LIPID UNIVERSE

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MCPD and GE in Refined Vegetable Oils - Health Risk, Process Mitigation and Safety Limits

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Editor-in-chief desk..............

Dear Friends,

As we bring you this edition of Lipid Universe, the global oils and fats industry finds itself at a fascinating crossroads - one where science, trade policy, and public perception are converging in ways that demand our close attention.

This issue opens with a detailed technical review of 3-MCPD and glycidyl esters in refined vegetable oils - process contaminants that continue to challenge refiners worldwide. As India currently lacks formal regulatory limits for these compounds, our industry has a responsibility to proactively adopt best-in-class mitigation practices, even as we await domestic guidelines. Technologists engaged in oil refining operations are required to study the process improvements outlined to ensure a safe quality product.

On the trade front, our sector is once again navigating turbulent waters. India's likely move to raise import duties on vegetable oils to support domestic oilseed farmers, alongside the escalating tariff standoff between the United States and China over soybean trade, reminds us how deeply interconnected - and vulnerable - global edible oil supply chains remain. Brazil's continued ascent as the world's dominant soybean supplier is a trend worth watching closely for its long-term implications on sourcing strategies.

Equally noteworthy is the ongoing public debate around seed oils versus traditional fats. As this issue's coverage shows, much of the current backlash is driven more by social media narratives than by peer-reviewed science. As professionals in this field, we have a duty to engage with accurate, evidence-based communication and help counter misinformation wherever it surfaces.

I'm also pleased to share our feature on Frankincense (*Boswellia serrata*) essential oil - a reminder of the rich diversity within our discipline, from industrial-scale refining to specialty botanical oils with therapeutic applications.

I extend my sincere thanks to our advertiser, contributors, the Editorial Board, and OTAI's North Zone members for their continued support in bringing this issue together.

Warm regards,

Yours truly

C.S. Joshi

Editor-in-chief

Editor-in-chief desk..............

Editor's desk..............

Dear Readers,

Food safety is becoming increasingly important due to heightened consumer awareness. In the edible oil industry, MCPD and GE are the contaminants formed as a by- product on processing oils at elevated temperatures specifically during deodorization. FDA has developed methods to measure these contaminants and researched the potential adverse health effects of MCPD and GE. The present article deals with operational risks, process mitigation strategies and safety limits of these contaminants. Health experts in our country advise to follow European standards as regulatory guidelines for monitoring them.

A tariff- driven soybean crises took place in U.S. President Trump's sweeping tariffs have devastated the U.S. soybean industry. China, which historically bought over half of all U.S. soybeans, heavily boycotted American beans in retaliation for Trump's tariffs. Chinese importers shifted their contracts to Brazil and Argentina, leaving U.S. farmers to grapple with collapsing prices and plunging revenue.

Eventful issues in Trade news show Global market analysis of oilseeds and by- products, nutrition experts warn against misinformation around seed oils, engineered production of oilseed crop Cameline containing a valuable red pigment (Astaxanthin) which are prized not only for their colouring properties but also for their exceptional antioxidant property.

Health news cover issues like lipid nanoparticles that boost cancer vaccines to provide a powerful tumour- killing response; bakers can choose strategies to reduce saturated fat by blending or interesterification of canola oil and hydrogenated cottonseed oils to obtain the properties such as texture, melting point and performance by adjusting solid and liquid fat ratio.

Essential oils provide immense value to the lipid industry by serving as natural, plant - derived functional ingredients. Included Frankincense essential oil in this issue finds a wide spectrum of benefits in the field of cosmetics and personal care products.

This issue provides a comprehensive technical perspective of latest trends in the field of lipids and hope the readers will find it interesting..

Yours truly

Dr. S. Adhikari
Editor

Editor's desk..............

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MCPD AND GE IN REFINED VEGETABLE OILS - Health risk, process mitigation and safety limits

J.B. Agarwal

Vice President (operations), Ajanta Soya Ltd, Bhiwadi, Rajasthan

Introduction

Process contaminants like mono or di ester of 3-monochloropropane-1,2-diol (3-MCPDEs) and glycidyl esters (GEs) formed during the process of refining of edible oils due to presence of required process conditions and various precursors have raised various food safety concerns because of their potential for negative health impact. These process contaminants are formed due to elevated operating conditions, especially temperature and time. Unlike 3-MCPDEs which are impossible to remove, it is possible to either convert GEs to harmless compounds or to separate out the GEs in the refined oil. Many countries still do not have any set standards for these process contaminants in refined edible oils. However, these process contaminants concentration can be minimized following certain strategies and advancement in processing technologies. This article deals with these process contaminants along with their mitigation strategies, sources of precursor, impact on health, global standards of these contaminants.

What are 3-MCPD and GE?

3-MCPD stands for 3-monochloropropanediol, and GE for glycidyl fatty acid esters. 3-MCPD is the most commonly occurring group of contaminants known as chloropropanols. First identified as a contaminant of acid-hydrolysed vegetable proteins and soy sauce, it was later found in other foods.

Glycidyl fatty acid esters (GEs) are processing induced contaminants primarily found in refined fats and oils, and foods containing fats and oils.

Both substances are considered to be of concern to public health and it is recommended to minimise the amount consumed.

Health risk

In 2016, the European Food Safety Authority (EFSA)'s expert panel on contaminants first assessed the potential risks of 3-MCPD and GE.

Consumption levels of 3-MCPD in food are considered safe for most consumers but there is a potential health concern among high consumers in younger age groups. In the worst case scenario, infants receiving formula only may slightly exceed the safe level.

GEs are a concern for public health because they are genotoxic and carcinogenic, i.e. they can damage DNA and cause cancer.

During digestion, 3-MCPDE and GE break down to the organic chemicals 3-monochloropropane-1,2-diol (3-MCPD) and glycidol. In studies of rodents, 3-MCPD caused adverse effects on kidneys and male reproductive organs, and both 3-MCPD and glycidol caused cancer.

To better understand the potential risks of 3-MCPDE and GE in foods for humans, the FDA has developed methods to measure these contaminants in foods, conducted surveys of edible oils and other foods containing edible oils, and researched the potential adverse health effects of 3-MPCDE and GE.

All vegetable oils, including rapeseed oil, soybean oil, coconut oil, sunflower seed oil, and palm oil, as well as margarines and processed foods may contain these contaminants as a by-product of food processing, particularly processing that involves high-temperature refining at above 200°C.

The refining of vegetable is usually done at elevated temperature above 230 deg c while in cpo it goes above 250 deg c making palm oil and palm oil products more vulnerable to have these contaminants in larger quantities than other oils

Formation in oils during process

3-MCPD and GE are compounds formed on processing oils at elevated temperatures specifically during deodorisation. GE may form during crushing and storage of oils in crude form as well.

GE is also formed from diacylglyceride (DAG) compounds at temperatures of 230 °C or higher.

Process Mitigation

The process improvement has been programmed to redress the formation of GE and 3 mcpd.

- The inherited GE reduction is done by hot water washing of oils as pretreatment.
- The chloride free chemicals used in processing of oils are being promoted.
- The deodourisation temperature in refining process is being reduced to 220-225 °C with enhanced vacuum so that the purpose of deodourisation is not forfeited ,
- The chloride free water and steam is being used in the process .
- The retention of oil at elevated temperature has also been rationalized with technological advancement.

Safety limits of these contaminants

There are two proposed maximum levels of 3-MCPD for vegetable oils and fats and fish oils for the consumers, or for use as food ingredients:

Category A: Unrefined oils, refined oils and fats from coconut, maize, rapeseed, olives (except olive pomace oil); sunflower, soybean, palm kernel,and mixtures of oils and fats from this category only.

Safety Limit: 1,250 micrograms per kg.

Category B: Other refined vegetable oils, fish oils and oils of other marine organisms and mixtures of oils and fats from this category only.

Safety Limit: 2,500 micrograms per kg.

*ìg/kg = Micrograms per kilogram

*Maximum permitted level = the maximum amount of 3-MCPD which may be present in the food as set out in relation to that food…

For mixtures of oils and fats from the two different categories, if the quantitative composition of the mixture is not known, the maximum level set of 3-MCPD should not exceed 2,500ìg/kg.

Because of the potential health concern among high consumers in younger age groups, foods, for children, have different limits. The proposed maximum level of 3-MCPD for baby food, infant formula, follow-on formula and foods are as follows:

Category A : For vegetable oils and fats used for baby food, processed cereal-based food for infants and young children, and young child formulas

Maximum Safety Level (µg/kg) : 750µg/kg (being considered)

Category B: Powder infant and young children formula, follow-on formula and foods for special medical purposes

Maximum Safety Level (µg/kg): 125µg/kg

Category C: Liquid infant and young children formula, follow-on formula and foods for special medical purposes

Maximum Safety Level (µg/kg) : 15µg/kg

The EU's current maximum level of GE and products containing them are:

Category A : Vegetable oils and fats

Maximum level (µg/kg): 1,000µg/kg

Category B: Vegetable oils and fats for the production of baby food and processed cereal-based food for infants and young children

Maximum level (µg/kg): 500µg/kg

Category C: Powder infant formula, follow-on formula and foods for special medical purposes

Maximum level (µg/kg): 50µg/kg

Category D: Liquid infant formula, follow-on formula and foods for special medical purposes

Maximum level (µg/kg): 6µg/kg

Conclusion :

The role of each stage from breeding of oil bearing materials to preparation of food in refined oils play a crucial role in the formation of process contaminants like 3-MCPDEs and GEs in edible oils. These process contaminants negatively affect human health in a very serious manner and can cause cancer and damage several body organs such as renal organs and reproductive organs. Various solutions have been suggested by researchers to control formation of these contaminants such as use of chlorine free pesticides, use of chlorine free process chemicals, proper handling of oil bearing materials during harvesting to prevent the formation of MG and DG.

India currently lacks the regulatory guidelines for monitoring the levels of GEs and 3-MCPDE, however, health experts have advised to follow European standards for 3-MCPDE and GE in cooking oils and fats as these contaminants pose a significant health risk.

TRADE NEWS

Exclusive: India likely to raise vegetable oil import taxes to help support local farmers

A man loads empty containers of edible oil onto a tricycle at a roadside in Kolkata, India

India is likely to raise import taxes on vegetable oils for the second time in less than six months to help support thousands of oilseed farmers reeling from a crash in domestic oilseed prices, two government sources said on Friday.

The hike in import duties by the world's largest importer of edible oils could lift local vegetable oil and oilseed prices, while potentially dampening demand and reducing overseas purchases of palm oil , soyoil , and sunflower oil.

