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Oil Technologists' Association of India (North Zone)

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

All of plant oils have a different combinations of omega fatty acids and other components like fatty acids/ medium chain fatty acids and micro-nutrients mainly. And the different ratios of these are what give each plant oil its specific benefits and sensory qualities.

Coconut oil is an integral part of South Indian cuisine, whereas Mustard oil, widely known as *Sarso ka tel* is a common ingredient in North India. Both oils have their benefits and have proven to be good for health, skin and hair.

Sesame oil and pure Cow Ghee, processed with some Ayurvedic herbs and incorporation of essential oils mentioned in the Ayurvedic texts make a nourishing Body Massage Oil.

Cosmetics and Personal Care (CPC) products cover a wide range which can be divided into four main categories i.e. skin care, hair care, oral care and colour cosmetics items. The CPC products can be prepared in the form of lotions, creams, shampoos, gels and sticks using oleo chemicals and derivatives.

Therefore, Oils and Fats, derived from Plant Sources being a mixture of mixed triglycerides find its applications in Edible oil industry. On hydrolysis, triglycerides yield fatty acids and glycerol which form the basis of Oleo-Chemical industry for the CPC products.

Yours truly
C.S. Joshi
Editor

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

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(North Zone)

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Contents

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OILS- APPLICATIONS IN HAIR & SKIN

Prepared by:
Dr. S.K. Luthra, Karthika Urban, Karishma Anand
Dabur India Ltd.

1

HAIR: ANATOMY & BENEFITS FROM VEGETABLE OILS

2

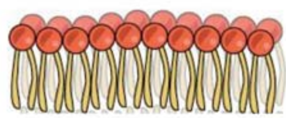
Composition of Hair

HAIR IS MADE UP OF [1]

Proteins (65-95%)

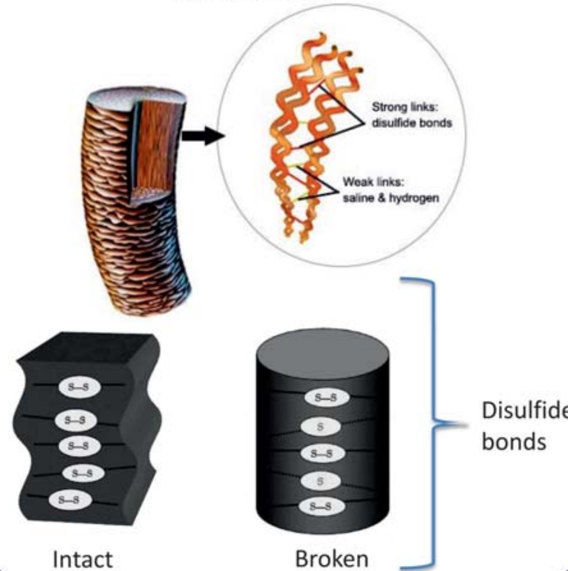
Water (12-15%)

Trace elements & pigments (<1%)



Lipids (3-5%)

HAIR BONDS [2]



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Lipids Present in Hair

Lipids in Human Hair [1]

Type of Lipid	% of total lipid	Source
Hydrocarbons	21.52	Unknown
Squalene	15.12	Sebaceous glands
Wax Esters	14.01	Sebaceous glands
Triglycerides	11.06	Sebaceous glands
Total Fatty Acids	10	Sebaceous glands
Cholesterol	6.22	Hair Matrix cells
Ceramides	2.68	Hair Matrix cells
18-MEA	2.34	Hair Matrix cells
Total	100	

FFA composition in human hair lipid [1]

Chain length	% total FFA	% Unsaturated of this chain length
7	0.07	-
8	0.15	-
9	0.20	-
10	0.33	-
11	0.15	-
12	3.5	4
13	1.4	3
14	9.5	15
15	6	25
16	36	50
17	6	67
18	23	80
20	8	85
22	2	-
Residue	4	-
Total	100	

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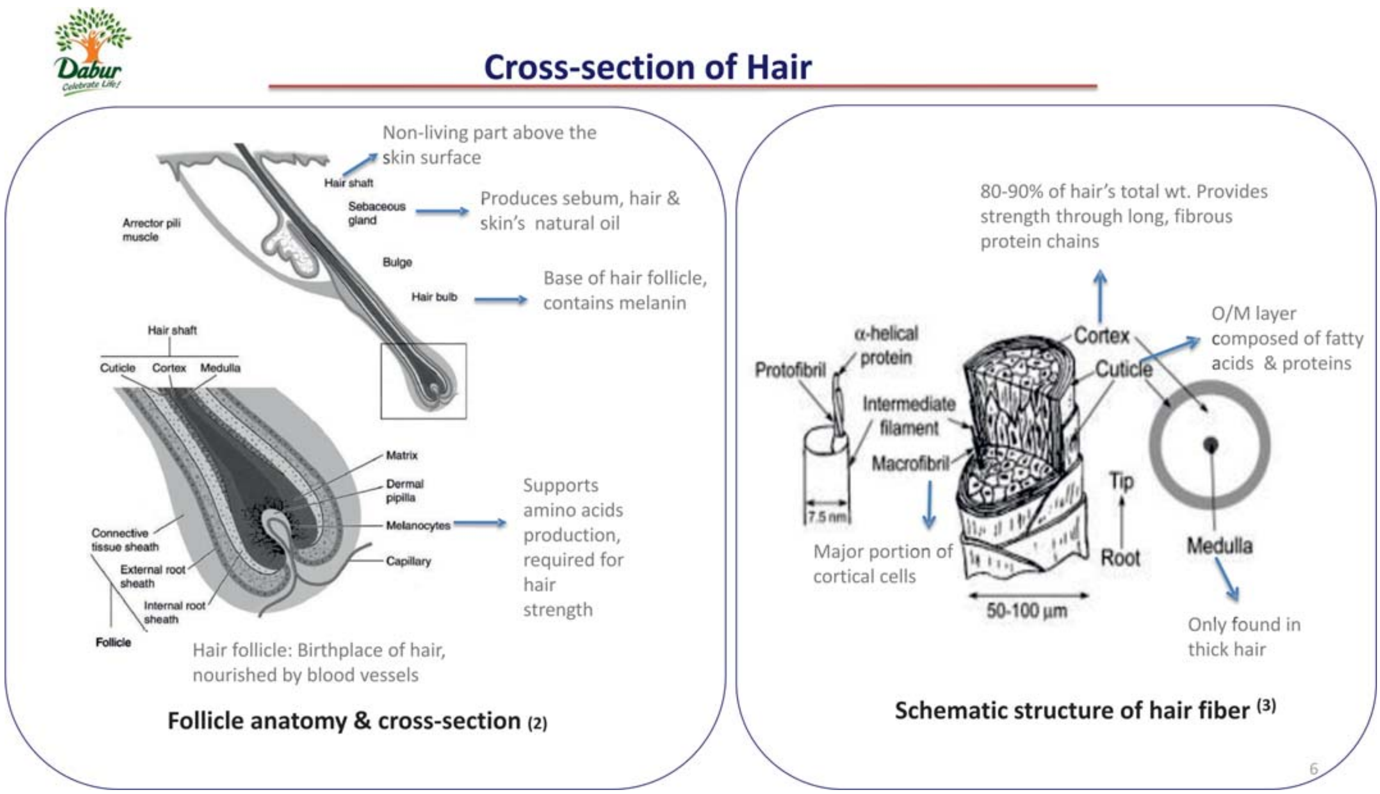
Cross-section of Hair
Non-living part above the skin surface
Hair shaft
Sebaceous gland
Produces sebum, hair & skin's natural oil
Arrector pili muscle
Bulge
Hair bulb
Base of hair follicle, contains melanin
Hair shaft
Cuticle
Cortex
Medulla
Matrix
Dermal pipilla
Melanocytes
Supports amino acids production, required for hair strength
Capillary
Connective tissue sheath
External root sheath
Internal root sheath
Follicle
Hair follicle: Birthplace of hair, nourished by blood vessels
Follicle anatomy & cross-section (2)
80-90% of hair's total wt. Provides strength through long, fibrous protein chains
α-helical protein
Protofibril
Intermediate filament
Macrofibril
7.5 nm
Cortex
Cuticle
O/M layer composed of fatty acids & proteins
Tip
Root
Medulla
Major portion of cortical cells
50-100 μm
Only found in thick hair
Schematic structure of hair fiber (3)
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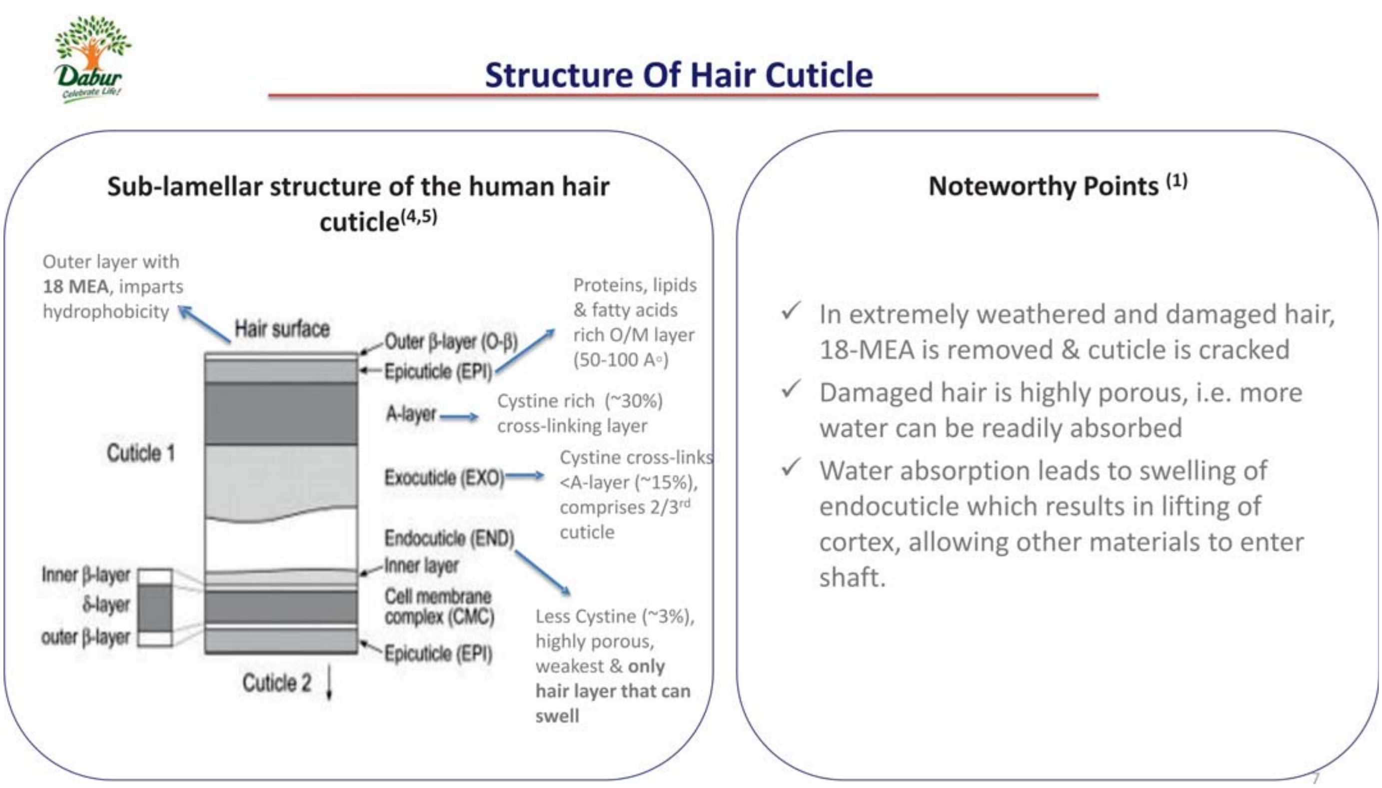
Structure Of Hair Cuticle
Sub-lamellar structure of the human hair cuticle(4,5)
Outer layer with 18 MEA, imparts hydrophobicity
Hair surface
Outer β-layer (O-β)
Epicuticle (EPI)
Proteins, lipids & fatty acids rich O/M layer (50-100 A°)
A-layer
Cystine rich (~30%) cross-linking layer
Cuticle 1
Exocuticle (EXO)
Cystine cross-links <A-layer (~15%), comprises 2/3rd cuticle
Endocuticle (END)
Inner layer
Inner β-layer
δ-layer
outer β-layer
Cell membrane complex (CMC)
Epicuticle (EPI)
Less Cystine (~3%), highly porous, weakest & only hair layer that can swell
Cuticle 2
Noteworthy Points (1)
✓ In extremely weathered and damaged hair, 18-MEA is removed & cuticle is cracked
✓ Damaged hair is highly porous, i.e. more water can be readily absorbed
✓ Water absorption leads to swelling of endocuticle which results in lifting of cortex, allowing other materials to enter shaft.
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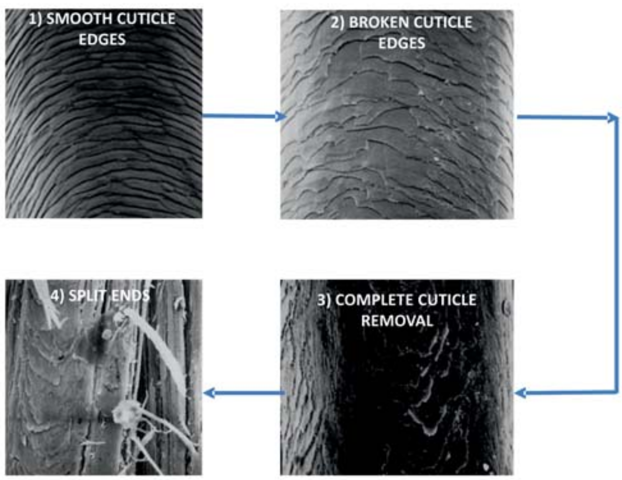
Hair Damage & Protective Effect of Vegetable Oils

Weathering & cuticle wear (commonly occurs by grooming actions) (1)



Role of oils in preventing hair damage (2)

Without the oil barrier	With saturated oils	With unsaturated oil

Moisture freely enters & exits	Semi-permeable film formed, blocked moisture entry, easy penetration in hair fiber	Strong film formed, blocked moisture entry, difficult penetration in hair fiber

- Vegetable Oils act as moisture blockers
- Fills gap between cuticle cells
- Prevention of aggressive substances into hair follicles.

