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Postępy w technologii tłuszczów roślinnych

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W konferencjach brali udział przedstawiciele placówek naukowych, zakładów przemysłowych i firm współpracujących z przemysłem tłuszczowym z kraju i zagranicy.

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POLYUNSATURATED FATTY ACIDS N-3 IN THE PREVENTION AND TREATMENT OF CARDIOVASCULAR DISEASE

POLIENOWE KWASY TŁUSZCZOWE Z RODZINY N-3 W PROFILAKTYCE I LECZENIU CHORÓB UKŁADU KRĄŻENIA

Elżbieta Bartnikowska

Summary

Cardiovascular disease is the major cause of premature death in most developed countries, e.g. coronary heart disease and stroke accounts for 49% of all deaths in Europe and for 30% of all deaths before the age of 65 years. Cardiovascular disease is due to a combination of many risk factors, both of endogenous and exogenous origin. There is a wealth of evidence that certain lifestyles related to diet, physical activity and tobacco smoking play an important role as causes of cardiovascular disease and all these factors interact with each other in a complex way. Therefore, the population strategy to prevent cardiovascular disease focuses on reducing the number of people who smoke, increasing the number of people eating a balanced diet, and increasing the number of people who are physically active. Similarly, people with established cardiovascular disease should keep to dietary recommendations, maintain appropriate regular physical activity appropriate , take prescribed medicines and stop smoking. Dietary interventions are highly effective in the prevention of cardiovascular disease as well as recurrent events in patients with established cardiovascular disease. Reducing saturated fat intake by at least a third and replacing it with polysaccharides, polyunsaturated fat or monounsaturated fat as well as increasing the consumption of fruit, vegetables and grains are the main dietary changes recommended to decrease risk factors of cardiovascular disease. The evidence that polyunsaturated fatty acids n-3 (PUFA, n-3) may have a beneficial effect on the atherogenic process is well documented. Results of nutritional studies, experiments in animals as well as results from experiments on cultured cells in vitro indicated that mechanism of action of PUFA, n-3 is multidirectional, including effects on lipid metabolism, blood pressure, heart rhythm, platelet aggregation and hemostatic balances. Several decades ago, it has been established that alfa-linolenic acid (the precursor in PUFA, n-3) belongs to essential fatty acids, and its physiological needs are well known like vitamins and mineral compounds. In humans longer-chain, more unsaturated fatty acids, i.e. eicosapentaenoic acid (EPA- C20:5, n-3) and docosahexaenoic acid (DHA - C22:6, n-3) are synthesized from alfa linolenic acid (C18:3, n-3) by alternating desaturation and elongation, and the best dietary source of long PUFA, n-3 are fish. These acids are more effective in prevention of cardiovascular disease than alfa-linolenic acid. Recommended dietary intakes of alfa-liniolenic acid are usually about 0.5-1.0% energy; such intake avoids any apparent deficiency symptoms and gives maximum tissue levels of docosahexaenoic acid. Current average intake of PUFA, n-3 is around 1 g/day or less, while, for example, effects on blood pressure are seen at doses of 3-4g/day. The protective effect of EPA and DHA on fatal cardiovascular events was noted in many nutritional epidemiologic studies in populations which regularly consumed fish as well as in experimental studies with the use of supplemental PUFA, n-3.

The main objective of this lecture is a discussion on the physiological effect of PUFA, n-3, in particular in the prevention and treatment of cardiovascular disease.

FOOD CONTAMINATION BY AROMATIC POLYCYCLIC HYDROCARBON (PAHs) IN POLAND WITH SPECIAL CONSIDERATION OF OILS AND FATS. FACTUAL AND LEGAL CONSIDERATION

ZANIECZYSZCZENIA ŻYWNOŚCI WIELOPIERŚCIENIOWYMI WĘGLOWODORAMI AROMATYCZNYMI (WWA) W POLSCE ZE SZCZEGÓLNYM UWZGLĘDNIENIEM OLEJÓW I TŁUSZCZÓW. STAN FAKTYCZNY I PRAWNY

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Streszczenie

Wielopierścieniowe węglowodory aromatyczne (WWA) powstają w przyrodzie oraz w gospodarczej działalności człowieka, jako efekty pirolizy substancji organicznych. Początkowo, w wysokiej temperaturze powstawania są lotne i łatwo się rozprzestrzeniają powodując skażenia środowiska, powietrza, wody i gleby. Z gleby WWA dostają się do roślin, a w raz z paszą roślinną dostają się doustnie do organizmów zwierzęcych, w tym i człowieka. Stąd wynika nasze zainteresowanie WWA stwierdzanymi w żywności. Z reguły w procesie tworzenia WWA powstają liczne ich odmiany różniące się ilością złączonych pierścieniami benzenowymi i sposobem konfiguracji połączeń, często w układzie generujących jeden lub więcej obszarów o zwiększonej gęstości elektronowej „bay region", umożliwiającej połączenia z DNA, oddziałujące na replikę komórek i skutkujących nowotworzeniem w tkankach żywych organizmów. Tabela 1 przedstawia charakterystykę najczęściej oznaczanych WWA. Strzałki przy wzorach strukturalnych pokazują obszary o zwiększonej gęstości elektronowej. Najbardziej znanym z działalności rakotwórczej i najlepiej przebadanym WWA jest benzo(a)piren [b(a)p], który przyjęto traktować, jako wzorzec reprezentatywny dla innych WWA przypisując mu względny współczynnik kancerogenności K=1 (patrz tabela 2). Oznaczanie b(a)p wprowadziliśmy w Instytucie Przemysłu Mięsnego uruchamiając w latach siedemdziesiątych XX wieku badania ukierunkowane na produkcję preparatów dymu wędzarniczego (PDW), a w zespole kierowanym przez K. Milera w tej dziedzinie wyspecjalizował się jego doktorant, dzisiejszy profesor M. Obiedziński. Wyniki badań na obecność b(a)p w produktach spożywczych z lat 70-tych zostały opublikowane w 1982 roku w Rocznikach Instytutu /1/ i te wyniki zostały zacytowane w ekspertyzie Komitetu Technologii i Chemii Żywności PAN, wydanej w 1991 roku /2/. Dane z późniejszych badań zawartości b(a)p w wędzonych produktach mięsnych opublikowano w postaci posteru na konferencję, a aktualnie są przygotowane do druku. Dodać w tym miejscu należy, że formalne przepisy wprowadzające limity b(a)p w żywności ustanowiono w Unii Europejskiej Rozporządzeniem Komisji nr 188/2006 z 19 grudnia 2006 roku i obowiązywały one samodzielnie do czasu wejścia w życie nowych zasad nrmalizacji ustanowionych Rozporządzeniem Komisji (WE) Nr 835/2011 rozszerzających badanie zawartości WWA na sumę czterech WWA z listy podanej w tabeli 1: benzo(a)pirenu [b(a)p], benzo(a)antracenu [b(a)a], benzo(b)fluorantenu

[b(b)f] oraz chryzenu (ch). Wymagania określone w obu Rozporzadzeniach WE dotyczące limitów stężeń i terminów obowiązywania zawarte zostały w załącznikach, które prezentujemy w postaci tabel: nr 3 i 4. Wyniki badań olejów i nasion roślin oleistych oraz margaryn i wędzonych ryb w oleju prowadzonych w Instytucie nie były dotychczas publikowane. Margaryny są „czyste" (poniżej lub na poziomie stężeń granicznych oznaczalności), podobnie oleje rafinowane. Poważnym problemem jest stan olejów surowych, tłoczonych. Praktycznie żaden badany surowy tłoczony olej rzepakowy nie spełniał wymagań: do 2µg/kg b(a)p i do 10 µg/kg sumy WWA. Spełniały lub były bliskie spełnienia wymagań surowe tłoczone oleje słonecznikowe i sojowe. Spełniały wymagania wędzone ryby: szproty i sardynki w oleju, wyniki oznaczeń WWA były na granicy wykrywalności. Generalnie w Polsce powyżej połowy (około 53%) pobrania WWA wraz z żywnością przypada na przetwory zbożowe, przede wszystkim ze względu na wielkość i codzienność ich spożywania /4/. Możliwość znacznego indywidualnego pobrania WWA istnieje w przypadku mało prawdopodobnej częstej konsumpcji wyjątkowo dużych ilości produktów wędzonych /5/. Osobnego omówienia można by oczekiwać dla problemu narażenia zdrowia pracowników różnych zakładów pracy na kontakt z WWA zawartym w atmosferze typowej dla danej branży. Normuje się zawartość WWA w powietrzu, a limituje się normatywnie sumę iloczynów współczynników kancerogenności i stężeń wszystkich 9 WWA podanych w tabeli 2, oraz limituje zawartość b(a)p (graniczna wartość 2 µg/ m^3, obowiązującą w Polsce od 1995 roku) oraz dibenzo(a,h)antracenu (graniczna wartość 4 µg/m^3, obowiązującą w Polsce od 1998 roku). Badania takie wykonuje się w przemyśle koksowniczym /6/.

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HEALTH PROMOTING AND STABLE OIL OBTAINED FROM UNCONVENTIONAL SOURCE

PROZDROWOTNY I STABILNY OLEJ OTRZYMANY Z NIEKONWENCJONALNEGO SUROWCA

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Summary

In recent years, the obtainment of oils from unconventional sources for both nutritional and cosmetic or only cosmetic purposes has become very popular. Commercially available, there is a growing variety of oils from kernels of popular drupes such as apples, cherries, European plums, pomegranates, apricots, rose hips. With some exceptions, at the moment these oils are not typically aimed for consumption. This probably results from relatively poor knowledge of their chemical composition and insufficient studies on their impact on human organism.The subject of the investigations carried out at the Dept. of Food Chemistry, Technology and Biotechnology, Gdańsk University of Technology, was the oil extracted from mirabelle plum (Prunus domestica L). The oil was either pressed or obtained by solvent extraction, without or including pretreatment of raw material. The latter consisted of microwave pretreatment or roasting the stones. The content of fat in kernels of mirabelle plums was high and amounted from 34% to 47% of dry mass. Importantly, the share of C18:1 fatty acid reached 70%. The tocopherols occurred in the range from 605 to 790 mg per kg of oil with gamma tocopherol content amounting 490 to 593 mg/kg depending on the place of harvest and pretreatment method. The thermooxidative stability calculated based on induction period (IP) determined by differential scanning calorimetry (DSC) demonstrated that the pretreaments improved mirabelle oil stability depending on the method. In general, IPs measured for oil derived from first pressing, extracted with solvents, extracted from pressed cake, with or without pretreatment of raw material, were at least 100% longer than those determined for commercial olive oils “virgin” and “pomace” or rapeseed oils after industrial refining processes and cold pressed. The assessment of toxicity of mirabelle oils in an eukaryotic model recommended for food studies (human colon cancer HT 29 cell line) did not reveal detrimental effects for the oils obtained by the proposed methods.