"(The) Inter-ministerial consultations regarding duty hike are over," said a government source, who did not wish to be named as he was not authorised to talk to the media. "The government is soon expected to raise the duties."

The government would take into account the impact of the decision on food inflation, said another government source who also did not wish to be identified, citing official rules.

A government spokesperson did not immediately respond to a request from Reuters for comment.

In September 2024, India imposed a 20% basic customs duty on crude and refined vegetable oils. After the revision, crude palm oil, crude soyoil, and crude sunflower oil attracted a 27.5% import duty, compared to 5.5% previously, while refined grades of the three oils now have a 35.75% import tax.

Even after the duty hike, soybean prices are trading more than 10% below the state-set support price. Traders also expect winter-sown rapeseed prices to fall further once new-season supplies begin next month. Domestic soybean prices are around 4,300 rupees ($49.64) per 100 kg, lower than the state-fixed support price of 4,892 rupees.

Due to lower oilseed prices, it makes sense to raise import duties on edible oils, said the first official, adding that the exact amount of the hike has not yet been decided.

Oilseed farmers are under pressure, and they need support to maintain their interest in oilseed cultivation, said B.V. Mehta, executive director of the Solvent Extractors' Association of India.

Reuters on Thursday reported that Indian refiners have cancelled orders for 100,000 metric tons of crude palm oil scheduled for delivery between March and June, partly due to the likely hike in import duties.

India meets nearly two-thirds of its vegetable oil demand through imports. It buys palm oil mainly from Indonesia, Malaysia and Thailand, while it imports soyoil and sunflower oil from Argentina, Brazil, Russia and Ukraine.

($1 = 86.62 rupees)

Source: Reuters

Canola weighing its place in U.S. biofuel future

Where canola hopes stand on the U.S. biofuel market and whether Canadian crops will or will not benefit

There are hurdles in the way of Canadian canola winning big in the U.S. biofuel market. | Photo: File

What will biofuel policies in the United States mean for Canadian canola?

That was the key question causing large swings in canola futures during the week ended May 16, as traders tried to get a handle on conflicting rumours on biofuel coming out of Washington. The nearby July contract swung within a C$45 per tonne range in the span of two days, while new crop November moved in a C$30 range.

The supportive news came first, as the U.S. House Ways and Means Committee proposed extending the Clean Fuel Production Credit, also known as the 45Z biofuel tax credit, through 2031. The proposed amendments would limit feedstocks to those sourced from the U.S., Canada and Mexico. Canola-based fuels — currently deemed as too carbon-intensive for the credit — could also qualify for credits once again.

Even if canola oil isn't used for biofuel production in the U.S., the proposals would effectively keep three million tonnes of used Chinese cooking oil out of the U.S. market. If that's replaced with soyoil, the edible vegetable oil market would still need to be filled by something.

July canola climbed to the highest level for a nearby contract in 18 months on the news, settling above C$720 per tonne on May 13.

However, the optimism faded amid talk that proposed biodiesel blending targets from the U.S. Environmental Protection Agency came in well below what the industry had lobbied for.

An alliance of oil and biofuel producers had called for a biodiesel blending target in the U.S. of 5.25 billion gallons, but the proposed level submitted by the EPA was rumoured to be much smaller than that at 4.65 billion gallons.

The loss of 600 million gallons of prospective demand sent soyoil and canola crashing lower. However, to put it in perspective the 2025 target was only 3.35 billion gallons.

The likelihood of more twists and turns on the biofuel front will lead to more swings in the futures, especially as the price movement so far has all been tied to proposals and rumours.

The underlying tariff and trade issues have also not gone away, with market participants also watching for any developments on that front. From a fundamental standpoint, weather conditions through the growing season will be another factor to keep an eye on.

Source: Glacier FarmMedia

European Producers Face Limited Alternatives to U.S. Market

European olive oil exporters are exploring alternative markets as officials in the European Union and the United States prepare for trade negotiations.

Currently, most goods imported from the European Union, including table olives and olive oil, are subject to a ten percent tariff.

The levy could increase to 20 percent on July 8th if the two sides do not agree to an extension or reach a deal. European olive oil exporters said this would put them at a competitive disadvantage compared to Turkey and Tunisia. Both countries are expected to continue to have a ten percent tariff on their exports to the U.S.

According to U.S. Department of Agriculture data, the United States imported $1.5 billion of olive oil from Italy, Spain and Greece in 2023, the last year for which a complete data set exists.

Overall, the U.S. imported $2.2 billion of olive oil that year, including $428 million from Turkey and Tunisia.

While European producers have been making inroads in India, China and other regions of Asia for years, Christopher Clague, an independent trade advisor based in Malaysia and associate fellow at the International Institute for Strategic Studies, believes short-term opportunities are limited.

“Whatever European producers are losing because of the U.S. tariffs, they’re not going to make up with Asia,” Clague told Olive Oil Times. ”Despite marketing efforts to push olive oil into new markets, the drop in U.S. demand due to tariffs is too large to offset with incremental gains in Asia.”

“While Asia presents some potential, olive oil isn’t widely consumed here, making it challenging to establish significant demand,” he added.

According to World Bank data, India, China, Japan and South Korea combined to import $477 million of olive oil in 2023, less than one-third of the value of Spanish, Italian and Greek exports to the U.S. that year.

Clague highlighted how Asian cuisines favor other edible fats, including peanut or soybean oil in China and ghee in India. Even Japan, which has a growing olive oil culture, does not have olive oil integrated into everyday cooking like Western countries.

“Japan’s love for Italian food makes it a stronger market than most, but even here, its aging population increasingly prefers traditional Japanese meals over Western influences,” Clague said.

“In South Korea, premium olive oils are sometimes seen as luxury goods, but not as widely adopted staples,” he added. “The fragmented demand across Asia means that olive oil exports may rise modestly but will not compensate for the scale of lost U.S. sales.”

In his adopted home of Malaysia, which imported $8 million of olive oil in 2023, Clague said consumption is mainly concentrated in the European immigrant community.

“If you’re a European olive oil producer looking at Malaysia, I’d suspect it’s a losing game,” he said. ”There’s nothing here. Locals don’t use olive oil. They use palm oil, sunflower oil and canola oil.”

“Malaysia reflects broader trends in Asia regarding olive oil consumption,” he added. ”The country’s three major ethnic groups — Malay, Chinese and Indian — have distinct culinary traditions that do not commonly include olive oil.”

While Clague said ethnic Malays are predominantly Muslim and may incorporate some Middle Eastern cuisine, including olive oil, into their diets, this is usually in limited quantities.

“While olive oil is sold in supermarkets, it is primarily for expatriates rather than local consumers,” he said.

Taking a broader perspective, Clague said the conditions that have caused olive oil consumption to rise meteorically in the U.S. over the past three decades have not taken shape in Asia.

“The U.S. market is highly established, and consumers there understand the health benefits and culinary uses of different varieties of olive oil,” he said. ”In contrast, Asia’s adoption of olive oil remains slow, lacking the same embedded cultural preference for Mediterranean flavors.”

“There’s no natural outlet for the excess capacity, and [European] producers may indeed scramble to find alternative buyers," Clague added. "They could maybe turn to Africa, but consumers there largely prefer palm and vegetable oils, while if they were to go for Australia, its small population makes it incapable of absorbing large volumes of exports."

He suggested that lower European olive oil export prices may stimulate some demand in alternative markets.

"However, price cuts alone may not be enough to drive significant increases in Asian consumption, as cultural food preferences remain the primary barrier," Clague concluded. "Even in Japan, where Mediterranean cuisine is relatively popular, premium olive oil brands tend to compete in the luxury segment rather than aiming for mass-market sales."

Source: Olive Oil Trade News

New Alliance Takes Aim at Seed Oils with Certification Label, But Experts Warn of Misinformation

Courtesy: Seed Oil Free Alliance

The Seed Oil Free Alliance has rolled out a certification label for products that eschew these fats, building on growing discontent around seed oils and amid a resurgence of tallow.

The battle against seed oils has been taken up a notch with the launch of a new certification label that aims to help Americans "make informed decisions about their health".

The Seed Oil Free Alliance's accreditation has already been adopted by over 40 brands, from plant-based innovators like Vita Coco and Trubar, to animal protein and fat startups Grazly and Beefy's Own Chips, and fermented sugarcane oil maker Zero Acre Farms.

It's applicable across a number of categories, including non-dairy milks, dips, protein bars, baked goods, restaurant meals, and non-food items. To help consumers identify options without these fats, the organisation has set up a product finder on its website.

It pinpoints canola (rapeseed), corn, cottonseed, grapeseed, rice bran, safflower, soybean, and sunflower seed oils as "high-concern" oils that are made using industrial refining techniques and didn't exist in human diets before the 20th century.

The Seed Oil Free Certified label comes amid a heightened backlash against these oils, thanks in large part to health secretary Robert F Kennedy Jr, who has suggested that these products have "unknowingly poisoned" people and has prompted many to wonder if a ban might be coming.

Another trend that has arisen as part of the wider anti-seed oil backlash is a rise in beef tallow use, as consumers move away from seed oils due to their purported health detriments, despite renowned nutritionists pushing back against the idea.

Where the seed oil backlash stems from

The Seed Oil Alliance suggests that these fats account for 20-30% of the average American's daily calorie intake. Their consumption has skyrocketed as their inexpensiveness and abundance have made them a more popular option in many packaged foods and restaurant dishes.

Conflicting studies have shrouded these fats in mystery and confusion. The argument against them centres around the presence of omega-6 fatty acids. These contain linoleic acid, which critics say can oxidise 40 times faster than saturated fat, creating free radicals that can cause a host of health issues, including inflammation.

Additionally, when heated to high temperatures beyond their smoke point, seed oils high in linoleic acid can generate a compound called hydroxynonenal, which can lead to health issues like decreased metabolism and higher oxidative stress.

However, studies have shown that refined seed oils have no effect on inflammation, and in fact, linoleic acid can help lower it. The average human eats around 6-10% of their overall calories from linoleic acid today. However, the American Heart Association and Institute of Medicine actually recommend getting 5-10% of your daily calories from omega-6 fats.

Concerns around ultra-processed food have further contributed to the seed oil conundrum. A fierce critic of UPFs and seed oils, RFK Jr pointed to how McDonald's transitioned from beef tallow to seed oils for its famous fries.

