. On the other hand, vacuum freeze drying helps to improve the quality along with a heavy increase in the cost of the product. Spring bamboo shoot (*Phyllostachys pubescens*) is a popular and highly priced vegetable grown widely in the southern part of China. It contains essential amino acids and vitamins for human nutrition. It also contains minerals and plenty of dietary fiber which has some functional properties such as reducing weight, preventing constipation, and bowel cancer and reducing the cholesterol level and so forth. But fresh bamboo shoot is not easily stored as it soon turns brown during storage. Therefore, combined AD and FD can prolong the shelf life of fresh bamboo shoot and helps to avail the product throughout the year. The objectives of this research were to apply combined hot-airflow and vacuum freeze drying for spring bamboo shoot and to determine the optimal AD and FD conversion points, and at the same time, reduce energy consumption and maintain high quality similar to that of FD products. To obtain dehydrated bamboo shoot slices of high quality, a two-stage hybrid method of drying was tested to make it cost-effective. While freeze drying provides the best quality bamboo shoot it is a very expensive process for the market. In this study, the drying techniques (a) hot air drying followed by vacuum freeze drying

and (b) the reverse of the process (a) were examined. The quality of bamboo shoot dried by process (b) was found to be approximately equal to that of freeze dried bamboo shoot but at a significantly lower cost. This paper reports results comparing the two processes in terms of energy consumption and the physico-chemical properties of the dried bamboo. The quality of dehydration bamboo shoot slices, from combined AFD drying was worse than for single AD drying or single FD drying. The quality of dehydration bamboo shoot slices, from combined FAD drying, was nearer to that for single FD drying. The best FAD process, from quality and energy consumption considerations, was found to be 10.5 h of freeze drying, to a moisture content of 24.4% (db), followed by 4h of hot-air drying. Dehydrated bamboo shoot slices from the combined FAD drying were superior to those from single AD drying for sensory, nutrition, cell structure and rehydration ratio aspects. Gross energy consumption for combined FAD drying was 21% lower than for single FD drying. Therefore, as also found by Phanindra- Kumar (2001) for carrot and pumpkin, combined FAD drying was effective for improving the quality of dehydrated bamboo shoot slice, and for saving energy consumption.

A50125

Sterilization of Green Tea Beverage by Pulsed Electric Fields

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Green tea is one of the most widely consumed beverages in the world, especially in oriental countries. Green tea beverage is usually sterilized with heat treatment. However, high temperature may cause the browning and loss of flavor of it. Pulsed electric field (PEF) is a newly developed nonthermal food preservation technology, which has been successfully applied in acidic fluid foods. The objective of the research was to investigate the possibility of applying PEF to the processing of green tea beverage, a kind of low acidic beverage. Green tea leaves were soaked in hot water (50°C) with 5 ppm β -CD and 5 ppm ZnCl_2 for 20 minutes according to a ratio of 1/100 (W/W). The mixture was filtered with a 200-mesh sieve. The filtrate was rapidly cooled to 10°C and then centrifugated at 7200g for 15 minutes. OSU-4L pulse generator, a six co-field flow tubular PEF chambers and a gear pump fluid handling system were selected. Electric field intensity and treatment time varied from 20 ~40 kV/cm and 40 to 160 micros, respectively. About 5 logs reduction of *E. coli* in inoculated green tea sample was reached at 40 kV/cm for 120 microseconds (2 μ s pulse width, 667 pulses per second). In this selected treatment condition, no significant changes in the color, flavor and content of tea polyphenols were observed in green tea beverage. The reliability of PEF-treated green tea product was high even after two months (stored at 8°C).

Keywords: pulsed electric fields, green tea beverage, tea polyphenols

A50128

Modeling of Purifying Buckwheat Protein Solution by Ultrafiltration

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Ultrafiltration was widely used in many fields such as food, pharmaceutical and biotechnological industries, especially in purifying of protein, DNA and some macromolecules because of its high efficiency and low cost. Nowadays buckwheat protein (BWP) had become an attractive food ingredient, for its well-balanced amino acids constitutes and multi-functions. However, salt is added during BWP production, which is normally adverse to the following process. In this paper, ultrafiltration was used to purify the BWP solution, which contained about 2% NaCl. Furthermore, a mathematic model was simulated the relationship between temperature, pressure, time and member's flux. Finally, the wrap ratio (WR) of the model was tested and the average WR was below 1% after modification. The results showed member flux (MF) decreased with the operation going on. The full process was divided into three stages: (1) fast flux phase, 10~30 minutes, (2) slowdown phase, 30~100 minutes and (3),

