The future potential of oleic type sunflower in Turkey

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ABSTRACT

Whereas traditional sunflower with high linoleic acid is predominant, the worldwide demand for oleic-type sunflower has been increasing gradually. However, while oleic-type of sunflower has been raised in the USA since 1995 with the mid-oleic NuSun trademark, sunflower produced in Turkey is still almost only of the linoleic acid type and few steps have been taken so far to make the oleic-type more widespread in both production and usage in this country. Aside from the U.S., the most important European sunflower production has totally shifted to oleic-type and now even 75–80% of the share has been reached in France. Actually, Turkey has a big potential for oleic-type of sunflower oil since 600–700 t of worldwide sunflower oil consumption of around 10 million t is consumed by Turkish people. Besides, contrary to the traditional linoleic-type, oleic type sunflower oil totally conforms to EU Biodiesel Standard of EN 14214 and Turkish Biodiesel Standard of TS EN 1421 due to its lower iodine value. Therefore, oleic-type of sunflower may be an alternative for biodiesel production in Turkey while Turkish crude petroleum imports may reach even 20 Billion USD in 2008 with current record petroleum prices. Moreover, at least half of Turkish edible refined sunflower oil is consumed via collective (catering firms, hotels, restaurants, etc) ways and so multi-usage advantage (improved frying and cooking performance) of oleic-type sunflower oil will reduce the dependency of Turkey with lower imports.

Key words: biodiesel – oleic – sunflower – Turkey.

INTRODUCTION

Turkey's varied ecology allows farmers to grow many crops, but most arable land and the greater part of the farm population have been traditionally allocated to producing cereal crops, which are mostly wheat and barley. Other grain crops including rye, oat, corn, and rice, are produced in most parts of Turkey. Industrial crops follow the grains, i.e. cotton, sunflower, sugar beet, tobacco etc. However, it should not be forgotten that pulses such as chickpea and lentils, forage crops such as alfalfa, vetches, sainfoin, are considered as being the main field crops of Turkey.

Sunflower is the most important oilseed of Turkey as sunflower oil has a 70% (600–700.000 t) dominance in Turkish liquid vegetable oil consumption. However, sunflower production of around 800,000 t is not enough to meet the domestic sunflower oil requirements of Turkey. Therefore, Turkey is second in the world ranking in both sunflower and sunflower oil imports. Unlike the emerging worldwide trend, currently all sunflower production is still unfortunately of the conventional linoleic-type in Turkey. Actually, there is a big potential for oleic-type sunflower in Turkey due to a higher edible sunflower oil consumption and bigger biodiesel demand.

The potential planting areas of oleic type sunflower in Turkey

Turkey is among the largest countries in Europe (and is in the world's top 20). Its size is comparable to that of France and the United Kingdom together and Turkey's area is around 20% of the EU- 25 surface. The most important land use for crop production is wheat, which supplies 70% of Turkey's food consumption in terms of calories, with an area of about 10 million ha. With an average wheat harvest of 20 million t per year, Turkey's wheat production amounts to approximately 15% of the EU-25 wheat harvest. The total production area of cereals is about 13 million ha out of a total of 18 million ha of cultivated areas. About 5 million ha of the agricultural area could be considered as fallow land, which is an important form of land use especially in dry regions (Table 1). Crops are the most important products with 55.8% of total value of agricultural production, split between cereals (11.6%), industrial crops such as sugar beet and tobacco (6.4%), vegetables (13.7%), fruits (17.4%) and other crops. Wheat is the most important single crop with 7.9% of total output value in Turkey. Therefore, wheat has long been the basic food in the Turkish diet, generally eaten in the form of bread, whose Turkish per capita consumption ranks among the highest in the world.

