OIL TECHNOLOGISTS' ASSOCIATION OF INDIA

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For equiries please contact : S. K. Roy, Editor
5C, Tarak Mitra Lane, Kolkata - 700 026, Ph. : 2466 6243 / 2463 972 1
E-mail : esskay_roy81@rediffmail.com / es.k.ray@gmail.com

Health Benefits of Cocoa Powder

From the Editor's Desk

"Cocoa" is now a days used in various ways and the modern research has provided us with the results of innumerable benifits in terms of health & nutrition of cocoa Power.

Appended below for our readers are some of them

1. **Rich in Polyphenols That Provide Several Health Benefits**

   Polyphenols are naturally occurring antioxidants found in foods like fruits, vegetables, tea, chocolate and wine. They have been linked to numerous health benefits, including reduced inflammation, better blood flow, lower blood pressure and improved cholesterol and blood sugar levels. Cocoa is one of the richest sources of polyphenols. It's especially abundant in flavanols, which have potent antioxidant and anti-inflammatory effects.

   However, processing and heating cocoa can cause it to lose its beneficial properties. It's also often treated with alkaline to reduce bitterness, which results in a 60% decrease in flavanol content.

   So while cocoa is a great source of polyphenols, not all products containing cocoa will provide the same benefits.

2. **May Reduce High Blood Pressure by Improving Nitric Oxide Levels**

   Cocoa, both in its powdered form and in the form of dark chocolate, may be able to help lower blood pressure. This effect was first noted in the cocoa-drinking island people of Central America, who had much lower blood pressure than their non cocoa-drinking mainland relatives.

   The flavanols in cocoa are thought to improve nitric oxide levels in the blood, which can enhance the function of your blood vessels and reduce blood pressure.

   One review analyzed 35 experiments that provided patients with 0.05-3.7 ounces (1.4-105 grams) of cocoa products, or roughly 30-1,218 mg of flavanols. It found that cocoa produced a small but significant reduction of 2 mmHg in blood pressure.

   Additionally, the effect was greater in people who already had high blood pressure than those without it and in older people compared to younger people.

   However, it's important to remember that processing significantly reduces the number of flavanols, so the effects most likely will not be seen from the average chocolate bar.

3. **May Lower Your Risk of Heart Attack and Stroke**

In addition to lowering blood pressure, it appears that cocoa has other properties that may reduce your risk of heart attack and stroke. Flavanol-rich cocoa improves the level of nitric oxide in your blood, which relaxes and dilates your arteries and blood vessels and improves blood flow. What's more, cocoa has been found to reduce “bad” LDL cholesterol, have a blood thinning effect similar to aspirin, improve blood sugars and reduce inflammation.

These properties have been linked to a lower risk of heart attack, heart failure and stroke. A review of nine studies in 157,809 people found that higher chocolate consumption was associated with a significantly lower risk of heart disease, stroke and death.

Two Swedish studies found that chocolate intake is linked to a lower rate of heart failure at doses of up to one serving of 0.7-1.1 ounces (19-30 grams) of chocolate per day, but the effect was not seen when consuming higher amounts.

These results suggest that frequent consumption of small amounts of cocoa-rich chocolate may have protective benefits for your heart.

4. **Polyphenols Improve Blood Flow to Your Brain and Brain Function**

Several studies have found that polyphenols, such as those in cocoa, may reduce your risk of neurodegenerative diseases by improving brain function and blood flow.

Flavanols can cross the blood-brain barrier and are involved in the biochemical pathways that produce neurons and important molecules for the function of your brain.

Additionally, flavanols influence the production of nitric oxide, which relaxes the muscles of your blood vessels, improving blood flow and blood supply to your brain.

A two-week study in 34 older adults given high-flavanol cocoa found blood flow to the brain increased by 8% after one week and 10% after two weeks. Further studies suggest that daily intake of cocoa flavanols can improve mental performance in people with and without mental impairments. These studies indicate a positive role of cocoa on brain health and possible positive effects on neurodegenerative diseases like Alzheimer's and Parkinson's. However, more research is needed.

5. **May Improve Mood and Symptoms of Depression by Various Means**

In addition to cocoa's positive impact on age-related mental degeneration, its effect on the brain may also improve mood and symptoms of depression. The positive effects on mood may be due to cocoa's flavanols, the conversion of tryptophan to the natural mood stabilizer serotonin, its caffeine content or simply the sensory pleasure of eating chocolate.

One study on chocolate consumption and stress levels in pregnant women found that more frequent intake of chocolate was associated with reduced stress and improved mood in babies.

Furthermore, another study discovered that drinking high-polyphenol cocoa improved calmness and contentment.

Additionally, a study in senior men showed that eating chocolate was linked to improved overall health and better psychological well-being.

While the results of these early studies are promising, more research on the effect of cocoa on mood and depression is needed before more definite conclusions can be drawn.

6. **Flavanols May Improve Symptoms of Type 2 Diabetes**

Though overconsumption of chocolate is certainly not good for blood sugar control, cocoa does, in fact, have some anti-diabetic effects.

Test-tube studies indicate that cocoa flavanols can slow down carbohydrate digestion and absorption in the gut, improve insulin secretion, reduce inflammation and stimulate the uptake of sugar out of the blood into the muscle. Some studies have shown that a higher intake of flavanols, including those from cocoa, can result in a lower risk of type 2 diabetes. Additionally, a review of human studies showed that eating flavanol-rich dark chocolate or cocoa can reduce insulin sensitivity, improve blood sugar control and reduce inflammation in diabetic and non-diabetic people.

Nevertheless, these results combined with the more concrete positive effects on heart health indicate cocoa polyphenols may have a positive impact on both preventing and controlling diabetes, though more research is required.

Have a cup of “Cocoa” &
Enjoy a Healthy, Cheerful Life.

Ack / Courtesy
Amazing Chronicle
March - 2019

S. K. Roy
Editor

Kaufmann Memorial Lecture 2016

Speaker's Profile & Abstract

Prof. Yang Yuexin
Chinese Nutrition Society, China

President of Chinese Nutrition Society Director Researcher supervisor in the institute for Nutrition and Food Safety of Chinese Center for Disease Contrst and Production director of FAO-MASSAFOODS, Vice-chairman, Danone (China) Institute Science Committee Member of National Food Hygiene standards committee. Associate director of National FDA Member of Ministy of Health, Health and Related Prduct Eealuation Committee. Council member (2015-2019) of Foundation of Asian Nutrition Societies.

Prof. Yang's research interest is primarily on the study of food nutrition evaluation and the association between food nutrients and human health, as well as health food function evaluation etc. She has reached several scientific achievemets and received a number of rewards, and enjoys great reputation in China.
Prof. Yang wrote more than 20 major scientific books, more than 10 popular science books. Her representative works as follows :

- Chinese Dietary Reference Intakes (2013). Edited by Chinese Nutrition Society ISB 978-7-03-04140 1-4, Science Press..
- Development Report of China Nuttition Research (2013). Edited by Chinese Nutrition Society.
- Nutrition and Food Function Function Guide (2011). Peking University Medical Press
- Food component analysis (2010). China Light Industry Press
- China Food Composition Table (2009). Peking University Medical Press
- Nutritious meals and dietary assessment practical guidance - nutritionists must read (2008) People's Medical Publishing House.
- Public health nutritionist course (2007), (2012)

Prof. Yang obtained more than 12 patents and technological achievements. Representative results are as follows :

- 2007, "Research on the nutrition of food resources and applied technology", won the Chinese Preventive Medicine Association of Science and Technology second prize.
- 2008, "Research on the food nutrition evaluation carrier and application", China Science and Technology Institute of Food Science and Technology Award.
- 2009 "Chinese food nutrition resource inquiry system (v2.0)" computer software copyright certificate number No 179,897
- 2010 "Evaluation index system and application of food resources nutrition" Chinese medicine prize (first completed author)
- 2010 " Basic research on the food glycemic index and establishment of the in vitro prediction model " Chinese Nuttition Society, Science and Technology Award (first complete author)
- 2007-2011 obtained three national patents where she is the first author.

Oil Nutrition and Health Benefits

Background : Edible oil study is one of the most important aspects of nutrition research. In recent years, a great deal of interest has been shown in the effect of diet fatty acid and triglyceride (TAG) structure on serum lipids profile and development of cardiovascular disease from both scientific and consumers. Although it would be beneficial to resolve this issue by conducting more research to determine more clearly the health effects of fatty acids in the diet.

Objective : the present lecture attempts to clarify the difference of edible oils in composition, and this relationship between different cooking oils and human serum lipid profiles, liver lipid deposition in Chinese population.

Study Design : The present lecture is based on several studies together. In the study of different oil composition chemical methods were used, and three clinical trials studies via double blind, crossover and and comparison design; test oils include olive oil, palm oil, cocoa butter and

soybean oil. Certain considerations that are relevant to standard parallel-group trials, receive adequate attention in trial planning and data **analysis for the results to be of scientific value.**

Result : The main components of edible fats and oils were analysed. The components include mono and polyunsaturated fattt acids, steroids, fat-soluble vitamins, tocopherols. And finally an edible oil database is established for research. Main results from Clinical trials showed that the participants who participated six months in the study, no significant differences in the dietary intakes of energy and macro-nutrient composition were observed between Palm Olein (PO) and Olive Oil (OD) diet group during the experimental stage. The results of composition of fatty acid between PO and OO showed main fatty acids at sn-2 position are polyunsaturated fatty acid and monounsaturated fatty acid for PO and OO. With statistical analysis of cross-over trial, the current study supported the previous finding that the effect of palm olein on total serum cholesterol and LDL cholesterol in healthy individuals with normal plasma cholesterol concentrations is neutral compared with that of olive oil. There is no difference between the effects of palm oil, cocoa butter and olive oil on serum lipids and the secondary indexes of young and middle-aged healthy people in a new study.

Conclusion : Oil composition database is established. Dietary cross-over trial indicated that palm olein and olive oil had no significant difference on blood lipids in Chinese young age population.