"This switch was made because saturated animal fats were thought to be unhealthy, but we have since discovered that seed oils are one of the driving causes of the obesity epidemic. Interestingly enough, this began to drastically rise around the same time fast food restaurants switched from beef tallow to seed oils in their fryers."

His comments coincided with the revival of tallow, thanks to anti-seed-oil brands and TikTok beauty influencers. What is not being said is that this is a product made by the most polluting industry in the food system, and contains high levels of saturated fat, a leading cause of heart disease, which kills one American every 33 seconds. Nevertheless, RFK rallies on, appearing at a Steak 'n Shake location in Florida to praise its switch from seed oils to tallow in March.

Nutrition experts warn against seed oil misinformation

The misinformation around seed oils and tallow has created a lot of confusion among Americans. While two in five consumers are worried about seed oils' health impacts, a similar number of them want more information.

Nearly a third think there isn't enough evidence to support negative claims about seed oils, and agree that they're unfairly criticised in health discussions, with most putting the blame on social media influencers and self-proclaimed wellness experts.

A recent Harvard study suggested that swapping just a tablespoon of butter with plant-based fats (including seed oils) can lower the risk of premature death from cancer and other causes by 17%. The American Heart Association has proclaimed that there is "no reason to avoid seed oils and plenty of reasons to eat them".

Dr Christopher Gardner, a professor of medicine at Stanford University School of Medicine in California, says that omega-6 fatty acids get demonised because they play a smaller role in lowering cardiovascular disease risk than omega-3s, which are more anti-inflammatory.

However, to take that to mean omega-6 fats are pro-inflammatory is wrong. Both omega-6 and omega-3 fats play a role in the inflammatory response of the body. What is optimal is a balance," he explains.

"I cannot find convincing data that seed oils are any worse for health than any other high-calorie food, and the evidence for their benefits as compared to animal fats seems strong and consistent," NYU Professor Emerita Dr Marion Nestle recently wrote.

She also highlighted a crucial concern – if we phase out seed oils, we would likely see an increase in palm oil imports. That raises a multitude of issues, including an "unhealthy degree of fat saturation, deforestation, loss of biodiversity, child labour, labour exploitation, adulteration, and criminal behaviour". With President Trump's tariffs, it would mean higher costs for Americans, too.

For many brands, it's almost becoming a necessity to tell consumers they're free from seed oils, so this new certification will serve to help them. What it won't do, however, is counter the misinformation that has plagued seed oils and driven many Americans to beef tallow, against the wishes of top health experts.

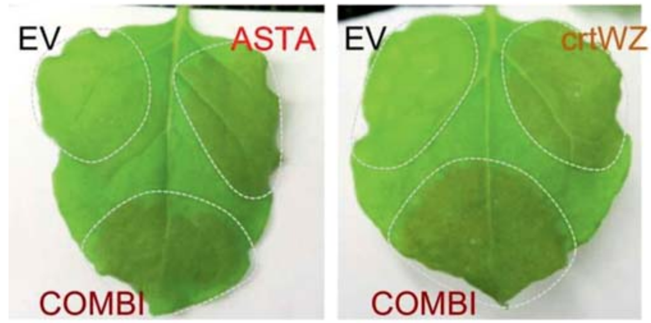
As Nestle said: "Getting them out of the food supply could help reduce calorie intake, but only if they are not replaced by other fats. Using seed oils is healthier than using more saturated fats."

Source: Green Queen

Engineered oilseed crop produces high levels of powerful antioxidant

In a major step forward for sustainable pigment production, scientists have successfully engineered the oilseed crop Camelina sativa to produce high levels of astaxanthin—a valuable red antioxidant used

(a)



(b)

TLC analysis of Nicotiana benthamiana leaves transiently expressing Adonis genes or bacterial genes involved in astaxanthin biosynthesis

to color farmed salmon and shrimp—using plant-derived genes rather than bacterial pathways.

The findings, from a joint US/UK research team of biotechnologists led by Prof. Edgar Cahoon, director of the Center for Plant Science Innovation at the University of Nebraska-Lincoln (UNL), could offer a commercially viable alternative to synthetic astaxanthin, which is currently produced through costly chemical synthesis or from limited natural sources like algae.

Astaxanthin belongs to a group of red pigments known as ketocarotenoids, which are prized not only for their coloring properties but also for their exceptional antioxidant capacity. These pigments don't occur naturally in most crops, but by borrowing genes from the scarlet flax flower (Adonis aestivalis), researchers introduced a new ketocarotenoid biosynthesis pathway into Camelina seeds.

Unlike earlier efforts that used bacterial genes, this plant-derived pathway proved more efficient and cleaner. It converted nearly all the precursor â-carotene into ketocarotenoids, with astaxanthin making up over a third of the total—reaching around 47 micrograms per gram of seed.

Importantly, the extracted oil was notably more resistant to oxidation—a trait that may appeal to the food industry for uses such as oleogels in plant-based products.

Crucially, the modified plants showed no stunting or visible signs of stress in the field, and the results were replicated across multiple growing seasons in both the US and UK.

"With growing pressure to find natural, scalable alternatives to synthetic additives, we believe this approach could pave the way for a new generation of sustainable pigment-rich oilseeds," said Rothamsted's Dr. Richard Haslam, one of the co-authors of the research paper.

Professor Johnathan Napier commented, "The Rothamsted team was very pleased to be part of this highly successful collaboration resulting in crops with enhanced traits. It's also great to test our prototype plants under real-world conditions in the field"

UNL's Professor Cahoon added, "Rothamsted's world-class expertise in GM camelina field trials and lipidomics was critical to the success of this research. We look forward to working with Rothamsted investigators to commercialize this technology."

Source: Rothamsted Research

The share of online sales of vegetable oils in China will reach 45% in 2025 - expert

Online shopping is rapidly growing in China, including for food products. The share of online sales in the vegetable oil market will reach 45% in 2025, getting close to equal with traditional retail. This forecast was made by Fang Gang, director of the Chinese company ZHEJIANG GRAIN GROUP Co. (one of the largest state-owned enterprises in Zhejiang province), during his speech at the fourth international fats and oils conference "FOC 2025: Fats and Oils Conference" on June 3 in Almaty.

He specified that online sales mainly dominate the premium oil segment (olive, organic oils) where this share reaches 60%. The main drivers are demand for healthy eating and the convenience of delivery.

At the same time, for more common oils (soybean, rapeseed), the online share is still about 30%, meaning traditional offline sales are still leading. According to the expert, the main reason is consumers' loyalty to local stores in rural areas.

Talking about consumption patterns, the speaker noted that in China, the balance between price and quality still remains the key factor in consumer choice. So, due to high sunflower oil prices in the 2024/25 MY, consumption of this product in China has decreased, staying only at the minimum necessary level.

Fang Gang also said that China is actively increasing the planting area for oilseed crops, aiming to boost self-sufficiency in oilseed raw materials. By 2030, the country's self-sufficiency level in oilseeds should reach 55% (it was 35% in 2023, with a target of 45% for 2025). At the same time, the government subsidizes soybean and rapeseed planting and sets minimum purchase prices for raw materials during state purchases. High-tech special zones for growing oilseeds are also being allocated, and GM breeding is being developed (with a focus on varieties with higher oleic acid content).

Source: Agri News

IMPORTANT FIGURES

Table 01: Major Oilseeds: World Supply and Distribution (Commodity View)

Million Metric Tons

	2022/23	2023/24	2024/25
Production			
Oilseed, Copra	6.05	6.27	6.12
Oilseed, Cottonseed	40.31	39.48	41.16
Oilseed, Palm Kernel	19.78	19.60	20.35
Oilseed, Peanut	49.81	50.00	51.85
Oilseed, Rapeseed	89.86	89.97	86.29
Oilseed, Soybean	378.21	396.45	427.93
Oilseed, Sunflowerseed	52.78	55.93	53.02
Total	636.79	657.71	686.70
Imports			
Oilseed, Copra	0.08	0.08	0.09
Oilseed, Cottonseed	1.37	1.19	0.93
Oilseed, Palm Kernel	0.16	0.19	0.22
Oilseed, Peanut	4.18	4.10	3.73
Oilseed, Rapeseed	20.07	18.26	20.00
Oilseed, Soybean	168.50	178.54	179.18
Oilseed, Sunflowerseed	3.77	2.54	2.61
Total	198.12	204.89	206.76
Exports			
Oilseed, Copra	0.10	0.09	0.08
Oilseed, Cottonseed	1.09	1.21	0.90
Oilseed, Palm Kernel	0.06	0.09	0.17
Oilseed, Peanut	4.85	4.80	4.66
Oilseed, Rapeseed	19.80	18.56	19.82
Oilseed, Soybean	171.76	177.76	184.06
Oilseed, Sunflowerseed	4.02	2.72	3.37
Total	201.68	205.23	213.07
Crush			
Oilseed, Copra	5.90	6.18	6.06
Oilseed, Cottonseed	30.22	31.41	31.26
Oilseed, Palm Kernel	19.77	19.46	20.22
Oilseed, Peanut	19.08	18.44	19.35
Oilseed, Rapeseed	82.11	84.68	84.63
Oilseed, Soybean	315.77	331.25	359.14
Oilseed, Sunflowerseed	51.36	52.26	48.25
Total	524.20	543.68	568.91
Ending Stocks			
Oilseed, Copra	0.07	0.06	0.06
Oilseed, Cottonseed	1.46	1.62	1.53
Oilseed, Palm Kernel	0.29	0.34	0.32
Oilseed, Peanut	4.32	3.85	4.04
Oilseed, Rapeseed	11.00	11.95	9.94
Oilseed, Soybean	101.84	115.14	126.00
Oilseed, Sunflowerseed	4.12	3.20	2.54
Total	123.09	136.14	144.44

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 02: Major Protein Meals: World Supply and Distribution (Commodity View)

