



REVIEW ARTICLE

Conventional and Introduced Oilseeds: a Lifeline for Pakistan Household Needs

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ABSTRACT

The oil from plant sources is high valued commodity both for edible or commercial purposes. Likewise, in the world, the demand for high quality vegetable oil is growing with increasing population of Pakistan. Conventional oilseeds like groundnut, sesame, brassica and mustard and introduced crops like soybean, safflower, and sunflower are major sources of edible oil in Pakistan. The current oil production from all these crops cannot meet the national oil demands. So, a huge gap between local oil production and actual consumption is met through heavy imports. Additionally, some non-true crops like cotton, maize, and rice bran could also help in resolving the oil crisis of the country. The potential of these crops is utilized to some extent but not fully uncovered yet. So, in future, appropriate measures should be taken to improve oil quality and quantity in the country.

Key words: Oilseeds, Conventional oilseeds, Introduced oilseeds, Non-true oilseeds, Medicinal oilseeds.

INTRODUCTION

Vegetable oil is a high value agricultural product obtained from plants and oilseed crops are grown worldwide for extraction of edible oil as well as for use in industry. By-products from oilseed crops are used for animal feed, poultry, and industries like medicine, cosmetics, fertilizers, fibers, and paints etc. Oil is extracted from seeds of different crop plants including cotton, soybean, mustard, and rapeseed. Oilseed crops are categorized into two types i.e., conventional (rapeseed-mustard, groundnut, sesame, cotton) and introduced (sunflower, soybean, canola, safflower) (Hussain, 2011). Some non-true oilseed crops cotton, maize, and rice bran are also used for the extraction of edible oils (Syed et al., 2016).

Pakistan is not producing enough edible oil to meet local demand and mostly relies on heavy imports from foreign countries. Edible oils are 3rd largest import of Pakistan after petroleum. Domestic production is only 13% and the rest of the 87% of imports resulting in a burden on Pakistan's economy (Mustafa, 2021). To resolve constraints in enhancing local production, Pakistan edible oil corporation (PEOC) and the Pakistan oilseed development board came into being but a little or no improvement in

oilseed production was observed (Mustafa, 2021). More recently, Pakistan's national seed policy was formulated for improvement of oilseed crops that focuses on use of modern technologies, allocation of designated area for oilseed crops and advanced oil extraction techniques (Farooq, 2023). This can potentially increase the production of oilseed crops and lessen the burden on the economy.

