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FROM THE EDITOR'S DESK

It is quite interesting and astonishing to know that the Cooking Medium of most of the Popular Fried Fast food is imported Oil, in the context of India being blessed with a rich resource of 25 permitted vegetable oils.

In the last year alone in the oil year i.e., Nov '11 to Oct '12, India has imported 10 Million ton of edible Oils costing around Rs 56,265/- crore. This is the highest amount ever imported by India and about half of the TOTAL consumption of Edible Oils. The cost of these imported oils has gone up by 38% in the last six years from Rs. 14,700/- corers to in 2006-07 (Source; Min of Commerce, Government of India). The proposed demand and supply of agricultural products also shows the biggest challenge will be in producing enough Edible Oils at Globally competitive rates to meet the Growing demand.

If we are to produce this 10 million ton of additional oil thorough existing oilseeds crop complex, one needs about 30 million hectares of additional area under oilseed at current levels of productivity. Can we afford to divert this much area from any other FOOD GRAINS, which occupy more than 60% of India's GROSS CROPPED AREA, without sacrificing our Food security?

The obvious answer is NO. That means to increase domestic production of Edible oils either we have to increase the productivity of existing Edible Oilseeds and/or find a suitable oil crop, which can give high oil content on per hectare basis and expand its cultivation and also to bring greater efficiency in processing of seed into oils. Currently Oil seeds occupy about 27 M.HA of GCA (Gross Cropped are) with soyabean at 10 mha and the remaining 6-7 mha each by groundnut and Mustard and the remaining 3-4 mha goes to all other Oilseeds. But Soybean is more a protein (meal) crop than an OIL crop as the bean contains only 17-18% Oil, while Groundnut has 40% oilto kernel ratio and traditional Mustard oil contains 33% Oil. The Productivity of each of these dominant oilseed corps hovers between 1-1.3 tonnes/ha although Soybean is basicalloy rainfed, while ground nut has 20% and Mustard has about 75% irrigation cover. But in terms of Oil content on per hectare basis soya bean gives 234 kg, Ground nut gives 364 kg and mustard gives 430 kg. The good news, is that some private companies have developed hybrids in Mustard which gives 2.6 tones per hectare, but also to raise the oil content from 33 to 44%. This makes mustard the most promising crop. Accordingly the recommendation to increase the MSP to increase 50% over the last two years bringing them to import parity levels. However all this can not bridge the gap between demand and supply. De-reservation of Mustard and Ground nut from small scale industries may also help in augmenting the supply through more modernized mills.

The ultimate answer to the India's Edible Oil problem lies in the OIL PALM as it is the only plant that can give 4 Tonnes of Oil/Hectare basis. Oil Palm has a gestation period of 4 to 6 years, starts yielding some fruit in the fourth year and attains full maturity by the sixth year and it gives fruit for the next 27 years.

Can India grow Oil Palm in globally competitive environment? The Projections show that Palm oil prices will remain above $800/Tonne, as any drop below the cut off promotes it's usage as BIODISEL and pushes up its price. Oil palm can be grown on about 2 m.ha says Dept. of OIL PALM RESEARCH.

There seem to be two ways: 1. Declare this Crop as Plantation Crop like TEA and COFFEE and for this States will have to change Land lease Laws.

Two, Let the Farmers develop this crop, but they will need support especially in the first three / four years. The current calculation suggests that if India is ready to invest nearly Rs. 4000/- crores per year for the next 5 years as compensation to farmers for the opportunity costs of their lands for the first three/four years, as also to support to drip irrigation investments in oil palm plantations, it has high probability to take off at a large scale. Tapping 2 m/ha of OIL PALM per year can give about 8 mt of oil per year for the next 27 years saving a cumulative import bill of more than 12 Lakh Crore.

I hope, I have provided you a GOOD FOOD FOR THOUGHT FOOR OPTIMISTIC NEW YEAR!!

Keep Smiling with your gastronomical delights !!

S. K. ROY
Editor

Ack.: Inputs from Ashoke Gulati/ET/SEAI.

ABOUT OURSELVES

In the last 67th annual convention and international Conference held in Mumbai, the following members attended the convention

S. K. Roy, Vice President (H.Q)

Ranjit Chakraborty, President (E.Z.)

Mohua Ghosh, Hony Secretary (E.Z.)

Dr. Pubali Ghosh Dhar, Ms. Surashree Sengupta, Ms. Susmita Roy, Ms. Isita Nandi, Mr. Siddhartha Sankar Saha, members of OTAI (EZ).

2. Recipient of Dr S. Hussein Zaheer Memorial Award : Dr Mohua Ghosh Asst Professor, Deptt of Chemical technology, University of Calcutta for her excellent work in Lipid Science Technology.
3. Recipient of R. B. G. V. Swaika Memorial award - Dr Avery Sengupta, Moumita pal, Sumita Sil Roy, Dr Mohua Ghosh, of Deptt of Chemical Technology…as the researchers have made original contribution in the synthesis of sterol esters by using Bio-Reactors, which are otherwise of plant origins.
4. Three posters were presented from the eastern region by 1. SAMADRITA SENGUPTA 2. SAMJUKTA KAR 3.TANIMA BHATACHARYYA, research scholars of BESU, SHIBPUR, WEST BENGAL.

Making soy yoghurt containing Rice Bran oil and sesame Oil as superior quality probiotic Yoghurt by Ms Samadrita Sengupta was adjudged as BEST in the category of Posters.

In the Panel discussion, Dr Mondal defended with scientific and logical facts on his dissenting observation about the proposed unlimited Melting Point of Vegetable oil products by the FSSAI. And suggested to consider his views.

S.K.Roy and Dr Mohua Ghosh (1) Expressed their views about the interesting facets of the prescribed specification of Oils with parameters of Flash Points where the veg oil is not solvent Extracted. (2) Inclusion of tests like B.T.T. in respect of OILS like MUSTARD OIL ; OLIVE OIL etc. which has lost its relevance and stands as an unscientific parameter to harass a genuine Producer.

The views expressed were appreciated by the representative of the S.E.A.I. present, but the fate of the issue is unknown,as we do not have any feedback.

Dr. Santinath Ghosh Memorial Research Award – 2012

ENZYMATIC SYNTHESIS OF LIPOPHILIC RUTIN AND VANILLYL ESTERS FROM FISH BYPRODUCTS

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ABSTRACT

Lipase-catalyzed synthesis of lipophilic phenolic antioxidants was carried out with a concentrate of n-3 polyunsaturated fatty acids (PUFAs), recovered from oil extracted from salmon (Salmon salar) byproduct. Vanillyl alcohol and rutin were selected for the esterification reaction, and obtained esters yields were 60 and 30%, respectively. The antioxidant activities of the esters were compared with those of commercial butylated hydroxytoluene (BHT) and α-tocopherol using DPPH radical scavenging and thiobarbituric acid assays. In the DPPH assay, rutin esters showed better activity than vanillyl esters, and on the contrary in lipophilic medium, vanillyl esters were found to be superior to rutin esters. In bulk oil system, the antioxidant activities of rutin and vanillyl derivatives were lower than that of BHT and α-tocopherol, but in emulsion, they showed better activity than R-tocopherol. By attaching to natural phenolics, the PUFAs are protected against oxidation, and PUFA improves the hydrophobicity of the phenolic, which could enhance its function in lipid systems.

KEYWORDS : lipophilization, PUFA, phenolics, antioxidant.