*S. K. Roy, the Editor of this News Letter was present in the I.S.F. held in Kualalampur, Malayasia as an invitee of OTAI, INDIA

Low-Dose Daily Intake of Vitamin K_2 (Menaquinone-7) Improves Osteocalcin γ-Carboxylation: A Double-Blind, Randomized Controlled Trials

Naoko INABA, Toshiro SATO and Takatoshi YAMASHITA

R&D Division, J-Oil Mills, Inc., Yokohama 230–0053, Japan

(Received April 9, 2015)

Summary Vitamin K is essential for bone health, but the effects of low-dose vitamin K intake in Japanese subjects remain unclear. We investigated the effective minimum daily menaquinone-7 dose for improving osteocalcin γ-carboxylation. Study 1 was a double-blind, randomized controlled dose-finding trial; 60 postmenopausal women aged 50–69 y were allocated to one of four dosage group and consumed 0, 50, 100, or 200 μg menaquinone-7 daily for 4 wk, respectively, with a controlled diet in accordance with recommended daily intakes for 2010 in Japan. Study 2 was a double-blind, randomized placebo-controlled trial based on the results of Study 1; 120 subjects aged 20–69 y were allocated to the placebo or MK-7 group and consumed 0 or 100 μg menaquinone-7 daily for 12 wk, respectively. In both studies, circulating carboxylated osteocalcin and undercarboxylated osteocalcin were measured. The carboxylated osteocalcin/undercarboxylated osteocalcin ratio decreased significantly from baseline in the 0 μg menaquinone-7 group, in which subjects consumed the recommended daily intake of vitamin K with vitamin K_1 and menaquinone-4 (Study 1). Menaquinone-7 increased the carboxylated osteocalcin/undercarboxylated osteocalcin ratio dose dependently, and significant effects were observed in both the 100 and 200 μg groups compared with the 0 μg group. Undercarboxylated osteocalcin concentrations decreased significantly, and the carboxylated osteocalcin/undercarboxylated osteocalcin ratio increased significantly in the 100 μg menaquinone-7 group compared with the placebo group (Study 2). Daily menaquinone-7 intake $\geq$100 μg was suggested to improve osteocalcin γ-carboxylation.

Key Words carboxylated osteocalcin, undercarboxylated osteocalcin, blood coagulation, recommended daily intake

Vitamin K is a fat-soluble vitamin with a naphthoquinone skeleton and various lipophilic side chains (*1*, *2*). There are two main vitamin K compounds, which differ with respect to their side chain. Vitamin K_1 has a phytyl group and is found mainly in leafy green vegetables and vegetable oils (*3*). Menaquinones (MKs) have isoprenoid side chains with 4–14 repeats and are found in animal products; they are also produced in various bacterial fermentation processes and are, therefore, found in fermented products such as cheese and pickles (*3*). Vitamin K acts as a cofactor for post-translational carboxylation, in which γ-glutamyl carboxylase converts certain protein-bound glutamate residues into γ-carboxy glutamate (Gla) (*2*, *4*). At least 14 types of proteins with glutamate residues, designated vitamin K-dependent Gla-proteins, have been discovered. Well-known Gla-proteins are involved in blood coagulation (factors VII, IV, and X), which are synthesized in the liver (*4*, *5*). Gla-proteins that are not involved in coagulation include osteocalcin, a bone modulator (*1*), and matrix Gla protein, an inhibitor of vascular calcification (*6*). Osteocalcin has a structural function wherein it binds to hydroxyapatite because of γ-carboxylation (*7*), depositing calcium on bone for bone formation.

Observational studies in Japan showed that fracture frequency was inversely correlated with high consumption levels of natto (fermented soybean), which contains large amounts of menaquinone-7 (MK-7) produced by *Bacillus subtilis* (*8*, *9*). Vitamin K is also used for osteoporosis medication in Japan (Glakay™, menaquinone-4 [MK-4], 45 mg/d, Eisai, Tokyo, Japan) (*10*, *11*). These studies collectively suggested that daily vitamin K intake improves bone metabolism, bone mineral density (BMD), and bone strength, consequently decreasing fracture risk. However, the effects of low-dose vitamin K intake in Japanese subjects remain unclear.

Therefore, we investigated the effective minimum dose of MK-7 for improving osteocalcin γ-carboxylation as an index of bone health. This is the first study investigating osteocalcin γ-carboxylation by MK-7 supplementation as part of a controlled diet in Japanese subjects. The effective dose was determined for postmenopausal women, who are at high-risk of osteoporosis. Further-

E-mail: naoko.inaba@j-oil.com

Abbreviations: BMD, bone mineral density; BMI, body mass index; cOC, carboxylated osteocalcin; Gla, γ-carboxy glutamate; INR, international normalized ratio; MHLW, Ministry of Health, Labor, and Welfare; MK, menaquinone; MK-4, menaquinone-4; MK-7, menaquinone-7; PT, prothrombin time; ucOC, undercarboxylated osteocalcin.

more, the efficacy of daily MK-7 intake was evaluated in healthy adults.

MATERIALS AND METHODS

Study design.

Study 1: Effective minimum dose of dietary MK-7 to affect carboxylated osteocalcin/undercarboxylated osteocalcin ratio in blood: This double-blind, randomized, parallel-group comparison study was conducted in Fukuhara Clinic, Hokkaido, Japan. Healthy, postmenopausal women aged 50–69 y who were not receiving medical treatment were recruited. The exclusion criteria were: ≤2 y since menopause; food allergies; irregular meals; excessive smoking or alcohol intake; routine medication; dietary supplement use; hepatic or renal diseases; chronic diseases; history of gastrointestinal surgery; lactose intolerance; night/irregular shift work; excessive physical activity; blood donation within 12 wk; and those who were judged inappropriate to include in the study by the principal investigator. Sixty women were included (n=30, 50–59 y; n=30, 60–69 y). The wash-out and intake periods were 14 and 28 d, respectively. Based on the order of the carboxylated osteocalcin (cOC)/undercarboxylated osteocalcin (ucOC) ratio in each age group, the women were allocated to one of four dosage groups—0, 50, 100, or 200 μg MK-7 (n=15 each), with stratified randomization in each age group. Each dose of MK-7 was dissolved in 14 g oil (J-Oi Mills, Tokyo, Japan), and the dose was consumed daily with dinner during the 4-wk intake period.

Table 1. Average daily nutrition over 2 wk in study 1.

	Content	Set value[1]	Sufficiency rate (%)[2]
Energy (kcal)	1,981	1,950	102
Protein (g)	67	50	134
Lipid (g)	57.9	54	107
Carbohydrate (g)	284.1	50–70%[3]	57%[3]
K (mg)	1,856	2,000	93
Ca (mg)	626	650	96
P (mg)	971	900	108
Fe (mg)	4.4	6.5	68
Vitamin K (μg)	72	65	111
Dietary fiber (g)	8.6	17	51
Salt (g)	7.2	7.5	96

[1] Recommended daily intake, Ministry of Health, Labor, and Welfare of Japan set in 2010.
[2] Fulfillment rate vs. set value.
[3] Recommended daily carbohydrate intake in Japan was determined as the energy ratio of daily total energy.

Subjects' meals were controlled throughout the study (Table 1). Subjects were provided with all daily meals (mandatory intake), and beverages and snacks (voluntary intake); foods and drinks besides these were prohibited. The nutrient contents of meals were based on the recommended daily intakes determined by the Ministry of Health, Labor, and Welfare (MHLW) of Japan in 2010. The recommended daily intake of 65 μg vitamin K for Japanese adult women was made up with vitamin K_1 and MK-4; MK-7-containing foods were excluded from the meal design. The meals were designed for a 2-wk period, and these were provided three times during the 6-wk study.

Study 2: MK-7 intake at 100 μg and improvement of osteocalcin γ-carboxylation: This double-blind, placebo-controlled, randomized, parallel-group comparison study was conducted at Yaesu Sakura-dori Clinic, Tokyo, Japan. Healthy men and women aged 20–69 y who were not receiving medical treatment and with a body mass index (BMI) of 18.5–28 kg/m^2 were recruited. The exclusion criteria were: food allergies; irregular meals; excessive smoking or alcohol intake; routine medication; dietary supplement use; hepatic or renal diseases; chronic diseases; history of gastrointestinal surgery; lactose intolerance; positivity for hepatitis B antigen, anti-hepatitis C virus antibody, human immunodeficiency virus (HIV) antigen and antibody, or syphilis serodiagnosis; night/irregular shift work; excessive physical activity; blood donation within 12 wk; habitual intake of high vitamin K-containing foods or supplements ≥3 times per week; as well as these who were judged inappropriate to include in the study by the principal investigator. In accordance with these criteria, after an interview and questionnaires about the habitual consumption of vitamin K-containing foods, 150 subjects were screened.

The wash-out/screening, intake, and follow-up periods were approximately 5, 12, and 4 wk, respectively (Fig. 1). The dosage of vitamin K and sample size were determined on the basis of the results of Study 1. Of the 150 subjects who were screened, those whose cOC or ucOC values or cOC/ucOC ratio were abnormal or whose cOC/ucOC ratio differed substantially between blood samplings (approximately 5 wk [S1] and 1 wk [S2] before the start of intake) were excluded to minimize scattering. The remaining 120 subjects included 50

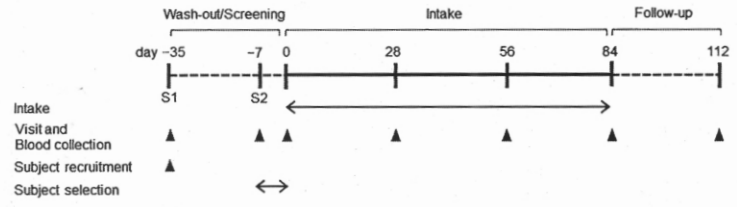

Table 2. Study 1: Baseline characteristics.

Parameter	0 μg MK-7	50 μg MK-7	100 μg MK-7	200 μg MK-7
n	15	15	15	15
Age (y)	60.3±4.0	61.7±4.0	60.5±3.5	59.7±3.9
Weight (kg)	55.7±9.7	48.5±5.1*	55.5±7.4	50.5±5.1
Height (cm)	155.8±5.9	152.1±3.1	154.9±4.5	154.3±3.4
BMI (kg/m^2)	22.9±3.5	20.9±2.0	23.2±3.1	21.2±1.9
n	15	14	14	14
cOC (ng/mL)	17.73±4.76	19.47±4.17	19.85±10.28	18.48±3.64
ucOC (ng/mL)	5.34±2.38	6.98±4.07	5.83±2.88	5.61±2.09
cOC/ucOC	3.87±1.55	3.43±1.58	3.86±1.97	3.68±1.43

Data are mean±SD.
MK-7, menaquinone-7; BMI, body mass index; cOC, carboxylated osteocalcin; ucOC, undercarboxylated osteocalcin.
*$p<0.05$ vs. 0 μg MK-7 group (ANOVA with Dunnett's test).

men ($n=10$ each, 20–29 y, 30–39 y, 40–49 y, 50–59 y, and 60–69 y) and 70 women ($n=10$ each, 20–29 y, 30–39 y, 40–49 y; $n=20$ each, 50–59 y, 60–69 y). The subjects were arranged by cOC/ucOC ratio for each age group and each sex, and were allocated to the placebo or MK-7 groups ($n=60$ each) with stratified randomization for each age group and sex. Subjects consumed 11 g oil containing 0 or 100 μg MK-7 daily at an arbitrary time during the 12-wk intake period.