Oil Consumption in Pakistan

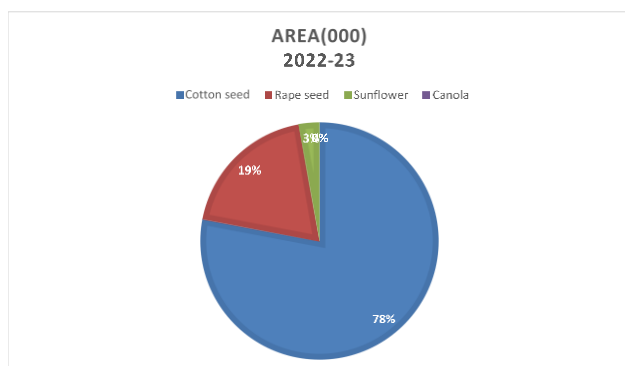
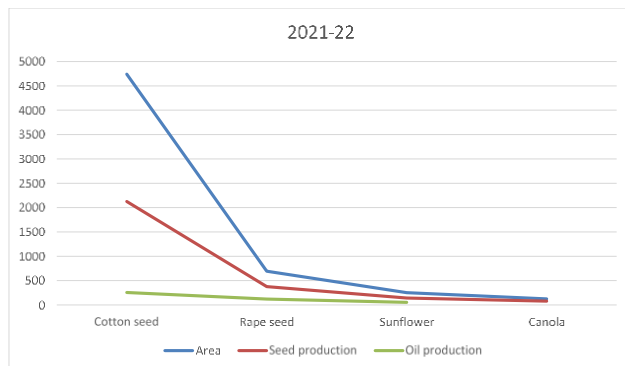
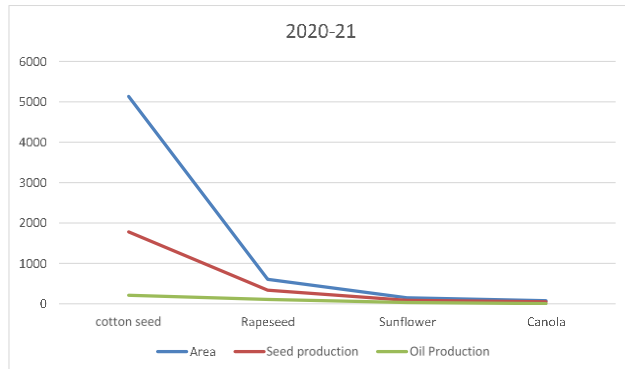
Pakistan is deficit in production of edible oil and relies on import due to the high per capita consumption that has increased from 5.3kg/annum in 1973-74 to 20 kg/annum in 2018 and can increase to 22 kg/annum by 2028. (Rana et al., 2022). The increase in population at alarming rate and change in eating habits e.g., junk food and deep-fried items, demands a large amount of oil. Edible oils are classified into two types: stearing (stearic acid) and oleing (oleic acid), the latter is good for human health but stearic acid is less desirable as it has low carbon compounds plus a high melting point. Average daily oil consumption of world is 4 teaspoons per day per person which makes a total of 7-8 kg per person per year, but in Pakistan use of edible oil is 23-24 kg per person per year, due to excessive use of oil in routine (Mahmood, 2021).

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Area and Production of Major Oil Seed Crops

Crops	2020-21			2021-22		
	Area (000)	Seed Production	Oil	Area (000)	Seed Production	Oil
Cottonseed	5,137	1,782	214	4,740	2,126	255
Rapeseed	608	338	108	692	377	121
Sunflower	151	87	33	253	141	54
Canola	77	49	19	124	79	30
Total	5,073	2,256	347	5,809	2,723	460

Source: Pakistan oilseed development board (PODB), Pakistan bureau of statistics



In 2019-20 total availability of edible oil was 4.316 million tonnes, whereas, the import bill in 1959-60 was US\$ 0.12 million compared to US\$4 billion in 2021 (Rana et al., 2022). Import policies change from time to time which causes fluctuation in the consumption of oilseed crops. The demand for oilseed meals improves due to the extension of poultry farms and animal feed.

During 2019-2020 major contribution of edible oil came from cottonseed, rapeseed, sunflower, and canola (Rana et al., 2022). Oilseed crops are neglected

because of low profitability for farmers and one of the reasons is lack of certified seed in local market. This demands a action plan for enhancing supply chain of certified seed.

Quality of Oil Seed in Pakistan

Pakistan imports palm oil, which is a low in quality oil and causes major health issues (cardiovascular diseases, high blood pressure). Palm oil is majorly used in most edible products. In Pakistan people also extract oil from animal fat which is also an inferior quality oil used by many industries. Edible oil also contains omega 3,6, and 9, and they are important for human health, which are lacking or insufficient in inferior quality of oil used in Pakistan. Polyunsaturated fatty acids are necessary for the prohibition of cardiovascular diseases, but excessive use of ghee (saturated fat) products increases the rate of health problems. The American Heart Association also suggests no more than 5 to 6 % of daily calories intake from saturated fat. Soybean seeds are also imported by the government for oil extraction and meal for poultry. Due to the rise in prices of edible oil, low quality oil gets promoted and causes numerous life-threatening diseases.

Conventional Oil Seed Crops

In Pakistan, many oil seed crops are grown to fulfill the oil requirements of the country. These are mainly classified into two groups i.e., the conventional and the introduced oil seed crops. Conventional oil seed crops are those grown since long such as rapeseed, mustard, groundnuts, sesame, etc., while, introduced oilseeds include sunflower, soybean, and safflower (Farooq et al., 2016).