INTRODUCTION

The use of phenolic antioxidants to protect food-based products from oxidation and also to improve the shelf life of lipidcontaining products has nutritional and pharmaceutical relevance.[1] The use of natural phenolics as antioxidants has been increasing because the most widely used and commercially available antioxidants such as butylated hydroxytoluene (BHT), butylated hydroxyanisole (BHA), and tert-butylhydroquinone (TBHQ) are not considered safe due to their suspected role as promoters of carcinogenesis.[2] The other alternative is the use of natural phenolics, which is, however, limited due to their poor solubility in hydrophobic media. To address this, several papers on the lipophilization of natural phenolics to prepare lipophilic antioxidants have been published.[36] Natural phenolics, which are abundant in the plant kingdom, are of particular interest because of their potential biological properties, such as antioxidant, chelating, free radical scavenging, anti-inflammatory, antiallergic, antimicrobial, antiviral, and anticarcinogenic.[1]

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Fish oils are receiving increased interest due to their high content of omega-3 polyunsaturated fatty acids (PUFAs), which are reported to exert positive effects on human health.[7,8] In addition, PUFAs serve a role as precursors of a wide variety of metabolites (prostaglandins, leukotrienes, and hydroxyl fatty acids) regulating critical biological functions. Because mammals have limited ability to synthesize these unsaturated fatty acids, they must be supplied in the diet. The practical use of omega-3 PUFAs for a preventive purpose is limited because of their high susceptibility to autoxidation, which is responsible for the unfavorable off-flavor in rancid oils. A solution would be to combine PUFA with natural antioxidants such as flavonoids, by forming an ester bond. Viskupicova et al.[9] observed that long-chain fatty acids conjugated to rutin provided improved stabilization of sunflower oil against oxidation compared to conjugates with short-chain fatty acids. On the basis of this observation, and the increasing demand for omega-3 PUFA, it was assumed that esterification of PUFA concentrate with natural phenolic compounds can be helpful in protecting both the PUFAs and the product in which the PUFAphenolic derivatives are present against oxidation. They could, for example, be useful for protecting various types of fish oil based products. The PUFAphenolic derivatives prepared would confer the beneficial effects of both the PUFA and the phenolic compounds. In addition to antioxidant activity, products of natural phenolics as esters of PUFA have been reported to show significantly improved anti-inflammatory activities as well antiviral and anticancer activities that were not present in the original phenolic molecule, suggesting that PUFA moieties contribute to the bioactivities of the ester derivatives.[10]

Recently, we reported the utilization of byproduct from fish industries as a source of omega-3 PUFAs.[11,12] To the best of our knowledge, there are no reports on the utilization of PUFA concentrate from fish oil to prepare lipophilic antioxidants and test them on stabilization of fish oils. Two natural phenolics, rutin and vanillyl alcohol, were selected for this study. Enzymatic lipophilization of rutin with individual fatty acids (C4C18) has been reported.[9,13] Similarly, enzymatic esterification of vanillyl alcohol with individual fatty acids to prepare capsinoid derivatives has been reported.[14,15] The objective of the present study was to prepare PUFAphenolic esters exemplified by rutin and vanillyl alcohol through enzymatic esterification of PUFA concentrate obtained from salmon byproduct and to employ the products as lipophilic antioxidants in PUFA-enriched oil and aqueous emulsion systems.

2. MATERIALS AND METHODS

2.1. Materials. Immobilized lipase B from Candida antarctica (Novozym 435) was a kind donation from Novozymes A/S, Denmark. Protex 30 L (g2750 GSU/g) was a gift from Genencor, a division of Danisco A/S,Denmark. Rutin, vanillyl alcohol (4-hydroxy-3-methoxybenzyl alcohol), 2,2-diphenyl-1-picrylhydrazyl radical (DPPH), BHT, thiobarbuturic acid, R-tocopherol, and molecular sieves 4 Å were purchased from Sigma-AldrichChemicals (St. Louis,MO). Precoated silica gel 60 F_{254} TLC plates and silica gel 60 for column chromatography were purchased from Merck (Darmstadt, Germany). Salmon heads (Salmo salar) were a kind donation from Kalles Fisk, Goterborg, Sweden. All solvents and other reagents were of analytical grade or HPLC grade purchased from Merck.

2.2. Preparation of n-3 PUFA Concentrate. The preparation of n-3 PUFA concentrate was achieved in three steps: (a) enzymatic oil extraction, (b) hydrolysis of the obtained oil,

and (c) urea complexation for PUFA enrichment. Oil was extracted from salmon heads (S. salar) using 0.15% v/w Protex 30 L.[11] The recovered oil was hydrolyzed to free fatty acids (FFAs) using a method described by Haraldsson and Kristinsson16 with slight modifications. Crude oil (100 mL) was mixed with 250 mL of 90% ethanol containing 15 g of NaOH. The contents were refluxed for 1 h with stirring. The hydrolysis reaction was monitored by TLC, and the reaction was complete within 1 h. The FFAs were recovered by lowering the pH to 2 using 12 N HCl. Recovered FFAs were washed with water to neutralize the acid and then dried over anhydrous sodium sulfate.

The obtained FFA mixture was enriched in PUFA content by the ureainclusion method as described by Hayes et al.[17] Briefly, 50 g of FFAs, 150 g of urea, and 550 mL of 96% ethanol were heated at 65 C until a homogeneous solution was obtained. The contents were rapidly cooled under running tap water for 10 min to allow crystallization. The crystallized and noncrystallized fractions were separated by filtration. The method for preparation of fatty acid methyl esters (FAME) and the program for FAME analysis by GC were as described by Mbatia et al.[11]

2.3. LIPASE-CATALYZED SYNTHESIS OF LIPOPHILIC ESTERS.

2.3.1. Enzymatic Synthesis of Rutin Fatty Acid Esters. This was performed following a method reported by Lue et al.[13] Briefly, rutin (1 g) and PUFA concentrate (1.9 g) 1:4 rutin/PUFA molar ratio were solubilized in dried acetone (300 mL). Immobilized lipase (6 g) and molecular sieves (15 g) were added, and the reaction was agitated at 200 rpm and 50 C for 96 h.

To terminate the reaction, enzyme and molecular sieves were filtered off and acetone was evaporated. The residue was transferred into four centrifuge tubes. Heptane/water 30 mL (4:1 v/v) was used to extract unreacted PUFA. The heptane phase was discarded. Rutin and rutin PUFA esters were separated using 35 mL of ethyl acetate/hot water (60 C, 1:6 v/v). Esters were extracted into the ethyl acetate phase. The ethyl acetate phases were pooled, dried over anhydrous sodium sulfate, and evaporated using a rotary evaporator to recover the rutin esters of PUFA as a solid dark-yellow product (0.43 g, 30%).

2.3.2. Enzymatic Synthesis of Vanillyl Fatty Acid Esters. This was performed as described by Kobata et al.14 with slight modifications. To a mixture of fish oil PUFA (6 g) and vanillyl alcohol (4.5 g) (1:1.5 PUFA/vanillin molar ratio) in acetone (25 mL) were added lipase (2 g) and 2.5 g of molecular sieves, and the mixture was agitated at 200 rpm for 48 h at 50 C. To stop the reaction, enzyme and molecular sieves were separated by filtration and the filtrate was concentrated in vacuo. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (96:4 v/v) to obtain the vanillyl esters of PUFA as an oily colorless liquid (5.16 g, 60%).

2.4. Analytical Methods. The reaction products of both rutin and vanillyl esters weremonitored by TLC and HPLC and confirmed by LC-MS of purified samples. For rutin esters, mixtures of chloroform/methanol (80:20 v/v) and for vanillyl esters pure chloroform were used as mobile phase forTLCanalysis.TLCplates were visualized underUVlight (254 nm).

HPLC analysis was carried out using a Dionex Ultimate HPLC system equipped with a Varian 385-LC evaporative light scattering detector (ELSD) and a Luna RP-C18 column

(2503.0 mm, 5 ìmparticle size). This system was also equipped with an autosampler, online degasser, and column heater. The injection volume was 20 ìL. Acetonitrile and water containing 0.05% acetic acid were used as mobile phases A and B, respectively, in the following gradient elution: 78-100% A over 50 min, 100% A for 5 min, followed by 10 min re-equilibration time between samples. The column temperature was 25 C, the flow rate was 0.43mL/min, and detection was carried out in ELSD using evaporator and nebulizer temperatures of 25 and 40 C, respectively, and a gas flow of 1.7 standard liters per minute (SLPM).

LC-MS analysis was carried out on a hybrid QSTAR Pulsar quadrupole time-of-flight mass spectrometer (PE Sciex Instruments, Toronto, Canada), equipped with an electrospray ionization (ESI) source. The software used was Analyst QS 1.1, also from PE Sciex. LC-MS was used to characterize the purified vanillyl and rutin PUFA esters. The elution program was similar to that used during RP-HPLC analysis. The scan range was m/z 2001500. Negative ESI mode was used for PUFA and rutinPUFA esters, whereas positive ionization mode was used for vanillylPUFA esters.