Throughout the study, natto and vitamin K_1-rich foods (e.g., chlorella tablets, green leafy vegetable juice, and *mulūkhīya* [*Corchorus olitorius*]) were prohibited. In addition, other vitamin K_1- or MK-4 rich foods (e.g., dark green leafy vegetables, tea leaves, *foie gras*, pickles, and cheese) were restricted to <300 g per day and <100 g per meal.

In both studies, the intake of study products, wake/sleep times, noticeable changes in health, physical activity, dietary patterns, defecation status, menstruation (for women), smoking, alcohol consumption, and medication use were recorded in a diary, and checked at every visit.

Subject assignment was implemented by third-party doctors. Subjects and investigators were blinded to the assignments until study completion.

Both studies were conducted in accordance with the guidelines of the Declaration of Helsinki, and the protocols were approved by the ethics committees of J-Oil Mills Inc. (for both studies), Miyawaki Clinic (for Study 1), and Yaesu Sakura-dori Clinic (for Study 2). Written informed consent was obtained from all subjects before participation.

Study product. In both studies, each oil was processed into 20 g (Study 1) or 15 g (Study 2) of mayonnaise (Knorr Foods, Kanagawa, Japan) for subjects to take easily. All mayonnaise products containing or not containing MK-7 were identical in appearance, texture, and taste. The daily doses of each mayonnaise were individually packed in polyethylene packages, and stored in shaded zippered polyethylene terephthalate/aluminum/polyethylene bags. The MK-7 content remained at >95% of the initial level during storage.

Blood sampling. In Study 1, blood was collected after overnight fasting at the start of the wash-out period and on days 0, 14, and 28. All blood samples were drawn between 10:00 AM and 12:00 PM. In Study 2, blood was collected more than 12 h after intake of study products and vitamin K_1- and MK-4 rich foods, whose consumption was restricted at S1 and S2; days 0, 28, 56, and 84; and at the end of follow-up (day 112). For plasma preparation, blood was collected in heparinized tubes, centrifuged for 10 min at 1,500 ×*g*, aliquoted into shaded tubes, and stored at −80°C until analysis. Serum was prepared similarly, except blood was allowed to clot at room temperature.

Circulating markers. Serum cOC was analyzed by ELISA (Takara Shuzo, Shiga, Japan). Serum ucOC was analyzed using an electrochemiluminescence immunoassay (Eidia, Tokyo, Japan). The cOC/ucOC ratio was subsequently calculated. Plasma vitamin K_1, MK-4, and MK-7 concentrations were analyzed as described previously (*12*). Briefly, plasma was extracted with hexane, after prepurification on Sep-Pak silica (Waters, Milford, MA), and analyzed by LC-APCI-MS/MS. Deuterium-containing vitamin K_1 (vitamin K_1-d_7) was used as an internal standard. Prothrombin time (PT) was analyzed by SRL (Tokyo, Japan) using a Quick's One-stage Test, which measures the time to fibrin clot formation using Thromborel S (Siemens, Tokyo, Japan) in a coagulometer (CA-7000; Sysmex, Hyogo, Japan) at S1 and S2, and days 0, 84 and 112 in Study 2. The PT-international normalized ratio (PT-INR) was also calculated. ucOC was analyzed by Daiichi-Kishimoto-Rinsho Kensa Center (Hokkaido, Japan) and SRL in Studies 1 and 2, respectively; cOC and vitamin K levels were analyzed by Shimadzu Techno-Research (Kyoto, Japan).

Statistical analyses. In Study 1, changes from baseline (day 0) were analyzed using the paired Student's *t*-test. Inter-group differences were evaluated using ANOVA with Dunnett's test.

In Study 2, because all data were non-normally distributed, the baseline characteristics were compared

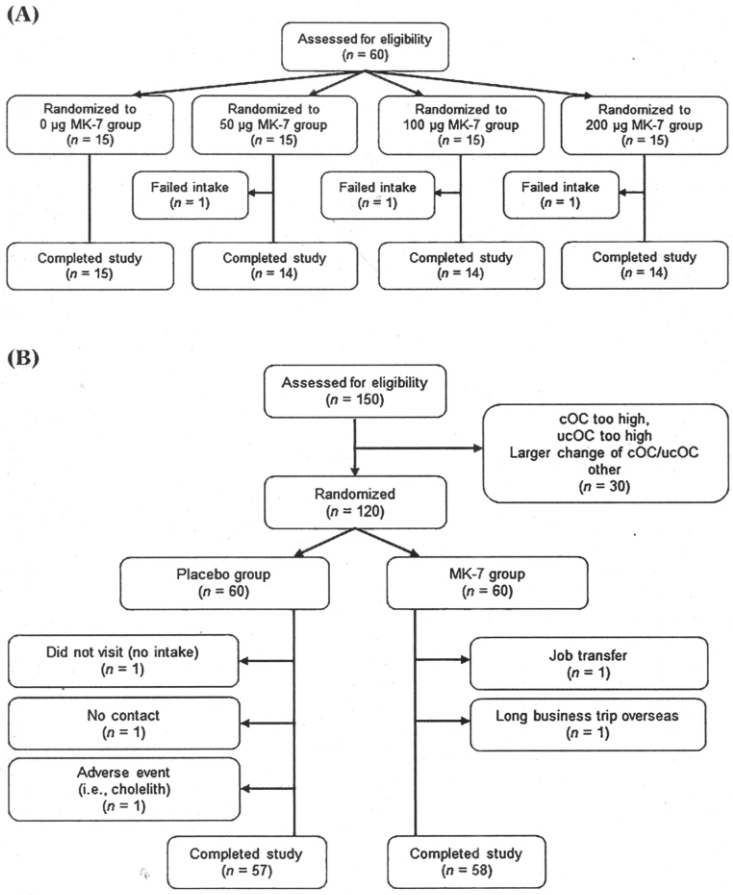

Fig. 2. Flow diagrams of Study 1 (A) and Study 2 (B). MK-7, menaquinone-7; cOC, carboxylated osteocalcin; ucOC, undercarboxylated osteocalcin.

using the Wilcoxon rank-sum test. Changes in bone turnover markers from baseline (day 0) were analyzed using the Wilcoxon signed-rank test. Inter-group differences were evaluated using the Wilcoxon rank-sum test.

The levels of significance were set at $p<0.05$ and 0.01. Statistical analyses for changes in cOC/ucOC ratio from baseline and between group differences in changes in cOC/ucOC ratio in Study 1 were performed using JSTAT v13.0 and for baseline characteristics using SAS v9.1.3 (SAS Institute Japan, Tokyo, Japan). All statistical analyses in Study 2 were performed using SAS v8.02 (SAS Institute Japan). The sample size required for Study 2 was estimated from the results of Study 1 using R v2.14.0. (R Foundation, http://www.r-project.org/), with a level of significance of $p<0.05$ and statistical power of 0.8.

RESULTS

Effective minimum dose of dietary MK-7 to affect carboxylated osteocalcin/undercarboxylated osteocalcin ratio in blood

The baseline characteristics of subjects in Study 1 are summarized in Table 2. A flow diagram of Study 1 is shown in Fig. 2A. One subject each in the 50, 100, and 200 μg MK-7 groups dropped out because of errors in study product intake; therefore, 57 subjects were analyzed. Subject recruitment commenced in August 2011, and the study was completed in December 2011. The intake rates of study products in each group exceeded 99%. There were no differences among groups in the number of dropouts, noticeable changes in health or adverse effects. No adverse effects associated with the study products were observed in any subjects.

There were no significant differences among groups in either the cOC or ucOC concentration, and no dose dependency was observed. The ucOC concentration increased significantly from baseline in the 0 μg MK-7 group ($p<0.05$ on day 28), and decreased significantly from baseline in the 200 μg MK-7 group ($p<0.05$ on day 28). The cOC concentration decreased significantly in the 0 μg MK-7 group ($p<0.01$ on day 28).

The cOC/ucOC ratio in the 0 μg MK-7 group decreased significantly by 1.55 ng/mL from baseline. In other groups, the cOC/ucOC ratios changed slightly from baseline, but the difference was not significant. In

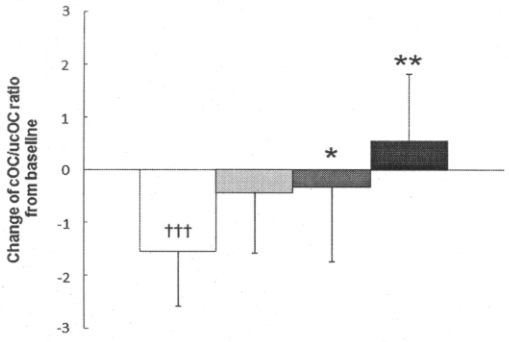

Fig. 3. Change in carboxylated osteocalcin (cOC)/undercarboxylated osteocalcin (ucOC) ratio from baseline in Study 1. Data are mean±SD. White, light grey, dark grey, and black bars indicate the 0, 50, 100, and 200 μg MK-7 groups, respectively. $^{*}p<0.05$, $^{**}p<0.01$ vs. 0 μg MK-7 group (ANOVA with Tukey-Kramer test). $^{\dagger\dagger\dagger}p<0.0001$ vs. baseline (Student's paired *t*-test). $n=14$ for 50, 100, and 200 μg MK-7 groups, $n=15$ for 0 μg MK-7 group.

Table 3. Study 2: Baseline characteristics.

Parameter	Placebo	MK-7
n	60	60
Age (y)	47±14	47±14
Weight (kg)	57.4±9.3	58.7±7.9
Height (cm)	162.6±8.8	163.4±8.2
BMI (kg/m^2)	21.6±2.3	22±2.1
cOC (ng/mL)	25.79±7.76	23.55±5.88
ucOC (ng/mL)	5.86±3.32	5.26±2.67
cOC/ucOC	5.38±2.47	5.37±2.57

Data are mean±SD.
MK-7, menaquinone-7; BMI, body mass index; cOC, carboxylated osteocalcin; ucOC, undercarboxylated osteocalcin.

the 100 and 200 μg MK-7 groups, the changes from baseline in the cOC/ucOC ratio were significantly higher than those in the 0 μg MK-7 group (Fig. 3).