Since there is neither literature data concerning the oil derived from kernels of mirabelle plums nor concerning methods of its extraction, as well as because of chemical composition suggesting health promoting potential and high oxidative and thermooxidative stability of this oil, it has become the subject of application for patent protection (no. P.409695, October 3,2014).

RAPESEED MEAL – VALUABLE, BUT UNDERESTIMATED PRODUCT OF OILSEED INDUSTRY

ŚRUTA RZEPAKOWA – WARTOŚCIOWY, ALE NIEDOCENIANY PRODUKT PRZEMYSŁU OLEJARSKIEGO

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Summary

Basic information about quantity of rapeseeds processing in Poland and quantity of the products – raw oil and post-extraction meal derived from processing were given. Moreover, the scheme of processing of seeds on oil and meal was presented. Directions of utilization of rapeseed meal and capabilities its capabilities in feed production were discussed. Rapeseed meal, as valuable source of protein, but also anti nutritive components was also described. Chemical composition of seeds, hulls and embryo, paying special attention to anti nutritive components was presented. What is more, technological possibilities of improving of quality of rapeseed meal in oil industry were pointed out. Possibilities of decrease of content of anti nutritive components by dehulling of seeds or separation of hulls from meal were discussed. Next, possibilities of increase of quality of meal by reduction of temperature and time parameters, on the stage of processing of seeds were presented. Utilization of rapeseed meal as energy raw material, were presented.

MARGARINE – CONTINUAL DEVELOPMENT. THE OLD – NEW PRODUCT

MARGARYNA – NIEUSTANNY ROZWÓJ. STARY – NOWY PRODUKT

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Summary

The Polish fat industry, which includes the production of margarine, had already existed in Poland before the second world war. The oldest Polish fat processing plant, called OLEO,was built in Gdańsk in the year 1917. In the years 1926 – 1928 the AMADA plant was established,-also in Gdańsk and in the year 1932 another factory called UNION was built in Gdynia. In the post war period the systematic development of the fat industry took place - the modernisation of existing factories (Bielsko, Szopienice, Trzebina, Szamotuły) and the development of the new ones (Warszawa, Kruszwica, Brzeg, Bodaczów, Czernin). The first fat plant producing margarine in the post war period (1945) was Bielsko-Biała, nowdays Bielmar sp.z o.o. The last decades have been charcterised by dynamic development in the fat industry, which continiue evolving. New modern technologies, machines and instruments, computers, updated quality control systems and new production engineering were introduced. Privatisation introduced changes to the fat industy marke introducing high levels of competition, which influenced demend for high quaity products and a need to satisfy customer demands. A wide range of diverse margarin products play a key role in the Polish fat industry. Different groups of margarin can be specified depending on the desired use; for bread spread, which can include functional elements (sterols, omega – 3 fatty acids and low kalorie properties), for baking (cakces, puff pastry and other), for frying, cooking etc. The separate groups represent so-called mixes – combinations of margarin and butter in various proportions. Margarine products have unlimited possibilitys of developing, which is seen in the variety of new products appearing on our market.

MANUFACTURE OF MARGARINE USING ULTRASONIC HOMOGENIZATION

EMULSYFIKACJA ULTRADŹWIĘKOWA W TECHNOLOGII PRODUKCJI MARGARYNY

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Summary

Create a microemulsion and nanoemulsion oils and fats with water and additives. Create an exceptionally stable emulsion perfectly fragmented, allowing for the highest quality and stability of the margarine. Exceptional polydisperse and nano-emulsification for direct use in the production of margarine. Using ultrasound to improve the stability and quality of the margarine with considerable limitation of surfactants. The emulsion droplet size has a significant impact on the quality and performance margarines, such as spreadability, texture, stability and taste perception. Compared with the mechanical agitators, shear, ultrasonic homogenization requires less surfactant to provide the production of smaller and more stable droplets. The method of ultrasound emulsification is cost savings, safety and simple operation with easy adaptation and installation in existing industrial lines to ensure the highest quality of emulsified products.

RAPESEED MEAL AND EXPELLERS AS A FACTOR OF RAPESEED MARKET DEVELOPMENT IN POLAND

PASZE RZEPAKOWE JAKO ELEMENT ROZWOJU RYNKU RZEPAKU W POLSCE

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Summary

Recently high increase of rapeseed production in Poland was observed what is caused in a large extent by the development of first generation biofuels, but also by the development of cultivation technology and an improvement of seed materials. Higher rapeseed crops resulted in enhanced production of rapeseed feeds, thus rapeseed meals and rapeseed expellers. Both of those products are a highly valuable source of protein and also energy. According to the Polish Association of Oil Producers (PSPO) estimates, over 1,5 million tones of rapeseed feeds were produced in Poland in 2014.Those feeds are perfectly suitable for composing the feed mixtures for various farm animals species, especially for cattle and pigs. Unfortunately, despite of various nutrition values and competitive price compared to other protein sources, rapeseed meals and expellers are more appreciated abroad, then among domestic breeders. For this reason, we observe the high export of rapeseed meals, hence in 2014 it reached out approximately 570 thousand tones. However, lately the high price of soybean meal and also the change of breeder's attitude may soon contribute to the growth of popularity of rapeseed meals and expellers.

PREZENTACJA SPEKTROMETRU ICP W DZIALE KONTROLI JAKOŚCI I LABORATORIUM ANALITYCZNEGO W ZAKŁADACH TŁUSZCZOWYCH BIELMAR

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Streszczenie

Zakłady Tłuszczowe „Bielmar" Sp. z o.o. produkują margaryny, tłuszcze roślinne, oleje i marynaty. Przedsiębiorstwo jest polską firmą prywatną, której właścicielami są pracownicy, dostawcy rzepaku i dystrybutorzy produktów spółki. Spółka istnieje od 1995 roku, natomiast zakład rozpoczął swoją działalność w 1945 roku. Nasza firma zatrudnia ponad 400 osób, roczne obroty wynoszą ok. 200 milionów złotych, a udział w polskim rynku tłuszczów żółtych daje nam jedną z czołowych pozycji wśród producentów margaryn. Siedziba Zakładów Tłuszczowych „Bielmar" mieści się w Bielsku-Białej na południu Polski, u podnóża Beskidów. Tutaj, znajdują się magazyny nasion rzepaku, nowoczesna tłocznia oleju i margarynownia oraz baza logistyczna. W Baborowie, w województwie opolskim, posiadamy dodatkową bazę silosów do składowania rzepaku naszego podstawowego surowca.

Na terenie zakładu funkcjonuje nowoczesne laboratorium fizyko-chemiczne i mikrobiologiczne (Dział Kontroli Jakości i Laboratoria Zakładowe). Głównym zadaniem laboratorium fizyko-chemicznego jest:

- kontrola jakościowa surowców, półproduktów, materiałów pomocniczych i dodatków używanych do produkcji wyrobów gotowych,
- kontrola jakościowa opakowań oraz innych artykułów związanych z produkcją przedsiębiorstwa,
- kontrola międzyoperacyjna,
- kontrola jakościowa wyrobów gotowych i dopuszczenie ich do sprzedaży,
- bieżące (online) powiadamianie o wynikach prowadzonej kontroli międzyoperacyjnej poszczególne działy produkcji.

Techniki i metody analityczne stosowane w naszym laboratorium:

1. Fizyczne - oznaczanie m. in.: barwy, gęstości, punkt poślizgu, temperatury topnienia, krzepnięcia, zawartość zanieczyszczeń, zawartość wody, współczynnik refrakcji;
2. Metody oznaczania wybranych parametrów chemicznych, z wykorzystaniem określonych reakcji chemicznych - oznaczanie m. in. liczby kwasowej, zasadowej, jodowej, nadtlenkowej, zawartości mydeł, pH.
3. Techniki instrumentalne - oznaczanie składu kwasów tłuszczowych, liczby jodowej (GC), Indeksu fazy stałej (NMR), liczby nadtlenkowej, stabilności oksydatywnej (potencjometria), oznaczanie białka, wody i tłuszczu w ziarnach nasion (analizator podczerwieni NIR), oznaczanie zawartości fosforu, sodu, metali ciężkich (ICP-AES).

Rozwój naszego laboratorium polega na:

- coraz mniejszym udziale klasycznych metod miareczkowych i grawimetrycznych,
- coraz większym zastosowaniu metod instrumentalnych,

- stosowaniu automatycznych systemów dozowania i oznaczeń oraz przygotowania próbek, komputerowej rejestracji, przetwarzania i przekazywania danych.

Współczesna chemia analityczna stawia sobie za cel uzyskiwanie informacji jakościowych i ilościowych z bardzo różnorodnych materiałów i kładzie nacisk na dokładność i precyzję oznaczeń, stałego obniżania granic wykrywalności i jednoczesnego skracania czasu analiz. Obecnie metody instrumentalne podążają za tym trendem współczesnej chemii, gdzie nadrzędnym celem jest zużywanie jak najmniejszych ilości odczynników podczas realizacji procedur analitycznych. Skomplikowane problemy analityczne powodują konieczność łączenia różnych technik analitycznych w techniki sprzężone, aby uzyskać wymagane informacje o próbce. Np. połączenie techniki generowania wodorków z optyczną spektrometrią emisji atomowej, daje nowe możliwości do wyizolowania i rozdziału interesujących analitów z matrycy próby. Dodatkowo można uzyskać korzyść w postaci obniżenia granicy wykrywalności i uniknięcie interferencji fizyko-chemicznych. Dlatego złożone zagadnienia analityczne mają swoje przełożenie w coraz bardziej skomplikowanej i innowacyjnej aparaturze instrumentalnej.