● = Unsaturated oil molecule

• = Water molecule

● = Keratin Protein

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Comparison of Vegetable Oils on The Basis of Fatty Acids Composition (6,7)

		SFA OILS	SFA & MUFA	MUFA OILS			MUFA & PUFA				PUFA OILS	
	Fatty Acids	Coconut oil	Palm oil	Almond Oil	Olive Oil	Castor Oil	Mustard Oil	Argan Oil	Rice Bran Oil	Sesame Oil	Sunflower Oil	Soyabean Oil
Saturated Fatty Acids (SFA)	Caproic acid (6:0)	0.52	0	0	0	0	0	0	0	0	0	0
	Caprylic acid (8:0)	7.6	0	0	0	0	0	0	0	0	0	0
	Capric acid (10:0)	5.5	0	0	0	0	0	0	0	0	0	0
	Lauric acid (12:0)	**47.7**	0.1	0.09	0	0	0	0	0	0	0.02	0
	Myristic acid (14:0)	19.9	0.7	0.07	0	0.07	0	0.1	0.39	0	0.09	0
	Palmitic acid (16:0)	0	**36.7**	6.8	16.5	8.06	4.1	12.1	20	9.7	6.2	11.3
	Stearic acid (18:0)	2.7	6.6	2.3	2.3	5.91	2.78	5.6	1.1	6.5	2.8	3.6
	Arachidic acid (20:0)	0	0.4	0	0.43	0.18	10.86	0.4	0	0.63	0.21	0.3
	Total	**83.92**	**44.5**	**9.26**	**19.23**	**14.22**	**17.74**	**18.2**	**21.49**	**16.83**	**9.32**	**15.2**
Mono Unsaturated Fatty Acids (MUFA)	Palmitoleic acid (16:1)	0.02	0.1	0	1.24	0.05	0	0	0	0.2	0.95	0.1
	Oleic acid (18:1)	6.2	**46.1**	**67.2**	**66.4**	2.54	**38.21**	**46.1**	**42.7**	**41.5**	28	24.9
	Ricinoleic acid (18:1, 12 OH)	0	0	0	0	**45.49**	0	0	0	0	0	0
	Eicosenoic acid (20:1)	0	0.2	9.1	0.3	1.16	0	0.4	1.11	0.32	0.18	0.3
	Erucic acid (22:1)	0	0	0	0	0	**11.35**	0	0	0	0	0.3
	Total	**6.22**	**46.4**	**76.3**	**67.94**	**49.24**	**49.56**	**46.5**	**43.81**	**42.02**	**29.13**	**25.6**
Poly Unsaturated Fatty Acids (PUFA)	Linoleic acid (18:2) (w-6)	1.6	8.6	19.6	16.4	19.57	25.31	33.8	33.1	**40.9**	**62.2**	**53**
	Linolenic acid (18:3) (w-3)	0	0.3	1.2	1.6	2.04	11.3	0.1	0.45	0.21	0.16	6.1
	Total	**1.6**	**8.9**	**20.8**	**18**	**21.61**	**36.61**	**33.9**	**33.55**	**41.11**	**62.36**	**59.1**

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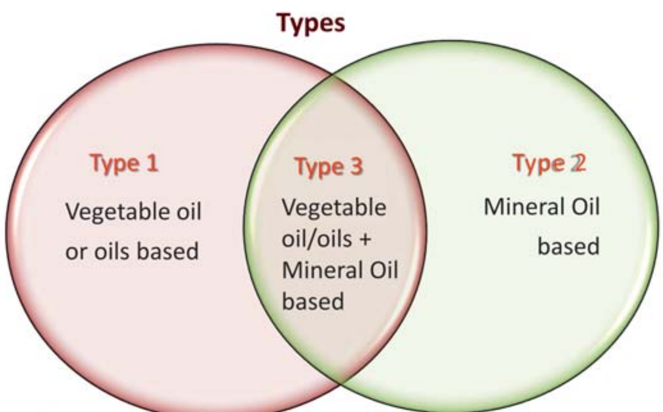
Hair Oils- Application in Personal Care [8,9]

Hair oil- Oil based cosmetic leave on product used to improve condition of hair

Can be vegetable/mineral oil based or combination of both

A typical hair oil contains base oil, silicones/IPM/CCTG, hair beneficial actives, additives (like sunscreen, anti-oxidants) etc.

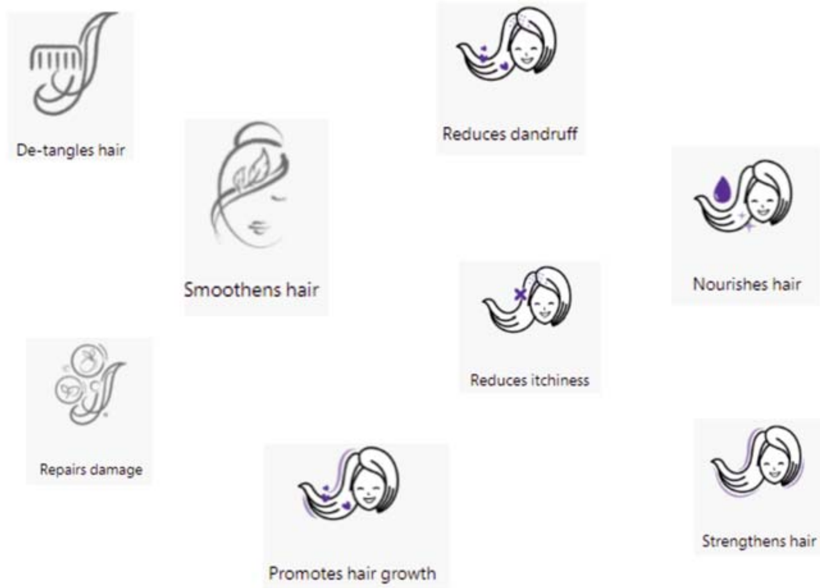
Cosmetic Hair Oils as per IS 7123:1993 [9]



Description

- Colourless or coloured
- With or without perfume
- Free from sediment and suspended matter at $27\ ^{o}C$
- Free from unpleasant rancid odor
- May contain suitable antioxidants to prevent rancidification

Topical Benefits of Oils on Hair/Scalp (8)



Commonly used veg oils are: Coconut, Rice Bran, Mustard, Olive, Castor, Sesame, Sunflower, Jojoba, Argan, Almond

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Ayurvedic herbs-Ingredient Benefits (8,10,11)

Amla (*Phyllanthus emblica*)- promotes hair growth, improves scalp health

Neem *(Azadirachta indica)*- dandruff control

Bhringraj (*Eclipta alba*)- helps promote hair growth, hair health beneficial

Curry leaves *(Murraya koenigii)*- helps control hair fall & hair thinnnng

Henna (*Lawsonia inermis*)-dandruff control, impart color to hair

Aloe Vera (*Aloe barbadensis*)- conditions & softens hair

Methi *(Trigonella foenum graecum)*- helps control dandruff

Hibiscus *(Hibiscus rosa-sinensis)*- conditions hair, stimulates hair growth

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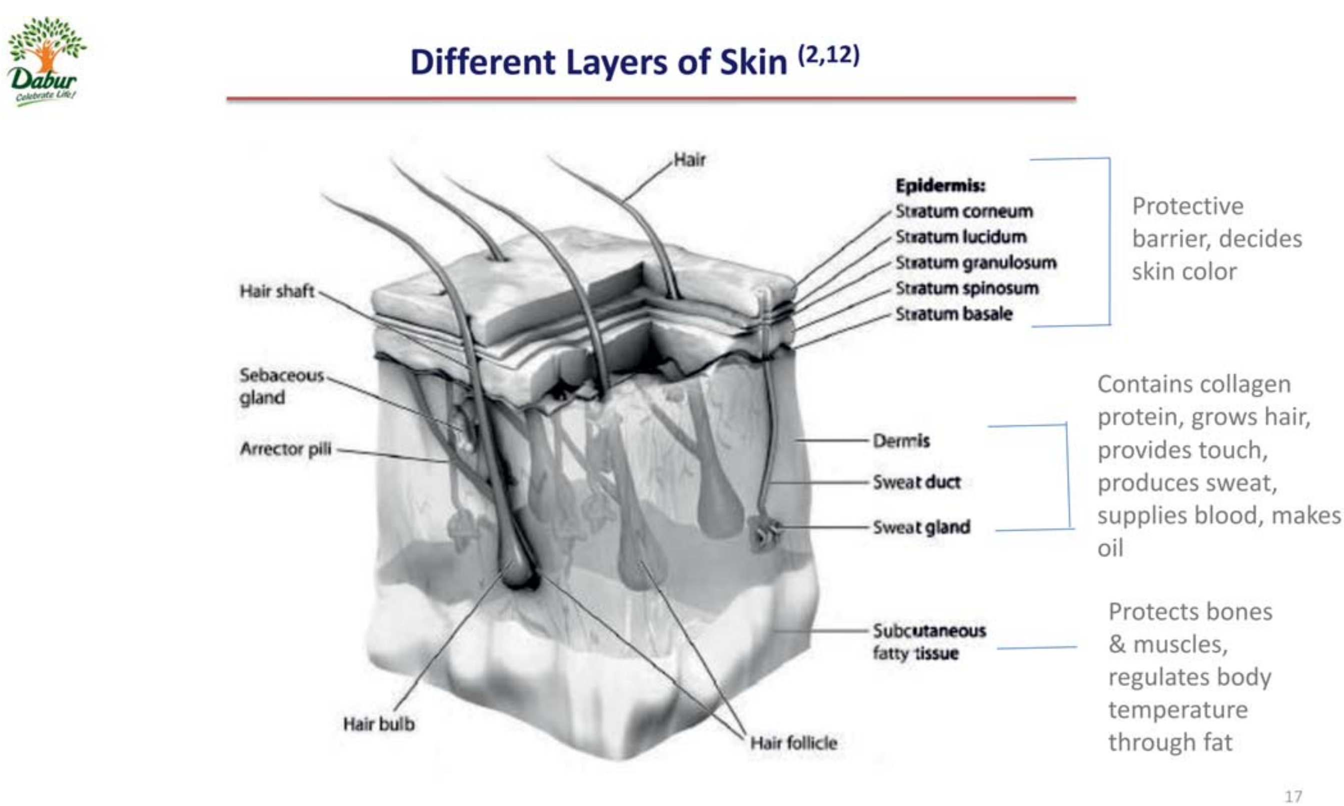
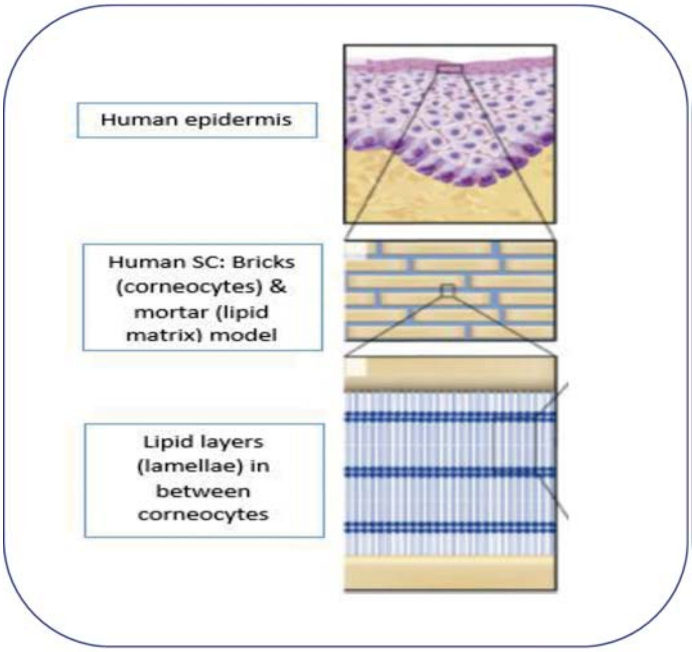
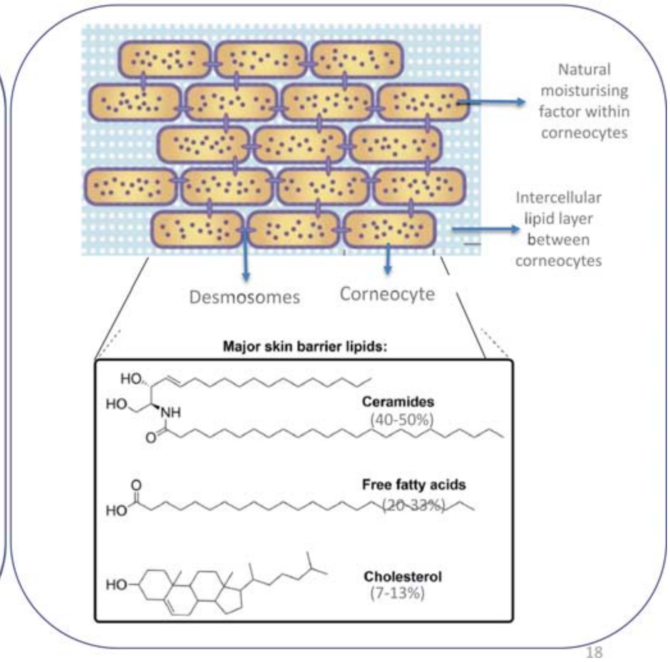
SKIN: ANATOMY & BENEFITS FROM VEGETABLE OILS