Rapeseed and Mustard

Brassica (family *Brassicaceae*) is second most important oil seed crop after cottonseed in Pakistan (Farooq, 2023). Oil extracted is used mainly for cooking purposes but efforts are needed to enhance its market value. The quality parameters of the brassica oil is determined by fatty acid composition. Generally oil of brassica (other than canola) has a high content of erucic acid but is still beneficial for industrial uses (Farooq et al., 2016).

Mustard oil comes from the seeds of mustard plants. It is rich in monounsaturated fatty acids, which appear to reduce the likelihood of developing cardiovascular disease. However, cooking with oil may pose a serious risk, especially for children. With an annual production of 233,000 tonnes and a cultivation area of 307,000 hectares, it provides around 17% of domestic edible oil production (2022). Mustard oil is widely used in Pakistan, but many farmers put little to no emphasis on growing this crop. Since wheat and mustard crops are in competition with respect to growing season, mustard is often neglected by farmers. To increase the interest of farmers in mustard, awareness as well as improves varieties of certified

mustard seed supply must be enhanced. Mustard crop has the potential to improve situation of oil industry by decreasing the gap of import and usage of oil in Pakistan.

The farmers are tilting towards brassica cultivation but they face many problems like non-availability of high-quality seed, lack of specific machinery, uncertain market price and non-adoption of recommended production technology (Rana et al., 2022). By providing proper awareness to farmers, we can improve cultivation of conventional oilseeds especially brassica and thus contribute to enhance local oil production.

Ground Nuts

Groundnut is used for roasted nuts and confectionery products and almost no oil is extracted from it. Other crops such as sesame, sunflowers, soybeans, and safflowers all together contribute only about 5-6 % of the local edible oil production. The planting of groundnut on a commercial scale first time in Pakistan was done on 400 hectares in the Rawalpindi division (Abbas et al., 2010). Later on, as the production technology developed, it spread to the provinces of Sindh and NWFP but the area in these provinces was very small. The area under the groundnut crop increased slowly and reach 50,700 hectares during the last years. To predict the highest yield of groundnut, research conducted in Pakistan has shown that the highest yield of groundnut is 2000kg/ha (Abbas et al., 2010).

The major reasons for the low cultivation of groundnut include the non-availability of high-yielding varieties, short-duration varieties, pest attack and disease infestation in groundnut crops. If these problems are tackled the cultivation of groundnut can be increased and we can also improve oil production and quality of oil produced in Pakistan.

Sesame

Sesame is the most ancient and important oilseed crop. Sesame seeds have been found from excavations at Harappa, Pakistan. It is cultivated in a limited area and is considered a minor oilseed crop. Like other conventional oilseed crops in Pakistan, the area under sesame is almost stagnant. It was grown on 30,800 hectares, and thereafter increased gradually up to 1981-82 (Abbas et al., 2010). The area once again started dropping and reached 18,000 hectares. Over the last 19 years, the sesame area has shown a negative growth rate of 2.18 percent per year. The total production of sesame was 10,100 tons in the past (Abbas et al., 2010).

The main reasons for low production of sesame in Pakistan are lack of access to improved and high-yielding varieties, shattering losses, cultivation of sesame on marginal lands, and low use of fertilizers. Most of these problems can be solved by proper training and awareness to farmers. Work on improved and shattering resistant varieties is being done in research institutes of Pakistan.

Introduced Oilseed Crops

Soybean

The soybean crop has great nutritional value and commercial significance. Global annual production is increasing steadily. Its demand is increasing day by day due to its great nutritional composition and end uses. The seed contains 40-42% protein and 18-22% oil content. This protein and oil content range is good for the animal and human consumption. Soybean (*Glycine max*) is known to be grown in the northern region of Hazara, Azad Kashmir, Sawat, Dir, and Kuran agency of Pakistan since time immemorial. Local black and chocolate-colored pulses now identified as soybean have been grown from ancient times in the hills of the northern region. Mothi (*Glycine max*. L.Merrill) is the landrace of soybean. Mothi is cultivated for feed and forage in the Hazara region (Asim et al., 2005).