Zakłady Tłuszczowe „Bielmar” stale inwestują w rozwój naszego laboratorium. Ostatnim naszym zakupem jest spektrometr ICP-AES Jobin Yvon (JY) firmy Horiba model Ultima Expert. Przeznaczony do w pełni automatycznej, sekwencyjnej analizy pierwiastków głównych i śladowych w próbkach w postaci roztworu. Główne zalety aparatu to:

- wysoka rozdzielczość w całym zakresie widma uzyskana przez zastosowanie siatki dyfrakcyjnej holograficznej o gęstości rowków 2400/mm pracującej w pierwszym rzędzie;
- wszystkie pierwiastki teoretycznie dostępne analizie techniką ICP mogą być w praktyce analizowane na naszym spektrometrze;
- bardzo dobre limity detekcji, będące efektem wysokiej rozdzielczości i zastosowania generatora półprzewodnikowego 40.68 MHz poprawiającego współczynnik sygnał/szum;
- możliwość analizowania roztworów o dużym stężeniu bez rozcieńczania, będąca wynikiem stosowania opatentowanej przez JY osłony gazowej areozolu;
- prędkość analiz jakościowych – 10 pierwiastków/min.;
- prędkość analiz ilościowych – 10 pierwiastków w czasie mniejszym od 3 minut, przy bardzo wysokiej dokładności.

APPLICATION OF PIGMENTS FROM SELECTED MICROALGAE AS SUBSTANCES WITH POTENTIAL ANTIOXIDANT ACTIVITY

ZASTOSOWANIE PIGMENTÓW Z WYBRANYCH MIKROALG JAKO SUBSTANCJI O POTENCJALNYM DZIAŁANIU ANTYOKSYDACYJNYM

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Streszczenie

Celem niemal każdego producenta artykułów zawierających tłuszczu jest takie opracowanie procesu produkcji oraz dystrybucji, by jak najdłużej zatrzymać proces utleniania czyli psucia się tłuszczów w produkcie np. w olejach na zimno tłoczonych. Odpowiedzią mogą być prace nad opracowaniem procesu kondycjonowania oleju opartego o naturalne środki przeciwutleniające. Mogą to być przykładowo środki oparte na naturalnych ekstraktach z ziół oraz związkach występujących w biomasie algowej. Tego rodzaju związkami są naturalne pigmenty takie jak karotenoidy. W algach karotenoidy funkcjonują przede wszystkim jako elementy foto-ochronne oraz jako pigmenty -'zbieracze' nadmiarowego światła, chroniąc w ten sposób aparat fotosyntezy przed foto-uszkodzeniem. Karotenoidy zawarte w wyprodukowanej biomasie alg, po ich wprowadzeniu do olejów na zimno tłoczonych, mogłyby wpływać nie tylko na ochronę oleju przed utlenianiem, ale także – zwiększać prozdrowotne działanie oleju jako składnika diety. Karotenoidy wpływają bowiem na wiele funkcji organizmu np. przeciwdziałają otyłości i cukrzycy. Tak wzbogacony produkt tłuszczowy, poparty stosownymi analizami np. ORAC, byłby predestynowany do zyskania przewagi konkurencyjną na rynku krajowym i międzynarodowym w stosunku do tradycyjnych olejów, w tym także tzw. „na zimno tłoczonych" (cold-pressed).

CHALLENGES IN BIOFUEL SECTOR RELATED TO THE CHANGES IN UE LEGISLATION

SEKTOR BIOPALIW U PROGU ZMIAN W PRAWODAWSTWIE EUROPEJSKIM

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Summary

Transport biofuels in the European Union and Poland is a regulated sector, directly determined by the shape of the legal solutions adopted whose intention was to carry out specific targets for environmental protection, but also economy and building energy security. Key acts in this respect are Directive 2009/28/EC on the promotion of energy from renewable sources and Directive 2009/30/EC on the fuel quality, which defined the basic objectives of climate and energy policy in the Community by 2020: 10% of energy from renewable sources in transport and 6% reduction target in greenhouse gas emissions in the life cycle of liquid fuels. A key tool in achieving these practical assumptions is the use of biofuels like bioethanol and biodiesel. Production of biofuels on an industrial scale is primarily based on the agricultural raw materials like cereals, sugar crops and oilseeds. In the case of the latter, in Poland the basic raw material for the production of fatty acid methyl esters (FAME) is rapeseed, from which oil is extracted approx. 95% of all raw materials used by the industry in the country. According to the analysis made by Polish Chamber of Biofuels approx. 90% of rapeseed oil used in biodiesel production in Poland is sourced on the domestic market. This was a very important impetus to the development of the resource base at the level of agriculture, but also in installed capacity in oil crushing sector and biodiesel production observed in recent years. Today rapeseed oil sector is largely dedicating its production for the purpose of manufacturing of biocomponents, according to estimates of the Polish Association of Oil Producers in approx. 60%. Similar proportions of domestic production is accompanied by rapeseed, which is a perfect example of the positive economic trends running through the development of liquid biofuels industry. This was possible thanks to applied legal solutions in Poland expressed in particular by the act of 25 August 2006 on biocomponents and liquid biofuels. The recent amendment to this act carried out in 2014 has implemented into Polish law regulations under the Community directives, which changes has been initiated by the European Commission in the legislative proposal from 17 October 2012. The proposed draft provides, among others, the introduction of the top-down limit of the use of conventional biofuels, imputation to the agricultural raw materials, including oily crops, additional greenhouse gas emissions associated with the phenomenon of so-called indirect land use change (ILUC) and the introduction of new mechanisms to promote development of advanced biofuels. Currently, the discussion on EC proposal at the level of the European institutions came to almost end and the recent decisions made by EU Council and the European Parliament specify the final shape of the changes in the climate and energy policy of the EU in the field of transport by 2020. Their implementation will mean significant changes in the existing approach to achieve the objectives in this sector and the need to adjust the biofuel industry (and thus oil crushing and other feedstock providers) to the new conditions of manufacturing operations. In the presentation it will be shown the key elements of the European biofuel legislation, which is subject of the changes listed above and assessed from the perspective of the present achievements of practical policy towards biofuels in Poland.

MODIFICATION OF RHEOLOGICAL PROPERTIES OF MODEL FATT STRUCTURES BY LINSEED OIL

MODYFIKACJA WŁAŚCIWOŚCI REOLOGICZNYCH MODELOWYCH UKŁADÓW TŁUSZCZOWYCH OLEJEM LNIANYM

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Summary

The aim of the study was to characterize model systems derived from pig fat pork fine or a fine, hard fat and chaps and linseed oil in terms of their mechanical and rheological properties. In model systems of fatty carried out to determine the content of water (W), crude protein (B), fat (T), sodium chloride (S), according to the applicable standards ISO and conducted rheological characterization of the relaxation method using a rheological analyzer. Rheological parameters describing the elasticity model system was determined by DMA at a frequency of 2.1 Hz using a rheological analyzer DMWT, COBRABID. Determined the value of the elastic modulus G', loss tangent tgδ and the coefficient of dynamic viscosity η. The results showed that the addition of linseed oil to the model systems containing fatty small pork fat resulted in a significant increase in viscosity, an increase in the elastic modulus and the loss modulus, and a decrease in loss tangent with respect to the embodiment of the control. Modification of fatty derived from fine pork fat, fat hard and jowls vegetable oil was reflected in a statistically significant increase in all evaluated parameters of rheological. Linseed oil significantly modified rheological properties evaluated fat systems, causing a substantial increase of the elastic properties and the values of the elastic modulus G 'with respect embodiment containing only animal fat.

HIGH PRESSURE TECHNOLOGY AND APPLICATION IN SOME PRODUCTION AND FOOD PROCESSING

TECHNIKA WYSOKO CIŚNIENIOWA I JEJ ZASTOSOWANIE W NIEKTÓRYCH PROCESACH PRODUKCJI I PRZETWARZANIA ŻYWNOŚCI

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Streszczenie

W pracy przedstawiono przegląd techniki wysokociśnieniowej stosowanej w przemyśle spożywczym zarówno w skali laboratoryjnej jak i skali przemysłowej. Przedstawiono podstawowe mechanizmy niszczenia bakterii, pasożytów oraz modyfikacji własności żywności. Podano przykłady prac badawczych przeprowadzonych zarówno w Laboratorium Wysokich Ciśnień Politechniki Warszawskiej jak i w innych ośrodkach. Przedstawiono najważniejsze zastosowania techniki wysokociśnieniowej w konserwacji mięsa, wydłużania okresu przydatności do konsumpcji wyrobów mleczarskich oraz soków.

PROBLEMS OF CHOCOLATE PRODUCERS ARISING FROM THE APPLICATION OF ISO STANDARDS FOR DETERMINATION OF CBE IN CHOCOLATE

PROBLEMY PRODUCENTÓW CZEKOLADY WYNIKAJĄCE ZE STOSOWANIA NORM ISO NA OZNACZANIE CBE W CZEKOLADZIE

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Summary

Different considerations cause that in confectionery products other fats replace cocoa butter. These fats have physical properties similar to cocoa butter (CB), but may have a different chemical structure. They are so called CBA (cocoa butter alternatives). There are three main groups of these fats: replacers (CBR), substitutes (CBS) and equivalents (CBE). A completely different structure of the two first make that their presence is relatively easy to detect. They can be identified on the basis of the composition of fatty acids. CBEs are composed of the same TAGs as cocoa butter. Great similarity makes it very difficult to precisely determine the amount of CBEs in chocolate products. Since 2000, when the Directive 2000/36/EC was introduced, the use of these fats has become commonplace. In accordance with Directive the addition of these fats to chocolate products, up to a maximum of 5%, should be permitted in all Member States. To prevent the addition of larger amounts of CBE has developed a method for the quantitative determination of the CBE in chocolate. The contents of triacylglycerols POP, POS and SOS are analyzed by gas chromatography. But the diversity of cocoa butters from different parts of the world makes that reliability of this method is problematic. Designated equation that is used to calculate the amount of CBE takes into account the average content of the main TAGs. This can be a source of significant errors. Analyzing the cocoa butters, which the compositions significantly differ from the medium content, even negative CBE content can be obtained. For the analysis of milk chocolate, the presence of milk fat may cause additional problems. In this case first need to determine the amount of added dairy fat and correct fat composition in chocolate. The ISO 11053 recommended that the quantity of milk fat in chocolate determined based on the content of triacylglycerol PSB (P - palmitic acid, S - stearic acid, B - butyric acid). However, highly diversified composition of milk fats can cause appreciable error resulting from these differences. Therefore, ISO standards should take into account not only the error of analysis (repeatability and reproducibility of the method) but also to a greater degree error resulting from the natural diversity of the analyzed fats (cocoa butters and milk fats).