Stratum Corneum (SC)- Outermost Layer Of Skin (13,14,15)





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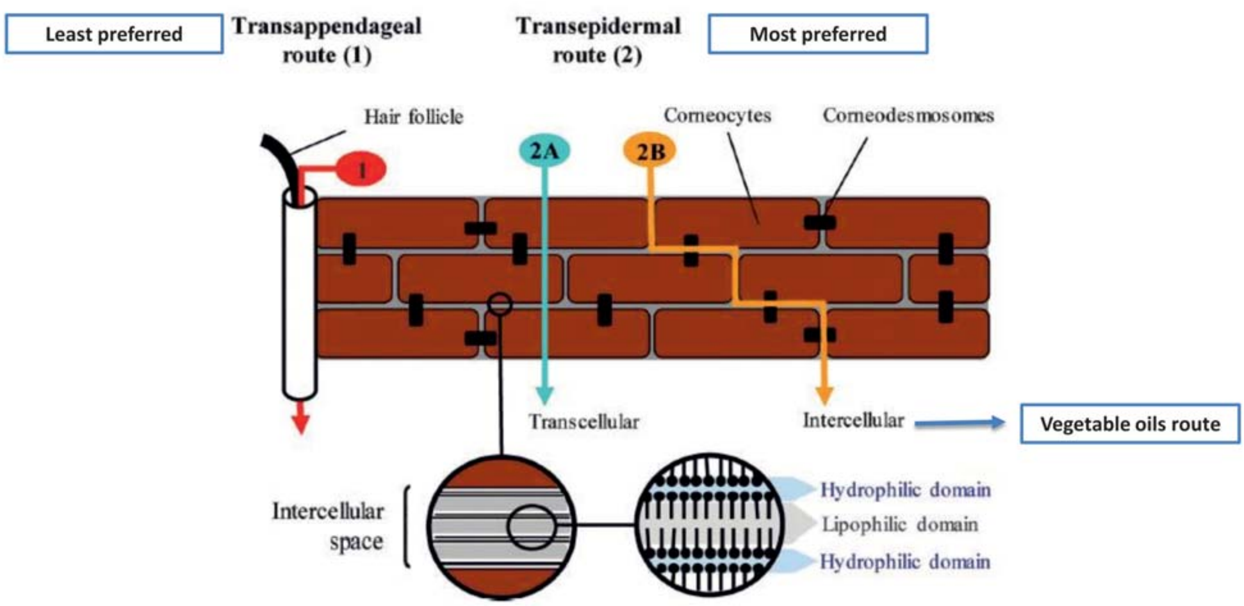
Routes Of Skin Penetration & Vegetable Oil As A Delivery System (16)



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Fatty Acid Composition of Total Lipids in Epidermis[17]

FATTY ACIDS	% w/w
Linoleic acid (C18:2) (w-6)	21.52
Oleic acid (C18:1)	15.12
Palmitic acid (C16:0)	14.01
Stearic acid (C18:0)	11.06
Lignoceric acid (C24:0)	10
Arachidonic acid (C20:4)	6.22
Behenic acid (C22:0)	2.68
Palmitoleic acid (C16:1)	2.34
Arachidic acid (C20:0)	1.58
Dihomo Gamma Linolenic acid (C20:3)	1.46
Myristic acid (C14:0)	1.11

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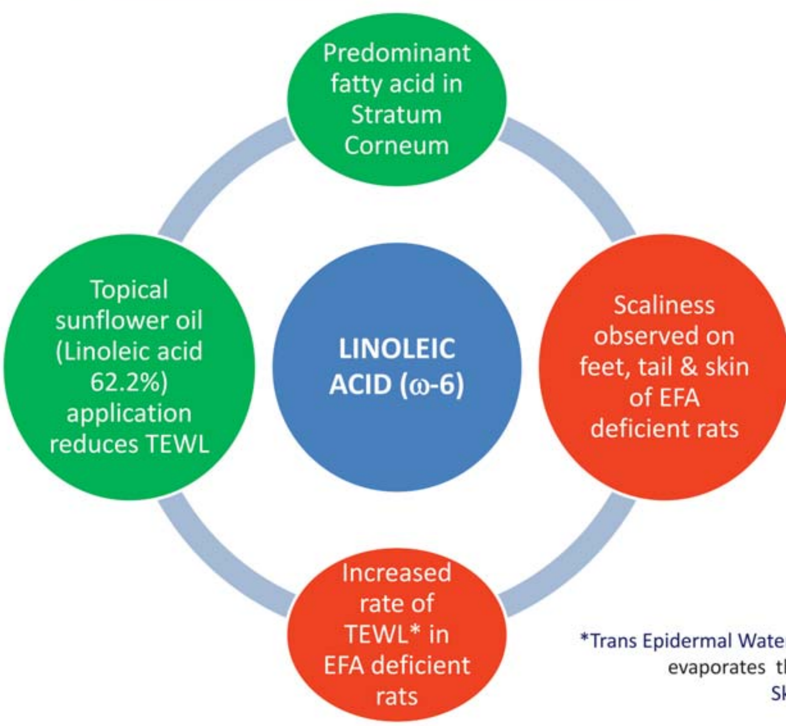
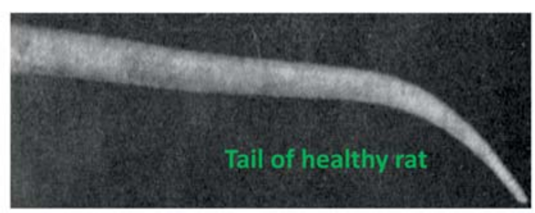
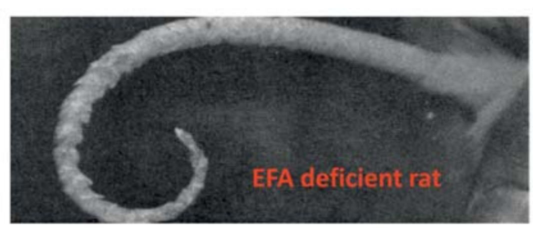
Role Of Essential Fatty Acid (EFA) - Linoleic Acid on Skin Barrier Repair [18,19,20]







*Trans Epidermal Water Loss (TEWL) is the amount of water that passively evaporates through skin to the external environment.

Skin barrier disruption $\propto$ TEWL

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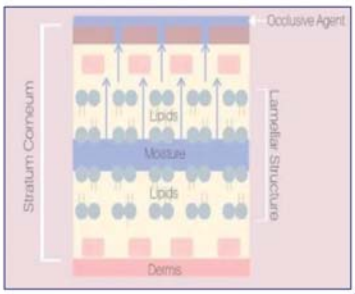
Restoring Skin Barrier Through Moisturizers [21,22]

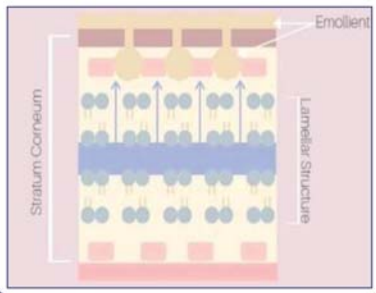
OCCLUSIVES

- Forms protective layer on top of skin & reduce/physically block TEWL
- **Limitations:** Odor, greasy feel, potential allergenicity
- **Examples:** Lanolin, petrolatum, silicone derivatives etc.



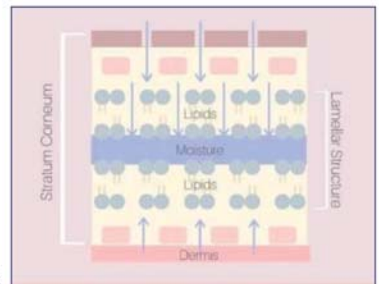
EMOLLIENTS

- Makes skin smooth & supple by filling gaps between skin cells, replenish skin's depleted lipids
- **Examples:** Cholesterol, squalene, fatty acids, vegetable oils etc.



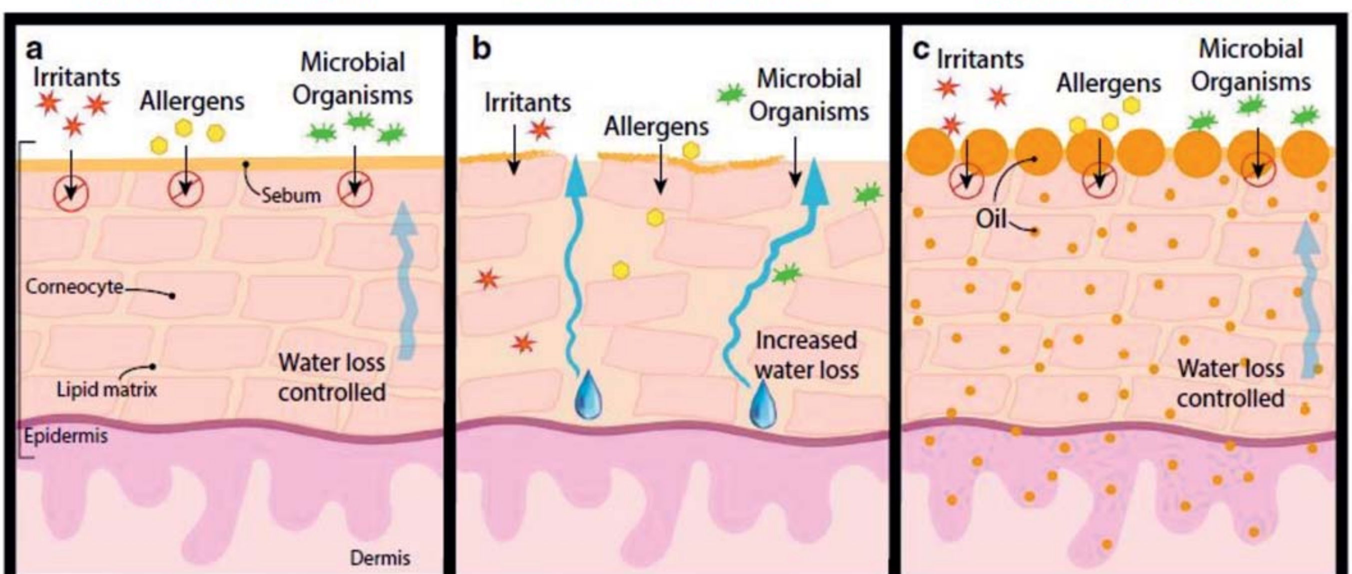
HUMECTANTS

- Draws water from dermis to the epidermis & from air to the epidermis
- **Limitations:** Can increase TEWL by enhancing water absorption from dermis to epidermis
- Always used together with occlusive agent
- Examples: Glycerol, urea, panthenol, honey



Skin Barrier Repair Using Vegetable Oils [23]

Normal Stratum Corneum | **Disrupted Stratum Corneum** | **Repaired using vegetable oils**



Topical Benefits of Plant Oils on Skin [24]

Category	Vegetable oils	Oleic acid content (%)	Linoleic acid content (%)	Skin Barrier Repair	Anti-Bacterial Effect	Anti-Inflammatory Effect	Antioxidant effect	Skin aging
Commonly used	Coconut Oil	6.2	1.6	×	✓	✓	✓	✓
	Rice Bran Oil	42.7	33.1	?	✓	✓	✓	✓
	Mustard Oil	38.21	25.31	×	✓	?	✓	×
	Sesame Oil	41.5	40.9	✓	?	✓	✓	✓
	Sunflower Oil	28	62.2	✓	?	✓	?	✓
	Olive Oil	66.4	16.4	×	?	✓	✓	✓
	Castor Oil	2.54	19.57	×	✓	✓	✓	✓
	Almond Oil	67.2	19.6	?	?	?	?	✓
	Soyabean Oil	24.9	53	✓	✓	✓	✓	?
Premium	Argan Oil	46.1	33.8	✓	?	✓	?	?
	Jojoba Oil	11.2	5	×	✓	✓	✓	✓
	Grapeseed oil	12-22	65-85	?	✓	✓	✓	✓
	Avocado oil	72.8	8.6	?	?	✓	?	?
	Shea butter	46.4	6.6	×	?	✓	✓	?
	Peanut oil	16.41	59.91	✓	?	?	?	?
	Oat oil	28.4-40.3	36.6-45.8	✓	?	✓	✓	?
	Pomegranate seed oil	12-14	13-15	?	?	?	✓	?
	Rosehip oil	18.7	53.5	?	?	✓	✓	✓
	Bitter Apricot oil	62.76	19-33	?	?	?	?	?
Note	✓ = Yes	× = No	? = No evidence					

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Sea Buckthorn, Evening Primrose & Chia Seed Oils

Sea Buckthorn (*Hippophae rhamnoides*) Oil [8,25]
- Rich source of w-3, w-6 , w-7 & w-9 fatty acids
- Possess wonderful anti-aging properties
- Reduces inflammation & prevents acne
- Repairs damaged hair
- Makes hair smooth & manageable

Evening Primrose (*Oenothera biennis*) Oil [8,26]
- Rich source of w-6, w-9 & stearic acids
- Soothes & moisturizes skin
- Helps in skin rejuvenation
- Protects hair from damage
- Helps in stronger, fuller & healthier hair