Million Metric Tons

	2022/23	2023/24	2024/25
Production			
Meal, Copra	1.96	2.04	2.00
Meal, Cottonseed	13.93	14.45	14.41
Meal, Fish	4.54	5.14	5.28
Meal, Palm Kernel	10.28	10.08	10.58
Meal, Peanut	7.62	7.38	7.78
Meal, Rapeseed	47.81	49.21	49.30
Meal, Soybean	248.39	259.86	281.74
Meal, Sunflowerseed	23.05	23.24	21.41
Total	357.57	371.39	392.49
Imports			
Meal, Copra	0.61	0.55	0.56
Meal, Cottonseed	0.20	0.19	0.23
Meal, Fish	3.36	3.62	3.95
Meal, Palm Kernel	7.70	7.41	7.26
Meal, Peanut	0.12	0.09	0.04
Meal, Rapeseed	9.30	9.93	10.15
Meal, Soybean	63.31	69.60	77.69
Meal, Sunflowerseed	8.55	10.16	7.75
Total	93.15	101.54	107.62
Exports			
Meal, Copra	0.56	0.54	0.53
Meal, Cottonseed	0.30	0.31	0.35
Meal, Fish	2.55	2.97	3.15
Meal, Palm Kernel	8.06	7.28	7.69
Meal, Peanut	0.18	0.12	0.10
Meal, Rapeseed	9.79	10.22	10.72
Meal, Soybean	67.07	74.22	83.04
Meal, Sunflowerseed	9.16	10.22	8.76
Total	97.66	105.88	114.34
Domestic Consumption			
Meal, Copra	2.01	2.02	2.02
Meal, Cottonseed	13.81	14.34	14.27
Meal, Fish	5.37	5.79	6.03
Meal, Palm Kernel	9.94	10.25	10.03
Meal, Peanut	7.58	7.34	7.72
Meal, Rapeseed	47.54	48.69	48.80
Meal, Soybean	247.04	255.09	272.76
Meal, Sunflowerseed	21.77	22.86	20.59
Total	355.06	366.40	382.21
Ending Stocks			
Meal, Copra	0.05	0.08	0.09
Meal, Cottonseed	0.11	0.10	0.11
Meal, Fish	0.25	0.24	0.29
Meal, Palm Kernel	0.62	0.57	0.69
Meal, Peanut	0.02	0.03	0.03
Meal, Rapeseed	1.26	1.50	1.43
Meal, Soybean	14.17	14.31	17.95
Meal, Sunflowerseed	1.81	2.13	1.93
Total	18.30	18.95	22.51

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 03: Major Vegetable Oils: World Supply and Distribution (Commodity View)

Million Metric Tons

	2022/23	2023/24	2024/25
Production			
Oil, Coconut	3.71	3.88	3.83
Oil, Cottonseed	4.56	4.74	4.71
Oil, Olive	2.53	2.44	3.33
Oil, Palm	76.72	76.09	78.84
Oil, Palm Kernel	8.76	8.61	8.93
Oil, Peanut	6.20	6.00	6.31
Oil, Rapeseed	33.25	34.39	34.28
Oil, Soybean	60.73	64.01	70.06
Oil, Sunflowerseed	21.71	22.12	20.41
Total	218.16	222.27	230.72
Imports			
Oil, Coconut	1.93	2.18	1.86
Oil, Cottonseed	0.09	0.08	0.07
Oil, Olive	1.08	1.11	1.24
Oil, Palm	46.64	42.36	41.36
Oil, Palm Kernel	2.69	2.72	2.69
Oil, Peanut	0.39	0.34	0.47
Oil, Rapeseed	6.90	7.50	7.08
Oil, Soybean	10.98	10.53	14.30
Oil, Sunflowerseed	12.61	13.96	12.01
Total	83.30	80.77	81.06
Exports			
Oil, Coconut	2.18	2.47	2.24
Oil, Cottonseed	0.08	0.05	0.06
Oil, Olive	1.21	1.17	1.35
Oil, Palm	49.37	44.41	45.02
Oil, Palm Kernel	2.97	3.09	3.17
Oil, Peanut	0.35	0.37	0.59
Oil, Rapeseed	6.54	7.52	7.14
Oil, Soybean	11.74	11.81	15.26
Oil, Sunflowerseed	14.31	15.34	13.66
Total	88.75	86.23	88.48
Domestic Consumption			
Oil, Coconut	3.43	3.64	3.56
Oil, Cottonseed	4.57	4.72	4.73
Oil, Olive	2.58	2.48	3.14
Oil, Palm	73.82	75.05	76.18
Oil, Palm Kernel	8.48	8.23	8.44
Oil, Peanut	6.20	6.03	6.15
Oil, Rapeseed	32.71	34.35	34.38
Oil, Soybean	59.42	62.90	68.31
Oil, Sunflowerseed	19.55	21.07	19.10
Total	210.78	218.47	224.00
Ending Stocks			
Oil, Coconut	0.89	0.85	0.75
Oil, Cottonseed	0.15	0.19	0.18
Oil, Olive	0.53	0.42	0.50
Oil, Palm	16.99	15.98	14.98
Oil, Palm Kernel	0.96	0.96	0.97
Oil, Peanut	0.39	0.33	0.37
Oil, Rapeseed	3.44	3.46	3.30
Oil, Soybean	5.85	5.68	6.47
Oil, Sunflowerseed	3.22	2.89	2.55
Total	32.43	30.76	30.07

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 04: Major Oilseeds: World Supply and Distribution (Country View)

Million Metric Tons

	2022/23	2023/24	2024/25
Production			
Brazil	166.91	160.29	179.56
United States	125.75	122.16	128.59
China	66.87	66.92	67.81
Argentina	31.45	54.24	59.10
India	42.31	41.39	42.83
Other	203.50	212.69	208.82
Total	636.79	657.71	686.70
Imports			
China	111.71	119.13	113.51
European Union	22.34	20.70	24.21
Mexico	8.14	7.86	7.85
Argentina	9.06	7.79	6.33
Turkey	4.02	3.71	5.02
Japan	5.49	5.41	5.57
Egypt	2.00	3.33	4.56
Thailand	3.34	3.53	4.29
Pakistan	1.50	1.89	2.60
Vietnam	2.21	2.51	2.83
Other	28.31	29.03	29.99
Total	198.12	204.89	206.76
Exports			
Brazil	95.92	104.52	103.59
United States	54.77	47.49	52.29
Canada	12.22	11.73	14.99
Argentina	5.11	6.13	9.61
Paraguay	6.50	8.00	6.43
Australia	6.98	6.62	5.75
Ukraine	8.37	7.28	7.39
Other	11.80	13.47	13.03
Total	201.68	205.23	213.07
Crush			
China	134.00	137.20	141.83
United States	64.16	66.23	70.43
Brazil	57.54	59.43	63.99
Argentina	34.60	40.58	48.44
European Union	48.25	48.29	46.92
India	34.78	35.63	35.64
Russia	24.50	25.70	26.23
Ukraine	15.68	18.55	15.70
Canada	11.73	12.69	13.09
Indonesia	13.25	12.59	13.44
Mexico	8.13	7.70	7.82
Pakistan	4.01	5.10	5.16
Turkey	6.03	5.18	6.14
Malaysia	5.08	5.38	5.20
Egypt	2.35	3.39	4.67
Other	60.11	60.06	64.22
Total	524.20	543.68	568.91
Ending Stocks			
China	36.71	48.35	48.95
Brazil	37.00	29.97	38.05
Argentina	18.34	25.38	25.94
United States	8.85	10.81	10.23
European Union	3.49	3.92	4.26
Other	18.71	17.71	17.00
Total	123.09	136.14	144.44

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 05: Major Protein Meals: World Supply and Distribution (Country View)

Million Metric Tons

	2022/23	2023/24	2024/25
Production			
China	95.71	98.24	101.91
United States	49.93	51.43	55.27
Brazil	43.45	44.24	47.14
Argentina	25.58	30.16	35.86
European Union	30.74	30.82	30.26
Other	112.17	116.50	122.05
Total	357.57	371.39	392.49
Imports			
European Union	21.49	22.38	25.23
Vietnam	5.85	7.02	6.81
China	8.39	9.39	7.93
Indonesia	5.67	5.24	6.44
United States	4.31	4.29	4.95
Thailand	4.01	3.60	3.51
United Kingdom	2.76	3.26	3.87
Other	40.68	46.37	48.89
Total	93.15	101.54	107.62
Exports			
Argentina	21.92	26.07	31.47
Brazil	21.33	22.72	23.39
United States	13.39	14.75	16.78
Canada	5.70	5.98	6.17
Ukraine	4.60	5.78	4.99
Indonesia	5.87	4.92	5.29
Russia	3.82	4.30	4.16
Other	21.03	21.35	22.09
Total	97.66	105.88	114.34
Domestic Consumption			
China	103.04	106.32	108.62
European Union	49.53	50.08	52.44
United States	40.78	40.90	43.48
Brazil	21.95	22.38	23.26
India	17.59	18.15	18.02
Russia	8.93	9.36	9.83
Vietnam	7.25	8.05	8.79
Mexico	7.82	7.82	8.17
Indonesia	6.62	6.85	7.59
Thailand	6.26	6.02	5.99
Other	85.29	90.48	96.02
Total	355.06	366.40	382.21
SME			
China	96.11	99.39	102.29
European Union	42.18	42.67	45.71
United States	39.34	39.46	41.92
Brazil	21.58	21.93	22.76
India	14.94	15.37	15.34
Vietnam	6.77	7.64	8.37
Mexico	7.54	7.59	7.95
Other	95.63	100.58	107.10
Total	324.08	334.64	351.43
Ending Stocks			
Brazil	3.83	2.99	3.49
Argentina	2.59	2.47	2.94
European Union	1.27	1.72	2.49
China	0.94	0.79	0.94
Russia	0.71	0.75	0.83
Other	8.96	10.24	11.83
Total	18.30	18.95	22.51

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 06: Major Vegetable Oils: World Supply and Distribution (Country View)

Million Metric Tons

	2022/23	2023/24	2024/25
Production			
Indonesia	51.10	48.81	51.74
China	30.41	31.06	32.40
Malaysia	20.59	22.03	21.61
European Union	18.33	18.48	18.25
United States	13.18	13.59	14.49
Brazil	11.94	12.57	13.56
Argentina	7.84	9.04	10.91
Other	64.77	66.70	67.76
Total	218.16	222.27	230.72
Imports			
India	17.12	15.85	16.29
China	11.35	9.14	7.51
European Union	9.17	9.62	8.01
United States	6.27	6.87	5.92
Pakistan	3.34	3.09	3.74
Turkey	2.75	2.41	2.12
Bangladesh	2.32	2.33	2.48
Egypt	1.64	1.81	1.80
Iran	1.75	1.34	1.74
Philippines	0.96	1.23	1.59
Other	26.63	27.10	29.88
Total	83.30	80.77	81.06
Exports			
Indonesia	30.25	24.46	25.49
Malaysia	16.64	17.82	16.98
Argentina	5.33	6.80	8.89
Russia	6.07	6.50	6.31
Ukraine	5.99	7.04	5.48
Canada	3.17	3.60	3.48
European Union	3.67	3.27	2.98
Other	17.64	16.76	18.87
Total	88.75	86.23	88.48
Domestic Consumption			
China	39.46	40.44	40.43
Indonesia	23.23	24.90	26.52
India	23.86	24.75	25.39
European Union	24.49	24.39	23.74
United States	19.27	20.13	19.05
Brazil	10.15	12.31	12.67
Malaysia	5.40	5.26	5.59
Pakistan	4.29	4.35	4.75
Russia	3.70	3.80	3.95
Bangladesh	3.12	3.18	3.43
Thailand	2.98	2.97	2.99
Mexico	3.17	3.13	3.18
Canada	1.73	2.19	2.34
Nigeria	2.66	2.71	2.88
Egypt	2.05	2.23	2.42
Other	41.22	41.74	44.67
Total	210.78	218.47	224.00
Ending Stocks			
Indonesia	5.64	5.24	5.07
India	4.37	4.63	4.69
Malaysia	2.87	2.56	2.74
China	3.73	3.32	2.44
European Union	2.10	2.55	2.08
Other	13.71	12.47	13.06
Total	32.43	30.76	30.07