OPTIMIZATION OF COLD PRESSING RAPESEED OIL ON KOMET CA 59G SCREW PRESS

OPTRYMALIZACJA TŁOCZENIA NA ZIMNO OLEJU RZEPAKOWEGO NA PRASIE ŚLIMAKOWEJ KOMET CA59G

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Summary

The most popular type of mechanical extraction in the edible vegetable oil industry is screw-press. Screw-press machines are commonly used for producing cold pressed oils in Central Europe. Quality of cold pressed oils depends on pressure and temperature of pressing in addition to the seed quality. The properties of the seeds as moisture and setting of the screw-press like rotational speed, nozzle diameter and press head construction have main influence on the pressure and temperature during pressing. Respectively, in this work the effect of three parameters: moisture of rapeseeds before pressing, nozzle diameter, rotational speed on the quality of the cold press rapeseed oil, temperature of press head and pressing efficiency were reported. The temperature of press head during pressing was measured by thermal camera. Oils for free fatty acids (FFA), peroxide value (PV), anisidine value (AV), antioxidant stability on Rancimat test (120°C) were analyzed. Moreover Totox ratio, oil yield and pressing efficiency were calculated.

In addition, oils were subjected to sensory evaluation, which the appearance, color, smell, taste and overall quality of the oil were assessed. All results were used to determine the optimal conditions for pressing rapeseed. Optimum pressing conditions of rapeseed on KOMET Ca 59G screw-press for the cold pressed rapeseed oil were 8% moisture, 6 mm, 45 rpm, respectively under which oil yield 25% and pressing efficiency 63% were calculated.

OPTIMIZATION OF SCREW PRESS OF RAPESEED IN DIFFERENT TECHNOLOGICAL CONDITIONS – CHANGES IN ANTIOXIDANT CAPACITY

OPTYMALIZACJA TŁOCZENIA NASION RZEPAKU W RÓŻNYCH WARUNKACH TECHNOLOGICZNYCH – ZMIANY AKTYWNOŚCI PRZECIWUTLENIAJĄCEJ

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Summary

Rapeseed (*Brassica napus* L.) is one of the most common oil crop in the continental temperate regions, while rapeseed oils are frequently used in Europe for consumption, cooking, and as an ingredient in food products. Rapeseed oil is rich source of omega-3 fatty acids and bioactive compounds such as polyphenols, phytosterols, tocopherols and other antioxidants, which play important role in prevention and treatment of some chronic diseases. The increases in health-promoting factors are the main reasons for the optimization of processing parameters in order to produce high-quality rapeseed oil. It is know that traditional production of the crude rapeseed oil is based on seed crushing, cleaning, preheating, flaking, cooking, mechanically heated screw pressing and solvent extraction with hexane. Therefore, in this work the effect of screw press parameters (nozzle diameter - ND and rotational speed - RS) and water content (MC) in rapeseed before pressing on antioxidant capacity of the crude oils is reported. Antioxidant capacities of the rapeseed oils, pressed from rapeseed by using screw press KOMET Ca 59G were determined by the modified three analytical methods: ferric-reducing antioxidant power (FRAP), 2,2′-diphenyl-1-picrylhydrazyl (DPPH) and 2,2′-azinobis(3 ethylbenzo-thiazoline-6-sulfonic acid (ABTS). Also total phenolic content (TPC) in the studied oils was analysed by Folin–Ciocalteu assay. Response surface methodology (RSM) was used for the study of linear, quadratic and interaction effects of three independent variables: moisture content, nozzle diameter and rotational speed on the response variables: FRAP, DPPH, ABTS and TPC. The highest FRAP (167 □mol TE/100 g) and ABTS (3564 □mol TE/100 g) results reveal rapeseed oil extruded by screw press (ND = 10 mm and RS = 55 rpm) from seed contained 6% moisture, while the highest DPPH (1657 □mol TE/100 g) and TPC (7.2 mg SA/100 g) were determined in rapeseed oil pressed from seeds with 8% moisture for smaller nozzle diameter = 8 mm and the same rotational speed = 55 rpm.

Experimental results of the antioxidant capacities (except ABTS method) and total phenolics content were close to the predicted values calculated from the polynomial response surface models equations (R^2 ranged between 0.8914-0.9984).

The optimum rapeseed moisture content (MC) and screw press parameters (ND and RS) for the cold pressed rapeseed oils were 7.8% and 7.6 mm, 55.5 rpm, respectively under which FRAP = 144 □mol TE/100 g, DPPH = 1640 □mol TE/100 g, ABTS = 3441 □mol TE/100 g and TPC = 6.5 mg SA/100 g were predicted.

THE EFFECT OF FATTY ACID SATURATION LEVEL ON THE DEGRADATION OF STIGMASTERYL ESTERS

WPŁYW STOPNIA NIENASYCENIA KWASÓW TŁUSZCZOWYCH NA DEGRADACJĘ ESTRÓW STIGMASTEROLU

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Summary

In USA, a panel of independent experts concluded, in 1999, that phytosterol esters are Generally Recognized As Safe (GRAS) for use as an ingredient in vegetable oil-based spreads and dairy products in the amounts not exceeding 20% of fat (Moreau et al. 2002). For over the past 15 years, the number and amount of plant sterol enriched foods increased significantly on the market. These products are used by consumers for cooking, baking and frying also as ready to eat dairy products. During thermal oxidation of phytosterols or fatty acids a variety of products with controversial biological properties are formed (Oehrl-Dean and Boyd, 2004).
The effect of unsaturation of the acyl moiety on the oxidative degradation of steryl and acid molecules present in phytosterol esters was investigated. Esterification by Neises and Steglich (1978) was used to obtain esters of stearic, oleic, linoleic and linolenic acids and stigmasterol. The purity of esters were checked by GC/MS and ^{1}H NMR. Stigmasteryl esters were placed in glass ampules filled with oxygen, sealed and heated at 60°C and 180°C for 1, 2, 4, 8 and 12 hours. Stigmasteryl esters were separated on HP 6890 gas chromatograph equipped in Rtx-200MS capillary column (30m x 0.25mm x 0.1 μm). Cholesteryl oleate was used as internal standard. Esters of C18:0 and C18:1 fatty acids heated at 60°C were stable for 12 hours, whereas the degradation of C18:2 and C18:3 esters account for 12% and 25%, respectively. During thermos-oxidation at 180°C esters degraded faster. After 12 h of heating 52% of C18:0, 55% of C18:1 and more than 95% of C18:2 and C18:3 esters disappeared. Obtained data showed that the saturation level of fatty acids has significant influence on the degradation of steryl esters. The changes of C18:0 and C18:1 esters were similar, but different from C18:2 and C18:3 esters.

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EFFECT OF RAPESEED PARTICLE SIZE, THEIR HYDRO AND ENZYMATIC TREATMENTS ON ANTIOXIDANT CAPACITY OF CRUDE RAPESEED OILS

WPŁYW ROZDROBNIENIA NASION RZEPAKU, ZAWARTOŚCI W NICH WODY I DODATKU ENZYMU NA AKTYWNOŚĆ PRZECIWUTLENIAJĄCA TŁOCZONYCH SUROWYCH OLEJÓW RZEPAKOWYCH

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Summary

The crude rapeseed oil is rich source of bioactive compounds, such as polyphenols, tocopherols, sterols, phospholipids and others, which exhibit strong antioxidant properties.
The effect of moisture content in seed (MC = 6, 8, 10%) their particle size (PS = 0.50, 0.75, 1.20 mm) and enzyme (Protease, Cellulase, Viscozyme) addition on antioxidant capacity of the crude rapeseed oils pressing by using a screw press KOMET Ca 59G was examined.
Therefore, response surface methodology (RSM) was applied to determine the impact of the independent variables, alone or in combinations and calculation of the optimum operating parameters of rapeseed treatment prior to oil pressing with a the highest antioxidant capacity.
Methanolic and acetonic extracts of the pressed rapeseed oils were prepared and analytical methods based on single electron transfer mechanism: FRAP, ABTS, DPPH and Folin-Ciocalteau were used for determination of antioxidant capacities and total phenolics content (TPC) in the crude oils. It is noteworthy that the studied independent variables significantly affect the antioxidant capacity and total phenolics content in the pressed rapeseed oils. The highest FRAP values (110 – 113 µmol sinapic acid (SA)/100 g) reveal methanolic extracts of rapeseed oils extruded from seeds of the lowest particle size (PS = 0.50 mm). For comparison, the FRAP results of the crude rapeseed oils pressed from the seeds of the size 0.75 - 1.20 mm, with MC = 6% and without enzymatic treatment were significantly lower and ranged between 57 and 83 µmol SA/100 g. However, acetonic extracts of rapeseed oils extruded from different size of seed contained 8-10% moisture without enzymatic treatment had the highest total polyphenolic compounds (TPC = 165 - 191 µmol SA / 100 g) determined by the Folin-Ciocalteu method and antioxidant activity analyzed by the modified DPPH method (1160 - 1209 µmol SA/100 g). On the other hand, total phenolics amount (TPC = 72 - 87 µmol SA/100 g) was the lowest for rapeseed oils pressed from different particle size of seeds with the lowest humidity (MC = 6%) without enzymatic hydrolysis.
The proposed analytical methods for the determination of antioxidant capacities of rapeseed oils, and along with RSM can be employed by the oil processing industry for producing rapeseed oil with high antioxidant capacity and antioxidant contents.

THE EFFECT OF RAW MATERIALS ON RATE OF DEGRADATION OF RAPESEED OIL DURING FRYING

WPŁYW RODZAJU PRODUKTU NA TEMPO DEGRADACJI OLEJU RZEPAKOWEGO PODCZAS SMAŻENIA

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Summary

The aim of this study was to determine the effect of the type of fried products (potato chips and snacks) on thermo-oxidative stability of rapeseed oil. The material used for the study was refined rapeseed oil. In oil preheated to a temperature of 180 °C potato chips and snacks were fried in 30-minute cycles for eight hours a day for five days. The fresh and degraded oils (after each day of frying) were analysed for acid and anisidine values, RI, colour, fatty acid composition and content and composition of polar fraction. It was found that the rate of hydrolytic changes occurred almost two times faster when the fried product was potato chips. The frying of potato chips accelerated also oxidative changes monitored by anisidine value. Larger losses of polyunsaturated fatty acids (linoleic and linolenic) were observed in the oil used for snacks frying. Along with the progressive degradation of the oil, colour underwent darkening, with the major changes when the fried products were potato chips. Higher amounts of polar compounds formed in the oil used for fry potato chips compared with snacks. At the end of frying, content of polar fraction in the oil was 18.2% when the fried product was snacks and 21.9% in oil used to for potato chips.