Chia (*Salvia hispanica*) Seed Oil [27]
- Contains about 68% ALA
- Powerful source of antioxidants
- Prevents premature skin aging
- Reduces hair frizz
- Prevents hair breakage & keeps hair shaft healthy

Pomegranate, Flaxseed & Pumpkin Seed Oils

Pomegranate (*Punica granatum*) Seed Oil [24,28]
- Rich source of w-5 (punicic acid) w-6 & w-9 fatty acids
- Contains phenolic compounds & phytosterols
- Makes hair follicles stronger
- Reduces scalp infections like itchiness, dandruff
- Anti-inflammatory properties
- Reduce hair frizz

Flaxseed (*Linum usitatissimum*) Oil [8,29]
- Contains about 70% ALA, also rich in w-9
- Boosts scalp blood circulation
- Keeps skin moisturized
- Soothes dry & itchy skin
- Prevents dandruff
- Protects hair from damage

Pumpkin (*Cucurbita pepo*) Seed Oil [8,30]
- Rich source of w-6 & w-9 fatty acids, and Zn
- For soft, smooth & supple skin
- Prevents skin aging
- Helps promote hair growth
- Increases hair shine

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Rosehip, Macadamia Nut & Moringa Oils

Rosehip (*Rosa canina*) Oil [8,24]

- Rich source of w-3, w-6, W-7 & w-9 fatty acids,
- High level of tocopherols, carotenoids, phenolic acids
- Keeps skin soft, smooth & moisturised
- Prevents premature wrinkles
- Reduces hair frizz
- Maintains scalp health

Macadamia (*Macadamia ternifolia*) nut Oil [31]

- Rich source of w-7, w-9 fatty acids
- Nourishes dry hair
- Reduces frizz & dullness
- Helps in skin rejuvenation
- Reduces wrinkles

Moringa (*Moringa oleifera*) Oil [32,33]

- Contains about 74% oleic acid
- Supports healthy scalp & hair
- Provides soft & smooth skin
- Helps in skin detoxification
- Combats hair dryness
- Known as Sigru in Bhavprakash

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TRADE NEWS

Jet Fuel Made From This Crop Could Cut Emissions by Up to 68%, New Analysis Proves:

The aviation industry is necessary for the world we live in today, but it places a strain on the environment, thanks to emissions from petroleum-based fossil fuel. According to a new study, we could reduce these emissions by up to 68 percent – by switching to a sustainable aviation fuel (SAF) derived from plants. Specifically, the non-edible oilseed crop *Brassica carinata*, a variety of mustard plant. And it could be more cost-effective than petroleum fuel. "If we can secure feedstock supply and provide suitable economic incentives along the supply chain, we could potentially produce carinata-based SAF in the southern United States," says sustainability scientist Puneet Dwivedi of the University of Georgia. "Carinata-based SAF could help reduce the carbon footprint of the aviation sector while creating economic opportunities and improving the flow of ecosystem services across the southern region."

Roughly 2.4 percent of all global carbon dioxide emissions in 2018 were generated by the aviation industry, according to a report by the Environmental and Energy Study Institute. A study published earlier this year found that these emissions constitute a contribution of 3.5 percent to anthropogenic climate change.

That may not seem like much, but it's growing, and worryingly fast. But carinata-based SAF is looking more and more viable. Challenges around transitioning to biofuels include their potential to displace important food crops and questions around whether it's even possible to grow enough fuel crops at all. Where, how, and what crop is grown also has a massive impact on whether it actually ends up reducing emissions.

That said, fuel derived from *B. carinata* is not a brand new idea. It was developed and tested some years ago – the first jet flight on pure carinata-derived biofuel was successfully flown in 2012, but the cost was much higher than conventional jet fuel. The new work by Dwivedi and his team was not to prove that the fuel is viable, but to estimate exactly how cost-effective and emissions-reducing it could be.

Conventional jet fuel currently costs around US$0.50 per liter. Without subsidies, carinata-based SAF comes in at around $0.85 to $1.28 per liter, the team calculated.

But governments are offering incentives for reducing emissions that were not in place in 2012, such as the Biden Administration's Sustainable Aviation Grand Fuel Challenge, which offers tax credits for a minimum emission reduction of 50 percent compared to conventional jet fuel.

When all available US credits were taken into account, carinata-based SAF costs between $0.12 and $0.66 per liter, the researchers found. "Current policy mechanisms should be continued to support manufacturing and distribution of SAF. The Grand Challenge announced by President Biden could be a game-changer in supporting carinata-based SAF production in the southern region," Dwivedi said.

In the southeastern states, where temperatures tend to be warmer, carinata can be grown in the winter months, which is the off-season for food production. This means it doesn't directly compete with other crops. In addition, the by-products of fuel production can still be used to produce animal fodder.

It seems like a no-brainer, except for at least one problem: The US currently lacks the infrastructure for turning the crop into fuel. The feasibility of building these facilities is the focus of the team's current research, with the hope of informing decisions to be made by farmers, investors and policy-makers. “Our results would be especially relevant to the state of Georgia, which is the sixth-largest consumer of conventional aviation fuel in the country, hosts the busiest airport in the world, and is home to Delta, a leading global airline company,” Dwivedi said.

“I am looking forward to pursuing more research for providing a sustainable alternative to our current model of air travel. Carinata has the potential to be a win-win situation for our rural areas, the aviation industry, and, most importantly, climate change.”

Courtesy: Science Alert

COP26: World leaders promise to end deforestation by 2030:

The COP26 global climate summit in Glasgow in November is seen as crucial if climate change is to be brought under control. Almost 200 countries are being asked for their plans to cut emissions, and it could lead to major changes to our everyday lives.

Trees are often cut down to create grazing land to feed the world’s hunger for meat

More than 100 world leaders have promised to end and reverse deforestation by 2030, in the COP26 climate summit’s first major deal.

The pledge includes almost £14bn ($19.2bn) of public and private funds.

Experts welcomed the move, but warned a previous deal in 2014 had “failed to slow deforestation at all” and commitments needed to be delivered on.

Felling trees contributes to climate change because it depletes forests that absorb vast amounts of the warming gas CO_2.

UK Prime Minister Boris Johnson, who is hosting the global meeting in Glasgow, said “more leaders than ever before” - a total of 110 - had made the “landmark” commitment. “We have to stop the devastating loss of our forests,” he said - and “end the role of humanity as nature’s conqueror, and instead become nature’s custodian”.

The two-week summit in Glasgow is seen as crucial if climate change is to be brought under control.

The countries who have signed the pledge - including Canada, Brazil, Russia, China, Indonesia,

IMAGE SOURCE,GETTY

the Democratic Republic of the Congo, the US and the UK cover around 85% of the world's forests. Some of the funding will go to developing countries to restore damaged land, tackle wildfires and support indigenous communities.

Governments of 28 countries also committed to remove deforestation from the global trade of food and other agricultural products such as palm oil, soya and cocoa.

These industries drive forest loss by cutting down trees to make space for animals to graze or crops to grow.

More than 30 of the world's biggest financial companies - including Aviva, Schroders and Axa - have also promised to end investment in activities linked to deforestation.

And a £1.1bn fund will be established to protect the world's second largest tropical rainforest - in the Congo Basin.

Prof Simon Lewis, an expert on climate and forests at University College London, said: "It is good news to have a political commitment to end deforestation from so many countries, and significant funding to move forward on that journey."

But he told the BBC the world "has been here before" with a declaration in 2014 in New York "which failed to slow deforestation at all".

There are reasons to be cheerful about the proposed plan to limit deforestation, specifically the scale of the funding, and the key countries that are supporting the pledge.

It is also very positive that it will try to reinforce the role of indigenous people in protecting their trees. Studies have shown that protecting the rights of native communities is one of the best ways of saving forested lands.

But there are significant challenges.

Many previous plans haven't achieved their goals.

In fact, deforestation has increased since a similar pledge was launched in 2014. There are often disputes between donors and recipients - Norway suspended funding for an Amazon fund in 2019 in an argument with Brazil's president. There are also major questions over how a major financial pledge could be effectively policed.

How can funders verify that forests are actually being protected without spying from satellites or challenging national sovereignty in some way?

And question marks also hang over a key plank of the new plan, which is to try to remove the link to deforestation from consumer goods sold in developed countries.

One aspect is eating meat from animals, raised on imported soy grown on cleared lands. Will governments push companies and consumers to eat less meat to save the world's most important forests?

Asked whether leaders like Brazil's Mr Bolsonaro could be trusted to abide by the pledge, the UK's Environment Secretary George Eustice said "we should be really positive when countries engage".

"Last time there was an attempt at getting such a commitment on forests [in 2014], Brazil didn't take part, neither did Russia, neither did China.

"Brazil, they've really engaged with us on this agenda. It's a big step for them."

But pressed on whether the agreement will be enforceable, Mr Eustice said: "It doesn't go as far into talking about enforcement mechanisms and so forth, that's not the nature of these agreements."

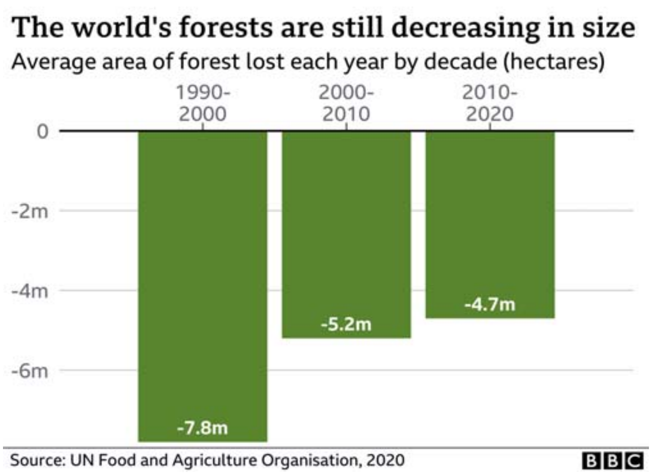
He said what was different about this pledge in particular is that there is "the finance to back [it] up".

US President Joe Biden said he was "confident" the global pledge could be met, telling world leaders: "All we need to do is summon the will and do what we know is right. We can do this."

He said the US would lead by example, and announced it would spend $9bn (£6.6bn) to conserve and restore forests.

Ana Yang, executive director at Chatham House Sustainability Accelerator, who co-wrote **the report Rethinking the Brazilian Amazon**, said: "This deal involves more countries, more players and more money. But the devil is in the detail which we still need to see."

But many people living in the Amazon, including in its urban areas, depend on the forest for their livelihoods and they need support in finding new incomes, she added.



Prince Charles told COP26 delegates that nations had to "honour" the rights of indigenous people as they were "experienced custodians" of their habitats. And speaking to members of the Global Alliance of Territorial Communities - representing 24 countries with tropical rainforests - he said: "We've got to work harder to save your forests, for all our sakes."

Tuntiak Katan, from the Coordination of Indigenous Communities of the Amazon Basin, welcomed the deal, saying that funds should be invested in supporting indigenous communities who are able to manage and protect forests.

Mr Katan, an indigenous Shuar from Ecuador, told the BBC indigenous communities globally protected 80% of the world's biodiversity but faced threats and violence.

"For years we have protected our way of life and that has protected ecosystems and forests. Without us, no money or policy can stop climate change," he said.

Courtesy : BBC News

India's Surfactant players back sustainability; long term outlook bullis

Sustainability is at the forefront of concerns among surfactant companies in India, as the pandemic turns a corner in the country to some degree, and consumption is set to rise. India's economy is growing, and demographic advantage makes the industry players confident of robust growth in demand in the long term.

Plastic consumption is projected to spike in the developing world over the next 10 years, at a point where the focus on developing a more circular economy for the materials is becoming more intense.

The key end use for surfactants is in cleaners, disinfectants and personal wash products. According to Galaxy Surfactants' Avinash Nandanwar, the role of surfactant players in India lies "in reducing plastics" and to use "less plastics in the supply chain", as well as to tap into "recycled plastics in the supply chain".

In their green efforts, Nandanwar said the company is also persuading customers to shift from taking small barrels or drums. He is the head of sourcing at Galaxy. "Why not take supplies in bulk shipments [instead]?" Nandanwar suggested during a panel discussion at ICIS European & Asian Surfactants Conference last week.

India is targeting net-zero carbon emissions by 2070 under a five-point plan, which includes raising the country's non-fossil energy capacity to 500 Gigawatts (GW) by 2030 so that half its energy requirements would start coming from renewable sources. "By 2070, India will achieve the target of net-zero emissions," Prime Minister Narendra Modi said at the United Nations Climate Change Conference of the Parties on 1 November.

The 26th COP (COP26) is being held in Glasgow, UK, from 31 October to 12 November. Modi vowed to reduce the carbon intensity of India's economy to less than 45% and reduce its total projected carbon emissions by 1bn tonnes by 2030. India is the last of the world's major carbon polluters to announce a net-zero target, which is set 10 years after China's 2060 target and 20 years after the 2050 target of both the US and EU.

The southern Asian nation relies on coal – a highly polluting fossil fuel – for about 70% of its power generation. Its net zero emissions pledge is two decades beyond what scientists say is needed to avert catastrophic climate impacts. India ranks third in greenhouse gas emissions after China and the US.