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 07: Middle East Oilseeds and Products Supply and Distribution

Thousand Metric Tons

	2022/23	2023/24	2024/25
Production			
Oilseed, Cottonseed	1,848	1,227	1,492
Oilseed, Rapeseed	470	470	475
Oilseed, Soybean	317	309	324
Oilseed, Sunflowerseed	1,946	1,595	1,399
Other	186	200	205
Total	4,767	3,801	3,895
Domestic Consumption			
Meal, Cottonseed	998	682	803
Meal, Soybean	9,746	11,748	12,622
Meal, Sunflowerseed	2,252	2,435	2,190
Other	1,250	1,075	1,137
Total	14,246	15,940	16,752
SME			
Meal, Cottonseed	809	553	651
Meal, Soybean	9,744	11,748	12,622
Meal, Sunflowerseed	1,502	1,624	1,461
Other	924	841	862
Total	12,978	14,765	15,595
Imports			
Meal, Cottonseed	12	32	11
Meal, Soybean	5,372	8,229	8,194
Meal, Sunflowerseed	1,059	1,519	1,198
Other	710	629	670
Total	7,153	10,409	10,073
Imports			
Oil, Palm	3,514	3,559	3,656
Oil, Rapeseed	148	111	135
Oil, Soybean	523	152	238
Oil, Sunflowerseed	3,617	3,405	3,617
Other	255	220	216
Total	8,057	7,447	7,862
Industrial Dom. Cons.			
Oil, Palm	245	240	255
Oil, Rapeseed	25	25	25
Oil, Soybean	55	50	50
Oil, Sunflowerseed	25	25	25
Other	37	40	35
Total	387	380	390
Food Use Dom. Cons.			
Oil, Palm	2,667	2,726	2,770
Oil, Rapeseed	379	320	360
Oil, Soybean	1,186	909	747
Oil, Sunflowerseed	3,073	3,505	3,285
Other	758	637	916
Total	8,063	8,097	8,078
Domestic Consumption			
Oil, Palm	2,912	2,966	3,025
Oil, Rapeseed	404	345	385
Oil, Soybean	1,246	964	827
Oil, Sunflowerseed	3,113	3,545	3,325
Other	795	677	951
Total	8,470	8,497	8,513

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 08: European Union Oilseeds and Products Supply and Distribution

Thousand Metric Tons

	2022/23	2023/24	2024/25
Production			
Oilseed, Rapeseed	19,613	20,431	17,073
Oilseed, Soybean	2,610	2,811	2,911
Oilseed, Sunflowerseed	9,386	10,051	8,645
Other	526	344	400
Total	32,135	33,637	29,029
Domestic Consumption			
Meal, Rapeseed	13,800	13,900	13,100
Meal, Soybean	26,642	27,042	31,242
Meal, Sunflowerseed	6,860	7,110	6,260
Other	2,232	2,029	1,841
Total	49,534	50,081	52,443
SME			
Meal, Rapeseed	9,819	9,890	9,321
Meal, Soybean	26,600	27,000	31,200
Meal, Sunflowerseed	4,536	4,702	4,135
Other	1,230	1,075	1,050
Total	42,184	42,667	45,706
Imports			
Meal, Rapeseed	846	839	420
Meal, Soybean	15,997	16,564	20,609
Meal, Sunflowerseed	2,753	3,238	2,567
Other	1,892	1,736	1,633
Total	21,488	22,377	25,229
Industrial Dom. Cons.			
Oil, Palm	2,200	1,850	1,300
Oil, Rapeseed	6,975	7,050	6,750
Oil, Soybean	1,100	1,150	1,400
Oil, Sunflowerseed	550	550	475
Other	555	555	535
Total	11,380	11,155	10,460
Food Use Dom. Cons.			
Oil, Palm	2,150	1,880	1,800
Oil, Rapeseed	2,900	2,850	2,900
Oil, Soybean	1,250	1,425	1,550
Oil, Sunflowerseed	4,650	4,950	4,725
Other	1,887	1,852	2,089
Total	12,837	12,957	13,064
Domestic Consumption			
Oil, Palm	4,500	3,890	3,200
Oil, Rapeseed	9,925	9,950	9,700
Oil, Soybean	2,405	2,630	3,005
Oil, Sunflowerseed	5,213	5,513	5,213
Other	2,447	2,407	2,624
Total	24,490	24,390	23,742
Imports			
Oil, Palm	4,576	4,013	3,135
Oil, Rapeseed	391	463	295
Oil, Soybean	641	592	757
Oil, Sunflowerseed	2,103	3,022	2,411
Other	1,461	1,534	1,407
Total	9,172	9,624	8,005

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 09: China Oilseeds and Products Supply and Distribution

Thousand Metric Tons

	2022/23	2023/24	2024/25
Production			
Oilseed, Peanut	18,330	19,231	19,000
Oilseed, Rapeseed	16,317	15,800	15,800
Oilseed, Soybean	20,284	20,840	20,650
Oilseed, Sunflowerseed	1,741	1,983	1,750
Other	10,196	9,069	10,611
Total	66,868	66,923	67,811
Imports			
Oilseed, Peanut	940	774	448
Oilseed, Rapeseed	5,335	5,486	4,600
Oilseed, Soybean	104,500	112,000	108,000
Oilseed, Sunflowerseed	266	183	132
Other	665	690	332
Total	111,706	119,133	113,512
Domestic Consumption			
Meal, Peanut	4,005	3,973	3,885
Meal, Rapeseed	13,512	14,519	14,639
Meal, Soybean	75,050	77,150	80,850
Other	10,472	10,678	9,249
Total	103,039	106,320	108,623
SME			
Meal, Peanut	4,502	4,466	4,367
Meal, Rapeseed	9,276	9,992	10,074
Meal, Soybean	73,900	76,000	79,700
Other	8,435	8,936	8,147
Total	96,112	99,394	102,288
Food Use Dom. Cons.			
Oil, Palm	3,100	2,800	1,800
Oil, Peanut	3,418	3,373	3,440
Oil, Rapeseed	8,800	9,700	10,350
Oil, Soybean	17,900	18,900	20,500
Oil, Sunflowerseed	1,803	1,419	717
Other	1,387	1,369	1,367
Total	36,408	37,561	38,174
Domestic Consumption			
Oil, Palm	5,400	5,000	3,300
Oil, Peanut	3,418	3,373	3,440
Oil, Rapeseed	8,800	9,700	10,350
Oil, Soybean	17,900	18,900	20,500
Oil, Sunflowerseed	1,803	1,419	717
Other	2,134	2,051	2,121
Total	39,455	40,443	40,428
Imports			
Oil, Palm	6,190	4,377	3,203
Oil, Peanut	292	247	347
Oil, Rapeseed	1,978	2,039	2,171
Oil, Soybean	365	381	296
Oil, Sunflowerseed	1,555	1,207	532
Other	967	884	956
Total	11,347	9,135	7,505

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

Table 10: India Oilseeds and Products Supply and Distribution

Thousand Metric Tons

	2022/23	2023/24	2024/25
Production			
Oilseed, Cottonseed	11,166	10,783	10,189
Oilseed, Peanut	6,300	6,000	7,100
Oilseed, Rapeseed	11,200	11,600	11,520
Oilseed, Soybean	12,411	11,875	12,882
Oilseed, Sunflowerseed	215	112	113
Other	1,022	1,021	1,021
Total	42,314	41,391	42,825
Domestic Consumption			
Meal, Cottonseed	4,443	4,409	4,329
Meal, Rapeseed	4,350	4,600	4,360
Meal, Soybean	6,625	7,075	7,185
Other	2,176	2,069	2,146
Total	17,594	18,153	18,020
SME			
Meal, Cottonseed	3,600	3,573	3,508
Meal, Rapeseed	3,095	3,273	3,102
Meal, Soybean	6,225	6,625	6,710
Other	2,021	1,903	2,015
Total	14,941	15,373	15,335
Food Use Dom. Cons.			
Oil, Cottonseed	1,315	1,290	1,285
Oil, Palm	8,300	8,340	8,150
Oil, Peanut	1,050	995	1,000
Oil, Rapeseed	3,600	3,900	3,925
Oil, Soybean	5,400	5,175	6,645
Oil, Sunflowerseed	2,750	3,525	2,900
Other	400	410	395
Total	22,815	23,635	24,300
Domestic Consumption			
Oil, Cottonseed	1,361	1,345	1,330
Oil, Palm	8,900	8,990	8,800
Oil, Peanut	1,060	1,005	1,010
Oil, Rapeseed	3,680	3,980	4,005
Oil, Soybean	5,400	5,175	6,645
Oil, Sunflowerseed	2,750	3,525	2,900
Other	710	730	695
Total	23,861	24,750	25,385
Imports			
Oil, Cottonseed	1	0	1
Oil, Palm	10,045	8,886	7,786
Oil, Peanut	0	0	0
Oil, Rapeseed	6	6	26
Oil, Soybean	3,968	3,308	5,471
Oil, Sunflowerseed	2,988	3,516	2,905
Other	111	131	98
Total	17,119	15,847	16,287

Source: *Foreign Agricultural Service/USDA Global Market Analysis*

EFFECT OF INCREASING US TARRIF ON AMERICAN SOYBEAN PRODUCTION

President Donald Trump's increase of tariffs — and retaliatory tariffs from other countries — will likely mean fewer U.S. agricultural exports. The president has consistently suggested that American farmers can make up the difference by selling more of their products at home. "Get ready to start making a lot of agricultural products to be sold INSIDE of the United States," Trump wrote in a social media post on March 3.

