Separation of biosynthetic polyunsaturated fatty acid (PUFA) from marine water fishes with supercritical fluids

Jamana K. Khandagale, Vidya Pradhan

Dr. Rafiq Zakaria College for Women Navkhanda, Jublee Park,
Aurangabad, Maharashtra, India.

***Abstract*: Well-drained liquid extraction is known as one of the most effective methods of extracting high quality fish oil. This method has been widely used to extract oil from fish meat and to process disposal. The health benefits of omega-3 polyunsaturated fatty acids, such as Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) have been well documented by researchers around the world. Fish oil is reportedly one of the richest food sources for EPA and DHA. As a result, fish oil is extracted on a global scale using a number of methods. Separation of biosynthetic polyunsaturated fatty acids (PUFA) is done by supercritical fluid. Polyunsaturated fatty acid was synthesized by WL-1021, which is a problem for marine bacteria isolated from marine fish. Polyunsaturated fatty acid can be effectively extracted from WL-1021 which has the characteristics of rapid growth in the implant site. PUFA in WL-1021 has been successfully separated by supercritical fluid extraction (SFE).**

***Keywords*: Supercritical fluid extraction, bio-synthesis, polyunsaturated fatty acid (PUFA), Marine water fishes.**

Introduction:

Fish oil is often regarded as a rich and inexpensive source of omega-3 polyunsaturated fatty acids, especially EPA and DHA. EPA and DHA are known for their actions in preventing heart disease, inflammation, tissue and brain function, liver, heart (Agostoni, 2008; García-Almeida et al., 2010). Polyunsaturated fatty acids are fatty acids that contain more than one bond in their spine. This category includes a number of important substances, such as essential acids and those that provide essential oils. In recent years, people have given greater importance to the effects of polyunsaturated fatty acid (PUFA). When PUFA is used in human health products, it causes a decrease in blood viscosity and blood pressure, a decrease in cholesterol and triglyceride concentration, can prevent thrombosis and atherosclerosis and a decrease in projected plasma lipids and blood pressure. Polyunsaturated fatty acids (PUFAs) are important for nerve function, blood pressure, brain health, and muscle strength. They are important, which means that the body needs them to function but cannot function, so one should get PUFAs in his diet. It is a genetic component that is best for controlling plasma lipids, thrombosis and atherosclerosis in the human body. There is a production method that involves the extraction of PUFA from seawater. Because of this limited resources, the biosynthetic polyunsaturated acid process was improved. The composition of biosynthetic polyunsaturated fatty acids is easy to manufacture and the speed of its production is high and much faster than other methods used to date. The technology is expected to be acquired through future sales. Already, many countries like japan USA etc work in this field. In recent years, supercritical fluid extraction (SFE) has become an attractive technology for the extraction and separation of essential chemicals from natural products (Linder et al., 2005). Increased consumer awareness about the nutritional value of fish oil has further encouraged its release for human consumption. Several different methods of extracting high quality fish oil are used. Liquid dehydration, enzymatic-assisted extraction, etc. One of the most widely used methods of obtaining fish oil. It uses moderate temperatures and provides oxygen-free media, reducing omega-3 oxidation during the process of extracting PUFA from fish. The supercritical water base has high precision, as the physicochemical properties of a given liquid, such as quantity, variability, dielectric and viscosity can be easily controlled by changing pressure or temperature. The technology also helps to prevent the release of polar impurities such as heavy metals which is why it is a high choice (Kawashima et al., 2006; Catchpole et al., 2000). Supercritical fluid (SFE) base is a new green separation technology. SFE is characterized by a high elimination of mass transfer suspensions and saves energy, and counter-releasing is not necessary. The SFE extraction process has special properties for chemical penetration and critical critical temperature, which is why it is advisable to separate the components by thermal separation and they can also be easily connected. The magnificent carbon dioxide (CO2) liquid has been used as a reference in this paper. Bright and Mcnally have developed a method for the purification of untreated acid oils by preparing chromatography for the finest liquid. The purpose of this paper is to clarify the relationship of extraction and cultural conditions from WL-1021 by SFE, so that polyunsaturated fatty acids can be extracted efficiently.

Materials and methods:

Biosynthetic strain and growth conditions

Biosynthetic compounds or WL-1021 are separated from Pneumatophorus Japonicas living in the deep Pacific Ocean. Using marine artificial sources or PY, the biosynthetic version of WL-1021 is isolated, installed and installed in a 2 liter bit-reactor (2L). The Biomass obtained from the bit-reactor will be dried by freezing, after which the extractor releasing the full liquid is filled separately.