2.5. Determination of Antioxidant Activity.

2.5.1. DPPH Radical Scavenging Activity. The antioxidant activity was determined by the radical scavenging ability using the stable DPP_H radical as described by Akowuah et al.[18] Briefly, 200 ìL of methanolic solution of the synthesized phenolic lipids (1 or 2 mM) was added to 2 mL of methanolic solution of DPP_H radical (0.1 mM), and the total volume was made up to 3mL with methanol. After 60 min of incubation at 30 C in the dark, the absorbance of the mixture was measured at 517 nm against methanol as blank in an Ultrospec 1000 UV spectrophotometer.

BHT and R-tocopherol were used as positive controls and their concentrations were kept equal to that of synthesized phenolic lipids. The free radical scavenging activity (FRSA in %) of the tested samples was evaluated by comparison with a control (2 mL of DPPH radical solution and 1mL of methanol). Each sample was measured in triplicate, and an average value was calculated. Antioxidant activity was expressed as a percentage of DPP_H radical scavenging activity compared to control. The FRSAwas calculated using the formula FRSA = [(AcAs)/Ac]100, where Ac is the absorbance of the control and As is the absorbance of the tested sample after 60 min.

2.5.2. Stabilization of Fish Oil against Oxidation Employing Synthesized Antioxidants. The potential of the synthesized antioxidants to protect fish oil acylglycerol concentrate prepared in our laboratory was evaluated. The acylglycerol concentrate was spiked with vanillylPUFA, rutinPUFA, R-tocopherol, or BHT to a final concentration of 5 or 25 mM. A control sample with no antioxidant added was included. The samples were heated for 6 h in a water bath set at 70^0C with agitation at 170 rpm. The extent of oxidation was determined by the thiobarbituric acid assay (TBARS) as described under section 2.5.4.

2.5.3. Stabilization of Fish Oil Emulsion against Oxidation Using Synthesized Antioxidants. The potential of synthesized antioxidants to protect an emulsion against oxidation was tested. An oil emulsion was prepared from the acylglycerol concentrate as described by Huber et al.[19] Acylglycerol concentrate (10 mg/mL) was dissolved in buffer (pH 7.0) containing 50mMTris-HCl, 150mMKCl, and 1% Tween 20. The contents were sonicated

for 20 s (ultrasonic cleaner Branson 200). The emulsion was maintained by agitating the tubes with the emulsion at 400 rpm. The emulsion sample (2 mL) was mixed with vanillylPUFA, rutinPUFA, R-tocopherol, or BHT to a final concentration of 5 or 25 mM. A control without antioxidant was included. The samples were heated at 70°C for 6 h, and the extent of oxidation was determined using TBARS assay as described under section 2.5.3. The experiment was performed in triplicate.

2.5.4. Thiobarbituric Acid Assay. This assay was performed on the basis of the method described by Huber et al.,[19] with slight modifications.

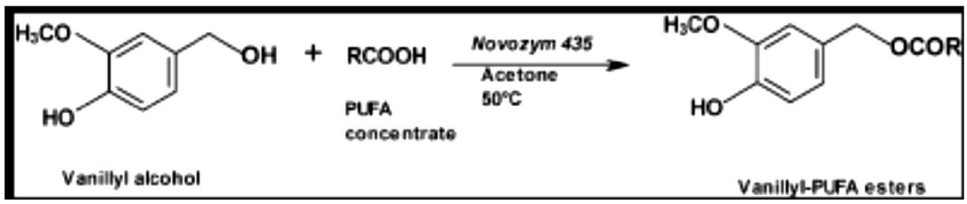
Briefly, 100 ìL of lipid sample or 400 ìL for emulsion sample was mixed with 2 mL of TBARS reagent (0.375% (w/v) TBA in 250 mM HCl) by agitating the contents at 200 rpm for 5 min. The contents were centrifuged at 2150g for 5 min. The lower phase (approximately 1 mL) was carefully transferred into Eppendorf tubes and heated at 80°C for 20 min. The tubes were then allowed to cool to room temperature and again centrifuged at 2150g for 5 min. The absorbance of the lower phase was recorded at 535 nm. Distilled water was used as a blank. The degree of oxidation inhibition was calculated using the formula % inhibition = (1(As/Ac))100, where As is the absorbance of sample and Ac is the absorbance of control.

Table 1. Fatty Acid Composition of Salmon Oil and PUFA Concentrate Obtained by Urea Complexation[a].

	mol %	
Fatty acid	**Before urea enrichment**	**After urea enrichment**
C 14:0	5.4±0.06	0.7±0.06
C 15:0	0.4±0.00	0.2±0.01
C 16:0	15.8±0.06	0.1±0.02
C 16:1	5.6±0.01	6.2±0.39
C 18:0	3.5±0.01	0.4±0.41
C 18:1 n-9	28.0±0.11	8.5±1.46
C 18:1 n-7	3.6±0.04	1.6±0.25
C 18:2	7.9±0.01	16.9±0.01
C 18:3 (ALA)	2.8±0.00	6.7±0.06
C 18:4	1.2±0.00	3.9±0.11
C 20:0	5.1±0.03	0.4±0.09
C 20:4	0.5±0.01	1.5±0.05
C 20:5 (EPA)	5.5±0.01	17.8±0.58
C 22:1	4.3±0.03	0.2±0.05
C 22:4	0.2±0.01	0.5±0.02
C 22:5 (DPA)	2.5±0.00	7.4±0.32
C 22:6 (DHA)	7.6±0.02	26.9±1.26

[a] The PUFA concentrate was enzymatically esterified to vanillyl alcohol or rutin to yield PUFA – phenolic derivatives.

Scheme 1. Enzymatic Synthesis of VanillylPUFA Esters



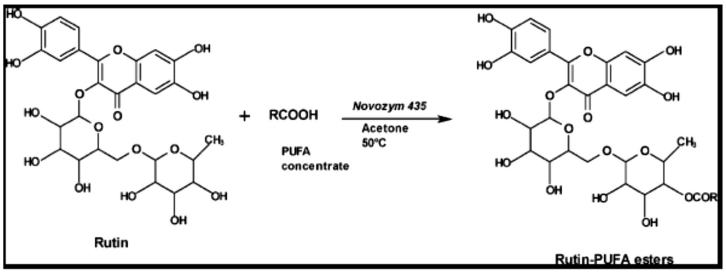
3. RESULTS AND DISCUSSION

In the present study, byproducts from fish processing were used as a source of PUFAs. Annually, an estimated amount of 63.6 million metric tonnes (MMT) of fish waste is generated globally from an annual total fish production of 141.4 MMT.[20] The oil content of byproduct from fish ranges between 1.4 and 40.1% depending on the species and tissue.[21] Such waste represents a rich source of lipids that can be used for omega-3 PUFA recovery. Because fish oils contain a mixture of saturated, monounsaturated, and polyunsaturated fatty acids, the PUFA content was enriched by urea crystallization. The fatty acid compositions before and after urea enrichment are shown in Table 1. The concentrate yield was 19% of the starting FFAs. The content of omega-3 fatty acids, R-linolenic acid (ALA, C18:3 n-3), eicosapentaenoic acid (EPA, C20:5 n-3), and docosahexaenoic acid (DHA, C22:6 n-3), accounted for 67.8 mol % of all fatty acids in the concentrate, and the mean molecular weight of the PUFA concentrate was determined to be 312 g/mol.

For clinical applications, concentrated forms of n-3 PUFAs devoid of saturated and monounsaturated fatty acids are preferred.[22] However, due to the presence of multiple double bonds in PUFAs, they are highly susceptible to oxidation, and the oxidation products can have adverse health effects to the consumer due to their cytotoxic and genotoxic effects.[23,24] The high rate of oxidation of PUFA can be controlled by the addition of synthetic antioxidants such as BHT, BHA, TBHQ, and synthetic or natural α-tocopherol. Furthermore, lipophilic derivatives of natural polyphenolic compounds such as lipophilic rutin esters have been reported to inhibit oxidation of lipids.[9]

3.1. Enzymatic Synthesis of Rutin and Vanillyl Esters of PUFA. The synthesis of lipophilic derivatives of rutin and vanillyl alcohol (Schemes 1 and 2) was performed employing reported methods with slight modifications.[13,14] The yields obtained for isolated rutin and vanillyl PUFA esters after purification were 30 and 60%, respectively. Previously, lipophilization of phenolic derivatives was mainly reported with pure fatty acids in the range of C4C18.[6,9,13,25] In this study, a PUFA concentrate with fatty acids mainly in the range of C18C22 was used. All of the fatty acids were incorporated into the phenolic derivatives despite the differences in chain length and degree of unsaturation (Figure 1b,c). The shift in the retention times in reversed phase HPLC of the PUFA concentrate components after reaction with either vanillyl alcohol or rutin (Figure 1) was an indication of ester formation. This was further ascertained by LC-MS. The observed and expected molecular weights of selected fatty acid esters are given in Table 2.