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CHARACTERISTICS OF SELECTED CULTIVARS HAZELNUTS GROWN IN POLAND

CHARAKTERYSTYKA WYBRANYCH ODMIAN ORZECHÓW LASKOWYCH UPRAWIANYCH W POLSCE

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Summary

Nuts, fruits of hazel common (Corylus avellana L.) are used in the food industry (eg. as a component of confectionery, chocolates, creams, desserts, breakfast items, separate snack), pharmaceutical, cosmetics, perfume and paint. World production of hazelnuts in 2012 reached 1 million tons. Also in Poland we have witnessed a growing interest in commodity cultivation of hazelnuts. Unfortunately, there is little literature sources characterize the nuts from the Polish crops. Therefore, in the present study was to evaluate commodity and physicochemical hazelnut varieties of Catalan and Siren in Poland. In nuts were determined: the content of the kernel, the average mass of a single nut, moisture, fat, protein, carbohydrate, total ash. It was also carried out the fat characteristics of tested hazelnut - indicated fatty acid profile, oxidative stability using Rancimat method, an acid and peroxide value. The results indicate that Siren hazelnuts are characterized by significantly lower weight of the whole nut (2.85 g) and testes (1.42 g), immediately after harvest than Catalan (respectively 4.64 g and 2.23). They contain more fat (59.5% d.m.) and protein (17.4% d.m.) and less carbohydrates and ash than Catalan nut. The lipid fraction is characterized by very advantageous from a nutritional point of view, the composition of fatty acids - contains about 90% unsaturated fatty acids, mainly monounsaturated oleic acid.

Key words*:* Corylus avellana L., hazelnuts, nutritional value, fat

CONSUMER OPINIONS CONCERNING THE COLD-PRESSED LINESEED OIL

OPINIE KONSUMENTÓW DOTYCZĄCE OLEJU LNIANEGO TŁOCZONEGO NA ZIMNO

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Summary

Linseed oil has a high nutritional value, among other things, due to the high content of α-linolenic acid belonging to the family of omega-3. Thanks to the presence of bioactive ingredients, the consumption of linseed oil can reduce the risk of many diseases. For these reasons it is classified as a functional food. In recent years there has been increased interest in cold-pressed linseed oil, and return it to our tables. The aim of the study was to investigate the opinions and views of consumers on cold-pressed linseed oil. The results of the work made it possible to conclude that although the vast majority of 200 respondents (approx. 90%) is aware of the beneficial effects on the health of linseed oil, giving many of its advantages, it is only approx. 18% of the oil consumed. Among people over 50 years of age linseed oil consumption increased (approx. 30%). Most respondents as the best storage conditions indicates shaded place at room temperature, and only about 30% - a refrigerator.

Keywords: linseed oil, functional food, flaxseed, α-linolenic acid, cold pressing

CHARACTERISTIC OF NUTRITIONAL VALUE IN SHORTENINGS FROM WARSAW MARKET

CHARAKTERYSTYKA WARTOŚCI ŻYWIENIOWEJ TŁUSZCZU CIASTEK KRUCHYCH Z RYNKU WARSZAWSKIEGO

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Summary

The nutritional value of diet fats determines not only the quantity but above all quality. High intake of fats, especially rich in saturated fats, is associated with the development of lifestyle diseases such as atherosclerosis, obesity, non-insulin-dependent diabetes mellitus, hypertension and some cancers. According to a nutritional value of fat is also significant share of trans unsaturated fatty acids, formed by industrial hydrogenation of oils. The source of saturated and trans fatty acids are cakes, including biscuits, which is important because of the high consumption of these products by children. Therefore, in the present study attempts to evaluate the quality of fat shortenings purchased retail network in Warsaw. The evaluation assessed 20 kinds of shortenings. In the isolated fat was prepared fatty acid methyl esters were analyzed by GC. Test articles contain from 17.1% to 43.1% fat. The fatty acid composition of the tested products varied widely. The share of saturated fatty acids ranged from 28.4% to 73.6%. The four test product the fat content of trans-isomers was <0.1%, and in the other at the level of from 0.8% to 11.5%.

Keywords: fatty acids, trans isomers, pastry products

ASSESSMENT OF CAMELINA SATIVA SEED OIL OXIDATIVE STABILITY USING RANCIMAT METHOD

OCENA STABILNOŚCI OKSYDACYJNEJ OLEJU Z LNIANKI SIEWNEJ Z WYKORZYSTANIEM METODY RANCIMAT

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Summary

Cold-pressed oils, particularly rich in deficient fatty acids n-3, are gaining interest of consumers. Among them stands out the *Camelina sativa* seed oil, registered in the European Union as a Traditional Speciality Guaranteed. However, due to differences in the quality of raw material and the nature of oil technology extraction, often the problem is oil quality especially its oxidation stability. Therefore it is important to find optimal methods for assessing this discriminant. The aim of the study was to determine the oxidation kinetics parameters for *Camelina sativa* seed oil using the method Rancimat. The study involved three cold-pressed oils from Camelina sativa seed, purchased in Warsaw market. In order to determine oxidation kinetics parameters oils were oxidized under isothermal conditions in the range of 70 -120^{o}C. Based on the results of oxidation induction time (t_{on}) determined in the Rancimat test, and Arrhenius equation, we calculated the activation energy Ea and the constants oxidation reaction rate (k) of tested oils at temperatures measurement. Oxidation induction time (OTI) of tested oils were varied (4,58- 6,14 h at 100^{o}C), a designated value of the activation energy (101,9 – 104,7 kJ / mol) of individual oils differed statistically, which could be explained various initial degree of oxidation (PV), as well as varied composition of non-glycerol fraction, so important for the stability of cold-pressed oils.

Keywords: Camelina sativa, Rancimat, oxidative stability.

QUALITY ASSESSMENT OF COLD-PRESSED OILS PRODUCED FROM SELECTED OILSEEDS

OCENA JAKOŚCI OLEJÓW TŁOCZONYCH NA ZIMNO WYPRODUKOWANYCH Z WYBRANYCH NASION OLEISTYCH

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Summary

In this study comparison between cold-pressed oils obtained from selected oilseeds: conventional rapeseed, linseed and *Camelina sativa* (L.), has been conducted. Oils were pressed at room temperature with a screw-press (Farmet, Czech Republic). The temperature inside the press was 60 ± 10 °C and the temperature of the outflowing oil was 39 ± 1°C. The free fatty acids content (AV), peroxides content (PV) and aldehydes content (AnV), and the content of carotenoid and chlorophyll pigments have been specified. The level of dienes and trienes have been determined by means of UV extinction, and the oxidative stability via Rancimat test at 90, 100, 110, 120, and 130°C was carried out.

The quality of the analysed cold-pressed oils was high, which testified to the appropriate technological value of the seeds used in the research. All oils fulfilled requirements pertaining to the acid value (< 4 mg KOH/g) and peroxide value (< 15 mEq O_2/kg) specified in the Codex Alimentarius for cold-pressed oils. The content of secondary oxidation products in the inspected oils did not exceed the value of 1.0, which testified to the insignificant influence of the cold-pressing process on the secondary degree of oxidation of the oil. The longest induction time (IP) in the Rancimat test, regardless of the temperature applied, was noted for rapeseed oil, followed by *Camelina sativa* (L.) and linseed oil. It was shown that rate of oils oxidation (Rancimat test) doubles for every 10 °C rise in temperature.

INFLUENCE OF MICROWAVE PRETREATMENT OF RAPESEED ON THE CONTENT OF ANTIOXIDANTS AND OXIDATIVE STABILITY OF OIL

WPŁYW OGRZEWANIA MIKROFALOWEGO NASION RZEPAKU NA ZAWARTOŚĆ ANTYOKSYDANTÓW I STABILNOŚĆ OKSYDATYWNĄ OLEJU

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Summary

The objectives of this research were to evaluate the effect of the initial moisture content of rapeseed and microwave pretreatment time on tocopherols, plastochromanol-8 ,and canolol content in oil, and to analyse the correlation between oxidative stability and minor components contents. For each sample, 0.5 kg of whole rapeseed were adjusted to moisture contents of 7 and 9%, and equilibrated at 0–4°C for 24 h. Then individual sample sets were subjected to microwaving for 3 and 7 min under 800W. The oil was cold-pressed using screw-press (Farmet, Czech Republic). Tocopherol, PC-8 and canolol contents were determined by NP-HPLC-FL. Oxidative stability of oils was determined with the Rancimat test at 120ºC.

Microwave pretreatment led to a constant increase of the canolol content, whereas only slight increase of tocochromanol contents was observed. Canolol contents increased with increasing microwave time and with decreasing initial moisture content of rapeseeds. When seeds initial moisture content was 7%, after 7 min of exposure the content of canolol in the samples increased drastically, the amount of which increased 48-fold (from 16.97 to 821.86 µg/g) in relation to control. However, when seeds were adjusted to moisture content of 9%, after 7 min exposure the canolol concentration was nearly 3-fold lower compared to seeds with 7% water content. Significant linear correlation have been found between the content of canolol and oxidative stability of oils (r^2=0.96). The IP lengths prolongation from 4.09 h up to 11.52 h was observed.

WPŁYW POWSZECHNIE STOSOWANYCH PRZYPRAW NA STABILNOŚĆ OKSYDATYWNĄ OLEJU RZEPAKOWEGO

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Summary

Oxidation has a negative effect on the nutritional and sensory properties of fats. This process may be limited by antioxidants. Some of these compounds occur in the oils, and many of them are present in the spices that are used for food. Therefore, spices affect not only the taste, but also on the oxidative stability of fats present in the food. The aim of the study was to determine the effect of commonly used spices (black pepper, sweet pepper, chili pepper, curry, basil, oregano, marjoram, tarragon and garlic) on the oxidative stability of rapeseed oil.