Some research work was started in 1960s in KPK to improve some prevailing varieties and introduce new varieties. The main problems of soybean production in Pakistan are unfavorable climate conditions, nonavailability of machinery, high cost of production. Soybean is under research as an oil seed crop for the last 20 years. Many attempts are made to introduce soybean for commercial planting but all in vain. Soybean grows in very small areas in Punjab, Sindh, and NWFP. In NWFP, 59% area is cultivated in the Hazara division, and the rest of the area is distributed in the Malakand division and federally administered tribal area. In Sindh soybean is grown in the Hyderabad division. In Punjab, soybean is grown in Multan in a very small area (Asad et al., 2020).

Comparison of Main Producing Countries of Soybean with Pakistan

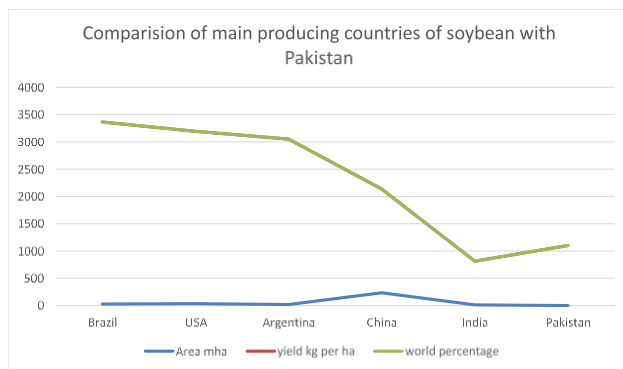
Country (world %)	Area in m.ha	Production (MT)	National contribution
Brazil 40%	38.44	163,000	Mato Grosso, Parana, Rio Grande do Sul, Goasis, Mato Grosso do Sul
USA 28%	33.73	114,454	Low, Illinois, Minnesota, Nebraska, Indiana
Argentina 12%	16.6	48,000	Buenos Aires, Cordoba, Santa Fe, Santiago del Estero
China 5%	10.5	20,500	Heilongjiang, Nei Mongol, Anhui, Sichuan, Henan
India 3%	11.34	12,000	Madhya Pradesh, Maharashtra, Rajasthan
Pakistan	0.0001414	0.000152	KPK, Sindh, Punjab

Source: Soybean Map, Foreign Agriculture Service, U.S. Department of Agriculture

Safflower

Safflower (*Carthamus Pistorius*) is used as an oilseed crop. Safflower (*Carthamus tinctorius* L.) is an oilseed crop that has not yet reached its full potential for oil and protein cake production. It is grown in Asia, North America, and South America. One of the advantages of safflower is its ability to thrive in diverse

environments, including those with drought, strong winds, hail storms, and flooding. Its tap root system makes it an ideal crop for arid agricultural land or areas with seasonal rains. Safflower plants vary in size, ranging from 30 cm to 1.5 m, and have flower heads of different colors, such as yellow, orange, and red. There is a growing interest in developing new safflower varieties with higher seed oil contents. Research is also being done on creating varieties with a healthy fatty acid profile, particularly high levels of mono and polyunsaturated fatty acids. It is very useful for cardiac problems. In the past, Safflower was grown as a source of dye, medicine, and human food. Safflower did not get attention as an oil seed crop. It is still neglected as an oil seed crop.



It is introduced as an oil seed crop in the 1960s. It has been grown on a very small land area. It has been cultivated in Attock, Faisalabad, Vehari, Sialkot, Thatta, Swat, and others. Main problems faced by farmers in safflower cultivation are: spiny nature, lack of high-yielding varieties, competition with winter crops, long-duration crops

Sunflower

Sunflower (*Helianthus annuus*) is the most important oil seed crop. During the eighties, it was introduced by Ghee Corporation of Pakistan. The farming community recognizes the importance of sunflower due to its short duration and ability to be grown between two major crops. Its oil has numerous health benefits and is of excellent quality for cooking. It is considered stable for frying, enhancing the natural taste and flavor in the kitchen.