Scheme 2. Enzymatic Synthesis of Rutin PUFA Esters



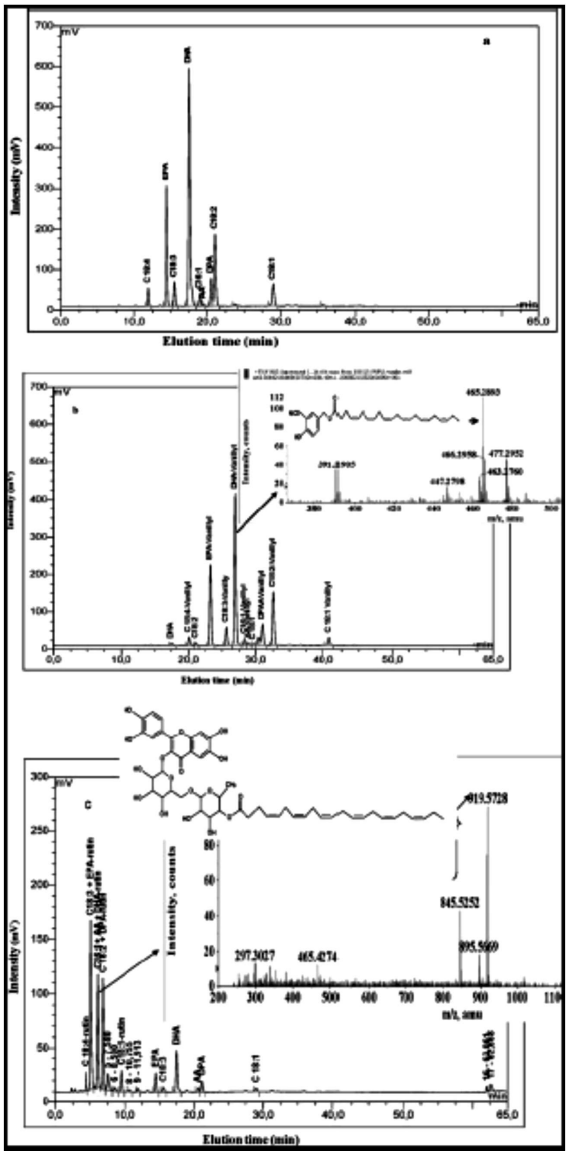


Figure 1. HPLC-ELSD profiles of initial PUFA concentrate (a) and products of enzymatic esterification of PUFA concentrate with vanillyl alcohol (b) or rutin (c). LC-MS spectra of DHAvanillyl and DHArutin esters (one of the products) are also shown along with the HPLC chromatograms.

Table 2. Molecular Weights of Synthesized VanillylPUFA and Rutin PUFA Esters As Observed in the LC-MS Analysis (Expected Masses Are Shown in Parentheses).

Fatty acid	VanillylPUFAa	RutinPUFAb
C 18:3	415.2869 (415.2848)	869.5341 (869.3596)
C18:4	413.2730 (413.2692)	867.5105 (867.3439)
C 20:4	441.2950 (441.3005)	895.5675 (895.3752)
EPA	439.2622 (439.2848)	893.5427 (893.3596)
DPA	467.2669 (467.3161)	921.6045 (921.3909)
DHA	465.2893 (465.3005)	919.5728 (919.3752)

[a]M + H. [b]M – H.

The better yields of vanillyl esters than those of rutin esters may be attributed to the lower reactivity of rutin with fatty acids compared to that of vanillyl alcohol. It has been reported that although Novozym 435 is a nonspecific lipase, it shows greater selectivity toward primary hydroxyl groups compared to secondary hydroxyls.[26] Vanillyl alcohol has a primary hydroxyl group, whereas in the case of rutin, acylation occurs on the 4000-hydroxyl group of the rhamnoside moiety.[9,27] Despite there being six secondary hydroxyl groups in the rutin molecule, LC-MS data indicated that no rutin molecule was acylated with more than one fatty acid. A previous study by Lue et al.[13] in which rutin was esterified with lauric or palmitic acid reported a rutinlaurate and rutinpalmitate ester yield of 81%. The lower rutin ester yields (30%) obtained in the current study could be due to the presence of greater amounts of long-chain PUFAs in the fatty acid mixture. It was earlier reported that as the chain length increases, the conversion yields of esters gradually decrease.[9,25] When using C. antarctica lipase in 2-methylbutan-2-ol, esterification of rutin with fatty acids of chain lengths C4C12 gave a conversion yield of >50%, whereas lower yields were obtained with longer fatty acids (C12C18).9 Not only the chain length but also the presence of double bonds influences the lipase specificity to a large extent. Several lipases have quite low specificity for EPA and/or DHA, but the C. antarctica lipase B used in the present study was clearly able to incorporate those fatty acids efficiently (Figure 1b,c).

3.2. Antioxidant Activity. Esterification of PUFA concentrate with vanillyl alcohol resulted in PUFAvanillyl esters that were more hydrophobic than the PUFA concentrate, whereas rutin PUFA esters were less hydrophobic according to the retention times in reversed phase HPLC (Figure 1b,c). However, both products were more hydrophobic than either rutin or vanillyl alcohol with retention times of 2.26 and 2.65 min, respectively.

The well-established DPPH radical scavenging activity was used to determine the antioxidant activity for the synthesized rutin and vanillylPUFA esters in two different concentrations. The results were compared with those of the reference compounds BHT and R-tocopherol as well as the parent compounds rutin and vanillyl alcohol and are given in Table 3. Both rutin and vanillylPUFA esters showed radical scavenging activity

in the DPPH radical assay. The antioxidant activity of the synthesized rutinPUFA esters was higher compared to that of vanillylPUFA esters in both tested concentrations. The rutin PUFA esters exhibited higher activity than the commercial antioxidant BHT and an activity similar to that of α-tocopherol. The difference in antioxidant activities between the synthesized esters may be attributed to the difference in the structure, solubility, and number of phenolic hydroxyls.[28] Unlike rutin, which has four phenolic hydroxyl groups, vanillyl alcohol has only one phenolic hydroxyl group and a methoxyl group. In addition, the solubility of the rutin derivatives in methanolic solution could be higher than that of vanillyl esters due to the presence of the carbohydrate moiety, which may be the reason for the difference in the activity in DPPH radical assay. Lipophilization of rutin did not influence the radical scavenging activity as both rutin and rutin esters showed similar radical scavenging capacities. Similar patterns have previously been reported.[9,29] Lipophilization of vanillyl alcohol, however, lowered its DPP_H scavenging activity. This could be due to the greatly increased hydrophobicity, which may have resulted in decreased solubility in the tested medium.

Table 3. Antioxidant Activity of Commercial Antioxidants, Substrate Phenolics, and Synthesized Rutin and Vanillyl – PUFA Esters As Determined by the DPPH Radical Method.