MK-7 intake at 100 μg and improvement of osteocalcin γ-carboxylation

In Study 2, there were no significant differences in the baseline characteristics between groups (Table 3). Figure 2B shows a flow diagram of this study. During the intake period, in the placebo group, 2 men dropped out because of a lack of contact, and 1 woman withdrew at 4 wk after the start of intake because of a diagnosis of cholecystitis. In the MK-7 group, 2 men dropped out owing to work circumstances. Therefore, 115 subjects were analyzed. Subject recruitment commenced in May 2013, and the study was completed in December 2013. The intake rates of study products in both groups exceeded 99%. There were no significant differences between groups in the number of dropouts, noticeable

Table 4. Study 2: Circulating vitamin K_1, MK-4, MK-7, cOC concentrations, ΔcOC and PT-INR.

Parameter	Day 0		Day 28		Day 56		Day 84		Day 112	
	Placebo	MK-7	Placebo	MK-7	Placebo	MK-7	Placebo	MK-7	Placebo	MK-7
n	57	58	57	58	57	58	57	57	57	58
Vitamin K_1 (ng/mL)	0.53±0.62	0.42±0.51	0.55±0.46	0.47±0.63	0.44±0.55	0.34±0.53	0.81±0.71††	0.54±0.68*	0.63±0.75	0.39±0.5
MK-4 (ng/mL)	0.00	0.00	0.00	0.02±0.14	0.00	0.00	0.00	0.01±0.07	0.00	0.00
MK-7 (ng/mL)	0.75±1.22	0.95±2.35	0.85±2.12	2.69±2.35**††	0.52±1.57††	3.09±1.91**††	0.7±1.46	4.29±5.34**††	0.95±2.46	1.4±3.37
cOC (ng/mL)	26.08±7.74	23.29±5.79*	24.29±8.1††	22.75±5.75	24.64±8.31†	24.22±6.75	24.98±7.85	24.47±6.19	27±7.344	24.47±7.54
ΔcOC (ng/mL)	0	0	−1.78±5.21††	−0.54±4.12	−1.44±5.3†	0.93±4.61*	−1.1±5.21	1.2±5.05*	0.92±4.03	1.18±5.00
PT-INR	0.98±0.04	0.99±0.05	—	—	—	—	0.99±0.05	1.00±0.04	0.98±0.05	0.99±0.05

Data are mean±SD.
MK-4, menaquinone-4; MK-7, menaquinone-7; cOC, carboxylated osteocalcin; PT-INR, prothrombin time-international normalized ratio.
Placebo: 0 μg MK-7/d. MK-7: 100 μg MK-7/d.
$^{*}p<0.05$, $^{**}p<0.01$ vs. placebo (Wilcoxon rank sum test).
$^{\dagger}p<0.05$, $^{\dagger\dagger}p<0.01$ vs. baseline (Wilcoxon signed-rank test).

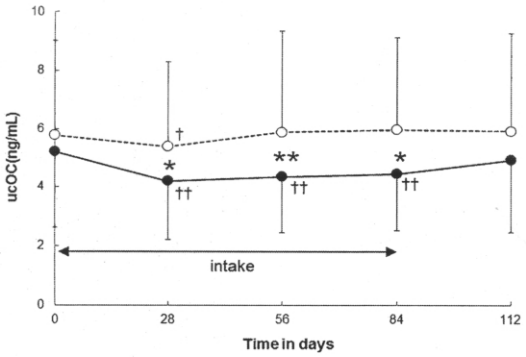

Fig. 4. Circulating undercarboxylated osteocalcin (ng/mL) in Study 2. Data are mean±SD. ○: Placebo, ●: MK-7. $^{*}p<0.05$, $^{**}p<0.01$ vs. placebo (Wilcoxon rank-sum test). $^{\dagger}p<0.05$, $^{\dagger\dagger}p<0.01$ vs. baseline (Wilcoxon signed-rank test). $n=57$ for the placebo group, and $n=58$ (day 0, 28, 56 and 112) or $n=57$ (day 84) for the MK-7 groups.

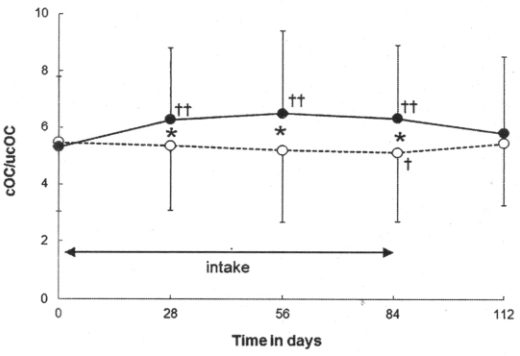

Fig. 5. Carboxylated osteocalcin (cOC)/undercarboxylated osteocalcin (ucOC) ratio in Study 2. Data are mean±SD. ○: Placebo, ●: MK-7. $^{*}p<0.05$ vs. placebo (Wilcoxon rank-sum test). $^{\dagger}p<0.05$, $^{\dagger\dagger}p<0.01$ vs. baseline (Wilcoxon signed-rank test). $n=57$ for the placebo group, and $n=58$ (day 0, 28, 56 and 112) or $n=57$ (day 84) for the MK-7 group.

changes in health or adverse effects. No adverse effects associated with study products were observed in any subjects.

In the MK-7 group, plasma MK-7 concentrations increased at day 28, plateaued at ~3 ng/mL during intake, and subsequently returned to baseline values at the end of follow-up. Plasma vitamin K_1 concentrations were considerably lower, and MK-4 concentrations were around the detection limit (Table 4).

For blood coagulation measurements of PT-INR, there were neither significant differences between groups nor clinically relevant changes in either group (Table 4).

No effects were observed regarding circulating cOC concentration, but the change from baseline in cOC was significantly higher in the MK-7 group than in the placebo group on days 56 and 84 (Table 4). The circulating ucOC concentration in the MK-7 group decreased at day 28 and remained unchanged thereafter (Fig. 4). The ucOC concentrations in both groups were not significantly different at baseline, but those in the MK-7 group were significantly below baseline during the intake period. The ucOC concentrations in the MK-7 group were significantly lower than those in the placebo group during the intake period. The cOC/ucOC ratio increased by day 28, plateaued during intake, and returned to baseline values after the end of intake in the MK-7 group; it did not change significantly during the study in the placebo group. The cOC/ucOC ratio in the MK-7 group was significantly higher in the MK-7 group than in the placebo group throughout the intake period (Fig. 5).

DISCUSSION

Vitamin K is involved in the γ-carboxylation of osteocalcin, and cOC functions in the deposition of calcium in bones, leading to bone formation. The ratio between cOC and ucOC is widely used as a bone metabolism marker, and circulating ucOC is utilized as a clinical marker of vitamin K deficiency for osteoporosis treatment in Japan (*10*). The ucOC concentration is higher in osteoporosis patients than in non-osteoporotic individuals. Shiraki et al. indicated that vitamin K insufficiency in bone occurs at a ucOC level ≥4.5 ng/mL, and early and frequent occurrence of fractures is observed in individuals with a ucOC level ≥5.5 ng/mL because of the correlation between the occurrence of fracture and baseline ucOC level (*13*). Circulating ucOC is a predictor of fracture risks independent of BMD (*14–16*). Thus, we considered that a reduction in ucOC concentration is important for bone health.

The recommended daily intake of vitamin K in Japan was set at 60–75 μg in 2010 (*17*); this value was based on the amount required to maintain normal coagulation function. It was not determined based on osteocalcin γ-carboxylation. Fracture incidence was inversely correlated with the intake of natto, suggesting that MK-7 mainly contributes to fracture prevention. In this study, the effective minimum dose of MK-7 required to improve osteocalcin activation was investigated with the use of a controlled diet in Japanese subjects.

This study demonstrated that low-dose MK-7 (50–200 μg/d) dose-dependently improved osteocalcin γ-carboxylation, and more than 100 μg MK-7 in addition to ordinary meals increased the cOC/ucOC ratio and decreased ucOC concentration.

ucOC concentration correlates with age and time since menopause in women, and a high vitamin K_1 and MK-7 concentration is required in the circulation to minimize the ucOC concentration in older women (*18*). The minimum dose of vitamin K for osteocalcin γ-carboxylation was investigated in postmenopausal women (Study 1). MK-7 doses were set at 50, 100, and 200 μg/d. Uematsu et al. reported that simultaneous intake of fat improved vitamin K_2 absorption (*19*). Each dose

of MK-7 was dissolved in oil and then incorporated into mayonnaise. Dietary vitamin K intake was completely controlled (mean: 72 μg/d) with mainly vitamin K_1 and small amounts of MK-4 in accordance with the recommended daily intake determined by the MHLW of Japan in 2010 (60–75 μg/d).

In the 0 μg MK-7 group, in which subjects consumed just the amounts in accordance with the recommended daily intake of vitamin K, the cOC/ucOC ratio decreased continuously throughout the intake period. Furthermore, cOC concentrations tended to decrease and ucOC increased. In the 50 μg MK-7 group, the cOC/ucOC ratio at day 28 remained unchanged from baseline. However, MK-7 intake ≥100 μg attenuated the decrease in the cOC/ucOC ratio compared with the placebo. In addition, the dose-dependent effect of MK-7 confirmed the effects of low MK-7 intake (50–200 μg) on osteocalcin γ-carboxylation. It was suggested that the minimum dose of MK-7 for improving bone metabolism is ≥100 μg.

A placebo-controlled test was performed to evaluate the effect of 100 μg MK-7 for a wide-range of age groups of both sexes (Study 2). MK-7 effects with realistic amounts of vitamin K intake in Japan were investigated in Study 2, in which daily meals were not controlled, but natto and vitamin K_1-rich foods (chlorella tablets, green leafy vegetable juice, and *mulūkhīya*) were prohibited and vitamin K_1 and MK-4 rich foods were restricted to <300 g per day. The number of subjects was 60 in each group, because the required sample size was estimated to be more than 54 from the results of Study 1. As expected, 100 μg MK-7 improved the cOC/ucOC ratio throughout the intake period. In addition, the ucOC concentration decreased even with a low MK-7 intake of 100 μg over a short period of 12 wk. During the intake period, the ucOC concentration in the MK-7 group fell below 4.5 ng/mL (standard for vitamin K deficiency) indicating that 100 μg/d MK-7 can improve vitamin K deficiency (*13*). Coagulation markers were not affected during the study period, suggesting that 100 μg MK-7 may be used for bone health, after meeting coagulation requirements.