The issue of impurity in edible oil is a significant concern, leading to large amounts of money being spent on importing it in Pakistan. While the expansion of sunflower crops fluctuates due to various production and socioeconomic constraints, research has shown that sunflower has the potential to adapt and grow under moisture-stressed and irrigated farming systems in different ecological zones of Pakistan. The procurement assurance policy enhanced the cultivation of sunflowers. The area under cultivation of sunflower is declining since 2010 (Zohaib, 2019). Major constraints are: uncertain price, less availability of quality seed, non-availability of hybrid

seed, high cost of imported seed, lack of planting, harvesting, and threshing machinery, insufficient marketing.

More than 80% of sunflower grows in cotton belt areas like southern PUNJAB after the late picking of cotton. Oilseed research institute (ORI) at Ayub Agriculture research Institute, Faisalabad has introduced a short-duration sunflower in order to avoid the overlap with the cotton growing season.

Sunflower Cultivation Areas in Pakistan

Punjab	Multan, Vehari, Lodhran, Bahawalpur, Rajanpur, Muzafarfarghar, Dera Ghazi Khan, Layyah
Sindh	Badin, Thatta, Umarkot, Mirpur Khas, Tando Muhammad Khan, Sanghar.
KPK	Dera Ismail Khan, Swabi, Mardan, Waziristan
Baluchistan	Sibi, Nasirabad

Recent Varieties and Hybrids of oilseed Crops Available in Pakistan

Name of Variety	Year of Release	Organization
ORISUN-648	2021	ORI, FSD
ORISUN-516	2020	ORI, FSD
AARI Soybean	2021	ORI, FSD
NARC 2016	2016	NARC, ISLAMABAD

Source: Ayub Agriculture Research Institute

Non-True Oilseeds

The non-true oilseeds are crops whose primary function is not oil extraction but they still play a huge part in the oil industry by contributing their share. These crops play an important role in the oil industry of Pakistan. These three crops are usually regarded as non-true oilseeds; namely cotton, maize, and rice bran.

Cotton

Cottonseed is the major oilseed crop grown in Pakistan, accounting for more than 84% of domestic oilseed production (Shafiq, 2021; Zafar et al., 2024a). Although cotton is primarily grown for its use in the textile industry, it still plays a huge part in meeting the oil demands of Pakistani households. But in recent years, due to a decline in cotton yield, there may be a threat to the oil industry as a large amount of oil comes from cottonseed (Kamal et al., 2024).

Refined cottonseed oil is used as a cooking oil. But gossypol, a natural antioxidant of cotton, has to be removed to use it as cooking oil. Its fatty acid contents have 70% unsaturated fatty acids. Cottonseed oil is named by scientists as “naturally hydrogenated” oil (2015). So, it is also suitable for frying. Cottonseed oil has many advantages and it can also solve many problems if used as an oilseed (Razzaq et al., 2023).

Cottonseed is a really good alternative to meet our oil demands domestically (Zafar et al., 2023). Cotton can be used as a tool to meet our oil and fiber demands. The factors that affected cotton production in recent years should be identified and solved. But

solely relying on cotton will not help our oil industry. So, along with using cottonseed, we should also look for other possibilities for meeting our oil demands (Zafar et al., 2022).

Maize

Just like cotton, maize is also a crop that is not traditionally an oilseed crop. But it is widely used as an oilseed worldwide, especially in Pakistan. Maize production in Pakistan has increased throughout the years growing at an annual rate of 5.38% (Ali et al., 2010). Maize oil is also used for cooking and due to its high smoke point; it is considered good for frying. Its oil has a large amount of unsaturated fatty acids ranging from 65 to 85% (Ali et al., 2010).

Corn oil is an emerging industry with huge potential. For oil extraction, maize corn should be crushed, so unlike cotton, it is useless to be used for other purposes. So, it can either be used as an oil source or for other purposes. This downside of maize also makes using it as an oilseed alternative difficult. So, we cannot entirely rely on maize for our oil supply. But it could be a good source for meeting oil demands to some extent, especially for a developing country like Pakistan. Studies should be done to use corn oil as effectively as possible without affecting its other uses. Also, the quality and nutrition of oil should be increased so it can be used widely as cooking oil.