Analytical method

Samples of SFE-separated biosynthetic polyunsaturated fatty acids are methylated with a solution of boron trifluoride methanol to produce methyl polyunsaturated fatty acid esters. Typical material heptane released after methyl esterification is determined by Gas Chromatography / Fourier Transform-Infrared Spectroscopy system (Model Nicolet 710 / lIP 5890), Chromatography / Mass Spectrometer system (Model Finnigan MAT-212), and High Performance Liquid Chromatography (HP.) system (Model Waters).

GC parameters are: fusedsilica capillary column (25 m x 0.32 mm i.d), eluant DV-101 edited; injector temperature, 250 ° C; raising temperature, 150-250 ° C, ramp rate 5 ° C min ~; division rate, 20: 1; a split-flow injector is used and the volume of the injection is 1 gl. The parameters of MS are: source temperature, 250 ° C; high temperatures, 110 ° C; current ionization, 0.30A. FT-IR parameters are: bright tube temperature, 250 ° C; MCT detector. The limits for HPLC were: 510 pump; 484 UV detector; U6K Injection; 810 work station; g-Bond park C18 column (30 cm x 4 mm i.d, packing particle diameter = 10 gm); temperature column, 25 ° C; flow phase, methanol and water, 88:12; flow rate, 1.2 mL / min; wavelength of UV detector, 254 nm. The standard EPA and DHA are from Sigma.

Supercritical Fluid Extraction (SFE): Sweet liquid extraction is similar to any other extraction process; the only difference here is the use of liquids that are considered solvents for extraction purposes. Sensitive liquids (SCF) are those solvents containing solvents such as liquids and gases where temperature and pressure are above the critical point (See et al., 2017). The low viscosity combined with the high dispersion facilitates the rapid dispersal of the solvent in the matrix and thus facilitates the extraction process. Among the various SCFs available for extraction, carbon dioxide (SC-CO2) is the most widely used solvent (Duarte et al., 2014). Vulnerable conditions (critical temperature: 31.1 ° C, critical pressure: 72.8 bar) and non-toxicity and its easy availability have made SC-CO2 as the only highly desirable SFE solution (Espinosa-Pardo et al., 2017; Wrona et al., 2019). The non-polar environment of SC-CO2 makes it ideal for the release of non-polar compounds. The use of polar ferrous chemicals and SC-CO2 will alter the recent cohesion, and thus make it more useful in the extraction of polar chemicals (Garcia-Mendoza et al., 2017).

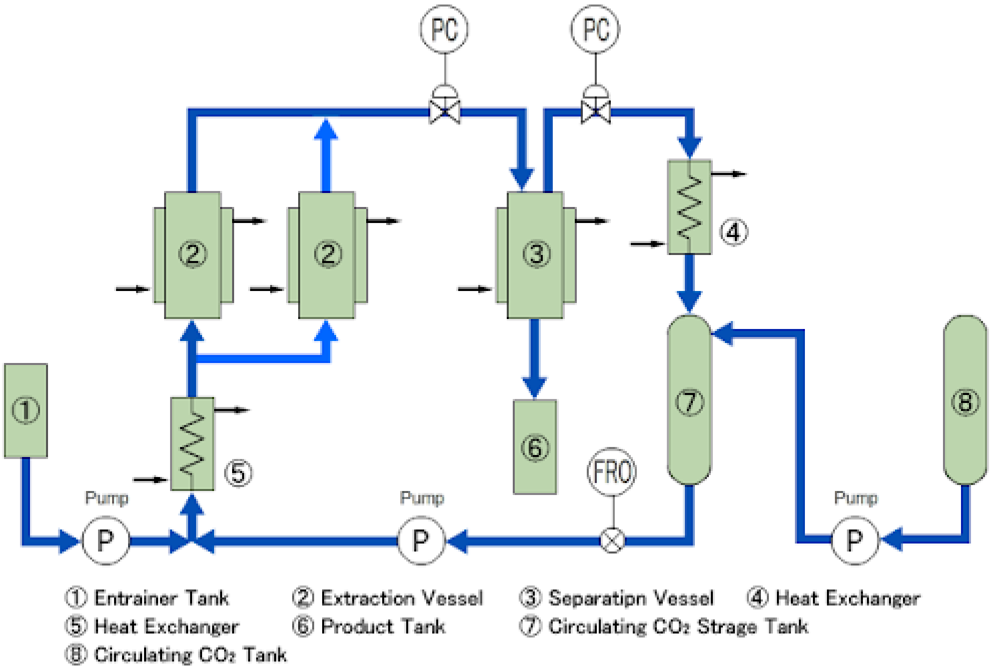

Fig.1 Supercritical fluid separation process

Results and Discussion :