As for differences in vitamin K effects in each sex, significant differences between groups in percentage changes in cOC from baseline were observed (day 84) (Fig. 6A), and those in ucOC and cOC/ucOC ratio were observed throughout the intake period in women (Fig. 6B and C). In men in the MK-7 group, the percentage change in ucOC was below that in the placebo group (days 28 and 84), and the percentage change in cOC/ucOC was above that in the placebo group (day 56) (Fig. 6B and C). The number of female subjects was larger than for males, and the proportion of women aged over 50 y who would mostly be post-menopausal was more than half of the total number of women in this study. Although relatively larger effects were observed in women, which included postmenopausal women who would be at higher risk of osteoporosis than men, the effects on osteocalcin γ-carboxylation were observed in both sexes.

Previous intervention studies demonstrated that high doses (1–45 mg/d) of vitamin K_1 or MK-4 affected osteocalcin γ-carboxylation or other bone indices (*10, 11, 20, 21*), whereas low doses of MK-7 (90–360 μg/d) can affect osteocalcin concentration (*22, 23*). MK-4 intake (1.5 mg/d for 12 wk) showed a 30% increase in cOC and a 40% decrease in ucOC (*24*). MK-7 intake at 650 μg/d for 2 wk demonstrated a 60% increase in cOC (*25*). These studies demonstrated larger effects than the present study, in which approximately a 7% increase in cOC and 20% decrease in ucOC were observed (Fig. 6A and B). These studies suggested that larger amounts of vitamin K are required for an increase in cOC than for a decrease in ucOC. In these studies, vitamin K intake was considerably larger than in the present study, or the proportion of perimenopausal women to whole subjects was larger than in the present study, suggesting that the sensitivity of osteocalcin to vitamin K was higher than in the present study. Additionally, it is difficult to compare the effects observed in this study with those in previous studies, because this study investigated the minimum dose of MK-7 for improving osteocalcin γ-carboxylation, but most of these other previous studies assessed the dose required to achieve maximal osteocalcin γ-carboxylation.

Shurgers et al. (*23*) reported that MK-7 had a longer half-life than vitamin K_1; it accumulates to higher concentrations in serum and has stronger effects on osteocalcin γ-carboxylation than vitamin K_1 when equimolar amounts of MK-7 and vitamin K_1 are taken. MK-7 was also reported to have a longer half-life than MK-4 (*26*). Therefore, MK-7 is considered to have higher bioavailability than other K vitamins. Shiraki et al. (*10*) demonstrated that MK-4 intake (45 mg/d for 2 y) decreased serum ucOC concentration, improved BMD, and decreased fracture incidence. In this study, we demonstrated that daily intake of MK-7 decreased serum ucOC. Although bone strength or mass were not evaluated, continuous intake of 100 μg MK-7 was expected to decrease future fracture risk. Moreover, this study targeted healthy adults. Thus, the doses of MK-7 required for young children, who are undergoing skeletal formation, and pregnant women, remain to be determined. The precise amounts required for each age group are also unknown, because the sample sizes were insufficient. Therefore, it is necessary to determine how the dose in this study affects each age group.

Vitamin D deficiency or abnormal calcium homeostasis causes secondary hyperparathyroidism by stimulating parathyroid hormone (PTH) production (*27*). Vitamin D and PTH play important roles in mobilizing calcium from bone (*28*). Lian et al. reported that calcium deficiency increased the serum osteocalcin level (*29*). Pietschmann et al. indicated that serum calcium concentration negatively correlates with serum levels of PTH and osteocalcin (*30*). Therefore serum levels of calcium and vitamin D are important for improvement of bone metabolism by vitamin K.

The recommended daily intake of vitamin K in Japan was revised to 150 μg/d from 60–75 μg/d in April 2015. Considering the result of this dose-finding study,

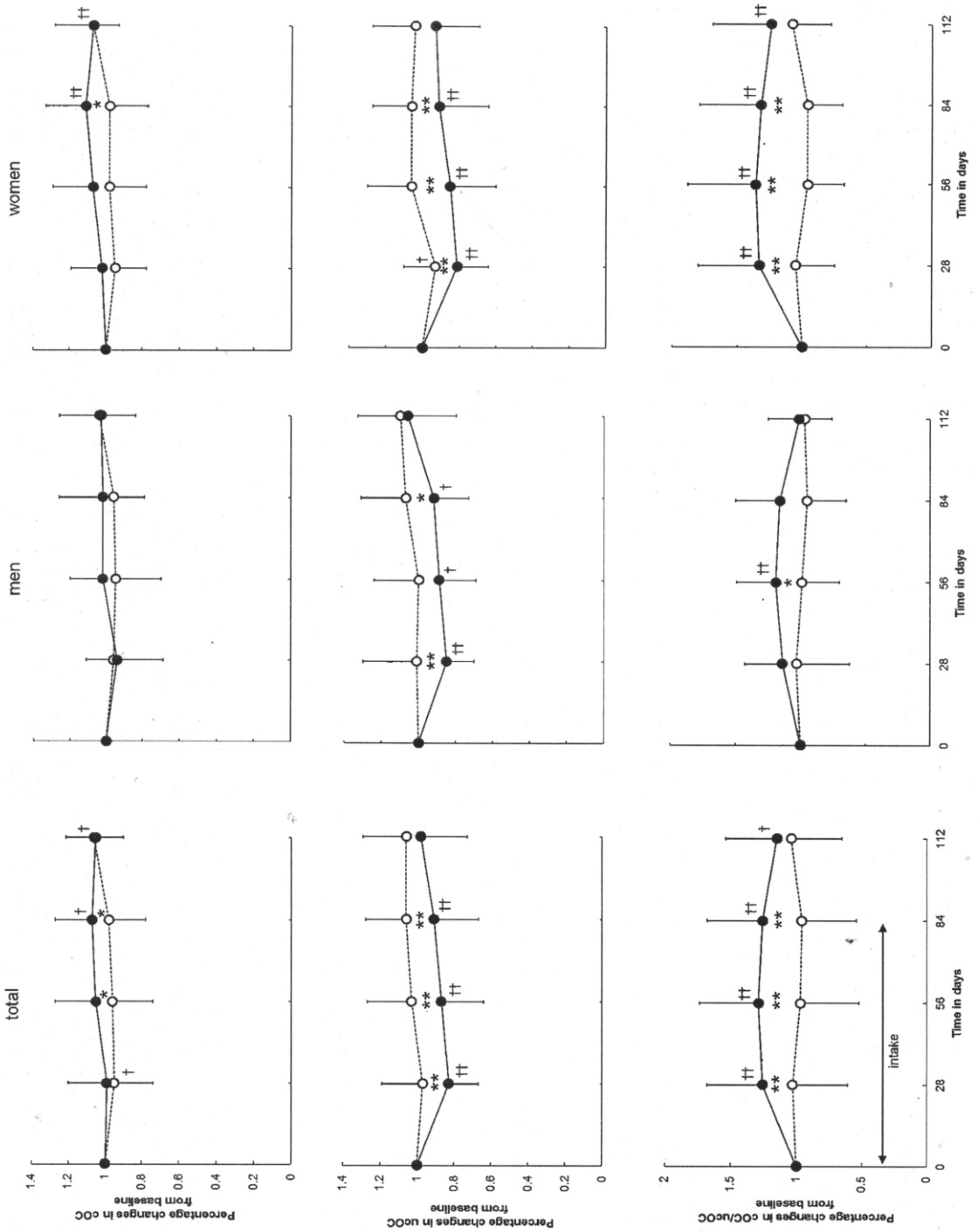

Fig. 6. Comparison of the effects of vitamin K between men and women in Study 2. Percentage changes in carboxylated osteocalcin (cOC) (A), in undercarboxylated osteocalcin (ucOC) (B) and cOC/ucOC ratio (C). Data are mean±SD. ○: Placebo, ●: MK-7. $^{*}p<0.05$, $^{**}p<0.01$ vs. placebo (Wilcoxon rank-sum test). $^{\dagger}p<0.05$, $^{\dagger\dagger}p<0.01$ vs. baseline (Wilcoxon signed-rank test). $n=23$ for men and $n=34$ for women in the placebo group, and $n=23$ (day 0, 28, 56 and 112) or $n=22$ (day 84) for men and $n=35$ for women in the MK-7 group.

the newly recommended value, which was also determined based on coagulation requirements, is suggested to maintain osteocalcin γ-carboxylation status, assuming that the increment (of 75–90 μg) was made up with MK-7.

Japanese practice guidelines recommended vitamin K intake of 250–300 μg/d for the prevention and treatment of osteoporosis (*31*). Kamao et al. estimated the average dietary intake of vitamin K at 154.1 μg/d in Japanese who do not eat natto habitually (*32*). Vitamin K intake in the MK-7 group of Study 2 could be assumed to meet the recommended value in the guidelines.

In conclusion, the present study demonstrated that ≥100 μg MK-7 in addition to ordinary meals could improve osteocalcin γ-carboxylation status. Furthermore, osteocalcin γ-carboxylation decreased ucOC concentration even over a short period of intake. A longer time period of this level of MK-7 would be expected to maintain γ-carboxylation status and bone metabolism, leading to improved bone health.

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Conflict of interest

No authors declare a conflict of interest.

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BLENDS OF COCONUT OIL

Dr. Surjit Kumar Saha
Chartered Engineer & Oil Technologist
3-AF, Green Park, Tagore Road, Civil Lines, Nagpur - 440 001
E-mail: surjitsaha@gmail.com

Coconut oil is an edible oil extracted from the kernel of mature coconuts harvested from the coconut palm (*Cocos nucifera*). India produces about 3.5 million tons of Coconut Oil each year. Coconut oil contains 91 percent of saturated fatty acids, 6 percent of monounsaturated fatty acids and 2 percent of Polyunsaturated fatty acids. This makes coconut oil highly resistant to oxidation at high heats. For this reason, it is the perfect oil for high-heat cooking methods like frying.

Coconut oil consists almost entirely of Medium Chain Triglycerides which have an entirely different metabolism process as compared to long chain Triglycerides. These medium chain fatty acids go straight from the digestive tract to the liver, where they are turned into ketone bodies and provide a quick source of energy. The most abundant fatty acid in coconut oil is lauric Acid, which is broken down into a compound called monolaurin in the body. Lauric acid and monolaurin are both very interesting substances due to their inherent antibiotic properties by virtue of which they can kill microbes like bacteria, fungi and viruses in the human body. For this reason, coconut oil can also act as a protective agent against various infections..