Rice Bran

Rice Bran is another example of non-true oilseed whose potential is not fully exploited. If the potential of Rice Bran Oil is fully exploited, the major crisis of oil can be solved in Pakistan. It is mainly produced in Japan, China, India, and Vietnam (Godber, 2009). It is produced to some extent in other countries but mainly oil is used for non-edible or industrial purposes.

Rice bran oil has great potential to be used as edible oil. It has many health benefits. Research shows that rice bran oil lowers cholesterol levels, inhibits platelet aggregation, and decreases the chances of early atherosclerosis (Godber, 2009).

Rice bran oil can be extracted mechanically or chemically by oil presser and solvent respectively. As a result, crude oil and defatted rice bran are produced (Binu, 2023) But care should be taken with rice bran as after removing bran from grain its quality decreases quickly. This is due to lipase hydrolysis reaction in rice bran (Binu, 2023). So, to solve this problem extraction should be done as soon as possible after removing bran from the grain. A common approach to this problem is that the extraction units are fixed with de-hulling units. Immediately after bran removal, oil is extracted. So, there is no time for hydrolysis, and the quality of the oil is not compromised.

There is a lot of potential in the rice bran oil industry. In countries like Pakistan, it could be used to narrow the gap between oil demand and oil production. For this, proper guidelines and machinery

should be provided. Our oil industry can improve by utilizing the potential of rice bran oil.

Medicinal Oilseeds

Oilseed crops are rich in nutrition and beneficial qualities. The use of oilseeds for medicinal purposes is a rising interest in developed countries. Because they are rich sources of many bioactive compounds like phenols, proteins and minerals. Oilseeds are a great source of affordable and potent bioactive compounds (e.g., carotenes, flavonoids, PUFAs, organo-sulphur compounds, phytosterols, and polyphenols) generally used in the pharmaceutical (anti-microbial toxins, adjuvants for cancer therapy, cholesterol-lowering therapeutics), agricultural (animal welfare) and cosmetic (oil-based creams) industries (Morya et al., 2022). Some important oilseeds suitable for use as medicinal purposes are described below.

Jatropha

Jatropha is a plant belonging to *Euphorbiaceae* family. This family is mainly known for its medicinal properties. All parts of jatropha plants i.e.; seeds, leaves and also bark are used for traditional as well as veterinary medicine. Jatropha oil makes a promising biofuel and contains high energy contents. Although all parts of plant have many nutritional as well as medicinal benefits, the jatropha seed oil can be used for the treatments of diseases like rheumatic diseases, parasitic skin diseases, jaundice, fever, and as a diuretic agent (Passarini Junior et al., 2012). For this reason, it is found in folk remedies of many countries. As this plant can be grown in poorly fertile soils, it can be cultivated in Pakistan and we can reap its benefits as biofuel as well as a medicinal oilseed. In this way, problems like energy crisis and oil import of Pakistan can be tackled to some extent.

Olive Oil

Olive oil is vegetable obtained by pressing whole olives and extracting oil. It is the most liked oil and used in many fancy, gourmet dishes because of its versatility. It can be used in variety of dishes from baked goods to salads, stir-fried as well as marinating recipes. The nutritional properties of olive oil also add to its wide use. Olive oil is very helpful in the prevention of many diseases. Olive oil can be used as a primary and secondary protection to prevent cardiovascular diseases as its consumption increases the concentration of high density lipoproteins (Alasmari et al., 2020). Olive oil is considered helpful for intestinal health as it can stimulate useful gut micro bacteria. Consumption of extra virgin olive oil can also control blood pressure. The phenolic compounds of extra virgin olive oil acts as antioxidants (Alasmari et al., 2020).

Mostly olives are cultivated in Mediterranean Basin countries. Spain, Greece and Italy contributes to almost 77% of world's production of olives (Torres et al., 2017). But Punjab region of Pakistan is suitable for olive

cultivation especially in winter. Olive is a beneficial crop for Pakistan not only for its nutritional and medicinal importance but also because of high benefit to cost ratio. Olive oil will also help in reducing the gap of oil demand and local production.