Pufa solubilities in supercritical fluid of carbon dioxide

The intense emission of carbon dioxide fluid Polyunsaturated fatty acid (PUFA), such as Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) was a major concern for economic and commercial efficiency. Solubilities are one of the most important factors in making their product. There are various theoretical methods used to combine solutions in extracting sensitive fluids. A simple process that will produce solutions directly from the molecular power can greatly aid the process of construction and efficiency. The methods include powerful and theoretical methods of knowing the solutions in the SFE. To reduce unit costs and improve extraction, the connection will be set up between Polyunsaturated fatty acid (PUFA) and solvent and so on. Let us consider Polyunsaturated fatty acids (PUFA), from the Bio-synthetic type or WL-1021 to the magnificent carbon dioxide. Temperatures are planted around the worst possible temperature. At 7 ~ / T <1, the temperature is lower than the ambient temperature. The conditions of supercritical fluid are paid for by pressure. At 7 ~ / T> l, the temperature is higher than the strongest temperature. The required pressure should be lowered to control the critical point. It is known that melting also increases when temperatures rise sharply. And in the process of deep liquid extraction, the above equations can be used to predict the presence of Polyunsaturated fatty acid (PUFA). This is the defining relationship between quantity, pressure and temperature. Relationships are used for analysis of test data. The flow method is used to quantify the quantity in this study. First, carbon dioxide as the only liquid used is supplied to the compressor by a pressure cylinder. And when there is a pressure you want, the liquid passes to an extractor controlled by a thermostat that contains bio-material. The fluid dissolves Polyunsaturated fatty acid (PUFA) in the extractor and, in the formulation using a temperature control switch, incorporates Polyunsaturated fatty acid (PUFA) into a collection system that can be measured by high energy.

Stochastic dynamics in supercritical fluid extraction of PUFA

The sharp separation and extraction of Polyunsaturated fatty acid (PUFA) currently attracts large industrial and scientific interest due to their unique properties. To understand the strong aqueous extraction of Polyunsaturated fatty acid (PUFA), the critical carbon dioxide fluid characteristic needs to be understood in an appropriate regulatory environment. From a technical point of view, excess emissions of carbon dioxide fluid have higher dissolving power and higher transfer rates, thus providing an attractive and simple tool for the separation of Polyunsaturated fatty acids (PUFA) from Biosynthetic substances. In this process the magnitude of the variable carbon dioxide fluid can vary continuously over a wide range by simply changing temperature and pressure. The issue of the evolutionary process has been applied to the use of the remarkable carbon dioxide fluid to promote the efficient production of polyunsaturated fatty acid (PUFA) from biosynthetic substances. Distribution methods and other processes are studied considering that this process is related to thermal distribution and performance. Cell mutation has been used to mimic this process [12]. As variations in the length of the correlation and flexibility of the critical region, the molecular strength is affected by the application. When this process is observed, the velocity of the Polyunsaturated fatty acid (PUFA) that dissipates through high fluids varies with the large number of small explosions resulting from random collisions between Polyunsaturated fatty acid (PUFA) and CO 2 carbon dioxide fluid cells. In this system all particles are affected by random force and speed is equal to the force of gravity.

Conclusion:

The critical water base can be used to separate and purify polyunsaturated fatty acids from biosynthetic strain WL-1021, and carbon dioxide can be extracted and used in the process of separating the dominant fluid. The liquid extraction process uses a carefully digested carbon dioxide method to transfer carbon dioxide and polyunsaturated fatty acids from the biosynthetic polyunsaturated acid source to the liquid receptor phase. Subsequently, this process involved the separation of carbon dioxide and polyunsaturated fatty acids from the active source phase to the polyunsaturated fatty acid receptor phase. This extraction process is very effective in purifying polyunsaturated fatty acids from biomass. In this experiment, interpersonal relationships, pressure, temperature and filtration were established. Products categorized by the liquid liquid separation process are rated by GC / MS, GC / FT-IR and HPLC. The fat content of biosynthetic polyunsaturated acid is higher than the fat content of polyunsaturated fat in fish oil. This result shows that biosynthetic polyunsaturated fatty acids can be successfully obtained through a deep liquid extraction process.

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