Courtesy: ICIS

With more choosing pure olive oil for Hanukkah, counterfeiters see an opportunity

Thousands of Orthodox Jewish Israelis are spending hundreds of dollars on '100% pure' olive oil, only to burn it in a menorah; but some are buying diluted fakes

In a supermarket in Jerusalem, Ohad David makes a beeline for the most expensive olive oil in the store. He takes three bottles of the award-winning Midnight Coratina brand, which goes for about $3 per ounce. It has "medium potency, green fruitiness, and a green-leaf, grassy bouquet," according to its description on the website of Ptora, the boutique olive oil factory that makes it. But David, a 40-year-old insurance agent and father of five, did not buy the oil for its taste. Like thousands of Orthodox Jewish consumers who buy premium olive oil ahead of Hanukkah, David purchased $160 of the stuff only to burn it — in a menorah.

Observant Israelis increasingly like to use olive oil in their Hanukkah candelabras instead of wax candles because of its significance in the holiday's story. Hanukkah, which this year begins on Sunday evening, is a celebration of how the Maccabees, after defeating the Greeks, were able to light the menorah in the temple in Jerusalem for eight days with a one-day supply of oil — believed to be of the olive variety.

"Using olive oil for Hanukkah candles is not required by halacha [Jewish law], but in our communities everybody does it," David said.

Those who follow suit want only 100 percent pure olive oil to use in their menorahs (technically known as hanukkiot) — and that has become more expensive in Israel over time because of tariffs on imports and the rising demand.

In response, some producers dilute their olive oil with cheaper vegetable oils without disclosing all of the ingredients and lure consumers in with lower prices. The product can still be considered kosher, but it is unacceptable for the observant Jews who want only pure olive oil in their menorahs.

"[T]he temptation to deceive customers is tremendous," Rabbi Moshe Biegel, an expert on Israel's kosher certification industry, wrote in a 2020 essay on the olive oil sector in Israel.

Ptora grows and bottles boutique olive oil at its farm in south-central Israel. (Courtesy of Ptora)

Israeli authorities perform inspections on dozens of brands each year around Hanukkah and often find oil advertised as pure to contain up to 50% canola or soy. But despite fines and the naming of offenders online, the phenomenon persists.

For David and others in his community, the solution is to stick to boutique brands, no matter the cost. “You know there’s no monkey business because to them it’s a matter of pride, so there’s a high level of transparency and trust,” David said. He discovered Ptora while visiting their facilities during a family trip to the northern Negev desert, where the factory and groves are located, about 30 miles southwest of Jerusalem. Like many boutique olive factories in Israel, Ptora offers tours and tastings to increase its brand recognition. “The place is magical,” said Hani Ashkenazi, owner of the Jerusalem Olive Oil factory, about the Ptora groves. He is technically a competitor, but the two companies cooperate on some projects to leverage their respective strengths.

The olive is a national symbol tied closely to the country’s broader agricultural history — it is even depicted in the official emblem of the State of Israel.

Israeli olive oil is currently on average double the price of its European counterparts, costing about 9 euros (roughly $10) in Israel per liter compared to 5 euros (roughly $6) throughout much of the European Union, according to a 2019 report by Israel’s Ministry of Agriculture. Israel employs a protectionist customs policy meant to level the playing field for local producers.

Both production and demand are rising steadily in Israel, a 2020 report from the ministry shows. About 30,000 tons of olive oil are sold in Israel annually, of which about 12,000 are imported. In comparison, the average annual production between 1990 to 2010 was 5,000 tons. The average for the past decade has been 16,000 tons annually.

Olives grow in Israel’s Negev Desert. (Roger Sherman/ Getty Images Plus via JTA)

(For comparison, Egypt, with a land area 47 times that of Israel’s, produces about 20,000 tons of olive oil annually. Italy produces about 340,000 tons annually, and the biggest producer is Spain, providing about 1.7 million tons annually, or half of the world’s supply.)

In recent years, local producers have profited from growing demand for olive oil generally and a preference for Israeli brands specifically, said Ashkenazi, who runs her olive oil factory in the northern Negev with her partner, Moosh.

“Hanukkah is the Jewish feast of light, but it’s also the feast of the Israeli olive oil,” she said. “Each year we’re seeing an increase in sales especially ahead and during Hanukkah.”

The share of shoppers seeking it as candle fuel is unknown, but increasingly firms are buying packages of premium Israeli olive oil as a holiday gift for their employees, Ashkenazi said.

Business is going so well that Ashkenazi says she doesn’t need the protectionist taxes imposed on imported products.

“Competition is good, the consumer should have broad choice,” she said.

Courtesy: The Times of Israel

IMPORTANT FIGURES

World and U.S. Supply and Use for Oilseeds 1/
(Million Metric Tons)

World			Output	Total Supply	Trade	Total Use2/	Ending Stocks
Oilseeds	2021/22		610.63	726.43	179	510.74	117.52
	2022/23 (Est.)		627.44	744.96	200.2	521.84	117.93
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	671.23	789.16	200.8	542.53	139.03
Oil meals	2021/22		349.64	368.44	96.17	346.74	19.3
	2022/23 (Est.)		355.51	374.81	95	355.28	16.33
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	371.25	387.58	99.37	365.58	18.41
Vegetable Oils	2021/22		207.86	236.55	79.4	202.55	29.1
	2022/23 (Est.)		217.05	246.15	87.27	211.34	30.05
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	223.29	253.34	88.68	217.99	30.59
United States							
Oilseeds	2021/22		131.35	141.16	59.71	63.87	9.14
	2022/23 (Est.)		125.93	136.52	55.7	64.73	7.58
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	132.85	141.67	54.82	67.21	10.89
Oil meals	2021/22		49.27	53.22	12.44	40.43	0.35
	2022/23 (Est.)		50.07	54.6	12.75	41.45	0.4
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	51.81	56.39	13.67	42.26	0.45
Vegetable Oils	2021/22		13.06	19.61	1.05	17.29	1.27
	2022/23 (Est.)		13.28	20.58	0.38	18.91	1.29
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	13.71	21.28	0.45	19.58	1.26

World			Output	Total Supply	Trade	Total Use2/	Ending Stocks
Foreign 3/							
Oilseeds	2021/22		479.28	585.27	119.3	446.87	108.38
	2022/23 (Est.)		501.52	608.43	144.5	457.11	110.35
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	538.38	647.49	145.9	475.32	128.14
Oilmeals	2021/22		300.37	315.22	83.73	306.31	18.95
	2022/23 (Est.)		305.44	320.21	82.25	313.83	15.93
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	319.44	331.19	85.69	323.32	17.96
Vegetable Oils	2021/22		194.81	216.94	78.35	185.27	27.83
	2022/23 (Est.)		203.77	225.57	86.89	192.43	28.76
	2023/24 (Proj.)	Apr	NA	NA	NA	NA	NA
		May	209.58	232.05	88.23	198.42	29.34

1/ Aggregate of local marketing years with Brazil and Argentina on an Oct.-Sept. year. 2/ Crush only for oilseeds. 3/ Total Foreign is equal to World minus United States.

U.S. Soybeans and Products Supply and Use (Domestic Measure) 1/

SOYBEANS	2021/22	2022/23 Est.	2023/24 Proj. Apr	2023/24 Proj. May
			Million Acres	
Area Planted	87.2	87.5	NA	87.5 *
Area Harvested	86.3	86.3	NA	86.7 *
			Bushels	
Yield per Harvested Acre	51.7	49.5	NA	52.0 *
			Million Bushels	
Beginning Stocks	257	274	NA	215
Production	4465	4276	NA	4510
Imports	16	20	NA	20
Supply, Total	4738	4571	NA	4745
Crushings	2204	2220	NA	2310
Exports	2158	2015	NA	1975
Seed	102	102	NA	101
Residual	1	19	NA	25
Use, Total	4464	4355	NA	4411
Ending Stocks	274	215	NA	335
Avg. Farm Price ($/bu) 2/	13.3	14.2	NA	12.1

SOYBEAN OIL	2021/22	2022/23 Est.	2023/24 Proj. Apr	2023/24 Proj. May
			Million Pounds	
Beginning Stocks	2131	1991	NA	1936
Production 4/	26155	26195	NA	27145
Imports	303	325	NA	350
Supply, Total	28590	28511	NA	29431
Domestic Disappearance	24825	26125	NA	27000
Biofuel 3/	10348	11600	NA	12500
Food, Feed & other Industrial	14477	14525	NA	14500
Exports	1773	450	NA	600
Use, Total	26599	26575	NA	27600
Ending stocks	1991	1936	NA	1831
Avg. Price (c/lb) 2/	72.98	64	NA	58

SOYBEAN MEALS	2021/22	2022/23 Est.	2023/24 Proj. Apr	2023/24 Proj. May
		Thousand Short	*Tons*	
Beginning Stocks	341	311	NA	350
Production 4/	51814	52464	NA	54375
Imports	649	675	NA	650
Supply, Total	52804	53450	NA	55375
Domestic Disappearance	38970	39300	NA	40175
Exports	13524	13800	NA	14800
Use, Total	52493	53100	NA	54975
Ending Stocks	311	350	NA	400
Avg. Price ($/s.t.) 2/	439.81	455	NA	365

Note: Totals may not add due to rounding. Reliability calculations at end of report. 1/ Marketing year beginning September 1 for soybeans; October 1 for soybean oil and soybean meal. 2/ Prices: soybeans, marketing year weighted average price received by farmers; oil, simple average of crude soybean oil, Decatur; meal, simple average of 48 percent protein, Decatur. 3/ Reflects soybean oil used for biofuels as reported by the U.S. Energy Information Administration. 4/ Based on an October year crush of 2,220 million bushels for 2022/23 and 2,310 million bushels for 2023/24. *Planted acres are reported in the March 31, 2023 Prospective Plantings report. Harvested acres are based on historical planted-to-harvested ratios. The projected yield is based on a weather-adjusted trend model and assumes normal weather.

World Soybean Supply and Use 1/
(Million Metric Tons)

2021/22	Beginning Stocks	Production	Imports	Domestic Crush	Domestic Total	Exports	Ending Stocks
World 2/	100.06	359.85	156.59	314.23	363.82	154.02	98.67
World Less China	69.21	343.45	65.03	226.33	255.42	153.91	68.35
United States	6.99	121.53	0.43	59.98	62.77	58.72	7.47
Total Foreign	93.07	238.32	156.16	254.25	301.06	95.3	91.2
Major Exporters 3/	55.39	181.82	4.43	91.83	102.47	87.26	51.91
Argentina	25.06	43.9	3.84	38.83	46.04	2.86	23.9
Brazil	29.58	130.5	0.54	50.71	53.96	79.06	27.6
Paraguay	0.48	4.18	0.04	2.2	2.25	2.27	0.18
Major Importers 4/	34.24	20.22	123.79	116.74	144.66	0.42	33.17
China	30.86	16.4	91.57	87.9	108.4	0.1	30.32
European Union	1.56	2.77	14.55	15.4	16.97	0.29	1.62
Southeast Asia 5/	1.19	0.53	8.26	4.45	9.27	0.02	0.69
Mexico	0.46	0.29	5.96	6.35	6.4	0	0.3

2022/23 Est.	Beginning Stocks	Production	Imports	Domestic Crush	Domestic Total	Exports	Ending Stocks
World 2/	98.67	370.42	165.2	313.31	364.87	168.37	101.04
World Less China	68.35	350.14	67.2	222.31	252.17	168.27	65.25
United States	7.47	116.38	0.54	60.42	63.69	54.84	5.86
Total Foreign	91.2	254.04	164.66	252.89	301.18	113.53	95.18
Major Exporters 3/	51.91	192	8.82	87.84	98.1	103.1	51.53
Argentina	23.9	27	8.3	31.5	37.75	3.3	18.15
Brazil	27.6	155	0.5	53.25	57	93	33.1
Paraguay	0.18	8.8	0.01	3	3.13	5.7	0.16
Major Importers 4/	33.17	23.62	131.36	119.64	149.14	0.37	38.64
China	30.32	20.28	98	91	112.7	0.1	35.8
European Union	1.62	2.44	13.9	14.65	16.23	0.25	1.48
Southeast Asia 5/	0.69	0.49	9.56	4.89	9.99	0.02	0.73
Mexico	0.3	0.18	6.4	6.5	6.55	0	0.33

2023/24 Proj.		Beginning Stocks	Production	Imports	Domestic Crush	Domestic Total	Exports	Ending Stocks
World 2/	Apr	NA	NA	NA	NA	NA	NA	NA
	May	101.04	410.59	169.77	332.31	386.49	172.41	122.5
World Less China	Apr	NA	NA	NA	NA	NA	NA	NA
	May	65.25	390.09	69.77	237.31	268.49	172.31	84.3
United States	Apr	NA	NA	NA	NA	NA	NA	NA
	May	5.86	122.74	0.54	62.87	66.29	53.75	9.11
Total Foreign	Apr	NA	NA	NA	NA	NA	NA	NA
	May	95.18	287.84	169.23	269.45	320.21	118.66	113.39
Major Exporters 3/	Apr	NA	NA	NA	NA	NA	NA	NA
	May	51.53	223.9	6.18	95.85	106.79	109.4	65.42
Argentina	Apr	NA	NA	NA	NA	NA	NA	NA
	May	18.15	48	5.7	36.5	43.2	4.6	24.05
Brazil	Apr	NA	NA	NA	NA	NA	NA	NA
	May	33.1	163	0.45	55.75	59.7	96.5	40.35
Paraguay	Apr	NA	NA	NA	NA	NA	NA	NA
	May	0.16	10	0.02	3.5	3.65	5.9	0.63
Major Importers 4/	Apr	NA	NA	NA	NA	NA	NA	NA
	May	38.64	24.56	134.64	124.83	155.8	0.42	41.62
China	Apr	NA	NA	NA	NA	NA	NA	NA
	May	35.8	20.5	100	95	118	0.1	38.2
European Union	Apr	NA	NA	NA	NA	NA	NA	NA
	May	1.48	3.1	14	15.15	16.74	0.3	1.54
Southeast Asia 5/	Apr	NA	NA	NA	NA	NA	NA	NA
	May	0.73	0.47	10.64	5.48	10.73	0.02	1.1
Mexico	Apr	NA	NA	NA	NA	NA	NA	NA
	May	0.33	0.24	6.55	6.6	6.66	0	0.46

1/ Data based on local marketing years except Argentina and Brazil which are adjusted to an October-September year. 2/ World imports and exports may not balance due to differences in local marketing years and to time lags between reported exports and imports. Therefore, world supply may not equal world use. 3/ Includes Uruguay 4/ Includes Japan 5/ Indonesia, Malaysia, Philippines, Vietnam, and Thailand. Totals may not add due to rounding.