Castor Oil

Castor is a member of the *Euphorbiaceae* family that is found across all the tropical and semi-tropical regions of the world. Castor oil is nonedible and has been used almost entirely for pharmaceutical and industrial applications. Since castor is not a legume researchers should avoid the use of the term “castor bean” frequently found in the literature on this crop. Castor crop is important for oil production, with over 400 commercial uses including medicines, cosmetics, and the production of biodiesel. Global castor production in 2010 was approximately 1.76 million tons, but it is a neglected crop in Pakistan. The area under castor cultivation has been decreasing in Pakistan since 1979, with a reduction from 5066 hectares in 2006 to 3390 hectares in 2010.

Castor bean oil has versatile applications in pharmaceuticals, cosmetics, chemicals, biodiesel, and more recently, the food industry due to its unique physiochemical properties. The oil composition of castor beans includes 1-5% saturated fatty acids, 2-4% oleic acid, 3-6% linoleic acid, and 80-90% ricin oleic acid. The high viscosity and density of castor oil contribute to its high ricin oleic acid content. Castor oil is known for its high stability, hygroscopicity, and solubility in alcohol, which affect transesterification reactions. It is important to introduce new high-yielding varieties of castor beans that have been developed worldwide and assess their performance in domestic climatic conditions.

Lemon Oil

The Citrus genus is a part of the Rutaceae family, which encompasses approximately 140 genera and 1300 species. A significant species within this genus is the *Citrus limon*, otherwise known as the Lemon. Essential oils, which are made up of numerous beneficial natural products, can be classified as blends of hydrocarbons, compounds with oxygen, and non-volatile residues. These elements include terpenes, sesquiterpenes, aldehydes, alcohols, esters, and sterols. There are many benefits of lemon oil such as calming, carminative, anti-infection, astringent, detoxifying, antiseptic, disinfectant, sleep inducing, and antifungal properties.

Tea Tree Oil

The Myrtaceae family is a primary source of essential oils, and within this family, the genus *Melaleuca* is particularly well-known for its high essential oil content. *Melaleuca* is native to Australia but can thrive in different climates and environments. Several major species of *Melaleuca*, including *M.*

alternifolia, *M. quinquenervia*, *M. bracteata*, and *M. cajuputi*, are used for oil extraction, resulting in tea tree oil (TTO), which is renowned worldwide. During World War II, TTO found applications as an insect repellent and a broad-spectrum antimicrobial agent. Over time, its uses have expanded, and it has gained popularity in various industries for its roles as a preservative, fungicide, natural biocide, and in the production of cosmetics, aromatherapy products, as well as allopathic and herbal medicines, among others.

Flaxseed Oil

The flax plant (*Linum usitatissimum*) is an ancient crop that has been cultivated since the beginning of civilization (Kirylyuk and Kosticka, 2020). *Linum usitatissimum* L. contains up to 45% oil. Linseed oil is a favorable fatty acid composition with a high linolenic acid content. Flaxseed oil is a valuable raw material for food and medical purposes due to its fatty acid composition and high content of linolenic acid. Omega-3 polyunsaturated fatty acids (PUFA) have shown that these compounds have therapeutic potential in several indications in neurology, psychiatry and cardiovascular disease (Nožinić et al., 2022).

Flaxseed oil's high ALA content may contribute to reducing inflammation and improving cardiovascular health. Flaxseed oil contains lignans, which are compounds that possess antioxidant properties and lignans may have anticancer effects, particularly in breast and prostate cancers. It also used for treatment of constipation (Goyal et al., 2014).

Barley Oil

Barley oil, also known as barley seed oil or barley extract, is derived from the seeds of barley (*Hordeum vulgare*), a cereal grain. It has been used traditionally in various cultures for its medicinal properties and health benefits. Barley is high in fiber, especially beta-glucan, which may reduce cholesterol and blood sugar levels. It may also aid weight loss and improve digestion. Cardiovascular disease (CVD) and diabetes primarily in the form of heart disease are treated by (β -glucans) barley (Pins, 2006).