Compound	1 mM	2 mM
α-tocopherol	92.3±0.69	92.6±0.71
BHT	65.8±3.75	84.8±0.21
Rutin	91.6±0.57	95.6±0.26
Vanillyl alcohol	87±0.09	90.5±1.48
RutinPUFA esters	91.1±0.32	92.2±0.31
VanillylPUFA esters	52.3±0.15	66.1±1.71

Table 4. Oxidation Inhibition after 6 h of Incubation of Fish Oil or Emulsion at 70 C in the Presence of Commercial or Synthesized Antioxidants As Determined by the TBARS Method.

	oil		emulsion	
Compound	5 mM	25 mM	5 mM	25 mM
BHT	43±1.8	85±2.7	87±4.0	92±2.8
α-tocopherol	60±6.1	80±2.5	8±1.0	38±3.0
rutinPUFA	42±0.3	62±4.9	22±1.0	67±4.7
vanillylPUFA	42±3.7	77±1.2	43±5.1	63±3.3

The antioxidant activity of the prepared lipophilic phenolic derivatives was also evaluated in two types of media rich in PUFA: an acylglycerol concentrate containing 53% PUFA obtained from enzymatic treatment of fish oil and an emulsion prepared using the same acylglycerol concentrate. Both the prepared lipophilic derivatives exhibited antioxidant

activity as determined by the TBARS assay. BHT and R-tocopherol were used as reference antioxidants, and the results are presented in Table 4. In the bulk oil system the antioxidant activities of rutin and vanillylPUFA esters were similar at 5 mM concentration, whereas at 25 mM the activity of vanillylPUFA esters was higher, probably because vanillylPUFA esters were more hydrophobic than the rutin esters. The activities for both the synthesized derivatives were, however, lower than those of reference compounds. In the emulsion system, vanillylPUFA esters exhibited antioxidant activity 2 times that of the rutin PUFA esters; however, at 25 mM, the activities were comparable (Table 4). Both of the products showed lower activity than one of the controls (BHT) but were superior to the lipophilic reference compound R-tocopherol, which exhibited the lowest antioxidant activity. BHT has previously been reported to provide a better stabilization of PUFA in emulsion against oxidation than R-tocopherol.[30]

The difference in activities in the tested methods is expected as the two media are different with respect to the solubility, distribution, and location of antioxidants.[15,31] Murata et al.[32] studied the relationship between hydrophobic nature and antioxidant activity of flavonoids and found that hydrophobicity is an important determinant for antioxidant potency. Viskupicova et al.[9] also observed that hydrophobicity may have an impact on the antioxidant capacity of a compound in lipophilic food systems, with long-chain fatty acid rutin derivatives offering better protection against oxidation of sunflower oil and β-carotene – linoleate suspension than short-chain derivatives. On the contrary, Laguerre et al.[31] observed that an increase in hydrophobicity does not necessarily improve the antioxidant activity of phenolics. A maximum antioxidant efficiency to protect emulsions against oxidation was achieved with rosmarinic acid octyl esters, with longer chain analogues showing a decreased activity. In the present study, ranges of products with various lengths of the fatty acid chain were synthesized, which can be a good strategy to ensure that at least some molecules have ideal properties for use in each system.

In conclusion, consumption of omega-3 PUFAs stimulates oxidation, which necessitates their use in the presence of an antioxidant. In this study, esterification of PUFA to naturalphenolics resulted in lipophilic esters that were able to stabilize oil and emulsions against oxidation. Esterification of omega-3 PUFAs to natural phenolics that have antioxidant properties thus protects the PUFAs from oxidation, and the PUFAphenolic derivatives carry the combined health beneficial properties of PUFAs and the phenolic molecules.

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GLOBOIL LEGEND AWARD 2012

Acceptance Speech

Mr. Nadir Godrej

Former President, OTAI

Managing Director, Godrej Industries Limited

This is indeed a special day
When all my friends from SEA
Are here at hand to hear me speak
And your indulgence I willseek
As I reminisce of times past.
Alas! Good old days never last.
But memories can still survive.
And events like this make them alive.
Ardeshir Godrej was our founder
You could not find someone sounder
In spite of obstacles and blocks
He pioneered safes and locks.
And then he chose a wider scope
He worked as hard in tackling soap.
For many years he tried his hand
Until he could well understand
The ins and outs of making soap.
To vegetarians he gave new hope.
The other makers were all callow
And made their soaps from lard and tallow.
But thanks to his determined toil
Fine soap could now be made from oil.
My father was an engineer
And like his uncle a pioneer.
He never chose the beaten path
Studied far from home and hearth.
And not the normal US, UK
He boldly chose the German way.
For years everything was fme
But then of course came '39.
The signs of war were in the air
The British Consul told Indians there
That it was time for them to go.
My father had no way to know
That he would have a longish break.
In fact ten years it would take
For him to get his PhD.
But during those long years you see
My father chose not to be placid
But made good soap from fatty acid,
The topic that he had selected
And thus his thesis was perfected.
But thanks to this twist in the plot
Godrej Soaps gained quite a lot.
In fact we went beyond just soap
Now chemicals were in our scope.
With food quite short there was no hope
Of edible oils being used for soap,
This breakthrough proved to be astute
And thanks to this novel route
Inedible oils were used for soap,
Thus giving industry new hope.
Between food and soap we were torn
Solvent Extraction was then born.
And Godrej also played a part
With groundnut first we made a start
Rice bran then was added soon
And this turned out to be a boon.
In learnt all this at my father's knee.
First languages and geography
Then dollops of oil chemistry.
I accept this blessing gratefully.
And equal guidance came from Adi
And though by now he's my best buddy,
Back then he was a father figure.
He looks quite young but please don't snigger
He advised me on my education
Then recalled me back to our nation
As my studies went on and on.
For six long years I had gone.
All these years, I had been shirking
But Adi had been busy working.

Boldly he had taken charge
Not just business but affairs at large.
He led associations one by one
And started a new as one was done.
And SEA he also lead
Achieving much while at its head.
At CLAFMA and at SEA
Adi firmly led the way,
Bought offices when they were cheap
And all of us could therefore reap
The benefits of this wise choice.
And SEA has a strong voice.
And Adi received this award
And now's my turn to be awed.
But let's move on from Adi's glory
And return to my own story.
In the waning days of the emergency
He called me with great urgency
"Back here," he said, "things are scary
And look like getting much more hairy.
I need you here right by my side."
I of course swelled with pride
An academic life was spumed
The perpetual student then returned.
And very early I took the lead
In the nascent business of making feed
In good time we could make it grow.
And many of you may not know
The way we stumbled into feed.
For compound feed there was no need.
Then Buhler sought out L & T
Together they had tried to see
If a market might exist
There were no takers on their list
They chose to make a clean swipe
But they were left with a prototype
A discount customer was sought
And Godrej were the ones who bought.
Serendipity and not a vision.
Thus gave birth to this division.
Solvent extraction led us here
And this is something I still cheer,
But I think it's rather sad
That when the times were very bad
We decided we should quit
And solvent extraction we did exit
And yet its puzzling that I'm here
The irony is very clear.
But when you think out of the box
There never is a paradox.
Perhaps the fact we left the core
Made us appreciated more
We let the others take the cake
But the fruits of all their toil
Is what we need, the meal and oil.
And in these fields I lead the way
In deciding how our group would play.
By now you have a real feel
Of the role that I played in meal.
On my father's hunch we had invested
In something strange and so untested
As making Olefins from oil.
It hardly seemed worth all that toil.
But Alcohol was an intermediate
Not Ethyl which gives an immediate
Kick to all who do imbibe it.
And for this audience I'd describe it
As chain length 12 to 18.
And now this change in tack would mean
A change in all our Sttategy
And it was largely up to me
To clean up the entire mess
And it was tough I must confess.
But when you have the perfect teams
The impossible also seems
Like a stroll in the park
Though sometimes strolling in the dark!
And at the end of this turmoil
My businesses used meal and oil.
And for as far as I can see
Now R&D will be the key.
For every problem that we face
A program should be put in place.
The populace shoud benefit
And business targets should be hit.
Imports of oil are quickly soaring

But we, I think, should be exploring
New ways of producing oil
Right here on our Indian soil.
Palm Oil's already on the way.
More trees are planted day by day
But farmers always have to choose
And they are scared that they might lose
If they commit to the Oil Palm tree
And some years later they then see
That prices have begun to fall.
You see for them it's a tough call.
Export duties have been hiked
The price we pay has duly spiked.
Perhaps we should retaliate
An import duty would be great.
Ten per cent on CPO
Would raise funds that could then go
To increase the domestic flow.
And in a nod to RSPO
For imports that are certified
A small concession could be tried.
Now com yields here are very high
So there is something we could try.
We could try and modify
By making oil and protein high.
A new oilseed could soon be born
Varieties of high oil corn.
Though it has not met the goal,
Jatropha could still play a role.
The yields have been much enhanced
The time to fruiting has advanced.
The toxicity has been reduced
And if in India it is produced
With biodiesel borne in mind
I'm sure that everyone will find
That oleochemicals could use it too
And that's indeed what we will do.
The first few steps have now been taken
But we should not be mistaken
Much more remains for us to do.
After all these years I'm quite tired
But this award has me inspired.
With lots of thought and lots of toil,
We'll make enough of our own oil,
And very humbly I do ask
All to join me in this task.
My special thanks to Kailash Singh.
Globoil's undisputed king.
For the pizazz and all the bling
That only Kailashji can bring
To all of us year after year.
And he deserves a special cheer!
And special greetings I'd like to send
To Sushil Goenka, my good friend,
And to all of us in Industry
Who jointly worked to quickly see
That tariff value was market based
Overcoming the crisis that we than faced.
To Vijay Data salutations
And heartfelt congratulations!
But one things that we well know
Is Presidents just come and go
And someone else must hold the fort.
And a real hero should be sought
And we could never find one better
Than our own dear Dr. Mehta.
For his friendly, can do attitude
I bow in deepest gratitude.
I think Dorab for the extra gloss
When introduced as his boss.
He's really gone very far
And become quite the star!
Of course it would be very odd,
Not thinking family or God.
But most of all a big thank you
To each and every one of you.
I am humbled and I am awed
At receiving this Award.