But that vision is colliding with a hard truth: there is no domestic substitute for China, especially when it comes to soybeans, America's second-largest crop.

The U.S. exported more than 40% of its soybean production in 2024, according to an Investigate Midwest analysis of USDA data. More than two-fifths of those exports went to China. No other country comes close: Mexico accounted for 11% and the European Union for 9%.

Trump, who once called "tariff his favorite word," has issued tariff hikes on nearly all U.S. trading partners, with the largest increase placed on China.

On Wednesday, Trump announced a 90-day pause on tariff increases for most countries, although not China, which he raised this week to 145%. China had already responded with an 84% tariff on U.S. goods.

"You can't replace that China market overnight," said Josh Gackle, a third-generation farmer in south-central North Dakota. "It's just such a big, big part of the picture that we, as farmers, need to try to make sure that we can continue to work with China and the buyers there."

In addition to its retaliatory tariffs, the Chinese government also suspended soybean imports from three U.S. companies. Trump said higher tariffs are a tool to correct trade imbalances and spur domestic manufacturing. He also said the rate hikes are a response to China providing unfair subsidies and even sheltering criminal groups involved in synthetic opioid production.

But the economic consequences are falling squarely on U.S. farms. States like Illinois, Iowa and Minnesota — the nation's top soybean exporters — rely on international buyers to keep commodity prices stable and local economies afloat. A recent study by the University of North Dakota underscored the stakes: If China imposes a 20% retaliatory tariff on U.S. soybeans, the state's soybean exports could fall by nearly 60%, costing North Dakota farmers an estimated $639.9 million.

Soybean exports support approximately 231,400 jobs across the country, while soybean meal exports contribute another 41,400 jobs, according to data from the U.S. Department of Agriculture's Economic Research Service. These exports create employment not only on farms but also throughout the manufacturing, service, trade and transportation sectors.

The American Soybean Association has called for a swift shift in strategy. "We are hoping that from obstacles can come opportunity," said ASA President Caleb Ragland, a soybean and grain farmer in Kentucky. "And that the administration will swiftly work with the affected countries to create new market access opportunities for U.S. soy and other U.S. products in these markets so these higher tariffs can be removed. That includes pursuing a Phase 2 Trade Agreement with China."

Trump administration officials and lawmakers are quietly discussing a potential bailout for U.S. farmers, as agricultural groups warn the president's escalating tariff strategy could trigger a significant economic fallout. Talks are still in the early stages, and the scope of any relief remains unclear, according to administration officials, lawmakers, congressional aides, and representatives from farm trade groups, The Wall Street Journal reported.

“We’re talking about it, looking at it,” said U.S. Sen. John Hoeven (R-N.D.), who noted he spoke with Agriculture Secretary Brooke Rollins about a possible relief package during a meeting last Thursday. Still, farm groups have cautioned that retaliatory tariffs on U.S. agricultural exports could further depress prices for key commodities, particularly soybeans.

According to the American Farm Bureau Federation, more than 20% of U.S. farm income is tied to exports. “We encourage the administration to work toward a swift resolution to trade disagreements to avoid tariffs that put farmers and ranchers in the crosshairs of retaliation,” said American Farm Bureau President Zippy Duvall in a statement, “and to pursue strategies that expand market opportunities for the men and women who grow the food every family in America relies on.

“Domestic demand isn’t enough

Soybean farmers can’t simply redirect their product to domestic markets, and they also can’t easily switch to another crop. ”It makes more sense to grow soybeans in the U.S. Midwest than it does to grow them in other parts of the world,” said Joe Janzen, assistant professor in the College of Agricultural, Consumer and Environmental Sciences at the

University of Illinois. “Switching costs are pretty significant.”

China, which accounts for 60% of all globally traded soybeans, became a major customer for American farmers as its middle class grew and diets shifted toward more meat and dairy.

Soybean meal is a critical component in the feed that powers China’s massive pork and poultry industries.

“You can’t replace that kind of demand domestically,” said Ishan Bhanu, lead commodities analyst at Kpler, a provider of technology-led data, analytics, and market insights. “It’s not just that they buy a lot — it’s that they’ve built an entire protein system around soy.”

The irony, Bhanu noted, is that while soy is often associated with tofu and soy milk in America, U.S. consumers don’t eat much of it directly. Instead, most soybeans grown in the U.S. are processed — or “crushed” — into two primary products: soybean oil and soybean meal.

Soybean oil is used in cooking oils, industrial lubricants and renewable diesel. But the market isn’t infinite. “The U.S. already crushes about 55% of its soybean crop each year,” Bhanu said. “And while demand for oil has increased due to biofuels, there’s only so much the domestic market can take.

“Building more crushing facilities would require years of investment, “ he added — and even then, it would raise a new problem: what to do with the byproducts. “You can’t just make more oil without also making more meals,” Bhanu said. “And if you don’t have a market for the meal, you’re stuck.”

The U.S. started exporting more soybean oil in 2024, a reversal from the past few years when most of it was consumed domestically. But Bhanu said this shift was less about strategic expansion and more about necessity — a way to offload excess production in a market with limited internal appetite. “It’s not a niche crop,” Bhanu said. “This is a major part of our agricultural economy. And it’s grown not because Americans are soy-crazed — it’s grown because there was a reliable, high-volume customer in China.”

South America steps in

As U.S. farmers brace for another season of uncertainty, South American producers are seizing the moment. During Trump’s first trade war, U.S. soybean producers saw a sharp shift as Brazilian soybeans captured a more significant share of the

Chinese market. When Trump took office in 2016, Brazil accounted for 46% of China's soybean imports. By 2024, that share had climbed to 71%. Over the same period, the U.S. share fell by more than a third.

In the wake of the first trade war during Trump's first term, Brazil became China's preferred supplier, offering cheaper prices and fewer political strings. Its advantage isn't just circumstantial — it's structural. "It's a record crop season in South America," said Joana Colussi, an agricultural economist with the farmdoc team, an extension program within the

Department of Agricultural and Consumer Economics at the University of Illinois.

South America's soybean-producing countries — led by Brazil, followed by Argentina, Paraguay, and Uruguay — account for roughly 55% of the world's soybean supply. Current estimates suggest that soybean output from the four leading South American producers will reach 8.41 billion bushels in the 2024–25 season, a 9% increase compared to the previous year, according to a farmdoc report. This situation adds even more pressure on U.S. soybean producers, who continue to feel the heat from the ongoing trade war.

Leading the way is Brazil, the dominant force in the global soybean market. Its production is projected to reach a record 6.15 billion bushels, a 13% increase from last year, according to a report from the National Supply Company (Conab), released last week and discussed during a farmdoc webinar last month.

With such a strong harvest, the Brazilian Association of Vegetable Oil Industries projects that soybean exports will reach 3.9 billion bushels this year, up from 3.6 billion in 2024, the second-highest volume on record. Colussi explained that the "harvest was really good" due to two main factors: an expansion in Brazil's soybean planting area and a favorable rainy season in the central-west region, driven by La Niña conditions. "Much of the growth in global soybean demand in recent years has been supplied by Brazilian soybeans," Colussi said.

Brazil's rise to become China's leading soybean exporter didn't happen overnight. She said Brazil has expanded its soybean acreage over time and still has room to grow, particularly in areas currently used for livestock. Another advantage, she explained, is Brazil's ability to produce two crops a year — a result of favourable climate conditions and strong international demand that continues to drive soybean production.

This growth has also been supported by technological adoption and a wave of infrastructure development, with private investment over the past decade expanding the country's capacity to transport agricultural goods. Colussi believes the new tariff war places U.S. soybean producers in a far more difficult position than during the first trade war in 2018, largely due to higher production costs and razor-thin profit margins. "For sure, [U.S. soybean farmers] will maybe need more help from the government than they did in 2018, when we had a different scenario, especially because of the production costs," she said.

Source: Investigate Midwest

HEALTH NEWS

Packing lipid nanoparticles with tumor proteins to boost cancer vaccine

The cancer vaccine targets the lymph system and enhances its ability to recruit T cells to eliminate tumors. Here, three T cells (blue) are shown attacking and breaking apart a cancer cell. Credit: Yu Zhao

The concept of using vaccines to treat cancers has been around for several decades. A vaccine was first approved for prostate cancer in 2010, and another was approved in 2015 for melanoma. Since then, many therapeutic—as opposed to preventive—cancer vaccines have been in development, but none are approved. One hurdle is the difficulty in finding antigens in tumors that look foreign enough to trigger an immune response.

Researchers at Tufts have now developed a cancer vaccine that effectively amplifies the visibility of tumor antigens to the immune system, leading to a potent response and a lasting immunological memory that helps prevent the return of tumors after they have been eliminated. Their vaccine avoids the need to hunt down a specific tumor antigen, instead relying on a digested mix of protein fragments called a lysate that can be generated from any solid tumor.

The vaccine they produced worked against multiple solid tumors in animal models, including melanoma, triple-negative breast cancer, Lewis lung carcinoma, and clinically inoperable ovarian cancer.

Developed by a team led by postdoctoral scholar Yu Zhao and Qiaobing Xu, professor of biomedical engineering, the method builds on earlier work expressing specific antigens for an enhanced immune response by making lipid nanoparticles that carry mRNA into the lymphatic system.

“We have significantly improved the cancer vaccine design by making it applicable to any solid tumor from which we can create a lysate, possibly even tumors of unknown origin, without having to select mRNA sequences, and then conjugating another component—called AHPC—that helps channel the protein fragments from the cancer cells into the immunological response pathway,” said Xu.

Unlike traditional vaccines designed to prevent infectious diseases caused by bacteria or viruses, cancer vaccines work by stimulating the body’s immune system to recognize and attack cancer cells. And unlike most vaccines against pathogens, they are designed to be therapeutic rather than preventive—acting to eliminate an existing disease.

Some preventive cancer vaccines do exist, but they are generally targeted to viruses that are linked to cancers, such as HPV linked to cervical cancer.

The key to the increased potency of the new cancer vaccine lies in its ability to direct tumor-derived antigens into a cellular pathway that efficiently presents the antigens to the immune system. Think of the presentation as a kind of police lineup, where each antigen is presented for the immune system to decide if it can be considered a “suspect.”

Rounding up the antigens and getting them into an antigen-presenting cell like a macrophage or dendritic cell (the police stations, if we continue with the analogy) is generally an inefficient process for tumor antigens. This is where the Tufts research team applied a two-stage method to power up the process.