Unrefined coconut oil actually improves blood lipid profiles. In two separate rat studies conducted in Kerala, India, consumption of virgin coconut oil was compared against refined coconut oil and corn oil. The virgin coconut oil significantly reduced Total and LDL cholesterol, oxidized LDL, triglycerides and increased HDL cholesterol. It also had favorable effects on blood coagulation factors and antioxidant status. In a further study of women with abdominal obesity, coconut oil increased HDL and lowered the LDL:HDL ratio, while soybean oil increased Total and LDL cholesterol and decreased HDL. The medium chain triglycerides in coconut oil have also been shown to reduce blood triglycerides compared to long chain fats. Coconut oil is therefore protective against heart disease and not the other way around as per the negative myths associated with this oil.

Further, there is considerable evidence that coconut oil can help in losing weight. Animal and human studies have shown that the fast rate of oxidation of medium chain fatty acids leads to greater energy expenditure. Most animal studies have also demonstrated that the greater energy expenditure with medium chain fatty acids relative to long-chain fatty acids results in less body

weight gain and decreased size of fat depots after several months of consumption. In a study conducted in Brazil on 40 women with abdominal obesity, coconut oil reduced waist circumference compared to soybean oil while also improving other health markers. Medium chain triglycerides have also been consistently shown to promote weight loss in both animal and human studies.

Despite the aforesaid multiple benefits of consuming coconut oil, it is often looked upon by an element of fear by the general public mainly due to historical myths and unwarranted adverse publicity. Coconut Oil has a typical taste and odour which restricts its consumption and it is here that the phenomenon of blending Coconut Oil with other conventional oils comes into the picture. Blending of Coconut Oil with other conventional oils will not only increase the consumption of indigenous Coconut Oil but also tend to bridge the gap between demand and supply of edible oils resulting in lower imports and conservation of foreign exchange.

Coconut Oil can be blended with conventional edible oils such as groundnut, soybean, safflower, sesame and mustard oil. The approximate contents of saturated, monounsaturated and polyunsaturated fatty acids of different oils and their corresponding S:M:P ratios of the individual oils and their blends with equal amounts of the other conventional oils are presented in Table-1 and Table-2 respectively.

TABLE-1

Saturated, Monounsaturated and Polyunsaturated Fatty Acid Content of Rice Bran Oil and Some Conventional Oils

OIL	SAFA	MUFA	PUFA	S : M : P
Coconut Oil	91	06	03	30.3:2.0:1.0
Groundnut Oil	21	43	36	1.0:2.0:1.7
Soybean Oil	17	25	58	1.0:1.5:3.4
Safflower Oil	07	15	78	1.0:2.1:11.1
Sesame Oil	20	40	40	1.0:2.0:2.0
Mustard Oil	07	63	30	1.0:9.0:4.3

TABLE-2

Saturated, Monounsaturated and Polyunsaturated Fatty Acid Content of Blends of Coconut Oil with some Conventional Oils

Blend No.	Oils in Blend	Content in Blend	S:M:P of Blend
1.	Coconut Oil	50%	2.9:1.3:1.0
	Groundnut Oil	50%	
2.	Coconut Oil	50%	3.5:1.0:2.0
	Soybean Oil	50%	
3.	Coconut Oil	50%	4.7:1.0:3.9
	Safflower Oil	50%	
4.	Coconut Oil	50%	2.6:1.1:1.0
	Sesame Oil	50%	
5.	Coconut Oil	50%	3.0:2.1:1.0
	Mustard Oil	50%	

Blending of Coconut Oil with other conventional oils increases the saturated fatty acid content and decreases the polyunsaturated content of the blends resulting in better antioxidant activity and enhancing the keeping quality of the blend. Increase in the quantum of lauric acid in the blend would not only improve the S:M:P ratio of the blends but also improves the antibiotic activity of the blends. Moreover, the saturated fatty acids in the blends are the medium chain acids from coconut oil which are converted into energy faster, are easier to digest and also help to boost body metabolism thereby contributing to alleviation of obesity. They also increase the body's absorption of antioxidants to promote health. Apart from this, blending of Coconut Oil with conventional oils according to regional preferences would also tend to improve the organoleptic properties of Coconut Oil as per regional preferences. However, much work is needed in this direction to educate the general public about the potential benefits of consumption of coconut oil as such or in blends with other conventional oils to dispel the negative myths and unwarranted adverse publicity associated with consumption of coconut oil.

International Sunflower Seed and Oil Conference 2019

19th and 20th July 2019, Mumbai

ADDRESS

Mr. Nadir B. Godrej

Managing Director, Godrej Industries Limited

The Sunflower is so aptly named.

At one time it was often claimed
This glorious flower turns its head
Towards the sun, but now instead,
We realize, the young plant turns
But as it grows it slowly spurns
These strange gyrations but at least
It steadily points to the east
And basks in the rising sun.

But when all is said done
Its golden disc, its petals bright,
Are a truly glowing sight
Like a solar disc with gleaming rays,
A glowing promise of brighter days.

The sunflower has a healthy seed.
It produces oil, food and feed.

The benefits can't be over stated,
The oil is polyunsaturated.

It can also be modified.
High Oleic has been tried.

And its demand is bound to grow.

Nutritionists can clearly show
Health benefits can be seen:
The seeds are rich in protein,
Most minerals and vitamins,
A healthy oil, so many wins.

In India also Sunflower grows
But of course our audience knows,
In spite of all our farmer's toil
We import most of our oil.

We left our self-sufficient heaven,
Way back in 1977.

OGL then came along
And ever since imports are strong.

The oilseed mission was once a hit
But it dissipated bit by bit.

With the help of better seed
Our cereal farmers could succeed.

Now is the time for a special drive
To make our oilseed farmers thrive.
In other countries we all know
High yielding seeds are GMO.

Just as SEA could help us master
High productivity in Castor,
A new initiative is awaited,
All oilseeds should be propagated!

We welcome the PM's verbal support
But now some real action's sought!

We need to explain it very well.
Perhaps by our Pasha Patel?

SEA will push, who could be better
Than Atulji and B V Mehta!

Unfortunately, we all know,
We have a long, long way to go!

The Sunflower is a new world crop.

Argentina's production's been nonstop.
Perhaps because this crop was new.
The Orthodox Church took the view
Sunflower oil was good in Lent.

For that is how the rules are bent!
And that is how one can explain
Its spread in Russia and Ukraine.

Collectivisation was a drag
And sunflower yields began to lag.

But once the Soviet Union fell
It all turned out very well.

And now we see a fourfold gain
On the Russian and Ukrainian plain.

The global commodity majors are there
But local companies have their share.

The majors have a substantial size
But Cofco and Kernel are on the rise.

Alas, now no margin is seen
In refining and production of Palm Olein
But Sunflower refining always pays.

The import decision therefore sways.

The softer oils are gaining ground.

In consumer packs, they are what's found.

Three million tons we now consume
But much more growth we can't assume.

Per capita consumption can still rise
But all the same I would surmise
That 20 Kilos would be the peak.

Growth thereafter could be weak.

But Govindbhai can better tell,
He knows his numbers very well!

While our population will still grow
The rate of growth will begin to slow.

While once it grew exponentially,
Now linear growth is what we'll see.

But growth of course will be there
And Sunflower deserves a bigger share.

I'm sure its future will be bright.

Our speakers will shed further light.
And we will learn many ways
To ensure e have sunny days.

A golden harvest we will reap
Thanks to our convener Sandeep.
His good advice is always sought
For his sunny outlook and deep thought

Putting the Brakes on Oil Palm or, how not to feed the world

Dato' Lee Yeow Chor*, Chairman, MPOC

The World population stands at 7.6 billion and is expected to reach nine billion by 2050. At the same time, the availability of arable land is becoming more scarce relative to the number of people who have to be fed.

According to UN figures, an additional 2.7-4.9 million hectares of cropland will be required every year to feed the growing world's population. But climate change, urban development and rural population migratioin affect agriculture directly.

Every year, between one million and two million hectares of land beome unsuitable for cultivation due to land degradation. Efforts to rehabilitate there e-graded lands are extremely expensive. Therefore, more innovative and efficient agricultural land use policies are needed to step up food supply.

The first fact to recognise when considering global food security is that the world is not homogeneous. Global food production is not evenly distributed among all countries.

Countries with a conductive climate and human capacity have surplus food production and will not encounter food security issues. Those which are less well-endowed will encounter food security issues. Very often, they are countries with large populations. This, clearly, is a potential cause of significant economic and social instability.

By 2050, an additional 35 million tonnes of oils and fats will be needed every year. This posts a major challenge where large areas of land will be required to meet the additional demand.

In order to produce 35 million tonnes of oils and fats. 88 million hectares of land would be required for soybean or 58 million hectares for sunflower. In contrast only nine million hectares of oil palm would be needed to produce the same volume of food - the actual areas may be smaller due to productivity improvements over time.

Realising this, the UN Food and Agriculture Organisation has recognised the importance of planting oil palm for food securitry, especially in developing countries. Althrough oil palm occupies only 0.3% of total agricultural land, the crop contributes more than 30% of the world's supply of oils and fats.

Sustainability certification

World-leading effeciency on its own has not been sufficient to lead palm oil into the good graces of decision-makers. Consistent negative campaigns about palm oil's environmental impact have damaged its image and forced the industry to respond to prove its sustainability credentials.

The Roundtable on Sustainable Palm Oil (RSPO) is today the most widely accepted sustainability certification scheme for palm oil, particularly for use in food and chemicals. Indeed, RSPO has made significant progress and impact in promoting the production, supply and use of sustainable palm oil.

However, there are signs that RSPO is increasingly alienating the oil palm growers; they have become disillusioned over the continuously shifting sustainability creiteria or application of these during audits.

Let's look at the statistics of RSPO membership. In 2008, four years after RSPO's formation, grower members made up 19.1% of total membership while 10 years later in 2018, only a mere 4.4% of the total membership comprised member-growers. These statistics showing a gross under-representation of growers should be a wake-up call for RSPO and the advocates for sustainable palm oil.

Growers are the ones who bear the brunt of the hard work, undergoing regular audits involving almost 100 criteria. They form the source of the palm oil supply chain on which the very existence of RSPO depends. If the goose that lays the golden eggs disappears or shrinks substantially, it would be meaningless for the remaining members - food companies, retailers, NGOs among other stakeholders - to talk about promoting the use of sustainable palm oil.

RSPO's core objective is to "promote" the production, supply and use of sustainable palm oil. "Promote" means "encourage" and has an underlying tone of voluntary effort and incentives.