equilibrium phase, 100~180 minutes. It was also found that MF and operation pressure (Δp) was in the direct ratio nearly when the filtrate was water, while the direct ratio only happened in the low Δp when BWP solution. With the increase of Δp , the surface of member was jammed and polarized, resulting in the slight decrease of MF. Another phenomenon was that MF increased significantly with the increase of temperature. Several mathematic models are proposed to explain ultrafiltration in previous documents. These models include gelation model, penetrating model and resistance model. In this study, we chose the resistance model for its precise and easy to use. After the complex calculation, the mathematic model was applied to simulate the process. When comparing the J_{theory} with $J_{practice}$, it showed that the higher BWP concentration was, the higher wrap ratio (WR) was, caused by the polarization and jam of membrane. With the concentration in a range of 3%~5%, the WR was -5%~4%, which should be revised. The concentration(c) and average WR (γ) has the following relation, $\gamma = 120.85c^2 - 7.009c + 0.0726$ ($R^2 = 0.9948$) based on the calculation. Therefore, the previous mathematic model was revised as:

$$J = \frac{(0.9274 + 7.009c - 120.85c^2) \times \Delta p}{0.03633 + 0.0768c^{0.1272} + 0.016c^{0.2866} \Delta p},$$

where the average WR was below 1%. Finally the cause of WR was discussed.

Keywords: food science, ultrafiltration, buckwheat protein solution, member flux, salt

A50130

Effect on the Emulsification Stability of Soybean Oil Powder by Emulsification Condition

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The method of microcapsule was used to make the soybean oil powder in this research. For wrapping up the core as most as possible, the content and proportion of emulsifier were researched at first. Based on the effect on the emulsification stability of HLB, the emulsifier was fixed that are the content of emulsifier is 0.5% and the glycerol monostearate to sucrose fatty acid ester ration is 1:4. The emulsification condition was discussed by orthogonal design. At last, research findings show that the optimum conditions are: temperature is 40℃, duration is 5min, the amount of the wall is 20% and the ration of wall is 1:20.

A50135

Effect of Steam Blanching on Quality of Blackberry Juice and Polyphenol Oxidase Activity

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Blackberry is a liane plant of rosaceous Rubus category, a small kind of berries. It contains plenty of flavonoid such as anthocyanin pigments and phenolic compounds, which play a role as dietary antioxidants in reducing the risk of such chronic diseases as coronary heart disease, cancer, diabetes and stroke. Processing it into a kind of fruit juice, functional beverage, has great potential market and great healthy benefit. In the juice processing of berries, steam blanching is very important to the final quality of juice. When blackberries were processed into juice, steam blanching before pressing can increase the content of anthocyanins and total polyphenolics efficiently, and also can inactivate the native polyphenol oxidase of blackberry which can cause the fruit juice browning and quality decrease. These effects can reserve the functional elements and the antioxidant ability furthest. When steam blanching 3 min, the anthocyanins content and total polyphenolics content were the highest among the blackberry juices pressed. When being blanched 2 min, the blackberry native polyphenol oxidase was fully inactivated. With the blanching time extended, the juice yield decreased below 60% due to de dissolving out of the pectin into the

juice. Adding 0.05% ascorbic acid to reduce the color loss of the juice can't promote more anthocyanins and polyphenolics dissolving out. Only to find out that the content of anthocyanins and polyphenolics decreased due to the interaction of ascorbic acid and anthocyanins. The optimal steam blanching time of thawed blackberry was 3 min before pressing.

Key words: blackberry, steam blanching, anthocyanins, total polyphenolics, polyphenol oxidase

A50140

Studies on Reliability of Isoflavones in Soymilks Processed with Different Techniques

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Soy isoflavones are widely recognized for their potential health benefits. The increasing consuming of traditional soy foods (such as soymilks) request assessment for soy isoflavones stability during processing. The stability of three soy isoflavone aglycones, genistein, daidzein and glycitein in the soymilks under different processing techniques was examined in the present paper. Soy granules were soaked in acid, neutral and alkaline liquor respectively. The optimal soaking conditions were investigated and determined by orthogonal experiment and the soymilk processed with the optimal soaking conditions were heated under different thermal treatments (95°C, 121 °C and 140°C) and treated with addition of different non-soy components, such as sugar, powdered milk, lecithin, etc. The effects of heating and addition of non-soy components on the stability of the aglycones in the soymilks were evaluated by HPLC external standard quantity method. All sample analyses were run in triplicates. The sample means were compared for statistically significant differences by the Duncan's multiple range test ($P \leq 0.05$) using SPSS 10.0 for Windows procedure. The results show that daidzein content in soy had a decreased trend as soaking length extended under acid condition (pH4.5), whereas daidzein content in soy milk show an opposite trend under neutral and alkaline soaking condition(pH8.5). The optimal soaking conditions show as follows: pH8.5, 10h duration, and 30°C. The results of heating treatments at 95°C, 121°C and 140°C show that all of the aglycones in soymilks had a decreased trend as time length extended. Daidzein was found most liable to thermal treatments than glycitein and genistein. The heat degradation kinetics of three aglycones were analyzed based on their loss under different heating treatments.