First, to make sure they round up all tumor proteins-of-interest, they modified the mix of tumor proteins with the AHPC molecule, which in turn recruits an enzyme to put a tag on the protein called a ubiquitin. It allows the cell to identify and process the protein into fragments for presentation to the immune system.

The researchers then packaged the AHPC-modified tumor proteins into tiny lipid (fat molecule) nanoparticles, specifically designed to home in on lymph nodes, where most antigen-presenting cells can be found.

Tested in animal models of melanoma, triple-negative breast cancer, Lewis lung carcinoma, and inoperable ovarian cancer, the vaccine elicited a strong response by cytotoxic T cells, which attack the growing tumors, suppressing further growth and metastasis.

“Fighting cancer has always been an arsenal approach,” said Xu. “Adding cancer vaccines to surgical excision, chemotherapy, and other drugs used to enhance cytotoxic T cell activity could lead to improved patient responses and longer-term prevention of cancer recurrence.”

Source: Tufts University

Marine Database Shows Plankton Are Shifting Their Lipid Distributions

The datasets include lipid profiles, key components of cell membranes, from 930 samples collected.

The study, a collaboration between MARUM – Center for Marine Environmental Sciences at the University of Bremen and the Woods Hole Oceanographic Institution (WHOI), reanalyzed massive datasets of large-scale distributions of plankton-derived lipids in the ocean, which were initially published by WHOI in 2022. “This study shows the value of open science,” says first author Dr. Weimin Liu from MARUM. “Using new methods on open-access data, we uncovered previously hidden patterns of plankton adaptation.”

The datasets, totaling over 200 GB of mass spectrometry data, include lipid profiles — key components of cell membranes — from 930 samples collected across the Atlantic, Pacific, and Arctic Oceans, at depths from the surface down to 400 meters. Unlike traditional approaches that focus only on known molecules, this study also included unknown lipids using network analysis, letting the data speak for themselves. This approach allowed a more comprehensive and less biased view of lipid diversity in marine plankton.

The analysis showed that plankton lipid profiles are closely linked to their environment. The numerically highest lipid diversity was found in cold polar and subpolar oceans, where plankton use a wider range of strategies — such as shortening fatty acid chains

— to keep their cell membranes fluid. In warmer open oceans, the team observed shifts in lipid distribution that likely reflect adaptations to low nutrient availability. In deeper waters of these regions, plankton increased the production of unsaturated fatty acids, a strategy that may reflect a response to low light conditions.

“These changes in lipids reveal how plankton communities adapt to their surroundings,” says Dr. Liu. “Since plankton, especially phytoplankton, form the base of ocean ecosystems, their responses can ripple through the entire marine food web and lead to far-reaching, sometimes unexpected, consequences.”

This research demonstrates how combining environmental lipidomics with data science can uncover the mechanisms behind plankton adaptation — offering new insight into how marine ecosystems function. The research is benefitted from the establishment of cheminformatics expertise within the Cluster of Excellence “The Ocean Floor – Earth’s Uncharted Interface” based at MARUM.

Source: Marum

Bakers can choose from a variety of strategies to reduce fat

The term “shortening” describes how saturated fats function. They shorten gluten development, leading to a more tender texture in the final product.

“Flour, primarily composed of carbohydrates and a small percentage of protein, forms a protein matrix

when mixed with water," said Roger Daniels, vice president, research, development and innovation, Stratas Food. "This matrix… creates elasticity but can also result in a tough texture. Shortenings contain both solid fats and liquid oils. The proportion of these components determines the final texture and consistency of the baked product, as the saturated fats in the shortening coat the protein strand, limiting their interaction and preventing excessive gluten formation. This results in a more tender and palatable dough."

Stratas Foods often recommends soy-based solutions to assist with reducing saturated fat content. Sometimes these oils become more solid through the rearrangement of the three fatty acids, which is known as interesterification.

"Shortenings with the right levels of saturated and unsaturated fatty acids can be produced by interesterifying a hard fat such as fully hydrogenated soybean oil with a liquid oil such as high-oleic soybean oil," explained Frank Flider, fats and oils consultant, United Soybean Board. "The process allows for precise control over the fat's properties — such as texture, melting point and performance — by adjusting the ratio of solid to liquid fats."

Through careful blending of fats and oils, total saturated fat content can be reduced, but this is not a one-size-fits-all science.

"While there are options to provide functionality, they are not always drop-in replacements," said April Parker, principal product developer for bakery, Cargill. "Depending on a baker's process, the application and other ingredients in the formula, some additional modifications may be needed. These might include changes to processing procedures."

Cargill offers an all-purpose shortening with 23% saturated fat, which is a big reduction from palm oil, which typically has 50% saturated fat. It is made from high-oleic canola and hydrogenated cottonseed oils.

"The resulting shortening system still provides the functionality bakers need, including plasticity, sensory attributes and ease of use in operations," Parker said.

Patco Products' Trancendim specialty diglyceride product line creates lower fat shortenings and puff pastry margarines while maintaining their spreading and workability.

"Our newest distilled monoglycerides, Alphadim 90 HO-V and Alphadim 90 MAK, are great for creating low-fat spreads, where a portion of the fat phase is replaced by water," said Margaret Walsh, senior scientist at Patco Products.

Toppings and more

Many bakers rely on saturated fats to produce frostings, fillings and icings. They require a different approach to reformulating.

"Cookie and wafer fillings are generally a blend of sugar, fat, salt and other minor ingredients," Parker said. "The type of fat used drives the consistency and eating characteristics of these fillings. Saturated fat helps provide the necessary structure for aeration, oxidative stability and the texture needed for depositing operations."

Saturated fat also contributes to the durability of these toppings and fillings during manufacturing, distribution and consumption.

"Blends can help customers reduce saturated fat in icings, too," Parker said. "We offer an icing shortening that cuts saturated fat levels in half, compared to palm oil-based products.

The newest addition to Cargill's shortening lineup brings together soybean oil and emulsifiers as a way to reduce saturated fat and still get top performance. It contains around 28% saturated fat.

Another newer option in the market comes from Epogee. EPG reduces total calories by as much as 45%.

"This alternative fat can help bakers reduce the level of saturated fats in their formulas by up to 80%," said Jayme Caruso, chief commercial officer, Epogee.

Yet another approach is to explore ingredients outside the fats and oils toolbox.

"Fat reduction in baked goods requires a multi-targeted approach," said Ashley Beech, bakery applications development manager, Corbion. "Because saturated fats lend to not just processing but finished product quality as well, manufacturers should identify the key functionality of the fat being replaced."

Corbion, for example, offers enzyme solutions to reduce the need for fats and oils without sacrificing texture or taste, Beech said. There's one for reducing the fat in sweet, chemically leavened goods and another that can reduce fat in breads, buns and tortillas as well as replace monoglycerides in breads and buns.

The time is now for bakers to reevaluate the fats and oils used in their products. They can reformulate to meet shelf life needs as well as consumers' sensory expectations and health-conscious demands.

Source: Backing Business

Epax launches first commercial very long chain PUFA, Epax Evolve 05

The omega-3 fatty acid solution, which will be debuted at Vitafoods Europe 2025, is designed for healthy ageing and overall wellness support — containing more than 10x the amount of VLC-PUFAs than standard fish oil does

Marine nutraceutical supplier Epax has launched EPAX Evolve 05, the first very long chain polyunsaturated fatty acid (VLC-PUFA) to be made commercially available, which it will debut at Vitafoods Europe 2025.

Recent research suggests that VLC-PUFAs — a family of omega-3s — can support healthy ageing, mostly through their ability to improve retinal function, as well as skin health and sperm structure and function. Notably, research has found that its depletion, which is associated with age-related changes such as a reduction in bone density and muscular strength, can have a negative effect on overall health.

Epax created EPAX Evolve 05 following the finding that crude fish oil contains a small concentration of these key fatty acids. Through almost a decade of development, the marine ingredients company has released a potent extract containing 10x the amount of VLC-PUFAs that would typically be found in fish oil.

The patent-protected concentrate will debut as part of the Epax's NovusLipid range and has already obtained self-affirmed GRAS status and non-novel food status, meaning it can be freely marketed in Europe and the US. To ensure the safety of the product, Epax has also performed genotoxicity and repeat-dose toxicology studies on the ingredient, which revealed positive results.

Now that the product is commercially available, Epax can provide samples to researchers for intervention studies, according to the brand. "VLC-PUFAs offer enormous potential in areas like vision and healthy ageing, but previous research into their benefits was hindered by a lack of material containing high concentrations of these fatty acids," noted Bjørn Refsum, CEO of Epax.

"By developing a VLC concentrate that opens the door to further research, we can discover their true potential and introduce a new family of valuable fatty acids to the marketplace; the stage is set for a new era for omega-3," he concluded.

Source: Nutraceutical Business Review

FRANKINCENSE (*Boswellia serrata*) ESSENTIAL OIL

Introduction:

The uses of frankincense essential oil span from **advanced skincare formulations** addressing photoaging and wrinkle formation to traditional aromatherapy applications supporting emotional wellness and spiritual practice. Research validates the benefits of frankincense essential oil for skin with clinical trials demonstrating improved elasticity, reduced fine lines, and enhanced wound healing when used at 0.5-2% dilution in carrier oils rich in fatty acids like rosehip and jojoba. The oil's complex chemistry featuring alpha-pinene (30-40%) and limonene (15-20%) provides anti-inflammatory, antioxidant, and antimicrobial properties applicable across therapeutic categories from respiratory support through steam inhalation to stress reduction via diffusion creating measurable anxiety score reductions of 15-25% in clinical settings.

India is the sole producer of *Boswellia serrata* oleo-resin. The harvesting predominantly takes place in dry, mountainous, and forested tracts across specific states: Madhya Pradesh (e.g., the dry deciduous forests of the Vindhya and Satpura ranges) Andhra Pradesh, Gujarat, Jharkhand.

Botanical Name : Indian frankincense is ***Boswellia serrata,*** locally known as *Shallai*, *Dhuno*, *Luban*, or *Kundur*.

Botanical Origins:

Frankincense comes from trees in the Boswellia genus. Several species produce the resin used to make essential oil. Boswellia sacra grows in Oman and Yemen. Boswellia carterii comes from Somalia and Ethiopia. Boswellia serrata grows in India. Each species produces slightly different chemical profiles affecting the oil's properties and scent.