Oil stability was investigated by DSC determining the induction periods (IP) at 120°C. Rapeseed oil was tested without and with the addition of spices. Analyses were performed the next day after the addition of spices and after one and two weeks of thermostating at 60°C. The most effective protection against oxidation provided the antioxidants contained in the tarragon, black pepper and sweet pepper. The weakest activity showed curry, chili peppers and garlic. These studies were preliminary and all the spices used in the same concentration. In these spices are various antioxidants in different concentrations. Therefore, various spices will have a maximum antioxidant activity at various concentrations. In further studies would determine the optimum concentration for individual spices.

OPTIMALIZATION OF SEEDS MOISTURE CONTENT AND MICROWAVE PRETREATMENT TIME TO PRODUCE HIGH QUALITY COLD-PRESSED RAPESEED OIL

OPTYMALIZACJA WILGOTNOŚCI NASION I CZASU OGRZEWANIA MIKROFALOWEGO W CELU OTRZYMANIA WYSOKIEJ JAKOŚCI OLEJU RZEPAKOWEGO

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Summary

The objective of this research was to evaluate the effect of the initial moisture content of rapeseed and microwave pretreatment time on the quality and oil yield of rapeseed oil. For each sample, 0.5 kg of whole rapeseed were adjusted to moisture contents of 6, 7, and 8%, and afterwards subjected to microwaving for 4, 6 and 8 min under 800W). The AV, PV, AnV, the content of carotenoid and chlorophyll pigments and browning index have been specified. The level of dienes(K_{232}) and trienes (K_{268}), and the oxidative stability via Rancimat test at 120°C have been determined.

It was shown that seeds microwave pretreatment, after their moisturizing, significantly affects the performance of oil extraction, reduces physicochemical quality of oil, and simultaneously increases oxidative stability. The highest increase in oil yield was found in oils obtained from seeds adjusted to moisture content of 8%, after 4 and 6 min of exposure. Thermal pretreatment of rapeseed led to a gradual increase of oxidative stability, from 4.86 to 9.95 h (for control and microwave exposure of 8 min, respectively). The seeds temperature reached during thermal pretreatment influenced the amount of carotenoid and chlorophyll pigments extracted into the oil. Nevertheless, an increased degree of hydrolysis and oxidation of lipids, assessed in terms of changes in characteristic values, was reported; however, obtained results of AV and PV were within Codex Alimentarius limits.

EFFECT OF THE TYPE OF FRYING FAT ON THE QUALITY OF SNACKS

WPŁYW RODZAJU TŁUSZCZU DO SMAŻENIA NA JAKOŚĆ PRZEKĄSEK

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Summary

The aim of this study was to determine the effect of the type of frying fat on the quality of fried potato and wheat snacks, and the degree of frying fat quality deterioration. Materials for this investigation were potato and wheat pellets and 4 types of frying fat: lard, refined rapeseed oil, cold-pressed rapeseed oil, *extra virgin* olive oil. Industrially produced puffs, fried in palm oil, were chosen for comparison. Pellets were fried for 4 sec. at the temperature of 185 ± 5°C. In the snacks the following data were determined: moisture content, fat content, snacks texture– with the use of texture analyser, and snacks internal structure – with the use of scanning electron microscope. The degree of hydrolysis and oxidation and oxidative stability of frying fats were determined.

Raw material dependent variation in the content of fat and microstructure of different snacks were found.The type of frying fat had no significant effect on snacks textural features, while hardnessof crisps was dependent on the type of raw material composition. The force needed to destroy potato snacks ranged from 10.36 to 13.33 N, and from 6.65 to 7.93 N for wheat snacks. Significant deterioration in the quality of frying fats used after 15 minutes of frying was observed. The most pronounced deterioration in frying fats quality was found in cold pressed rapeseed oil (7-fold increase of Totox index value), followed by lard (6-fold), refined rapeseed oil (over 3-fold), and olive oil (2-fold).

OXIDATIVE CHANGES IN EXTRA VIRGIN OLIVE OIL DURING ITS STORAGE

ZMIANY OKSYDACYJNE OLIWY EXTRA VERGINE W CZASIE PRZECHOWYWANIA

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Summary

Olive oil is a valuable crop regarded as a high-end product on the oil and fat market. Its world production has increased for many years. The demand for olive oil in Poland is stimulated by the ongoing promotion of a healthy lifestyle in media and an intense promotion of Mediterranean cuisine that uses olive oil. The unique properties of olive oil and a wide variety of olive oil types drive competition among its producers. Olive oil has also medicinal properties resulting from its chemical composition. Olive oil exposed to light and heat rapidly goes bad and rancid. It should be stored in a cool and dark place. Oils and olive oil may be kept in the refrigerator in order to preserve their freshness as effectively as possible. The aim of the described study was to assess the quality of selected Extra Virgin olive oil products based on their fatty acid profiles and to evaluate oxidative changes that occurred in the products during their storage. The tested samples represented Extra Virgin olive oil manufactured in Italy (Monini Classico, DiCarlo, Olitalia, Basso, Salvadori Firenze) and Spain (La Espanola, Goya, Carrefour, Borges, La Pedriza, Andaluz). The tested olive oil samples were stored in a temperature of 22°C without access of light. The acid value, iodine number, anisidine value and peroxide value were determined in the samples.

The results of the peroxide value tests performed during a period of 27 weeks clearly indicate an increase in the olive oil oxidation number in time. This is confirmed by an increasing peroxide value in individual olive oil samples tested over the research period. Initially, the increase in the peroxide value was insignificant and did not materially affect the quality of the tested olive oil samples, but the increase became more and more rapid over time, leading even to the threshold defined in the applicable Regulation (UE) nr 299/2013 being exceeded in some samples. Those olive oil samples did not meet the requirements set by the Regulation for an acceptable peroxide value anymore – which undoubtedly was caused by an excessive increase in the oxidation number in the tested oil brands and the resultant impairment of their quality.

USE OF VEGETABLE OILS IN MODIFYING THE FAT FATTY ACID PROFILE OF MEAT AND MEAT PRODUCTS

ROLA OLEJÓW ROŚLINNYCH W MODYFIKACJI SKŁADU KWASÓW TŁUSZCZOWYCH MIĘSA I WYBRANYCH PRZETWORÓW MIĘSNYCH

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Summary

The aim of the study was to evaluate modifications to the composition of fatty acids vegetable oils selected assortments of meat and meat products to improve their nutritional value. We evaluated Raw Meat, poultry and pork derived from livestock, during which were used in animal nutrition feed enriched with plant oils and selected assortments of meat products - sausages, hams block, pates, which was enriched with vegetable oils to improve their nutritional value. We analyzed the fatty acid composition, calculated UFA, SFA, UFA /SFA, MUFA, PUFA PUFA /MUFA, PUFA n-6, PUFA n-3 PUFA, PUFAs n-6/n-3 PUFA and calculated risk index of atherosclerosis - IA. Following the assessment, it was found that in each of the assessed raw materials and processed, there was a modification of the composition of fatty acids. The scope of modifications varied, a kind of raw material, oil dose and composition. For example, experimental chicken breast muscles characterized by a higher content of KT from the family MUFA, PUFA and twice more favorable proportions of PUFA n-6/n-3 PUFA in muscle control than that used conventional feed. Similar trends were found in the muscles of thigh.

DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN SELECTED OILS, MARGARINES AND FISH PRODUCTS

OZNACZANIE WIELOPIERŚCIENIOWYCH WĘGLOWODORÓW AROMATYCZNYCH W WYBRANYCH OLEJACH, MARGARYNACH I PRODUKTACH RYBNYCH

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Summary

The content level of polycyclic aromatic hydrocarbons (PAHs) in oils is a direct consequence of the cultivation conditions of oil plants and their seed processing. The process of drying oil plant seeds shows a correlation between the drying process itself and content of PAHs in oils. The carcinogenic properties of PAHs makes it necessary to control their level in oils, plant fats, smoked meat products and another related food products. According to Commission Regulation (EU) No 835/2011 of 19 August 2011 changing Commission Regulation (EC) No 1881/2006 of 19 December 2006, the maximum level of benzo[a]phyrene and sum of PAHs 4 (benz[a]antracene, chrysene (chr), benzo[b]fluoranthene (b[b]f) and benzo[a]phyrene (b[a]p) in oils and fats (excluding cocoa butter and coconut oil) (b[a]p) cannot be higher than 2,0 μg/kg and 10,0 μg/kg, respectively. The maximum level of b[a]p and sum of PAHs 4 in smoked sprats and canned smoked sprats cannot be higher than 5,0 μg/kg and 30,0 μg/kg, respectively. The maximum level of b[a]p and sum of PAHs 4 in muscle meat of smoked fish products cannot be higher than 2,0 μg/kg and 12,0 μg/kg, respectively. Samples of margarines and smoked fish products were prepared in a number of steps. In the first step fat was extracted from the samples, and then the hydrocarbon's fraction was separated by using liquid chromatography with preparative column and detector UVD. PAHs from the hydrocarbon's fraction were separated by using liquid chromatography with fluorescence detector. Oil samples were dissolved in organic solvent. The rest part of the procedure of determination of PAHs in oil samples was the same as for margarines samples and smoked fish products' samples. The contents of b[a]p in raw pressed rapeseed oils and refined rapeseed oils was contained in the range 0,97 – 5,89 μg/kg and 0,30 – 0,42 μg/kg respectively, sum of PAH 4 was contained in the range 13,99 – 41,78 μg/kg and 0,30 - 2,81 μg/kg respectively. The contents of b[a]p in raw pressed sunflower oils and sunflower oils was contained in the range 0,97 – 2,60 μg/kg and 0,30 – 1,08 μg/kg respectively, sum of PAHs 4 was contained in the range 5,08 – 9,55 μg/kg and 0,30 - 4,09 μg/kg respectively. The contents of b[a]p in margarines was no lower than 0,40 μg/kg, the contents of b[a]a, chr and b[b]f was below the quantification limit of the analytical method. The contents of b[a]p in rapeseed seeds and sum of PAHs 4 was no lower than 15,35 μg/kg and 51,49 μg/kg respectively. Methods of determination of PAHs is accredited for PAHs 4 (b[a]a, chr, b[b]f and b[a]p).