However, membership for growers has tuned into an avalanche of complaints against their production practices and hardly any complaint against other member groups. With this - coupled with the less than50% uptake of certified production volume as well as the fast-declining RSPO premium - it may not be surprising that the expansion of growers membership is so slow and that under-representation of member-growers is so stark.

Due to the stringent RSPO criteria and the significant certification costs, there is a real need for other schemes that are cheaper, less cmplex and more broad-based. The Malaysian Sustainable Palm Oil standard, for example, is a much-welcomed certificatiion scheme which is backed by the government and can be adopted by a much wider specturm of the oil palm growers, including the small holders.

Negative activism

The era of Internet and social media has proved a boon to environmental NGOs from western countries, as they are able to reach out to netizens around the world and garner strong followings to promote their cause. Palm oil has become a favourite target for these NGOs.

Armed with academic knowledge gained from western institutions, as well as information extracted from studies based on dubious science, activists from these NGOs who are mostly in their 20s and 30s have a tendency to exert their opinion on oil palm growers who have spent many years practising their trade.

The NGOs are relatively small in size, with manpower as low as five for the smallest to perhaps a few hundred for the bigger ones. However, with the clever use of social media and shrewd propaganda tactics, they are able to sway consumer perception. They also dictate to the oil palm grower communities, which total several million people, on how environmental conservation should be carried out in less developed countries.

It is acknowledged that activist groups play an important role in providing alternative views and serving as check-and-balance on matters of interest. However, in many instances, their approach to resolving issues could be changed to be less confrontational, more sympathetic and more collaborative. The fact is that growers are the ones who do the tough job of ensuring that oil palm is grown in an economically, socially and environmentally sustainable manner.

The campaign by activist groups in restricting oil palm planting have been effective, as seen from the much slower expansion of the planted area over the last few years.

The Indonesian government has extended a moratorium on approving new land for oil palm planting. Recently, the Malaysian government also announced a restriction on oil palm expansion.

These are good short-term measures that allow proper environmental protection to be implemented effectively on the ground, and to moderate the growth of palm oil supply in the global vegetable oil market.

However, a proper balance should be struck to avoid other social-economic problems such as food insecurity, food price inflation and an imbalance in rural development from surfacing in the longer term.

(Source : Global Oils & Fats Business Magazine : Vol 16 Issue 1 (Jan-Mar) 2019

The article is reproduced with the kind curtesy and permission of Datuk Dr. Kalyana Sundaram, CEO MPOC.

ABOUT OURSELVES

A certificate course on APPLIED NUTRITION &FOOD PROCESSNG was inaugurated on the 27th April92019 at the Subhas Mukherjee Memorial Reproductive Biology Research Centre Calcutta

Food& Nutrition Division in collaboration with

@Nutrition Society of India (Calcutta Chapter)

@Association of Food Scientists & Technologists'(India) Calcutta Chapter

@Oil Technologists' Association of India(Eastern Region)

The Convener was Prof Sunit Mukherjee

Among others

Lectures were delivered by Prof Sunit Mukherjee 2. Dr J. Chakraborty 3. S.K.Roy. It was well attended.

2.A Lecture Meeting on Edible oil Packaging was arranged on the 12th March 2019.

The Speaker was Dr Bidhan Das.of Institute of Packaging. It was well attended.

3,C.E.C. Meeting was held in Saturday club on the 21st April ,2019

Eight veteran Eastern Zone Members namely 1. A.S.Khanna2 Sunit Mukherjee

3.K.S.Parasuram 4. J.P.Singh 5 .S.Bandopadhya 6.B.P.Manchanda 7.A.K.Guha and S.K.Roy received a SILVER PLAQUE AND A SHAWL FROM PROF R.k.Trivedi National President in appreciation of their dedicated SERVICES towards OTAI in Presence of all C.E.C. Members and invited Guests present at a glittering CEREMONY in the Saturday Club on the 21st April 2019. This programme of HONORING THE HONOURABLES is held by the E.Z. during Annual Convention but could not be held in 2015

Absentee Awardees: Ranjit Chakrabarty. J. Chakraborty, D.K.Bhattacharyya

Ms Pubali Dhar c/o Posthumous Dr Santinath Ghosh

Welcome: Mr Pranab Das Affiliate Member LifeOTAI/EZ/Af-48 has been elevated as Life Fellow Member and raified in the C.E.C. held on 27th July n.Delhi,2010

Courtesy-SEAI

PARLIAMENT NEWS

Lok Sabha Starred Question No. : 64 Answered on 26th June 2019

TRANSPORT SUBSIDY TO AGRICULTURAL EXPORTS

Shri Y.S. Avinash Reddy:
Will the Minister of Commerce & Industry be pleased to state :

(a) Whether the Government proposes to increase the agricultural exports by providing transport subsidies to he exporters/States;

(b) If so, the details thereof; and

(c) The details of the other subsidies being given by the Government to export agencies to encourage exports?

ANSWER

The Minister of Commerce and Industry Shri Piyush Goyal

a) to c) : A Statement is laid on the Table of the House.

STATEMENT REFERRED TO IN REPLY TO PARTS (a) TO (c) OF LOK SABHA

STARRED QUESTION NO. 64 FOR ANSWER ON 26TH JUNE, 2019

REGARDING "TRANSPORT SUBSIDY TO AGRICULTURAL EXPORTS"

(a) & (b) Yes, Sir, The Government has brought out a new Central Sector Scheme – 'Transport and Marketing Assistance for Specified Agriculture Products' – for providing assistance for the international component of freight, to mitigate the freight disadvantage to the export of agriculture products, and marketing of agricultural products. The assistance under the Scheme is likely to result in higher exports of branded agriculture products in overseas markets, through enhanced competitiveness. The Scheme was notified on 27th February, 2019.

The assistance under the Scheme is available to exporters of specified agricultural products. The Scheme covers all the agricultural products. Falling under Chapters 1 to 24 of ITC (HS) Code List, with the exceptions as listed at Annexure-I.

For export of products by sea, the assistance is based on the freight paid for full Twenty feet Equivalent Unit (TEU) containers. Assistance for products exported by air is based on per tone freight charges on net weight of the export cargo, calculated on the full ton basis, ignoring any fraction thereof.

The Tea Board also has a 'Scheme for assisting tea exporters towards meeting additional transport & handling charges being incurred for teas exported through ICD Amingaon'. The Scheme is for compensating exporters who are shipping teas from the I.C.D. Amingaon, Assam, taking into account the fact that the additional charges being levied by the shipping companies towards transportation and terminal handling charges, arising out of the empty haulage of the containers during the return journey from the port of shipment to Amingaon, affects export competitiveness. Financial assistance by way of incentive towards export of tea through ICD, amingaon is at Rs. 2.00 per kg of tea.

The Coffee Board, under its integrated Coffee Development Project, also provides transit/freight assistance for the following :

I) Rs. 2/- per kg. for the export of High Value Green Coffees to far off hight-value markets viz., USA, Canada, Japan, Australia, New Zeland, South Korea, Finland and Norway.

i) Rs. 3/- per kg for export of value added coffees in retail consumer packs exported as "India Brand"

(c) Promoting exports of agricultural products from the country is the continuous process. Various measures to increase agricultural exports, bother strategic and operational, have been included in the newly introduced Agriculture Export Policy. The Department of Commerce also has several schemes to promote exports, including exports of agricultural products, viz., Trade Infrastructure for Export Scheme (TIES), Market Access Initiative (MAI) Scheme, Merchandise Exports from India Scheme (MEIS) etc. in addition, assistance to the exporters of agricultural products in also available under he Export Promotion Schemes of Agricultural and Processed Food Products Export Development Authority (APEDA), Marine Products Export Development Authority (MPEDA), Rubber Board and Spices Board. These organizations also seek to promote exports through participation in international fairs and exhibitions, taking initiatives to gain market access for different products in different markets, dissemination of market intelligences, taking steps to ensure quality of exported products etc.

Annexure 1

[Editor's Note : the agri commodities in the table below are NOT eligible for Transport Subsidy

Chapter	HS Codes	Description
Chapters 1,2 & 5	All HS Codes	Live animals - Meat and Edible Meat offal - Products of Animal origin, not elsewhere specified or included
Chapter 3	030617	- Other shrimps and prawns
Chapter 4	0401	- Milk and cream, not concentrated or containing added sugar or other sweetening matter
	0402	- Milk and cream, concentrated or containing added sugar or other sweetening matter
	0403	- Buttermilk, curdled milk and cream, yogurt, kephir and other fermented or acidified milk and cream, whether or not concentrated or containing added sugar or other sweetening matter or containing added fruit, nuts or cocoa.
	0404	- Whey, whether or not concentrated or containing added sugar or their sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or included.
	0405	- Butter and other fats and oils derived from milk; dairy spreads
	0406	- Cheese and curd

Chapter	70703	- Onions, Shallots, garlic, leeks and other alliaceous vegetables, fresh or chilled
Chapter	101006	- Wheat and Mesin - Rice
Chapters 13 & 14	All HS Codes	- Lac; Gums, Resins and other Vegetable Saps and Extracts - Vegetable Plaiting Materials; Vegetable Products not elsewhere specified or included
Chapter 17	1701	- Cane or Beet Sugar and Chemically Pure Sucrose, in Solid Form – Raw Sugar not containing Added Flavouring or colouring matter;
	1703	- Molasses resulting from the extraction or refining or sugar
Chapters 22 and 24	All HS Codes	- Beverages, Spirits and Vinegar - Tobacco and Manufactured Tobacco Substitutes

Lok Subha Unstarred Question No. 802 Answered on 26th June 2019

MERCHANDISE EXPORT

Shri Sudheer Gupta

Will the Minister of Commerce and Industry be pleased to state :

(a) Whether it is true that despite achieving a recorded high of $321.02 billion in merchandise exports, the country missed its own target of $330 billion, if so, the details thereof and the reasons there for;

(b) The details of the steps being taken by the Government to increase merchandise exports;

(c) Whether the country has experienced a high trade deficit for merchandise goods for the year 2018-19;

(d) If os, the details thereof and the reasons there for; and

(e) Whether the Government has any proposal to increase FDI through schemes like 'Make in India' by relaxing rules in FDI in several sectors and if so, the details thereof?

Answer

The Minister of Commerce and Industry – Shri Piyush Goyal

(a) India has achieved a record high of 330.07 US$ billion of merchandise exports in the year 2018-19, registering a positive growth of 8.75% as compared to the previous year.