World Soybean Meal Supply and Use 1/
(Million Metric Tons)

2021/22	Beginning Stocks	Production	Imports	Domestic Total	Exports	Ending Stocks
World 2/	15.17	246.53	66.93	244.22	68.75	15.66
World Less China	15.17	176.91	66.87	175.03	68.26	15.66
United States	0.31	47.01	0.59	35.35	12.27	0.28
Total Foreign	14.86	199.52	66.34	208.86	56.48	15.38
Major Exporters 3/	6.54	76.39	0.79	29.16	47.74	6.83
Argentina	2.29	30.29	0.14	3.33	26.59	2.8
Brazil	4.06	39.31	0.01	19.55	20.21	3.62
India	0.19	6.8	0.65	6.29	0.94	0.41
Major Importers 4/	2.39	22.6	38.56	60.1	1.12	2.34
European Union	0.54	12.17	16.7	28.04	0.77	0.6
Mexico	0.2	5.02	1.83	6.88	0.02	0.15
Southeast Asia 5/	1.6	3.47	18.33	21.54	0.33	1.53
China	0	69.62	0.06	69.19	0.48	0

2022/23 Est.	Beginning Stocks	Production	Imports	Domestic Total	Exports	Ending Stocks
World 2/	15.66	246.13	62.79	246.35	65.97	12.27
World Less China	15.66	174.06	62.74	174.42	65.77	12.27
United States	0.28	47.6	0.61	35.65	12.52	0.32
Total Foreign	15.38	198.54	62.17	210.69	53.45	11.95
Major Exporters 3/	6.83	73.75	0.07	30.08	45.05	5.52
Argentina	2.8	24.57	0	3.35	22.2	1.82
Brazil	3.62	41.26	0.02	20	21.4	3.5
India	0.41	7.92	0.05	6.73	1.45	0.2
Major Importers 4/	2.34	22.47	37.28	59.22	1.01	1.85
European Union	0.6	11.58	16	27.04	0.7	0.43
Mexico	0.15	5.14	1.85	6.95	0.01	0.18
Southeast Asia 5/	1.53	3.8	17.8	21.64	0.3	1.19
China	0	72.07	0.05	71.92	0.2	0

2023/24 Proj.		Beginning Stocks	Production	Imports	Domestic Total	Exports	Ending Stocks
World 2/	Apr	NA	NA	NA	NA	NA	NA
	May	12.27	260.85	66.87	255.47	69.98	14.54
World Less China	Apr	NA	NA	NA	NA	NA	NA
	May	12.27	185.61	66.82	180.68	69.48	14.54
United States	Apr	NA	NA	NA	NA	NA	NA
	May	0.32	49.33	0.59	36.45	13.43	0.36
Total Foreign	Apr	NA	NA	NA	NA	NA	NA
	May	11.95	211.52	66.28	219.02	56.55	14.18
Major Exporters 3/	Apr	NA	NA	NA	NA	NA	NA
	May	5.52	79.52	0.12	31.3	47.2	6.66
Argentina	Apr	NA	NA	NA	NA	NA	NA
	May	1.82	28.47	0.01	3.45	24.7	2.15
Brazil	Apr	NA	NA	NA	NA	NA	NA
	May	3.5	43.21	0.01	20.7	21.7	4.32
India	Apr	NA	NA	NA	NA	NA	NA
	May	0.2	7.84	0.1	7.15	0.8	0.19
Major Importers 4/	Apr	NA	NA	NA	NA	NA	NA
	May	1.85	23.42	38	60.05	1.2	2.02
European Union	Apr	NA	NA	NA	NA	NA	NA
	May	0.43	11.97	15.85	26.89	0.85	0.51
Mexico	Apr	NA	NA	NA	NA	NA	NA
	May	0.18	5.22	1.95	7.1	0.02	0.23
Southeast Asia 5/	Apr	NA	NA	NA	NA	NA	NA
	May	1.19	4.27	18.55	22.46	0.33	1.23
China	Apr	NA	NA	NA	NA	NA	NA
	May	0	75.24	0.05	74.79	0.5	0

World Soybean Oil Supply and Use 1/
(Million Metric Tons)

2021/22	Beginning Stocks	Production	Imports	Domestic Total	Exports	Ending Stocks
World 2/	5.36	59.22	11.54	59.21	12.24	4.67
World Less China	4.33	43.47	11.25	42.51	12.13	4.41
United States	0.97	11.86	0.14	11.26	0.8	0.9
Total Foreign	4.39	47.36	11.4	47.95	11.44	3.77
Major Exporters 3/	1.25	20.77	0.59	12.49	8.62	1.49
Argentina	0.3	7.66	0.09	2.66	4.87	0.52
Brazil	0.47	9.76	0.03	7.45	2.41	0.41
European Union	0.44	2.93	0.46	2.31	0.97	0.55
Major Importers 4/	1.68	18.9	6.64	26.16	0.28	0.78
China	1.03	15.75	0.29	16.7	0.11	0.26
India	0.27	1.53	4.23	5.83	0.02	0.19
North Africa 5/	0.36	1.19	1.42	2.53	0.14	0.31

2022/23 Est.	Beginning Stocks	Production	Imports	Domestic Total	Exports	Ending Stocks
World 2/	4.67	58.92	9.93	58.13	10.84	4.56
World Less China	4.41	42.62	9.48	41.83	10.75	3.93
United States	0.9	11.88	0.15	11.85	0.2	0.88
Total Foreign	3.77	47.04	9.79	46.28	10.63	3.68
Major Exporters 3/	1.49	19.84	0.53	12.7	7.83	1.33
Argentina	0.52	6.22	0	2.4	3.95	0.4
Brazil	0.41	10.26	0.08	7.98	2.3	0.46
European Union	0.55	2.79	0.45	2.27	1.08	0.44
Major Importers 4/	0.78	19.37	5.56	24.54	0.16	1.01
China	0.26	16.31	0.45	16.3	0.09	0.63
India	0.19	1.79	3.15	4.94	0.02	0.17
North Africa 5/	0.31	0.88	1.36	2.3	0.05	0.2

2023/24 Proj.		Beginning Stocks	Production	Imports	Domestic Total	Exports	Ending Stocks
World 2/	Apr	NA	NA	NA	NA	NA	NA
	May	4.56	62.47	10.87	60.84	11.78	5.28
World Less China	Apr	NA	NA	NA	NA	NA	NA
	May	3.93	45.45	10.37	43.74	11.68	4.33
United States	Apr	NA	NA	NA	NA	NA	NA
	May	0.88	12.31	0.16	12.25	0.27	0.83
Total Foreign	Apr	NA	NA	NA	NA	NA	NA
	May	3.68	50.16	10.71	48.59	11.51	4.45
Major Exporters 3/	Apr	NA	NA	NA	NA	NA	NA
	May	1.33	21.52	0.38	13.36	8.49	1.38
Argentina	Apr	NA	NA	NA	NA	NA	NA
	May	0.4	7.21	0	2.55	4.6	0.46
Brazil	Apr	NA	NA	NA	NA	NA	NA
	May	0.46	10.73	0.03	8.53	2.2	0.49
European Union	Apr	NA	NA	NA	NA	NA	NA
	May	0.44	2.92	0.35	2.22	1.1	0.4
Major Importers 4/	Apr	NA	NA	NA	NA	NA	NA
	May	1.01	20.27	6.06	25.67	0.2	1.47
China	Apr	NA	NA	NA	NA	NA	NA
	May	0.63	17.02	0.5	17.1	0.1	0.95
India	Apr	NA	NA	NA	NA	NA	NA
	May	0.17	1.73	3.2	4.94	0.02	0.15
North Africa 5/	Apr	NA	NA	NA	NA	NA	NA
	May	0.2	1.05	1.56	2.47	0.07	0.26

1/ Data based on local marketing years except for Argentina and Brazil which are adjusted to an October-September year. 2/ World imports and exports may not balance due to differences in local marketing years and to time lags between reported exports and imports. Therefore, world supply may not equal world use. 3/ Includes Paraguay 4/ Includes Bangladesh 5/ Algeria, Egypt, Morocco, and Tunisia. Totals may not add due to rounding.

A Review on PUFA rich plant-based edible oils and their health benefits

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1.0. Introduction

Oils are considered one of the basic components of food due to their immense role in determining the product's flavour, functionality, quality and taste. They are primarily made up of triglycerides, which are constituted of three fatty acids attached to a glycerol backbone. A hydrocarbon chain forms these fatty acids with a carboxylic and methyl group on each end. Based on the degree of unsaturation in their carbon chain, they can be classified as saturated fatty acids (SFA), Monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). Saturated fatty acids don't have double bonds in their chemical structure and have been found to have a negative implication on consumers' health. The PUFA are the fatty acids comprising more than two double bonds in their carbon chain. Based on the location of the double bond respective of their methyl end, they can further be grouped as omega-3 and omega-6 fatty acids; examples of omega-3 PUFA include á-linolenic acid (ALA), Docosahexaenoic acid (DHA) and Eicosapentaenoic acid (EPA)' while that of omega-6 is arachidonic acid (ARA) and linoleic acid (18:2). These fatty acids are referred to as essential fatty acids as the human body is not capable of their synthesis, and thus they must be consumed as a part of the diet. They play a crucial role in the body as a nutrient for maintaining homeostasis, preventing the prevalence of several chronic and autoimmune diseases, treating non-alcoholic fatty liver, improving cardiovascular health, reducing inflammations, etc. (Lee et al., 2016). The WHO and FAO have also claimed the consumption of PUFA reduces the risk of CVD (Halvorsen et al., 2011). PUFAs can be obtained from both plants in animal sources. Omega-3 fatty acids have also been found to have a beneficial effect in the treatment of schizophrenia and depression. The intake of Omega-6 fatty acids has been linked with cholesterol-lowering effect, and also, in several animal and human studies, it was found to yield positive results for the treatment of diabetes.

The primary dietary sources of PUFA are vegetables and fish. The major plant sources include cereals, chia, flax, walnut and Perilla oil, while marine fish oil is considered a very rich animal source of the same. However, despite being more stable, plant-based n-3 PUFA is found to be more prone to oxidative deterioration during storage than marine-based omega-3.

2.0. Plant-based Edible Oils and their composition

Generally, seeds (for example, sunflower seeds) are utilized for the extraction of oils. However, oil can also be procured from fruits (olives), legumes (peanuts, soybean), and nuts (walnut, almond). A few of the PUFA-rich oils have been discussed below.

2.1. Flaxseed Oil: Also known as Linseed or Linum, it belongs to the Linaceae family. It is cultivated in temperate regions. The major nations involved in its production are the USA, Canada, India, China and Ethiopia. These seeds occur in brown and golden or yellow varieties, but both these varieties possess a similar nutritional profile. It is generally cold-pressed due to its high PUFA composition (primarily ALA). Linseed Oil comprises of very low content of SFA of about 8.4-11.4%, a moderate 15.21-23.29%of MUFA and a rich 65.26—75.02% of PUFA content, of which á-linolenic acid is present in the highest amount of around 45-61%, while linoleic acid accounts for only 15.68-20.40%. Due to the presence of â-carotene and tocopherols, this oil is naturally considered to exhibit high antioxidant activity.

2.2. Grapeseed Oil: Grape seed oil possesses a high amount of tocopherols and phenolic compounds, due to which it is known to exhibit potent antioxidant activity. This oil is also very rich in PUFA content (85-90%), of which a significant part is contributed by linoleic acid (60-76%). This oil can also be obtained by the by-product (pomace) generated during wine and juice production.

2.3. Perilla Seed Oil: Perilla seed oil is derived from the Perilla frutescens plant, which belongs to the family Lamiaceae, and grows annually mainly in Asian countries like Japan, South Korea and China. In India, it is grown in Himachal Pradesh, Uttarakhand, Manipur, Kashmir, Sikkim, Meghalaya and Mizoram. These seeds are composed of about 40% oil content. The unstable fatty acid profile of the oil makes it prone to oxidative and thermal degradation due to the presence of very high PUFA content of about 75%, of which omega-3 fatty acid range from 60%-65%, and the rest is linoleic acid. The SFA and MUFA account for approximately 7% and 16% of the oil, respectively (Ciftci et al., 2012). Apart from this, the oil also exhibits antioxidant properties owing to the presence of a high amount of tocopherols (44%) and other similar compounds (Jung et al., 2012). This oil has also been claimed to have several therapeutic benefits such as anti-asthmatic effect, cardioprotective effect, antidepressant, anti-diabetic activity etc.

2.4. Almond Oil: Thealmond tree is a versatile, perennial tree nut, generally cultivated in regions with temperate and cold conditions. The major countries involved in its production include Spain, Italy, Greece, Iran, France and Morocco. These almond trees bear fruits that contain seeds comprising the almond oil. This seed is composed of about 35% oil and is very rich in phytochemical content, which in turn exhibits cardioprotective effects (Akpabio et al., 2012; Baloji et al., 2013). The oil has several applications in the food as well as pharmaceutical, and cosmetic industries. In food, it can be used as cooking oil, salad dressing, food flavour and almond butter, while the non-food applications include the use of oil in soaps, massage/ hair oil, fragrance in perfumes, biofuel/biodiesel, etc.