Key words: polycyclic aromatic hydrocarbons, PAHs, smoked meat products, liquid chromatography.

CHARACTERISTICS OF SELECTED OLIVE OILS EXTRA VIRGIN BASED ON FATTY ACID COMPOSITION

CHARAKTERYSTYKA WYBRANYCH GATUNKÓW OLIWY Z OLIWEK EXTRA VIRGIN W OPARCIU O SKŁAD KWASÓW TŁUSZCZOWYCH

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Summary

Essential role in qualitative evaluation and classification different sorts of olive oil extra virgin play the sensory analysis, so the taste and smell. Another basic index of olive oil extra virgin identification is fatty acids composition which points at species and purity of assortment. On quality of used the raw material provides also analysis of isomeric diacylglycerols (DAG) content. Execution of these two analysis identifies olive oil extra virgin in principle and allowed to show the need of further qualitative tests like characteristics of triacylglycerols, sterols, stigmastadiens or waxes. The wide range of olive oil examinations shows the importace and scale of difficulties for characterizing this product. The complete register of analysis are in the documents of UE (No 1348/2013). The aim of the work was estamination of foreign olive oil extra virgin from different countries of Europe like Spain, Italy, Greece, France in conditions of domestic laboratory with using of chromatographic methods for identification and specification of analytical quality of products.

THE EFFECT OF TEMPERING THE SOLID CONTENT OF COCOA BUTTER SELECTED SAMPLE

WPŁYW SPOSOBU TEMPEROWANIA NA ZAWARTOŚĆ FAZY STAŁEJ WYBRANYCH PRÓB MASŁA KAKAOWEGO

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Summary

In this work, the chemical and physical properties of cocoa butter with special emphasis on its polymorphic forms were discussed. Findings on influence of the method for thermostating upon the solid fat content of selected samples of cocoa butter and its equivalents were shown. NMR was used to determine the solid fat content. Two methods for thermostating fat sample were used before analysis. It was affirmed that the method for thermostating fat samples significantly influences the melting course. The long stabilization of fat (40 hours at 26^{o}C) caused an increase in solid fat content over 20^{o}C, and a violent decrease was observed at 35^{o}C.

DETERMINE THE PARAMETERS OF ENZYMATIC DEGUMMING PROCESS OF RAPESEED OIL USING PHOSPHOLIPASE A_2

OKREŚLENIE PARAMETRÓW PROCESU ODSZLAMOWANIA OLEJU RZEPAKOWEGO ZA POMOCĄ FOSFOLIPAZY A_2

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Summary

The aim of the work was using phospholipase for removing phospholipids from rapeseed oil. Experimental processes were conducted at a laboratory scale. Rapeseed oil samples (pressed and solvent extracted after hydration process) obtained from one of oil factories were raw materials for experiments. Microbial phospholipase A_2 was obtained from enzyme producer. Phospholipids removal efficiency was evaluated on the basis of phosphorus, calcium and magnesium contents in oil samples before and after experimental processes. Besides, fatty acids contents in oil samples were monitored.

CLASSIC POLISH SOFT MARGARINES IN THE LIGHT OF THEIR FATTY ACIDS COMPOSITION

KLASYCZNE POLSKIE MARGARYNY MIĘKKIE W ŚWIETLE ZAWARTOŚCI KWASÓW TŁUSZCZOWYCH

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Streszczenie

Margaryny miękkie (kubkowe) przeznaczone przede wszystkim do smarowania pieczywa stały się ostatnio najbardziej rozpowszechnionymi produktami na polskim rynku. Można wśród nich rozróżnić kilka asortymentów zależnie od rodzaju i zawartości fazy tłuszczowej. Istotną sprawą zarówno dla producenta, jak i konsumenta jest otrzymanie produktów wysokiej jakości. Bardzo ważnym wskaźnikiem analitycznym, rzutującym na walory jakościowe i zdrowotne danego produktu jest skład kwasów tłuszczowych osnowy tłuszczowej, realizowany za pomocą techniki GLC-FID. Celem pracy była charakterystyka składu kwasów tłuszczowych (KT) wybranych produktów margarynowych ze szczególnym uwzględnieniem KT nasyconych oraz ogólnej zawartości izomerów trans C18:1 i kwasów polinienasyconych. Wybrane margaryny różnych producentów z rynku krajowego, zależnie od zawartości fazy tłuszczowej, oceniano w trzech grupach:
I - (45-55% tłuszczu, niskokaloryczne),
II - (60% tłuszczu, o obniżonej kaloryczności),
II - (65-80% tłuszczu, standardowe).
Oznaczenie składu kwasów tłuszczowych (KT) dokonano metodą chromatografi gazowej, na estrach metylowych KT osnów z poszczególnych produktów wg PN-EN ISO 5509. Analizy wykonywano na aparacie HP 6890 wyposażony w detektor FID, kolumnę wysokopolarną z fazą BPX 70 o długości 60 m, grubości filmu 0,25 µm i średnicy zewnętrznej 0,22 mm.
W badanych próbach (w fazie tłuszczowej) zawartość KT nienasyconych (suma C18:1, C18:2, C18:3) cennych pod względem walorów zdrowotnych, utrzymywała się w zakresie od ok. 75% do 64%. Wzajemne relacje pomiędzy KT nasyconymi, C18:1 i KT polinienasyconymi oszacowano w przybliżeniu jak 1:1,5:1,2. Równocześnie zawartość KT nasyconych i izomerów *trans* mieściła się w zakresie od 25,4% do 34,9%. Zawartość KT nasyconych (N + izomery *trans* kwasu oleinowego) w przeliczeniu na produkt, wynosiła od 12,6% do 26,9%. Izomery trans występowały w zróżnicowanych ilościach zależnie od typu produktu. Mieszane izomery kwasu linolowego pojawiały się w ilościach od 0,1 do 0,3%. Poziom kwasu palmitynowego w produktach wynosiła od około 10-24%, zaś mirystynowego - szczególnie niepożądanego, wahała się we wszystkich margarynach w granicach 0,8-2,3%.
Na podstawie przeprowadzonych prac można stwierdzić, iż margaryny typu miękkiego odznaczały się zróżnicowaną kompozycją kwasów tłuszczowych. Zaobserwowano ścisłą zależność pomiędzy występowaniem KT nasyconych a izomerami *trans* C18:1 w badanych próbach.

OXIDATIVE MODEL CHANGES DURING STORAGE SYSTEMS FATTY

ZMIANY OKSYDACYJNE MODELOWYCH UKŁADÓW TŁUSZCZOWYCH PODCZAS PRZECHOWYWANIA

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Summary

The aim of the study was to evaluate the susceptibility to oxidative changes in model systems derived from pig fat fat fat pork fine or a fine, hard fat and chaps, linseed oil and wheat fiber preparation and linseed during cold storage. Test samples were evaluated after 3, 6 and 12 weeks of refrigerated storage, the absence of oxygen and light. In model systems of fatty acid value determination is made according to PN-EN ISO 660: 2010, superoxide PN-EN ISO 3960: 2012 anisidine PN-EN ISO 6885: 2008 and calculated the rate of oxidative changes Totox PN-93 / A-86926. The results showed that oxidative changes in a model system containing tiny fatty pork fat and addition of linseed oil, have all been mild, with the trend increasing while extending the storage period. In an embodiment further comprising an additive changes of the fiber was similar to the embodiment of the control. The course of oxidative changes during storage of the fat obtained from fine pork fat, fat hard and jowls modified vegetable oil as well as fiber containing an additive was similar to the control variant. Formulations wheat fiber and flax made to model systems based on the composition of fatty materials resulted in a reduction or increase in the rate of Totox.

A STUDY OF SELECTED ARGAN OILS AVAILABLE ON THE MARKET IN TERMS OF STABILITY OXIDATION

BADANIA WYBRANYCH OLEJÓW ARGANOWYCH DOSTĘPNYCH NA RYNKU POD WZGLĘDEM STABILNOŚCI OKSYDATYWNEJ

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Summary

The aim of the work was an assessment of influence of temperature and storage time on quality characteristics of selected argan oils, obtained by pressing and refining. In pursuing the objective of work six argan oils imported from Morocco from different regions, and degree of purification were examined. Oil samples were stored at a temperature of 6°C and at a temperature of 25°C for a period of from 0 to 6 months. After the incubation period, the anisidin value, the acid value and the peroxide value were determined. Two series of measurements, were made and the results obtained were subjected to multivariate analysis of variance using the Statgraphics PLUS 4.0.

During storage of oils the anisidin value gradually increased, although at a lower temperature to these changes were smaller. Peroxide value tripled after a 6-month incubation at a temperature of +25°C at which to a large extent the impact had oil type and incubation time. Similarly, marked the beginning of a three-time increase in the number of acid value at a temperature of +25°C, this increase largely depends on the type of oils, but didn”t depend on the temperature of incubation.

PLANT OILS – VALUABLE BUT UNSTABLE SOURCES OF N-3 PUFA

OLEJE ROŚLINNE – CENNE, ALE MAŁO STABILNE ŹRÓDŁA PUFA N-3

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Summary

Nutritional value of dietary fat is determined by presence of n-3 and n-6 polyunsaturated fatty acids. The important physiological and healthy role of n-3 PUFA is widely mentioned particularly last time. Their good influence was observed especially in prevention of vascular diseases. Plenty vegetable sources of n-3 fatty acids are: flax oil, camelina oil, echium oil, hemp oil and blackcurrant seed oil. α-linolenic acid is dominated in these oils, however in some of them, stearidonic acid can be also found. These oils are an important source of n-6 PUFA too, including γ-linolenic acid. Presence of γ-linolenic and stearidonic acids in a diet, permits to avoid problems with low activity of enzyme delta-6 desaturase in human organism.

A significant limit in wider application of plant oils rich in n-3 PUFA, is their law durability, especially susceptibility to oxidation process. Excessive oxidation is the main problem in further application of these oils as the ingredients of functional food. In this study, composition and contents of fatty acids, composition and contents of tocopherols and Rancimat test, were examined. Achieved results were used in evaluation of the nutritional value of oils, their oxidative stability, as well as to describe the influence of unsaturation of oils and tocopherols contents on their stability. It was proved that rich sources of n-3 PUFA are: flax oil, camelina oil an echium oil. Especially echium oil, but also hemp oil and blackcurrant seed oil are the important sources of n-6 PUFA (linoleic and γ-linolenic acids) too. The least stable in Rancimat test was echium oil, twice more stable was flax oil, and three times camelina oil. There is almost full negative correlation (coefficient correlation r = - 0,95) between oxidative stability characterized as induction time in Rancimat test, and unsaturation degree described by iodine value. There also exists very high positive correlation (r = 0,88) between oxidative stability and the content of γ-tocopherol.