Barley is used for lowering blood sugar, blood pressure, and cholesterol, and for promoting weight loss. It is also used for digestive complaints including diarrhea, stomach pain, and inflammatory bowel conditions. Some people use barley for increasing strength and endurance.

Role of Plant Breeding

Advancements in plant biology and technology have significantly improved our understanding of crops and their manipulation. The "Green Revolution" in the mid-20th century utilized breeding and selection methods to substantially increase cereal production and prevent widespread famine. In the 2000s, focus shifted towards genomic approaches to plant breeding, employing technologies like marker-assisted selection,

next-generation sequencing, genetic engineering, and automatic mutagenesis/selection. These methods are now being applied to various crops, particularly oil crops, to enhance both food and non-food yield as well as the nutritional and technical quality of oils. Goals include increasing overall oil yield and stability on a per seed or per fruit basis, as well as achieving high oleic acid content in seed and fruit oils for premium edible and oleochemical applications. Other targets involve developing oils enriched in "fish oil" fatty acids like eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), or increasing levels of lipidic vitamins such as carotenoids, tocopherols, and tocotrienols (Murphy, 2014). Encouraging progress has been made in producing these oils in commercial crops, with several varieties already released or in advanced stages of development.

Future of Oilseed in Pakistan

If import is remained unchecked, with 5% increase in demand coupled with 5% price hike in global market each year, it may go up to 757 billion rupees in the year 2025 (Mustafa, 2021). During 2022-23 domestic edible oil production was 0.496 million tons which were 15.67% against the total availability of 3.177 million tons. Pakistan had to import 2.681 million tons (84.38%) of edible oil and oilseeds to fulfill domestic needs by spending Rs. 826.482 billion (Farooq, 2023).

There are some Prospects for Oilseed

Establishment of centers in collaboration with stakeholders at the grain market
 Provide availability of high-yielding seed
 Provide credit facilities for buying inputs
 Provide certified seed
 Availability of machinery for better yield (Mustafa, 2021)

Oilseed Production can be Increased by

The surplus area of wheat and sugarcane can be brought under Canola and Sunflower cultivation. There exists the possibility of enhancing oilseeds production by up to 34.41% of the domestic needs using additional areas from wheat and sugarcane. On the other hand, Olive, Oil-palm, Coconut, Soybean, Camelina, and Safflower cultivation should be promoted with a complete package of production technology in potential areas as alternative options to achieve self-sufficiency in edible oil.

Some Objectives to Increase Oilseed Production are

Development of high yielding, disease tolerant, insect or pest tolerant, varieties with better oil quality under climate change
 Development of appropriate production technologies for better yield
 Identification of crop production issues due to biotic or abiotic stresses.
 Development of canola version varieties in Rapeseed

and Mustard.

Conclusion

Oilseed crops are the main source of edible oil and are grown all around the world. Pakistan is in deficit in the production of edible oil and due to the high consumption of oil Pakistan has to import. Per capita consumption increases from 6kg/annum to 18 kg/annum. Oilseeds are rich in protein, and in addition they contain a high level of fat. Hence, they are not only good sources of protein, but also concentrated source of energy.

Four groups of the oil seed crop. One is in conventional oil seed, 2nd is non-conventional oil seed crops, 3rd is non-true oil seed crops and 4th is medicinal oil seed group. Conventional oil seed crops are those grow for a long time such as rapeseed, mustard, groundnuts, sesame, etc. Nonconventional are sunflower, soybean, and safflowers. Non true oil seed crops are cotton, maize and rice bran. Medicinal oil seed crops are olive oil, jatropha, tea tree oil, barley oil, flax oil, castor and lemon oil.

Oil seed production should be increased to meet the needs of people by development of high yielding, disease tolerant, insect or pest tolerant, varieties with better oil quality, climate resilience. Oilseed production is low as compared to major crops so by developing biotic or abiotic resistance, farmer can get higher oil yields, leading to self-sufficiency in coming years.

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