2.5. Sunflower Oil: This oil is extracted from the seeds of sunflower (Helianthus annus), which is an annual plant belonging to the family Asteraceae. The major nations producing this are Russia, Argentina, Ukraine, Romania, China, Turkey and US. It is composed of about 11% SFA, 30% MUFA and 59% PUFA (most of which is Linoleic/omega-6 fatty acid). It is used for cooking, frying oil, salad dressing, sunflower butter etc.

2.6. Walnut Oil: Walnuts have been found to possess a very high amount of polyphenols (ellagitannins) which are converted into beneficial compounds in the human body (stomach) (Holscher et al. 2007). These ellagitannins are converted into ellagic acid and finally into urolithins, and the latter (urolithins) can control prostate cancer by triggering cell death (Sanchez-González et al. 2014). The oil also reduces bad cholesterol (LDL), thereby decreasing the risk of heart diseases, which is due to the presence of high levels of omega-3 fatty acids and antioxidant compounds (Bamberger et al. 2017). The oil was reported to have an anti-hypertriglyceridemiceffect.

2.7. Chia Seed Oil: Chia seed oil is extracted from Salvia hispanica L. seeds, which are also known as "chia" and "Chia sage ."The oil is very rich in natural antioxidants, namely, phytosterols, carotenoids and tocopherols. The oil comprises 78.3% PUFA and just 10.3% SFA. It comprises a major amount of linolenic acid (~62%) (Abad &Shahidi 2020). It is very helpful in preventing skin aging, improving heart health, supporting brain health, etc.

2.8. Soybean Oil: Soybean seeds are composed of about 20% oil content. It is very rich in ALA, EPA and DHA. The fatty acids present in soybean oil include palmitic acid, stearic acid, oleic acid, linoleic acids and linolenic acid. These fatty acids together account for about 14% SFA, 18% MUFA and 68% PUFA.

2.9. Rice bran Oil: Rice bran oil is extracted from the outer covering of the rice, called the husk. Rice bran oil is composed of about 30% LA, 44% MUFA (as oleic acid) and 23%SFA (Latha&Nasirullah, 2014). It also has a high amount of unsaponifiable matter formed by tocotrienols, tocopherols, polyphenols, and phytosterols. The ã-oryzanol present in the oil enhances its stability at high temperatures. It also has a high smoke point, due to which it is considered to be acceptable for frying and cooking applications.

2.10. Pumpkin Seed Oil: Pumpkin or *Cucurbita Maxima*seeds comprise about 38% of oils in hulled seeds and 44% in naked seeds. They are also rich in chlorophylls and carotenoids, due to which the oil has such an intense colour. The oil is made up of about 42-59% linoleic acid and 25% oleic acid. The oil also shows very high antioxidant properties as it has a very high content of bioactive compounds and carotenoids.

Table 1 depicts the fatty acid profile along with the production data of the oils discussed above.

S. No.	Oil	SFA	MUFA	PUFA	Reference
1	Flaxseed Oil	8.4-11.4	15.21-23.29	65.26-75.02	Raczyk et al., 2016
2	Chia Seed Oil	8.5	5.68	85.85	Timilsena, 2017
3	Walnut Oil	7.1-9.6	23.47-25.13	61.72-62.19	Kodad et al., 2014
4	Sunflower Oil	16.95	23.30	59.77	Santana et al., 2017
5.	Soybean Oil	14	18	68	Clemente & Cahoon, 2009
6.	Perilla Seed Oil	7.58	16.21	75.85	Cifci et al., 2012
7.	Almond Oil	10.3	62.0	25.7	Sulieman et al., 2008
8.	Rice Bran Oil	25.6±0.05	43.7 ±0.01	30.7±0.01	Latha & Nasirullah, 2014
9.	Pumpkin Oil	25.20	25.54	48.14	Siano et al., 2016
10.	Grape seed Oil	9.66-12.6	14.5-22.2	66.3-75.8	Lutterodt et al., 2011

3.0. Stability of PUFA-rich Oils

The stability of PUFA-rich oils is usually very low owing to their chemical structure. They are very prone to deterioration upon exposure to heat, air/oxygen, light, and trace metals. These compounds readily oxidize (in the presence of oxygen-oxidative rancidity) and hydrolyze (by lipases) under such conditions and result in rancid-off-flavours, odours and nutritional losses in the oil. Additionally, lipid oxidation may also result in the degradation of lipophilic components like vitamins, and fatty acids, reduction of stability and shelf life of the oil. Oxidation of USFA due to reaction with oxygen can be explained in 3 phases, i.e. induction, propagation and termination phase. The peroxidation or autoxidation of lipids is basically a free-radical chain reaction. Thus, it can be said that the process of oxidation of USFA is initiated by the production of free radicals resulting from the exposure to oxygen, which results in primary oxidation products, namely hydroperoxides. These hydro-peroxides are later oxidized and polymerized to form secondary oxidation products, called peroxides. Fat oxidation leads to the formation of peroxides, free radicals and hydro-peroxides, which in turn lead to the development of ketones and aldehydes that are referred to as secondary oxidation products. This may also pose a risk to the health of consumers due to the formation of free radicals. This process is further catalyzed by the presence of pro-oxidants, namely, lipoxygenases, high temperature, singlet oxygen, transition metals and light. The secondary products, unlike primary products, have a direct effect on the organoleptic properties of the oil.

Several approaches have been studied in order to slow down or prevent these deteriorative processes. These include lowering of temperature, freezing, vacuum packaging, MAP, the addition of antioxidants etc. However, oxidative rancidity or auto-oxidation reactions cannot be stopped entirely by any of these measures, but they can be slowed down. Encapsulation is another novel and potential approach utilized to enhance the stability of PUFA-rich oils. Oil stability depends on its resistance to oxidation during production and storage. Oils contain naturally occurring antioxidants that can chelate metals, scavenge free radicals, and preserve the matrix from oxidation. The usage of vitamin E can decline the rate of the oxidation process.

4.0. Applications of PUFA rich Oils

These oils can be used in the food industries for cooking, baking, and roasting purposes. Since some of them have low thermal stability, they may also have applications as products salad dressings, butter, mayonnaise etc.

A majority of the PUFA rich oils discussed in this review are presently commercially accessible as edible or therapeutic oils. The applications of these oils have been discussed in the table 2.

S. No.	Oil	Medicinal Usage
1.	Flaxseed Oil	Reduce growth of cancer cells, lowers blood pressure, aid in treatment of diarrhea and constipation, improve skin health,
2.	Chia Seed Oil	Prevent skin aging, improve heart health, support brain health.
3.	Walnut Oil	Boost skin health, reduce inflammation, reduce risk of diabetes, improves cholesterol
4.	Sunflower Oil	Improve heart and skin health, prevent arthritis, asthama, cancer, controls obesity, improves stomach health

S. No.	Oil	Medicinal Usage
5.	Soybean Oil	Maintains heart health, supports bone growth, prevents skin aging, reduce cholesterol.
6.	Perilla Seed Oil	Anti-inflammatory, Anti-diabetic, Cardioprotective, improves gut health, prevents the prevalence of neurological disorders.
7.	Almond Oil	Elevated HDL and hence improves heart heakth, high in anti-oxidants, reduce aging symptoms.
8.	Rice Bran Oil	Controls blood sugar levels, promote heart health, anti-inflammatory, anit-oxidants, anti-cancer.
9.	Pumpkin Oil	Enhance Urinary Tract health, heart health
10.	Grape seed Oil	Improve inflammation and Insulin resistance, Decline in risk of heart illness, reduces the prevalence of blood clots.

5.0. Health Benefits

Long Chain PUFAs, including n-3 and n-6 fatty acids, have the ability to protect against several health issues like inflammatory disorders, cardiovascular diseases, and cancers like breast, prostatic and other autoimmune and nervous system diseases

5.1. Inflammation: The dietary consumption of PUFA has been claimed to prevent asthma by inhibiting bronchial inflammation due to its anti-inflammatory effect (Wall et al., 2010). Arachidonic acid-derived epoxyeicosatrienoic acids (EETs) exhibit anti-inflammatory functions, which are crucial for fighting against hypertension and progressive kidney disorders.

5.2. Cardiovascular disease: The intake of PUFA has been directly linked with the reduction of death rate by cardiovascular illnesses. They have been known to have a positive effect on the treatment of heart-related problems such as arrhythmia. This cardio-protective effect of the PUFA's have been explained by their capacity to alter the ion channels to make the heart cells less impulsive and further inhibit the atrioventricular conduction to finally decline the probability of undergoing a prolonged QT interval (Bocanegra et al., 2009)

5.3. Osteoarthritis: Osteoarthritis is the most common chronic disease in the elderly population, which disrupts metabolic homeostasis and thus weakens the articular chondrocyte. PUFAs provide a protective effect against osteoarthritis by aiding in the development and differentiation of cartilage and bone tissues. They also regulate calcium metabolism; hence, a deficiency of these FAs can lead to a lowering of the calcium in bones and matrix, thereby resulting in a notable demineralization. However, the supplementation of diet with PUFA's may result in a positive effect of improving bone strength, joint lubrication, and reduction of the prevalence of osteoarthritis (Pritchett, 2007)

5.4. Obesity: On account of the anti-inflammatory properties of the PUFAs, they are also effective against other illnesses resulting from the same, such as obesity, CHD, diabetes, cancer, etc. Omega-3 fatty acids specifically have been found to be very effective in controlling and preventing obesity. The omega-3 and omega-6 fatty acids exhibit opposite mechanisms for body aft development through systematic inflammation, fat homeostatic and adipogenesis. Omega-3 fatty acids are involved in â-oxidation in adipose tissues and reducing the lipogenic enzyme fat deposition, while the omega- 6 fatty acids increase the cellular triglycerides.

5.5. Autoimmune diseases

PUFA has also been found to be effective in altering the symptoms of several autoimmune disorders like psoriasis, multiple sclerosis, and rheumatoid arthritis. Supplementation of EPA/DHA mixture in the diet of Patients with recurrency-remitting MS reduced the secretion of cytokines and eicosanoid in peripheral mononuclear blood cells.

5.6. Cancer

Omega-3fatty acids have been claimed to have a protective effect against various types of cancers, including that breast, lung, colon, ovarian, prostrate, skin, stomach and pancreatic. Additionally, PUFAs also improve the tolerance potential and efficacy of chemotherapy (Mocellin et al., 2017). It was also reported that the addition of n-3, linoleic acid, tocopherols, phytoestrogen, and fibre aided in the treatment of breast cancer patients. Zheng et al., 2013 recorded a positive association between the consumption of n-3 fatty acids and a decline in breast cancer in a recent systematic meta-analysis study involving 527392 participants, of which 16718 had breast cancer.

Several other health benefits of PUFA have been enlisted in fig-1.

6.0. Conclusion

PUFAs can be availed from many readily available sources, and they must be included in the diet for the prevention of several diseases and, thus, maintain good health. They comprise essential fatty acids that cannot be generated in the body itself; therefore, they have to be taken from foods. They significantly influence the functioning and metabolic rate of the body.

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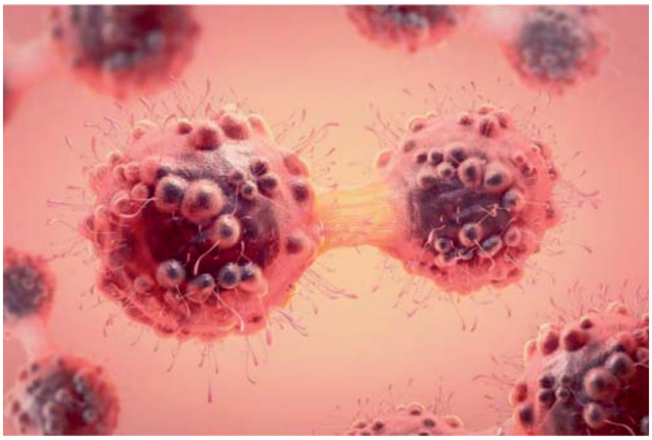
MIT study reveals how lipid imbalance affects cancer growth in mice

In a new study, a calorie-restricted diet significantly reduced tumour growth in mouse models, suggesting new possibilities for cancer therapies.



A new study from the Massachusetts Institute of Technology (MIT), US, that analysed two different diets in mice reveals how those diets can affect cancer cells. According to the researchers, this offers an explanation for why restricting calories may slow tumour growth and how manipulating lipid levels could be used in future therapies.

The team explain that cancer cells consume a great deal of glucose, so some scientists had hypothesized that either the ketogenic diet or calorie restriction might slow tumour growth by reducing the amount of glucose available. However, the team's initial experiments in mice with pancreatic tumours showed that calorie restriction has a much greater effect on tumour growth than the ketogenic diet, so the researchers suspected that glucose levels were not playing a major role in the slowdown.

To dig deeper into the mechanism, the team analysed tumour growth and nutrient concentration in mice with pancreatic tumours, which were fed either a normal, ketogenic or calorie-restricted diet. In both the ketogenic and calorie-restricted mice, glucose levels went down. In the calorie-restricted mice, lipid levels also went down, but in mice on the ketogenic diet, they went up.

When lipids are not available in a tissue, cells can make their own. As part of this process, they need to maintain the right balance of saturated and unsaturated fatty acids, which requires the enzyme stearoyl-CoA desaturase (SCD), which is responsible for converting saturated fatty acids into unsaturated fatty acids.