VEGETABLE OILS IN INDIA

Mr. Nadir Godrej

Our granaries are full of grain,
But the oilseeds sector's full of pain.
Although we grow a range of seeds
We just can't seem to meet our needs.
The demand is always growing fast,
While supply is still stuck in the past.
The imports show a rapid rise
And have reached an enormous size.
The number causes me distress
Ten million tons, no more no less.
Many think it is just fine
To import and then refine
But our suppliers aren't benign
Their export duties by design
Promote their industry not ours.
We hope our government empowers
Our industry and retaliates
And quickly closes the flood gates
And paves the way to produce more oil
Right here on our Indian soil.
The SEA now has a scheme.
And we should all work as a team.
All of us in one big tent
For an import duty of ten percent
Helping us to stanch the flow
Of imported CPO
By enabling us to greatly grow
Our own production of every oil
By better skills and greater toil.
RSPO desearves support
Hence oil that's certified ought
To enjoy some small remission
In the duty rate in recognition
Of the importance of their mission
Of sustainability and low emission.
Food inflation's rather high
And government is rather shy
To take a risk and raise the duty.
They needn't worry, that's the beauty
Of this rather clever stunt.
The producers will bear the brunt
As the price of CPO will fall.
For India it's the perfect call
Our prices will slightly rise
But the revenue the government pries
From Malaysia and Indonesia
Is a justified seizure
Of their ill gotten gains.
We have suffered great pains
Both direct and collateral
Because of their unilateral
And bad decision to impose
An unhealthily large dose
Of unjustified export duty.
We need to take back all this booty
And spend it on improving our yields
And irrigating all our fields.
We should raise the minimum price
Produce much more oil from rice.
Corn yields are now very high
This is a source we should now try.
The normal variety can be a source
But high oil types are better of course.
One new source that's on the way
And growing fast day by day
Is of course the oil palm tree
And very soon we will see
Production rising rapidly.
If in all this we are proficient
We surely can be self sufficient.
Whether we produce or import
The latest technology must be sought
For refinning and for fractionation
And so for all our edification
We have a program for two days
To learn about the various ways
We can refine more efficiently
And improve our products sufficiently
To break the cycle of bad luck
And finally make a buck.

INTERNATIONAL NEWS

Canada approves new health claim on food products

Canada's health regulatory organisation, Health Canada, has approved a new claim for use on food products, reports Lipid Technology.

The claim states that : "Replacing saturated fats with polyunsaturated and monounsaturated fats from vegetable oils helps lower or reduce cholesterol." An additional statement, "High cholesterol is a risk factor for heart disease", may also be added to the claim.

There are number of qualifications to the regulation.

The product with the claim must be a vegetable oil or food which has a fat composition of >80% mono - or polyunsaturated fats, not including long-chain omega-3 lipids.

To tie in with other heart health claims, the product should also contain 2g or less of saturated fatty acids and trans fats combined; and less than 0.2g of trans fats specifically, per 100g or referenced serving size; and also 100mg or less of cholesterol per 100g.

(Source : Oil & Fats International Aug/Sept' 12 issue)

Effect of heatig oils and fats in containers of different materials on thier trans fatty acid content

The nature of the container material and temperature employed for deep-frying can have an influence on the development of trans fatty acids (TFA) in the fat used. The present study was undertaken to determine the effect of heating vegetable oils and partially hydrogenated vegetable fats with different initial TFA content in stainless syeel, Hindalium (an aluminium alloy), cast iron and glass containers, Ground nut oil (oil I), refined, bleached and deodorizes (RBD) palmolein (oil 2) and two partially hydrogenated vegetable oils with low (fat 1) and high (fat 2) TFA content were uniformly heated at 175-185^{0}C over a period of 12 h. An increase in TFA content to 20 g kg^1 was observed in oil 2 in the cast iron container, while a decrease in TFA content of 20-30 g kg^1 was observed in fat2 in all containers. The heating process of fats and oils also led to an increase in Butyro refractometer reading and color values. This study showed that the TFA 18:1t content of oil 1, oil 2 and fat 1 increased with reprated or prolonged geating. The cast iron container showed the highest increase in TFA 18 : 1t for RBD palmolein (oil 2). The amount of linoleic acid trans isomers formed in the heating process was negligible. Fat 2 with high initial TFA content showed a decrease in TFA 18:1 and 18:2 on heating in all containers. Oils heated in glass and stainless steel containers showed less TFA 18:1t formulation.

(Amrutha Kala, A.I., et al., J. Sci, Food Agric, 92:2227-2233, 2012)

[Source : Inform Sept. 2012 Vol.23(8)]

Lok Sabha Un-Starred Question No. 2707 - Answered on 28.08.2012

Edible Oil

Shri Neeraj Shekhar & Others

Will the Minister of Consumer Affairs, Food and Public Distribution be pleased to state :

(a) the demand, supply, Import and price of edible oil and pulses during the last three years, variety-wise;

(b) whether the deficient monsoon is likely to have an advance impact on the production of edible oil and pulses and has also pushed up its prices in the international market;

(c) if so, the details regarding present stocks/estimated production and demand along with the additional financial burden to be borne by the Government on Import of foodgrains on this account and its likely impact on the domestic prices, varietywise; and

(d) the steps taken to ensure availability, check cartelization and control the prices of the said items during the ensuring year ?

Answer

Minister of State (Independent Charge) for Consumer Affairs, Food & Public Distribution Prof. K. V. Thomas.

(a)

- ★ Demand and supply of edible oil (oilwise) and pulses (variety*-wise) during the last 3 years are at Annexure - I & II respectively.
- ★ Import of edible oils (oil-wise) and pulses (commodity-wise) during the last 3 years are at Annexure - III & IV respectively.
- ★ Average domestic wholesale prices of edible oil (oil-wise) and retail prices of pulses (variety-wise) during the last 3 years are at Annexure - V & VI respectively.

(b) It is too early to estimate the production of oilseeds and hence of edible oils during 2012-13. However, Department of Agriculture & Cooperation, Ministry of Agriculture has stated that as per estimations made by the States for Inter Ministerial weather Watch Group meeting, area coverage under oilseeds has been reported at 161,054 lakh hectares as on 22.8.2012. The management of drought in Kharif 2012, Government has enhanced subsidy on distribution of certified seeds of oilseeds from Rs. 1200/qtl. to Rs. 2000/qtl. for resowing or purchasing of drought tolerant variety seeds for Kharif 2012 under Integrated Scheme of Oilseeds, Pulses, Oil Palm & Maize (ISOPOM).

Average area coverage under pulses for kharif season 2012-13, has been reported as 109.75 lakh hectares whereas the area sown has been reported as 85.32 lakh hectates during 2012.

It has no impact on the international prices of edible oils. Over the last one month (as on 22.8.2012) the prices of edible oils, Crude Palm oil, Soyabean oil and RBD Palmolein have declined in the International market by 2.6%, 0.1% and 4.5% respectively whereas prices of sunflower oil have increased by 2.2%.