DETERMINATION OF VOLATILE OXIDATION PRODUCTS AS A METHOD OF ASSESSMENT OF EARLY OXIDATION CHANGES OF LINSEED OIL

OZNACZENIE LOTNYCH PRODUKTÓW UTLENIENIA JAKO METODA OCENY WCZESNYCH ZMIAN OKSYDACYJNYCH OLEJU LNIANEGO

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Summary

The aim of this work was the evaluation the possibility of application of headspace-solid phase microextraction (HS-SPME) and gas chromatography with flame-ionization detection (GC/FID) to detect of early oxidation changes of flax oil.

The examined materials were cold pressed flax oils – high linolenic and low linolenic. Accelerated autooxidation process of oils was made in thermostat conditions, at the temperature of 60°C. Content of selected volatile compounds, peroxide value and anisidine value was determined, as well as Totox value was calculated.

It was stated, that the analyze of selected volatile compounds by HS-SPME_GC/FID method, with utilization of standard substances, is a method allowing to observe autooxidation process of linseed oil, high and low linolenic. Content of selected volatile compounds may be a good indicator of early oxidation changes of high linolenic linseed oil. In the case of low linolenic oil, this analysis doesn't give significant advantages in comparison with peroxide value, anisidine value or Totox value.

Key words: linseed oil, autooxidation, volatile compounds, HS-SPME_GC/FID

THE EFFECT OF PREPARATION OF SEEDS AND CHOKING OF MASS OF SEEDS IN EXPELLER PRESS ON PRESSING PARAMETERS AND QUALITY OF LINSEED OIL

WPŁYW PRZYGOTOWANIA NASION ORAZ DŁAWIENIA MASY NASIENNEJ W PRASIE ŚLIMAKOWEJ NA PARAMETRY PROCESU TŁOCZENIA I JAKOŚĆ OLEJU LNIANEGO

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Summary

The aim of this study was to determine the effect of moisture and flaking of seeds and choking of mass of seeds in expeller press on chosen pressing parameters and quality of flax oil. Flax seeds of high linolenic variety "Bukoz" (IWNiRZ Poznan) have been investigated. Flaking of seeds was made in two rolled laboratory mill using smooth rolls. The oils were pressed in expeller press UNO of Farmet company. It was stated, that moisture of seeds, diameter of escape nozzle of press and flaking of seeds before pressing have a significant influence on pressing parameters and quality of oil. Increase of moisture of seeds from 6,7% to 8,6% results in increase of capacity of press from 7,8 to 8,8 kg/h, decrease yield of pressing from 81,6% to 71,9%, decrease of temperature of oil from 51 to 47°C and cake from 65 to 69°C, increase of water content from 0,39 to 0,43%, and in decrease of insoluble impurities content from 4,4 to 3,2%. The suitable level of moisture of seeds is between 7,5 and 9%. Decrease of diameter of nozzle from 10 mm to 6 mm results in decrease of capacity of press from 11,8 to 8 kg/h, increase yield of pressing from 69,5 to 77,6%, increase of temperature of oil, from 45 do 51°C, and cake from 65 do 69°C, and in increase of content of insoluble impurities from 3 to 3,3%. The suitable diameter of nozzle for processing of whole seeds is 8 mm. Flaking of seeds results in increase of capacity of press from 8 to 9,8 kg/h, increase yield of pressing from 77,6 to 80,7%, decrease of temperature of oil, from 51 do 44°C, and cake, from 66 to 65°C, and in increase of content of insoluble impurities from 3,3 to 4,6%. The suitable diameter of nozzle for processing of flakes is 6 mm.

Key words: flax seeds, flax oil, cold pressing, expeller press

INFLUENCE OF LOW TEMPERATURE HYDROTHERMAL TREATMENT OF FLAKES ON PRESSING PARAMETERS AND QUALITY OF FLAX OIL

WPŁYW NISKOTEMPERATUROWEJ HYDROTERMICZNEJ OBRÓBKI PŁATKÓW NA PARAMETRY PROCESU TŁOCZENIA I JAKOŚĆ OLEJU LNIANEGO

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Summary

The objective of this study was to determine the influence of hydrothermal treatment of flakes on chosen pressing parameters and quality of flax oil

The examined material consisted of flaxseeds of high linolenic variety „Bukoz" from IWNiRZ (PL). Flaking of seeds was made in two rolled laboratory mill using smooth rolls, with slot 0,2 mm. Hydrothermal treatment of flakes was made for 3 h at temperature 50°C, in laboratory incubator. Flakes after treatment were dried in air flow dryer. The oils were pressed in expeller press UNO-SE, from Farmet (CZ). Temperature of materials was measured by laser thermometer. Content of water and volatile compounds in oil was determined according to method PN EN ISO 662:2001. Content of insoluble impurities in oil was determined according to method PN-EN ISO 663:2009.

Flaking of seeds resulted in a increase of capability of press, from 8,5 to 10,6 kg/h, yield of oil, from 72,0 to 73,5%, decrease of temperature of oil, from 48 to 43°C, and cake, from 68 to 64°C. Hydrothermal treatment of flakes resulted in a increase of capability of press, from 10,6 to 13,5 kg/h, yield of oil, from 72,0 to 73,5%, increase of temperature of oil, from 43 to 47 °C, and cake, from 64 to 68°C, and also increase of content of insoluble impurities in oil from 4,0 to 4,2%. Increase of content of peroxides from 0,80 do 1,48 meq. O/kg has also been observed.

Flaking of seeds before pressing has a significant beneficial effect on capability of press, yield of oil and temperature of oil and cake. Hydrothermal treatment of flakes results in beneficial increase of capability of press and yield of oil, and in negative increase of temperature of oil and cake. Flaking of seeds makes evident increase of content of insoluble impurities in oil, and hydrothermal treatment of flakes has positive effect on sensory features of oil but promotes its oxidation.

Key words: flaxseeds, flaking, hydro-thermal treatment, pressing, flax oil

THE EFFECT OF ENZYMATIC TREATMENTS OF FLAKES ON PRESSING PARAMETERS AND QUALITY OF LINSEED OIL

WPŁYW OBRÓBKI ENZYMATYCZNEJ PŁATKÓW NA PARAMETRY PROCESU TŁOCZENIA I JAKOŚĆ OLEJU LNIANEGO

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Summary

Mechanical destruction of seeds and partial opening of seeds cells significantly simplifies extraction of oils from raw material. Farther opening of cells may be achieved by enzymatic hydrolysis of grinding seeds, which may be conducted before all of the ways of extraction of seeds. The objective of this study was to determine the effect of enzymatic treatments of flakes with the use of enzymes addition on pressing parameters and quality of flax oil. The investigations on seeds high linolenic variety of flax "Bukoz" characterized by moisture of 8,5% were made. Flaking of seeds was made in two rolled laboratory mill using smooth rolls. Enzymes - Celullase, Protease and their mixtures in proportion 50:50 and 10:90 were used. The parameters of process: moisture of raw material – 20%, temperature -50˚C, time – 3 h. Enzymes were added by spraying of flakes and carefully mixing. Incubation of flakes was made in laboratory incubator. Flakes after treatment were dried in air flow dryer. The oils were pressed in expeller press UNO-SE of Farmet company, and next cleaned by natural sedimentation and decantation. Enzymatic hydrolysis made plenty of beneficial changes in pressing of oil. Increase of capability and field of pressing and decrease of temperature of cake was noticed.

Their effect on temperature of oil was negligible. The press capability was significantly depended on dose of enzyme used. The highest yield of pressing was obtained for enzymes dose 0,25% ddm., 77,5% - cellulase, 79,4% - protease, 79,8% - mixture both enzymes in proportion 10:90. Using of enzymes had very little influence on a temperature of oil, but temperature of cake decreased about 1 - 3°C. Flavor note „crust of bread", without nutty and bitterness notes, characteristics for oils obtained from whole seeds, without hydrothermal and enzymatic treatments dominated. Using of enzymes did not influence on color and content of water and volatile compounds in oil, there was a little increase of content of insoluble impurities. Moreover, using enzymes caused minimal changes of content of primarily and secondary oxidation products and acidity value. The process contributed to small increase of content of natural antioxidants in oil – polyphenolic compounds and tocopherols.

Key words: enzymes, hydrolysis, flaxseeds, cold pressing, flax oil

ANTIOXIDANT ACTIVITY OF NATIVE POLYPHENOLS IN PLANT OILS RICH IN PUFA N-3

AKTYWNOŚĆ PRZECIWUTLENIAJĄCA NATYWNYCH ZWIĄZKÓW POLIFENOLOWYCH W OLEJACH ROŚLINNYCH BOGATYCH W PUFA N-3

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Summary

The aim of this work was the evaluation of influence of native polyphenols compounds on oxidative stability and antiradical activity of cold pressed plant oils, rich in C18 PUFA n-3. The examined material consisted of five cold pressed oils - flax, camelina, echium, hemp and rapeseed. Profile of fatty acids, especially from n-3 family, and content of native compounds, lipophilic – tocopherols and carotenoids, and hydrophilic – polyphenolic compounds, was determined. Oxidative stability and antiradical potential of oils, before and after removal of phenolic compounds by methanolic extraction from hexane solvent, was evaluated. Oxidative stability was determined by Rancimat method and antiradical activity, determined as force of scavenging $DPPH^{\bullet}$ radical by EPR method. It was observed that examined oils are valuable, but unstable source of C18 PUFA n-3. Their oxidative stability in Rancimat test was not too high and clearly varied. Their antiradical potential varies as well, and depends on kind of oil. Removal of phenolic compounds from oils results in the substantial diminishing of their oxidative stability, depending on kind of oil. Type of oil determines the scale of decrease of antiradical activity too. Presence of phenolic compounds in cold pressed plant oils, rich in C18 PUFA n-3 has positive impact on their oxidative stability and antiradical potential.

Key words: plant oils, PUFA n-3, polyphenols, antioxidant activity