Both calorie-restricted and ketogenic diets reduce SCD activity, but mice on the ketogenic diet had lipids available to them from their diet, so they did not need to use SCD. Mice on the calorie-restricted diet, however, could not get fatty acids from their diet or produce their own and tumour growth slowed significantly compared to mice on the ketogenic diet.

"Not only does caloric restriction starve tumours of lipids, it also impairs the process that allows them to adapt to it. That combination is really contributing to the inhibition of tumour growth," summarised lead author Evan Lien.

Although the study, published in *Nature*, showed that calorie restriction has beneficial effects in mice, the researchers do not recommend that cancer patients follow a calorie-restricted diet. However, they believe that cancer cells' dependence on the availability of unsaturated fatty acids could be exploited to develop drugs that might help slow tumour growth.

One possible therapeutic strategy could be inhibition of the SCD enzyme, which would cut off tumour cells' ability to produce unsaturated fatty acids. "The purpose of these studies is not necessarily to recommend a diet, but it us to really understand the underlying biology," Lien explained. "They provide some sense of the mechanisms of how these diets work and that can lead to rational ideas on how we might mimic those situations for cancer therapy."

Courtesy: Nature

Vitamin D and Omega-3 Supplements Reduce Autoimmune Disease Risk

For those of us who cannot sit in the sun and fish all day, the next best thing for preventing autoimmune diseases may be supplementation with vitamin D and fish oil derived omega-3 fatty acids, results of a large prospective randomized trial suggest.

Among nearly 26,000 adults enrolled in a randomized trial designed primarily to study the effects of vitamin D and omega-3 supplementation on incident cancer and cardiovascular disease, 5 years of vitamin D supplementation was associated with a 22% reduction in risk for confirmed autoimmune diseases, and 5 years of omega-3 fatty acid supplementation was associated with an 18% reduction in confirmed and probable incident autoimmune diseases, reported Karen H. Costenbader, MD, MPH, of Brigham & Women's Hospital in Boston, Massachusetts.

"The clinical importance of these results is very high, given that these are nontoxic, well-tolerated supplements, and that there are no other known effective therapies to reduce the incidence of autoimmune diseases," she said during the virtual annual meeting of the American College of Rheumatology (ACR 2021).

"People do have to take the supplements a long time to start to see the reduction in risk, especially for vitamin D, but they make biological sense, and autoimmune diseases develop slowly over time, so taking it today isn't going to reduce risk of developing something tomorrow," Costenbader said in an interview with *Medscape Medical News.*

"These supplements have other health benefits. Obviously, fish oil is anti-inflammatory, and vitamin D is good for osteoporosis prevention, especially in our patients who take glucocorticoids. People who are otherwise healthy and have a family history of autoimmune disease might also consider starting to take these supplements," she said.

After watching her presentation, session co-moderator Gregg Silverman, MD, from the NYU Langone School of Medicine in New York City, who was not involved in the study, commented "I'm going to [nutrition store] GNC to get some vitamins."

When asked for comment, the other session moderator, Tracy Frech, MD, of Vanderbilt University, Nashville, Tennessee, said, "I think Dr Costenbader's work is very important and her presentation excellent. My current practice is replacement of vitamin D in all autoimmune disease patients with low levels and per bone health guidelines. Additionally, I discuss omega-3 supplementation with Sjögren's [syndrome] patients as a consideration."

Courtesy: Medscape

ROSEMARY ESSENTIAL OIL

Introduction:-

Rosemary tree is an aromatic, medicinal and condiment plant that belongs to the family Labiatae. Rosemary is preferred because it is of interest as a preservative due to its anti-oxidative characteristics and it is used in the pharmaceutical, food, and cosmetic industries.

Rosemary tree is a shruby evergreen bush that grows up to 15 meters or four feet high with green-grey needle-shaped leaves and pale blue or lilac flowers. The use of Rosemary oil are abundant ranging from medicine and odour to cosmetics. Its many forms consists of oils, gels, lotions, soap, shampoos, and sprays to name a few suggestions by homemade products.

Rosemary Oil is extracted from Rosemarinus officinalis. Rosemary oil has a clear, powerful refreshing herbal smell, is very clear in colour and watery in viscosity.

Botanical Name :

Rosemary (*Rosemarinus officinalis L*) is of considerable importance in terms of its great as an important medicinal and aromatic value. This plant belongs to Lamiaceae family.

Rosemary Oil Extraction Process:

Rosemary Oil is extracted from the fresh Rosemary flowering tops by steam distillation. Methods of Rosemary essential production can be extracted using a variety of methods, although some are not commonly used today.

Steam Distillation:

The vast majority of Rosemary essential oil is produced by steam distillation is in the most commonly used process for extracting essential oils. The steam distillation process is carried out in a still in which fresh or sometimes dried plant material is placed in a chamber of the still. Pressurised steam, made in a separate chamber is circulated through the plant material. The heat of the steam forces opens the tiny inter cellulor pockets in which the Rosemary essential is contained releasing the oil.

During steam distillation the temperature should be modrate so that it is high enough to open the oil pouches without destroying the plants, fracturing or burning the essential oil. As the tiny droplets of the essential oil are released, they evaporate and mingle with steam travelling during a pipe into a condenser. The steam and essential oil are then condensed to a liquid mixture.

Due to the immiscibility of the oil and water at low temperatures, the Rosemary essential oil can be divided from the water by either by decanting off the water or skimming of oil from the top. The water obtained as a byproduct by distillation is referred to as floral water quantity or distillate and retains many of the therapeutic properties of the plant.

Chemical composition:

The major chemical components pf Rosemary Oil are a- pinene, borneol, b-pinene, camphor, 1,8-cineol and limonene myrcene, carnosol, betulinic acid.

Benefits of Rosemery Essential Oil:

1. Rosemary essential oil increases the circulation to the scalp and is therefore also effective for prompting hair growth.
2. Boosts immune system when it comes to protecting the body from diseases , rosemary oil contains myrcene, a chemical that acts as a powerful antioxidant and hunts down free radicals that can damage cells and cause a number of infections and diseases. Thus inhaling rosemary oil as a regular basis can help boost the immune system.
3. Rosemary oil works as a powerful anti-inflammatory agent as it contains a- pinnene that works to alleviate swelling and pain.
4. Works as an antidepressant: Another great method that Rosemary oil benefits mental health is by acting as an antidepressant. The carnosol and betulinic acid creat in rosemary oil have been found to creat antidepressant effect in rats.
5. Aromatherapy use of Rosemary oil helps people relax and treats symptoms of depression.

LAUGH AND LOUD

*A Chemistry professor silently forted while showing the class how to conduct chemical reactions.

When students started making faces and whispering with each other, professor came to his own defense: "Class the side product of this chemical reaction is hydrogen sulfide, smell awful isnt' it".

****

Q. Why it is so easy to stay awake until 6 am but so hard to wake up at 6am ?

A. Things in motion tend to stay in motion while things at rest need more Force to get into motion.

****

Q. What did the thermometer tell the graduated cylinder?

A. You may have graduated, but I have more degrees.

****

A physicist, a biologist, and a chemist were going to the ocean for the first time. The physicist saw the ocean and was fascinated by the waves. He said he wanted to do some research on the fluid dynamics of the waves and walked into the ocean. Obviously he was drowned and never returned.

The biologist said he wanted to do research on the flora and fauna inside the ocean and walked inside the ocean. He, too, never returned.

The chemist waited for a long time and afterwards, wrote the observation, "The physicist and the biologist are soluble in ocean water."

*A month Before Exams, we prefer Books of foreign authors.

A week before exams, we prefer Books of Local authors.

A day before exams, trying to read our own notes. On the day of exam, we become authors.

****

Q: What do you do with a sick chemist?

A. First you try to helium, then you try to curium, but if this fails then you have to barium.

MEMBER PAGE

Dewaxing of Edible Oils

by M.C. Pandey

Some Vegetable Oils contain naturally occurring waxes which give the oil CLOUDY and low transparent look. These waxes required its removal. The waxes can not be removed during degumming, neutralization or bleaching process. It requires a separate method of de-waxing process based on cooling of Oils . The only main two oils require de-waxing are Rice bran Oil and Sunflower Oil.

RICEBRAN OIL :-

A) The oil contains 2-4% waxes of high melting point and part of wax is ester of long chain fatty acids and part of long chain Alcohols.

The wax has the following characteristics :- The wax is a useful ingredient and is used in Polishes, leather dressings, lipsticks, food wraps, and in the manufacture of candles. It is likely to attain importance in future when it could replace high value Carnauba wax which is currently imported.

Similarly, the Rice bran Oil also may be declared a Health Oil . Further, Rice bran Oil contains, up to 20% of high melting point (62 to 69 deg. C) saturated fatty acids which is a part of the oil and hence it becomes difficult to de-wax this oil at lower temperature like 8 or 10 deg. C. De-waxing is normally done at 20-25 deg.C temperature depending upon weather. De- waxed oil is likely to become cloudy in severe winter or on hill stations as in the case of Cotton Seed Oil and even Groundnut oil.

METHOD OF DEWAXING

At Present batch process is preferred as it is economical, convenient and dependable.

The Oil before de- waxing must be degummed and dried as gums interfere crystal formation as well as rate of filtration. So to degum and bleach the oil before de-waxing.

De- waxing also reduces Phosphatides as well as color of original color.

EQUIPMENT REQUIRED:-

1. CRYSTALLISER. A Neutralizer like vessel with a small cone / spherical bottom, low speed 12-18 rpm agitator and cooling coils of area 2.5 sq. m / T to 3.5 sq. m / T of Oil.
2. CHILLED Water storage tank with cooling coils and Refrigeration System.
3. FILTER PRESS P.P 36" X 36" up to 54 to 120 plate and dressed with PP cloth.

PROCESS (BATCH)

a) Pump hot oil of not lower than 70 deg. C in the Crystallizer. Cool oil to 35 to 37 deg. C by circulating clean spray pond / cooling tower water of around 28 to 30 deg. C in 1 ½ to 2 hrs.

b) after attending first cooling, switch over to chilled water system. Care has to be taken as :-

1. Chilled water temperature is not lower than 24-25 deg. C .
2. Rate of cooling is not more than 3.0deg. C per hour.
3. As soon as chilled water circulation is started , refrigeration is also put on so as to keep a difference of around 10 deg. C in oil and water temperatures. Faster rate of cooling damages the crystal structure.
4. After attaining the desired oil temperature , say of 24deg. C in around 8 hours , filter the crystallized oil through PP cloth. The press will form approx. 1"thick layer of wax.
5. When the press is full, it can be aired for 1-4hours to reduce the oil content of wax to around 40%. Bottom feed press gives better results as loose oil from such press can be drained out easily and lower airing time ie required.

Two Crystallizers of 15 T working capacity with 36x36x120 plates type Filter Presses will give an output of around 3o TPD by two filter presses.

TIME CYCLE	HOURS
Charging Crystallizers	1
1st Cooling	2
2nd Cooling	8
Filtration	4
Total	15

A 15 TR Compressor and tank having coils to cater15 TR will be sufficient. Crystallizer, water tank and pipeline to be insulated.

PROCESS CONTINUOUS

In this system , in place of one cooling vessel , there are usually 3 vessels. All the vessels have cooling system. Oil from the first vessel flows to 2nd vessel and then to 3rd getting chilled continiously and finally filtered . In this system normally the first vessel is cooled by the final cooled oil being pumped out for BLEACHING and deodorization process for heating.

DEWAXING OF SUNFLOWER OIL

Sunflower oil has a low wax content of around 0.5% to 1.0%. This wax is no special use and is disposed of to either Soap units or transferred to oil meant for Vanaspati Manufacture, as it contains almost equal amount of oil after de-waxing.

PROCESS (CONTINEOUS)

Centrifuge Method:-The oil is generally gum conditioned, neutralized, washed, dried, and bleached.

When centrifuge is used for de-waxing, it is done after the oil has been neutralized and chilled. The Soap particles left in oil act as a carrier of wax. The neutralized oil is mixed with small amount of water, chilled and centrifused. Waxes go out along with soap water. The oil is then heated, washed, dried and bleached.

BATCH PRCESS EQUIPMENT REQUIRED

1. CRYSTALLISER of 15MT capacity:- A heavy lagged, closed vessel with low speed agitator 18 to 20 rpm having cooling area of around 4.5 Sq. M/ T of oil in double coils. One coil to cool the bleached oil to around 35deg. C and the 2nd coil to chill the oil from 35 deg. C to 5-10 deg. C %

   In our country cooling the oil to 5-10deg.C is considered good enough as the filtered oil does not cloud at 0 deg. C.
2. CHILLED WATER TANK, with cooling coils and refrigeration system. A shell and tube type Chiller with smaller water tank is preferred .
3. FILTER PRESS 32"x32"x100 PP plates dressed with -2 layers of Cloth .
4. PUMP, PIPELINES, VALVES, ELECTRICALS, INSTRUMENTS ETC. Entire System to be properly insulated.

METHOD

Pump the bleached oil to crystallizer , cool the oil around 35 deg. C by using one coil for circulating clean spray pond/ cooling tower water

After attaining the temperature, switch over to chilled water cooling system keep cooling till oil reaches a temperature of 5-8 deg. C. and filter over the press .This oil will not cloud at 0deg. C.

TIME CYCLE	HOURS
Charging crystallizer 15 MT oil	0-30 Minutes
1st Cooling to 35 deg.C	1 hr.
2nd cooling to 5 deg. C	4 hrs.
Filtration	5.30 hrs.
TOTAL	

Output capacity in 24 hours will be approx. 25-30 MT. The Refrigeration system required 15 TR. CA

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