(c) As on 1.8.2012, actual stock of wheat and rice is 475.26 lakh tons and 285.03 lakh tons respectively. As per 4th Advance Estimate of Department of Agri. & Coopn, the total production of wheat is 939.03 lakh tons and of rice is 1043.22 lakh tons during the crop year 2011-12.

As per the Ministry of Agriculture, production estimates of Agricultural crops are prepared only after commencement of the Agricultural Year.

The stock of edible oils as on 1.8.2002 at various ports is estimated at 8.25 lakh tons. Details given below :-

Name of oil	Quantity in lakh tons
CPO	3.50
RBD Palmolein	1.40
De-gummed Soyabean	1.75
Crude Sunflower	1.35
Canola Rape	0.25

The stock of about 8 lakh tons of edible oils in pipelines. Total stock both at ports and in pipelines is 16.25 lakh tons. The estimated production and demand of Edible oils Oil-wise for the year 2011-12 (Oil Year November to October) is at Annexure - VII.

(d) : In order to ensure adequate availability and to contain the prices of edible oils in the country, Government has taken various steps as under :

(i) Import duties on crude and refined edible oils have been reduced to nil and 7.5% respectively.

(ii) Export of edible oils has been banned except coconut oil, edible oils from minor forest produce and branded oils in small consumer packs within a quantitative limit.

(iii) State Governments have been authorised to impose stock limits on edible oils and oilseeds.

(iv) In order to further augment the availability of edible oils, since 2008 Government has implemented a scheme for distribution of subsidized imported edible oils through States / UTs to ration card holders with a central subsidy of Rs. 15/- per kg. The scheme was extended from time to time and for further period for import of up to 10 lakh tons of edible oils from October, 2011 to September, 2012.

That steps taken to ensure the availability and control the prices of pulses during the ensuring year are as follows :

1. Government has been actively promoting the production of pulses through various crop development schemes such as National Food Security Mission on Pulses, Integrated

Scheme of Oilseeds, Pulses, Oil palm & Maize (ISOPOM), Micro-Management of Agriculture (MMA), and Integrated Development of 60,000 Pulses villages in Rainfed areas under RKVY in major pulses growing States in the country.

2. Customs duty on import of pulses has been reduced to zero w.e.f. June 8, 2006;

3. Export of pulses has been banned since June 27, 2006, except the export of Kabuli chana, and 10,000 tonnes of organic pulses and lentils;

4. Stock limit on pulses have been imposed since August 29, 2006;

5. Futures trade in urad and tur have been banned since January 27, 2007;

6. A subsidy scheme for imported pulses was operationalised during December, 2006 to March, 2011 whereby 5 designated public sector agencies undertook import of pulses and supplied it in the domestic market for which the Government reimbursed losses upto 15% of the landed cost.

Annexure referred in reply to part (a) of the Unstarred Question No. 2707 Answered on 28.8.2012 in the Lok Sabha.

Estimated Domestic Production, Import and Supply/Demand of Edible Oils (Oil-wise) during the last three years (November to October)

(Quantity in lakh tons)

Name of Oilseed	2008-09 Oil	2009-10 Oil	2010-11* Oil
A. PRIMARY SOURCE			
Rapessed / Mustard	22.32	20.48	25.35
Soyabean	15.85	15.94	20.38
Groundnut	16.48	12.49	19.01
Sunflower	3.82	2.81	2.15
Sesame	1.98	1.82	2.77
Niger Seed	0.35	0.30	0.32
Safflower Seed	0.57	0.54	0.45
Castor	4.68	4.04	5.40
Linseed	0.51	0.46	0.44
Sub Total	**66.56**	**58.88**	**76.27**
B. SECONDARY SOURCE			
Coconut	4.50	4.50	4.00
Cottonseed	7.60	8.00	10.89
Rice Bran	7.70	7.20	7.20
Solvent Extracted Oils	4.00	4.20	4.20
Tree & Forest Origin	1.20	1.20	1.20
Sub Total	**25.00**	**25.10**	**27.49**
Total (A+B)	**91.56**	**83.98**	**103.76**
C. Less : Export & Industrial Use	7.00	4.52	5.94
D. Net Domestic Availability	84.56	79.46	97.82
E. Import of Edible Oils $	81.83	88.23	83.71
F. Total Supply/Demand of Edible Oils from Domestic and Import Sources	166.39	167.69	181.53

* Based on Final Estimate (declared by Ministry of Agriculture on 03.02.2012).

$ Source : The Solvent Extractors' Association of India, Mumbai.

ANNEXURE - III

Annexure referred to in reply to part (a) of the Unstarred Question No. 2707 - Answered on 28.08.2012 in the Lok Sabha.

Import of Edible Oils (Oils-wise) during the last three years (November to October)

(Qty. in MTS)

Oil Year (Nov-Oct)	Refined Oils RBD Palmolein	Crude Oil								
		Palm Oil	Olein	Sunflower Oil	Canola Rapeseed Oil	Soyabean Oil	Cotton Seed Oil	Coconut Oil	Palm Ker. Oil	Total
2008-09	1,240,018	5,187,063	745	590,175	46,362	989,613	5,069	16,693	107,622	8,183,360
2009-10	1,213,409	5,169,445	4,428	630,005	13,950	1,666,492	9,438	4,198	111,973	8,823,338
2010-11	1,081,686	5,374,333	6,501	803,593	11,122	1,006,691	---	2,967	84,566	8,371,459

Source : The Solvent Extractors' Association of India.

ANNEXURE - V

Annexure referred to in reply to part (a) of the Unstarred Question No. 2707 - Answered on 28.08.2012 in the Lok Sabha.

Average Domestic Wholesale Price of Edible Oils During the last three years (Jan-Dec.)

Price : Rupees per quantal

Edible Oil		Year	
	2009	2010	2011
Soyabean Oil	4526	4697	6253
Mustard Oil	4984	5141	6390
Groundnut Oil	6058	7515	8693
Sunflower Oil (Refined)	4249	5009	6498
RBD Palmolein	3752	4397	5645

Source : The Solvent Extractors' Association of India, Mumbai

Annexure referred in reply to part (c) of the Unstarred Question No. 2707 Answered on 28.8.2012 in the Lok Sabha.

Estimated Domestic Production, Import and Demand of Oilseeds and Edible Oils (Oil-wise) during the current year (November to October)

(Quantity in lakh tons)

Name of Oilseed	2011-12**	
	Oilseed	Oil
A. PRIMARY SOURCES		
Rapessed / Mustard	67.76	21.01
Soyabean	122.8	19.65
Groundnut	69.33	15.95
Sunflower	4.99	1.65
Sesame	8.21	2.55
Niger Seed	1.00	0.30
Castor	1.21	0.36
Linseed	23.39	9.36
Sub Total	1.41	0.42
B. SECONDARY SOURCE		
Coconut	–	4.00
Cottonseed	–	11.52
Rice Bran	–	7.50
Solvent Extracted Oils	–	4.10
Tree & Forest Origin	–	1.20
Sub Total	–	28.42
Total (A+B)	–	99.67
C. Less : Export & Industrial Use	–	9.46
D. Net Domestic Availability	–	90.21
E. Import of Edible Oils $	–	95.05
F. Total Availability / Demand of Edible Oils from Domestic and Import Sources	–	–

* Based on Final Estimate (declared by Ministry of Agriculture on 03.02.2012).

** Based on 4th Advance Estimate (declared by Ministry of Agriculture on 16.07.2012.

$ Source : The Solvent Extractors' Association of India, Mumbai.

Lok Sabha Unstarred Question No. 2610 - Answered on 28.08.2012

Ban on Export of Edible Oil

Shri Anto Antony

Will the Minister of Consumer Affairs, Food and Public Distribution be pleased to state :

(a) whether the Government has banned export of branded edible oil; and

(b) if so, the details thereof and the reasons therefor ?

Answer

Minister of State (Independent Charge) for Consumer Affairs, Food & Public Distribution Prof. K. V. Thomas.

(a) and (b) : Yes, Madam, Government has banned export of edible oils in branded consumer packs with effect from 1st August, 2012. The export of edible oils in branded consumer packs of upto 5 kg. has exceeded the quantitative ceiling of 10,000 tons per year (from 1.11.2011 to 31.10.2012). Therefore, Department of Commerce has issued notification for ban on expart of edible oils in branded consumer packs.