Keywords: isoflavone, genistein, daidzein, glycitein, soymilk, reliability

A50142

The Effect of the Use of N-Acetyl Glucosamine (NAG) in Yoghurt Manufacture on Its Compositional Quality

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The physical, chemical, microbial, and organoleptic properties of yoghurt made from skim milk powder standardized to 0.5% and 3% fat and including N-acetyl glucosamine (NAG) added at 0%, 0.1%, 0.3%, 0.5% levels were analyzed at the first, 7th, 14th days. All samples were analyzed for pH, titratable acidity, fat, protein, total solids, viscosity, color L-, a-, and b- values and texture. Samples made with skim milk powder standardized to 0.5% fat exhibited higher values in Ash, viscosity, titratable acidity and lowest values in total solid content. Yoghurt samples fat content and color a- values were significantly affected by the addition of NAG and its ratio. The hardness values of samples with 0.5% fat were the highest while the cohesiveness, adhesiveness and springiness values were higher for samples with 3% fat, decline in adhesiveness values was observed with increasing NAG ratio. No significant change related to the addition of NAG was observed on cohesiveness and springiness values. The microbial quality of all yoghurt samples was excellent, and the yoghurt starter organisms

were in abundance. Storage time had significant effect on yoghurt samples compositional qualities. The sensory panel identified no significant difference between samples made with and without NAG in terms of appearance flavor and aroma attributes

Keywords: N-acetyl glucosamine, fat ratio, yoghurt properties

A50148

Application of Statistic Experimental Design to Assess the Effect of γ -irradiation Pre-treatment on the Drying Characteristics and Qualities of Rice

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Rice, pretreated by ^{60}Co gamma irradiation, was dried by hot-air. The range of irradiation dosage was 0~10 kGy, the drying temperature was between 30°C and 50°C, and the initial moisture contents were in the range of 20%~30% (drying basis). The drying characteristics and qualities of rice were evaluated based on drying time, average dehydration rate, apparent amylose content (AAC), gel consistency (GC) and gelatinization temperature (GT). A quadratic rotation-orthogonal composite experimental design, with three variables (at five levels each) and five response functions, and analysis method were employed to study the effect of the three variables on the individual response functions. The response functions (drying time, average dehydration rate, AAC, GC, GT) correlated with these variables by second order polynomials consisting of linear, quadratic and interaction terms. A high correlation coefficient indicated the suitability of the second order polynomial to predict these response functions. The linear effects of the three variables on the five response functions were all significant. The interaction effect of drying temperature \times initial moisture content on drying time was significant, the interaction effect of irradiation dosage \times drying temperature on average dehydration rate was significant, and the other interaction effects on response functions were not significant. The quadratic effects of irradiation dosage on apparent amylose content, gel consistency, and gelatinization temperature were significant, and that of drying temperature on drying time, average dehydration, and gel consistency were significant, and that of initial moisture content on average dehydration and gel consistency were significant. The optimum levels of these three variables for obtaining optimum magnitude (maximum or minimum) of the response functions (drying time, average dehydration rate, AAC, GC, GT) were obtained. As a result of optimisation analysis, 10 kGy irradiation dosage was always demanded for obtaining optimum magnitude of all the response functions, but drying temperature and initial moisture content were demanded differently from the maximum to the minimum (within range of the experimental variables). It was to say that the higher irradiation dosage benefited both drying characteristics and quality of rice.

Keywords: statistic experimental design, irradiation, drying characteristic, quality, rice

A50152

Optimization of the Extruding Process for Breakfast Cereal by Uniform Design and Response Surface Analysis

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Wheat, oat and corn meal were used as the main material, and crispness and bowl life were applied as the main indexes. We have gotten three factors which had deeper impact effect in the extruding process, and determined their numeric range by uniform design. Then, the extruding process for breakfast cereal was optimized by response surface analysis, and the best extruding process is listed as below: screw speed is 334 rpm, temperature I is 40°C, temperature II is 150°C, temperature III is 123.50°C, moisture content is 22.60%, protein content is 7.3%, and lipid content is 8%.