(b) Government has taken following steps to increase exports.

(i) A new Foreign Trade Policy)FTP) 2015-20 was launched on 1st April 2015. The policy, inter Alia, rationalized the earlier export promotion schemes and introduced two new schemes, namely Merchandise Exports from India Scheme (MEIS) for improving export of goods and 'Services Exports from India Scheme (SEIS)' for increasing exports of services. Duty credit scripts issued under these schemes were made fully transferable.

ii. The Mid-term Review of the was undertaken on 5th December, 2017. Incentive rates for labour intensive/MSME sectors were increased by 2% with a financial implication of Rs. 8450 cr per year

(iii) A new logistics Division was created in the Department of Commerce to coordinate integrated development of the logistics sector. India's rank in World Bank's Logistics Performance Index moved up from 54in 2014 to 44 in 2018.

(iv) Interest Equalization Scheme on pre and post shipment rupee export credit was introduced from 1.4.2015 providing interest equalization at 3% for labour intensive/MSME sectors. The rate was increased to 5% for MSME sectors with effect from 2.11.2018 and merchant exporters were covered under the scheme with effect from 2.1.2019.

(v) Various measures for improving ease of doing business were taken. India's rank in World Bank 'Ease of doing business' ranking improved from 142 in 2014 to 77 in 2018 with the rank in 'trading across borders' moving up from 122 to 80.

(vi) A new scheme called "Trade Infrastructure for Export Scheme (TIES)" was launched with effect from 1st April 2017 to address the export infrastructure gaps in the country.

(vii) A comprehensive "Agriculture Export Policy" was launched on 6th December, 2018 with an aim to double farmers' income by 2022 and provide an impetus to agricultural exports.

(viii) A new scheme called "Transport and Marketing Assistance" (TMA) scheme has been launched for mitigating disadvantage of higher cost of transportation for export of specified agriculture products.

(ix) A new scheme called Scheme for Rebate of State and Central Taxes and Levies (RoSCTL) covering export of garments and made-ups was notified on 7.3.2019 providing refund of duties/taxes at hither rates.

(a) and (d) : The trade deficit of merchandise goods increased from 162.05 US$ billions in 2017-18 to 183.96 US$ billions in 2018-19. The trade deficit depends upon relative fluctuations in the import and export of different commodities due to various global and domestic factors such as demand and supply in domestic and international markets, currency fluctuations, trade agreements between competing exporting countries with export destination countries, non-tariff barriers by export destination countries, cost of credit, logistics costs, etc. Trade deficit during 2018-19 has increased primarily due to higher imports of petroleum crude and products, electronic goods and machinery items and less export of gems and jewellery, textiles items and marine products.

(e): Government has put in place a liberal and transparent policy for FDI, wherein most of the sectors are open to FDI under the automatic route. The Government reviews the FDI policy on an ongoing basis and makes necessary changes from time to time to ensure that India remains attractive and investor friendly destination. FDI in various sectors in allowed in a calibrated manner after having consultations with stakeholders, including concerned Ministries/Departments, State Governments apex industry chambers, Associations and other organizations and taking into consideration their views/ comments.

Ministry of Health and Family Welfare
(Food Safety and Standards Authority of India)
New Delhi

Notification
Dated 5th July 2019

The following draft of certain regulations, further to amend the Food Safety and Standards (Prohibition and Restrictions on Sales) Regulations, 2011, which the Food Safety and Standards Authority of India proposes to make with the previous approval of the Central Government, in exercise of the powers conferred by section 92 of the Food Safety and Standards Act, 2006 (34 of 2006), is hereby published as required by sub-section (1) thereof, for the information of all persons likely to be affected thereby; and notice is hereby given that the said draft regulations shall be taken into consideration after the expiry of a period of thirty days from the date on which copies of the Official Gazette in which this notification is published are made available to the public.

Objections or suggestions, if any, may be addressed to the Chief Executive Officer, Food Safety and Standards Authority of India, FDA Bhawan, Kotla Road, New Delhi-110002 or sent on email at regulation@fssai.gov.in.

Objections or suggestions, which may be received from any person with respect to the said draft regulations before the expiry of the period so specified, shall be considered by the Food Authority.

Draft Regulations

1. Short title and Commencement. – (1) These regulations may be called the Food Safety and Standards (Prohibition and Restriction on Sales) Amendment Regulations, 2019.

   (2) They shall come into force on the date of their final publication in the Official Gazette.

2. In the Food Safety and Standards (Prohibition and Restrictions on Sales) Regulations, 2011, in regulation 2.3, in sub-regulation 2.3.15, after clause 7, following clause shall be inserted namely:-

   "8 The Total Polar Compounds in unused/fresh vegetable oil/fat shall not be more than 15%. Used vegetable oil/fat having developed Total Polar Compounds more than 25% shall not be used."

F. No. Stds/O&F/Notification(12)/FSSAI-2019
ADVT.-III/4/Exty./129/19

Sd/-
(Pawan Agarwal)
Chief Executive Officer

Ministry of Health and Family Welfare
(Food Safety and Standards Authority of India)
New Delhi

Notification
Dated 5th July 2019

F. No. Stds/O&F/Notification(10)/FSSAI-2017. – Whereas the draft Food safety and Standards (Food Products Standards and Food Additives) Amendment Regulations, 2018, were published as required by sub-section (1) of section 92 of the Food Safety and Standards Act, 2006(34 of 2006), vide notification of the Food Safety and Standards Authority of India number Stds/O&F/Notification (10)/FSSAI-2017, dated the 22nd June, 2018, in the Gazette of India, Extraordinary, Part III, Section 4, inviting objections and suggestions from the persons likely to be affected thereby, before the expiry of the period of thirty days from the date on which the copies of the Official Gazette containing the said notification were made available to the public;

And whereas copies of the said Gazette were made available to the public on the 6th July, 2018;

And whereas the objections and suggestions received from the public in respect of the said draft regulations have been considered by the Food Safety and Standards Authority of India;

Now, therefore, in exercise of the powers conferred by clause (e) of sub-section (2) of section 92 read with section 16 of the said Act, the Food Safety and Standards Authority of India hereby makes the following regulations further to amend the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011, namely:-

Regulations

1. (1) These regulations may be called the Food Safety and Standards (Food products Standards and Food Additives) Third Amendment Regulations, 2019.
   (2) They shall come into force on the date of their publication in the Official Gazette.
2. In the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011, in regulation 2.2.
   (1) In sub-regulation 22.2.1, after clause (29) relating to Palm Superolein the following clause shall be instered, namely:-

"30. Chia oil means the oil expressed from the clean and sound seeds of chia (Salvia hispanica) without the application of heat which shall be clear from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances and mineral oil and conforms to the following parameters and limits, namely:-

S. No.	Parameters	Limits
1	Refractive index at 400C	1.470-1.480
2	Saponification value	185 199
3	Iodine value	Not less than 180
4	Acid value	Not more than 2.0 mg KOH/g Oil
5	Unsaponifiable matter	Not more than 1.5%

Note:- Test for Argemone oil shall be negative,",

(II) in sub-regulation 2.2.7, in Table 1 relating to "Fatty Acid Composition", after column (26) and the entries relating thereto, the following column and entries shall be inserted namely :

"Fatty Acid	Chia Oil
(1)	(27)
C6:0	–
C8:0	–
C10:0	–
C12:0	–
C14:0	0.1 MAX
C16:0	6.0 – 8.0
C16:1	0.5 MAX
C17:0	–
C17:1	–
C18:0	3.0 – 4.5
C18:1	6.0 – 9.0
C18:2	17.0 – 22.0
C18:3	58.0 – 65.0
C20:0	0.5 MAX
C20:1	–
C20:2	–
C22:0	0.2 MAX
C22:1	–
C22:2	–
C24:0	–
C24:1	–

Pawan Agarwal
Chief Executive Officer

Four Presidents O.T.A.I

S. K. Roy President OTAI presenting memento to Dr Santinath Ghosh.

International Conference at Baranasi

Honouring the Honourables - OTAI-EZ

by National President Prof R. K. Trivedi

To Dr A. S. Khanna
Founder Member

To Mr J. P. Singh
President (EZ)

To Mr Manchanda
Hon. Secy. (EZ)

To Mr K. S. Parasuram

To Dr Bandophdhya

To Dr A. K. Guha

To S. K. Roy
Former President OTAI

Prof. D. K. Bhattacharyya

M. Sc., (Tech), Ph. D
Emeritus Fellow (AICTE)
Ex-Ghosh Professor of Applied Chemistry

DEPARTMENT OF CHEMICAL TECHNOLOGY
University Colleges of Science & technology
University of Calcutta
92, Achrya Prafulla Chandra Road
Kolkata - 700 009
Phone : 2350 8386/6396/6387/1847/1014/9937
2352 0051/0052
Gram : SCIENCE Fax : 91-033-351 9755
E-mail : dkb_olltech@yahoo.com

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 industrial circles throughout India because of he highly relevent and beneficial 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
21-06-2003

Regarding availability/price enquiries may be made to :
S. K. ROY, President OTAI (EZ)
5C, Tarak Mitra Lane, Kolkata - 700 026
Phone : 24666243 / 24639721
E-mail : esskay_roy81@rediffmail.com
es.k.ray@gmail.com

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 bioconversioin 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

Fatty acids composition of some edible oils. Percentage by weight.

Fat / Oil	SAFA	MUFA Oleic	PUFA		
			Linoleic	Linolenic	Total
Coconut Oil	87.9	7.8	0.8	----	0.8
Palm Oil	47.9	37.9	9.0	—-	9.0
Musta / rapseed	10.7	56.7	18.1	14.5	32.6
Sunflower Oil	10.7	17.7	78.5	----	78.5
Soybean Oil	13.1	28.9	50.7	6.5	57.2
Sesame Oil	13.4	41.3	45.3	—-	45.3
Sunflower Oil	9.1	25.1	66.2	----	66.2
Cottonseed Oil	25.9	22.9	47.8	----	47.8
Groundnut Oil	20.9	49.3	29.8	----	29.8
Rice Bran Oil	18.0	45.0	35.0	2.0	37.0
Olive Oil	9.0	75.0	16.0		

The edible fats and oils shown above are only divided into groups on the basis of their contents of different classes of fatty acids.

1. Fats rich in SAFA
2. Fats rich in MUFA
3. Fats highly rich in PUFA
4. Fats rich in PUFA
5. Fats more or less balanced

AHA - SAFA:MUFA:PUFA = 1:1:1

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SAFA:MUFA:PUFA = 1:1.5:1