Rajya Sabha Unstarred Question No. 2978 - Answered on 7.9.2012

Decline in Production of Pulses and Oilseeds

Shri Dharmendra Pradhan

Will the Minister of Agriculture be pleased to state :

(a) whether in view of the scarcity of oilseeds and pulses in the country, it is essential to take steps to increase their production.

(b) if so, the details thereof,

(c) the schemes run by Government during the last three years to increase the production of oilseeds and pulses; and

(d) the details of the schemes run by Government alongwith the result thereof ?

Answer

Minister of State in the Ministry of Agriculture, Food Processing Industries and Parliamentary Affairs.
Shri Harish Rawat

(a) Yes, Sir.

(b) to (d) : In order to address the scarcity and increase production of pulses and oilseeds in the country, the Government of India is implementing National Food Security Mission (NFSM), Rashtriya Krishi Vikas Yojana (RKVY), Macro Management of Agriculture (MMA) and Integrated Scheme of Oilseed, Pulses, Oil Palm & Maize (ISOPOM), National Food Security Mission has been strengthened from 1.4.2010 with the marger of pulses component of ISOPOM and inclusion of two new potential States, namely Assam and Jharkhand for pulses production. In addition to above schemes, Accelerated Pulses Production Programme (A3P) has been launched under NFSM-Pulses from Kharif 2010 for demonstrations on production and protection technologies in village level compact blocks for enhanced production of pulses as well as motivating farmers. Besides, 60,000 pulses and oilseeds villages programme was introduced in rainfed areas of 7 major oilseeds & pulses growing states namely; Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh during 2010-11. Under this programme, an amount of Rs. 300.00 crores was allocated to the State for custom hiring of tractors and improved farm implements to supplement the pulses and oilseeds production strategies in the country taken under Rashtriya Krishi Vikas Yojana (RKVY). During 2011-12, the programme was implemented in 11 major pulses growing States namely : Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Rajasthan and Uttar Pradesh to accelerate pulses production through support for in-situ moisture conservation, inclusion of minikits, pests surveillance and market linked extension support.

As a consequence of implementation of these schemes, the production of oilseeds has increassed from 24.88 million tonnes in 2009-10 to 31.01 million tonnes in 2011-12 (fourth advance estimates). The production of pulses has also increased from 14.66 million tonnes in 2009-10 to 17.21 million tonnes in 2011-12 (fourth advance estimates).

Lok Sabha Unstarred Question No. 3724 - Answered on 4.9.2012

Quota of Edible Oils

Shri Ramsinh Rathwa:

Will the Minister of Consumer Affairs, Food Public Distribution be pleased to state :

(a) whether the Government has failed to provide the sanctioned quota of edible oils to various States for distribution under the Public Distribution System (PDS) and as a result, people are forced to buy edible oils from the open market at exorbitant price;

(b) if so, the details thereof along with the reasons for this short supply, State-wise; and

(c) the measures taken by the Government to ensure the full supply of sanctioned quota fo edible oils to the States ?

(d) the details of the schemes run by Government alongwith the result thereof ?

Answer

Minister of State (Independent Charges) for Consumer Affairs Food & Public Distribution. Prof. K. V. Thomas

(a), (b) and (c) : Government made allocations to States/UT's as per demand received from the States under the scheme for distribution of subsidized imported edible oils to ration card holders through PDS or other outlets. Thereafter State Governments are expected to make contract directly with Central Public Undertakings (CPSUs) for import of edible oils for distribution. The State-wise allocations, actual quantity for which States/UTs contracted with CPSUs for imports and quantities lifted during 2011-12 is detailed below:

Fig. in Tones
(From April 2011 to 24.08.2012)

Name of States	**Allocation made as demand of States/Uts**	**Quantity Contracted by States for imports through CPSUs**	**Quantity lifted by States/Uts**
Maharashtra	261740.00	84000.00	83689.242
Goa	3650.00	3000.00	2911.818
Uttar Pradesh	8000.00	2000.00	1999.984
Andhra Pradesh	345500.00	260500.00	233608.422
Gujarat	30000.00	30000.00	21473.748
Dadra and Nagar Haveli	360.00	–	–
Tamil Nadu	303600.00	246954.000	228450.792
Himachal Pradesh	27000.00	16500.000	12869.896
Lakshadweep	60.00	–	–
West Bengal	20000.00	–	–
Rajasthan	5000.00	–	–
Mizoram	1300.00	–	–

There is no short supply of edible oils to States by Government or by Central Public Sector Undertakings (CPSUs) under the scheme as State Governments have to make contracts with CPSUs for imports. Government has written to State Governments from time to time for using the allocations made to them to the full extent and lifting the edible oils in time for distribution.

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A REVIEW

*The book entitled **"A treatise on Analysis of Food, Fats and Oils"** is an example of unique competence and contribution of the authors, S. K. Roy, N. K. Pramanik and A. R. Sen.*

The book is the first of its kind in India. It covers the traditional and modern analytical methods for the characterization and quality of fats, oils as well as other food items.

The authors are well reputed and qualified and they have applied their collective wisdom and expertise in including and presenting more appropriately and meticulously the analytical methods.

The book can also be viewed as a rarer type as it deals with the statutory and industrial aspects of fats, oils and their products, and pollution control in vegetable oil industry.

In fact these aspects are of extreme use and importance to those concerned with these issues.

The book is already well received by the readers and users in the academic and industiral circles throughout India because of the highly relevent and benefficial methodologies and basic-cum technological information. The book will be recognised in due course of time as one of the top quality analytical books in the area of food, fats and oils.

Prof. D. K. Bhattacharyya
21-6-2003

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BOOK REVIEW

A book entitled “Perfumery Materials, Production and Applications” has been authored by an very eminent Professor (Dr) D. K. Bhattacharyya, Emeritus Fellow (AICTE), Adjunct Professor Bengal Engineering and Science University, former President, O.T.A.I and a Scientist of National and International repute.

The book speaks for itself about his mastery and competence in the discipline of “Perfumery Materials”.

“The book demonstrates the scopes of certain specific reactions and raw materials in producing new synthetics. The enormous scopes of biotechnology involving bio-conversion processes’, with isolated enzymes and by fermentation biotechnology involving selective microorganisms has been indicated in making synthetics. The applications of natural aromatic oils in aromatherapy, food, cosmetics/toiletries, imitation perfumery and allied sector have been included.

Standardisation and evaluation of natural aromatic (essential oils and incidence of their adulteration have been elaborated in order to ascetain their quality and authenticity for sustaining the business in the industry” says Prof (Dr) R.N. Mukherjee, Former, Professor and Head, Deptt of Chemical Engg, University of Jadavpur. The book will fulfill a long felt want in the discipline of Essential Oils and will cater to the various categories of Scholars, Scientists and Technologists. The book has already been well appreciated in India and abroad, though published by the Stadium Press L.L.C., USA.

Those interested to procure a copy of this Valued book on Essential Oils may contact Professor D. K. Bhattacharyya at Phone No (033) 2461 9662.

(S. K. Roy)
Editor

BOOK REVIEW

A book entitled “Advances in Fish Processing Technology” has been authored by Dr. D. P. Sen, an executive committee member of the OTAI (EZ), Calcutta. He is highly qualified with National and International recognition.

The contents of the book are ● Resources, Their Utilisation - Emerging Trends ● Chemical Composition and Their Technological Significance ● Fish Odours and Flavours ● Fresh Fish Handling and Chill Storage ● Modified Atmosphere Packaging of Seafoods ● Assessment of Freshness Quality ● Traditional Salted and Dried Fish Products ● Proteolysed Fish Products ● Minced Fish Technology ● Retort Pouch Processing Technology ● Surimi and Surimi-Based Products ● Irradiation in Fish Processing ● Antarctic Krill and its Processing ● Microwave in Fish Handling and Processing ● Fish Food Products ● Advance in Freezing Technology ● Shrimp Culture, Shrimp Feed, Melanosis and Moulting ● Selected By-products from sea ● W-3 Fatty Acids, Fish Oil and Fish in Health and Nutrition ● Fishborne Pathogens and Depuration ● Toxins, Pollutants and Contaminants ● Quality Management.

The book should be useful to a wide range of readers including ichthyologistics and researchers involved with the fish industry. The book has already been well appreciated among the scientific community.

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