The trees grow in arid, rocky terrain where few other plants survive. Harvesters make small cuts in the bark. The tree produces resin to seal the wound — this is the "tears" or "pearls" of frankincense. After the resin hardens, collectors gather it. The best quality comes from second and third tappings when the tree produces clearer, more aromatic resin.

Harvesting Process:

Trees tapped 2-3 times annually during dry seasons. Resin hardens in 2-3 weeks before collection. Grade depends on color, size, and purity of tears.

Tapping: Harvesters use specialized tools to make shallow cuts or taps into the bark of the trunk and thick branches.

Exudation: The tree secretes a gummy, milky liquid to heal the "injury," which acts as a protective mechanism.

Collection: When exposed to air, the liquid hardens into resin droplets over 10 to 14 days. Harvesters return to scrape off the hardened resin and may make fresh cuts to stimulate further production.

Production:

Steam distillation of resin produces essential oil. Yield typically 3-10% oil from resin weight. The resin itself is sold for incense and traditional medicine. **Essential oil production** takes the highest quality resin and steam distills it. Water and resin go into a still. Steam carries volatile compounds out. The vapor condenses. Oil separates from water. The resulting essential oil is pale yellow to amber liquid with a woody, resinous, slightly citrusy aroma.

Chemical Composition and Active Compounds: Frankincense essential oil's therapeutic properties come from its complex chemical makeup. Gas chromatography-mass spectrometry (GC-MS) analysis reveals 50+ compounds. The main constituents are monoterpenes and sesquiterpenes.

Major chemical components: Alpha-pinene: 30-40% (pine-like, anti-inflammatory) Limonene: 15-20% (citrus note, antioxidant) Alpha-thujene: 5-10% (fresh, herbal) Beta-caryophyllene: 2-5% (spicy, anti-inflammatory) Para-cymene: 1-5% (fresh, sharp) Sabinene: 2-8% (spicy, woody)

These percentages vary by species and growing conditions. Boswellia sacra typically has higher alpha-pinene. Boswellia carterii shows more limonene. Indian frankincense (B. serrata) contains higher levels of alpha-thujene.

The resin also contains boswellic acids, though these don't distill into the essential oil significantly. Boswellic acids remain in the resin and appear in CO, extracts or alcohol extracts of frankincense. They provide strong anti-inflammatory effects studied for arthritis and inflammatory conditions.

Benefits and uses :

Anti-Aging and Wrinkle Reduction : The benefits of frankincense essential oil for skin start with its documented effects on aging signs. Several studies examining frankincense's impact on skin appearance and function showed significant improvement in photoaging scores, skin elasticity, and sebum levels. Wrinkle depth decreased measurably compared to baseline.

Anti-aging applications: Facial serums: 0.5-1% frankincense in carrier oils (**jojoba, rosehip**). Eye creams: 0.3-0.8% dilution for delicate eye area Night treatments: 1-2% in facial oils applied before sleep Face masks: Add 2-3 drops per tablespoon of clay base Massage oils: 1-2% for face and neck massage.

The oil should always be diluted. Never apply pure essential oil directly to skin — it causes irritation. Typical dilution for facial application is 0.5-2% (3-12 drops per ounce of carrier). For body skin, you can go slightly higher to 2-3% if well tolerated.

Wound Healing and Scar Reduction: Traditional medicine used frankincense resin on wounds for thousands of years. Modern research validates this practice showing frankincense promotes wound healing through several mechanisms.

Studies on animal models demonstrate faster wound closure rates when frankincense preparations are applied topically. The oil appears to speed up the inflammatory phase of healing, enhance fibroblast activity (cells that make new tissue), and promote re-epithelialization (new skin formation).

For scars, frankincense may help reduce their appearance through improved collagen remodeling. Old scars won't disappear completely, but regular application can soften texture and fade discoloration over months. New scars respond better — apply once healing has occurred and scab has fallen off naturally.

***Scar treatment protocol*:** Dilute to 2-3% in carrier oil (rosehip oil excellent for scars) Apply small amount directly to scar tissue twice daily Massage gently for 1-2 minutes to improve absorption Continue for minimum 8-12 weeks for visible results Combine with vitamin E oil for enhanced effect

Pregnant women should avoid applying to stretch marks until after delivery. Once healed, frankincense in carrier oil may help reduce the appearance of new stretch marks though genetics play a large role in how skin responds.

Acne and Inflammatory Skin Conditions : The anti-inflammatory properties make frankincense useful for acne-prone and reactive skin. The oil doesn't directly kill acne bacteria like tea tree oil does, but it reduces inflammation around breakouts helping them heal faster with less post-inflammatory hyperpigmentation.

For inflammatory conditions like eczema or psoriasis, some people find frankincense helpful as part of their management routine. It won't cure these conditions but may reduce flare severity. The oil should complement medical treatment, not replace it.

***Inflammatory skin applications*:** Spot treatment: 1 drop frankincense in carrier oil applied to blemishes. Calming serum: 1% frankincense + 0.5% German chamomile in carrier Body oil: 2-3% for eczema-prone areas (patch test first). Scalp treatment: Add to carrier oil for psoriasis scalp massage.

Always patch test when using on compromised or inflamed skin. Apply a small amount to the inner arm, wait 24 hours, check for reaction. If any redness, itching, or irritation occurs, don't use it on larger areas or face.

Compiled by:
Dr. S. Adhikari

LAUGH AND LOUD

Q. I asked the guy sitting next to me if he had any Sodium Hypobromite…

A. He said NaBrO

****

Q: Why was the mole of oxygen molecules excited when he walked out of the singles bar

A: He got Avogadro's number?

****

Q. As an ion chromatography chemist I made this one up:

A. Anions aren't negative, they're just misunder stood.

****

Q: What emotional disorder does a gas chromatograph suffer from?

A: Separation anxiety.

****

Q: What did one titration say to the other?

A: "Let's meet at the endpoint."

Copper -Cu, and Tellurium (Te) makes a real CUTE couple.

****

Q. Why was Searc Crow get a Nobel Prize ?

A. He was outstanding in his field.

****

Q. Did you know about the Scientists who had TWINS?

A. They name them ALISON and CONTROL

****

Q. Tired of Signal REDLIGHT ?

A. Travel at 114,004,827 mph. This velocity will BLUESHIFT them enough to appear GREEN.

****

Q. How do you tell if someone is a CHEMIST or PLUMBER ?

A. See, how they pronounced UNIONIZED.

****

1. You will meet a woman who wants to know all about you.

2. Really, where will we meet?

1. At a Biology lab.

****

Q. Why did the Acidic water get a GYM Membership?

A. It wanted to be a Buffer Solution.

MEMBERS' PAGE

WHAT'S THE RIGHT AGE TO MARRY? THE BHAGAVAD GITA OFFERS PERSPECTIVE:

by R.C. ARORA (Ex. Manager Q.C. - S.F.F.I., New Delhi)

A Timeless Question in a Fast-Paced World

In today's era of swipe-lefts and fast-paced flings, the question of marriage feels like a riddle wrapped in tradition, sprinkled with confusion. Parents say, "Settle down by 25." Friends say, "Live your life first." Instagram says, "Soft launch the partner, hard launch the lifestyle." But deep within the noise lies a fundamental question: What is the right age to marry?

It's not just about age. It's about timing, readiness, and inner evolution. To answer, we need more than just statistics—we need wisdom. And there's perhaps no deeper well of wisdom than the Bhagavad Gita, the timeless conversation between Krishna and Arjuna that still echoes in every corner of life. Let's take a creative dive into this sacred text and see how its eternal in sight might help us unlock this very modern dilemma.

The Illusion of the Perfect Age Society has tried to pin down the "ideal age" like it's a fixed calendar event. For decades, people thought the early 20s were the golden years—especially for women. Now, as mind sets shift, people say late 20s or even 30s are better. Some say earlier is wiser; some swear by waiting longer.

But the Bhagavad Gita doesn't talk in years—it talks in Yogas (paths), Gunas (qualities), and Dharma (purpose). Krishna doesn't ask Arjuna, "Are you the right age to fight?" He asks, "Are you ready to live your Dharma?"

Marriage, like war in the Gita, is not about age. It's about alignment—with self, with purpose, with growth. So, rather than "What age?", the question

becomes: What stage of life are you in spiritually, emotionally, mentally?

Dharma – The Call of Inner Responsibility. In the Gita, Dharma is the cosmic compass. It is your true role, your life's responsibility—not what society wants from you, but what your soul knows it must do.

Krishna says: "Better to fail in your own dharma than to succeed in someone else's." (Gita 3.35)

This is profound when applied to marriage. If you marry because society says it's time, not because your soul is aligned, you risk living someone else's idea of life. So, are you emotionally stable? Are you clear in your values? Do you understand commitment—not as chains, but as chosen growth?

The Three Gunas and Choosing Your Partner

The Gita speaks of three Gunas—Sattva (purity), Rajas (passion), and Tamas (inertia). They exist in all of us in different proportions and influence how we act, choose, and relate. A Tamas-based marriage may form out of laziness, societal pressure, or fear of being alone.

A Rajas-based marriage may be all fireworks, chemistry, and drama—but often lacks long-term stability. A Sattva-based marriage is founded on peace, mutual respect, and spiritual companionship.

Ask yourself:

Is your desire to marry based on societal noise or inner truth?

Is your partner someone who brings clarity or chaos?

Are you entering marriage with awareness or attachment?

The Gita would encourage a Sattvic union—one that uplifts both partners toward higher growth.

Arjuna's Dilemma Is Our Dilemma

Let's not forget: the Gita itself begins with Arjuna frozen by doubt. He questions everything. He feels torn between duty and desire. Between heart and mind. Isn't that where many of us are when we think about marriage? Some of us are scared to commit. Some of us are scared we're missing out. Some of us love someone deeply but feel unsure if the timing is right. Krishna doesn't dismiss Arjuna's fears. He listens. Then guides him toward clarity through action. Likewise, if you're confused about marriage, the Gita would say: Don't act in fear. Don't wait in fear either. Seek clarity through inner stillness, self-study, meditation, and yes—courage.

Soulmates and the Journey Beyond Romance

The Gita rarely speaks of romantic love, but it speaks endlessly about the love between the soul and the Divine. Perhaps that's a higher way to see marriage—not as a transaction, not just companionship, but as a spiritual sadhana (practice).

A good marriage can be like a Gita in itself:

The partner becomes your Krishna—guiding, questioning, supporting.

And sometimes, you become theirs—challenging, reflecting, loving.

You grow not just in comfort, but in consciousness.

So, don't ask: "Am I the right age?"

Ask: "Am I becoming the right soul?"

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