Table 1. Land use in Turkey (1,000 ha)[1]

Agricultural Area	41,690
Arable & Permanent Crops	28,523
Arable Land	25,938
Wheat Planted Area	9,400
Barley Planted Area	3,500
Maize Planted Area	800
Fallow Land	5,000
Irrigated Land	5,215
Perm. Crops	2,585
Perm. Pasture	13,167
Non Arable Permanent	48,440
Land Area	76,963
Total Area	77,482

[1]FAO Statistical Database

Based on this situation, Turkey has enough potential both for its domestic needs and also export to Middle East other Middle Asian countries and North Africa due to its geographical location and also its close relationships. Therefore, Turkey allocates or directs farmers to apply for subsidies to produce more oil crops, especially sunflower due to its greater adaptation capability and also low labor needs. At the moment, 70–80% of sunflower production is raised in Trakya, the European part of Turkey. However, Anatolia is also quite suitable for sunflower. If Turkish farmers become convinced that oleic-type of sunflower crop is more lucrative vis-à-vis alternative crops of wheat, sugar beet etc, sunflower production will be also equally widespread in South and East Marmara, Black Sea Region, Middle Anatolia, Cukurova (Adana city and around), GAP Region (near Syrian border) and Aegean Region as second crop in Turkey (Fig. 1).

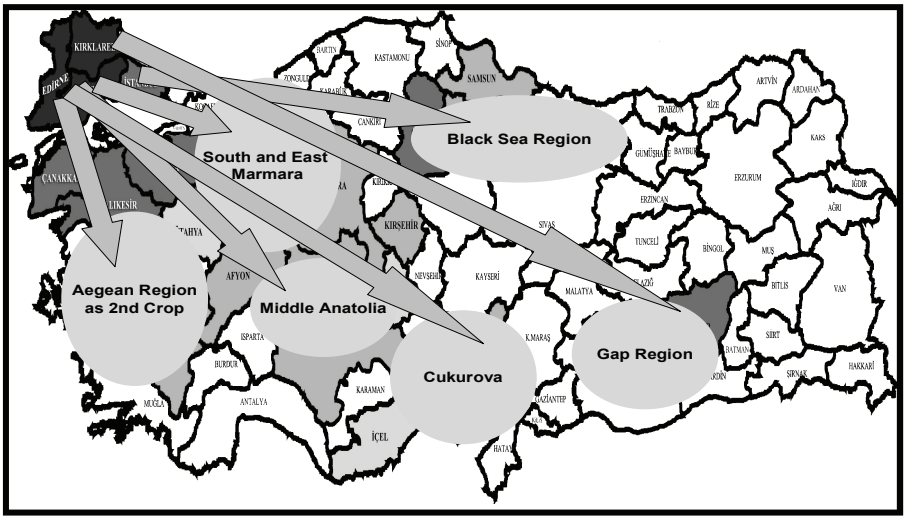

Fig. 1. Oleic type sunflower potential areas by regions in Turkey

The potential use of oleic type sunflower as biodiesel source in Turkey

Sunflower is produced in the world generally for human and non-food purposes (cosmetics, paints, etc.) due to the oil and fatty acid composition of the seed being adapted to these uses. Normally, world-wide sunflower use for edible oil, but non-food consumption has increased in recent years, especially after the planting of higher oleic types in Europe. High oleic sunflower which was first discovered by Soldatov (1976) in Russia, has become popular in recent years in the US, Argentina, and some European countries. However, while mid-oleic ones (60-70% oleic level) are more popular in US and Argentina especially as frying oil in fast food and chips, planting areas of high oleic types (over 80-85%) have gradually been increasing year by year in main sunflower producer countries in Europe such as France (75%), Spain (50%), Hungary (10%), etc. Oleic sunflower production and consumption started rapidly both for healthy frying oil, and also non-food purposes like biodiesel in recent years, but there is not yet enough production for biodiesel due to the high demand for frying oil in Europe.

Due to the especially low iodine value and higher oxidative stability of mid-oleic and high-oleic sunflower oil versus currently dominant linoleic sunflower oil (Vannozzi, 2006; Kaya et al., 2007a, b) oleic-type sunflower oil may also be an alternative biodiesel source in Turkey (Table 2). Oleic sunflower oil conforms to both EU Biodiesel Standard of EN 14214 and Turkish Biodiesel Standard of TS EN 1421. This means that domestically produced oleic sunflower oil could be easily used as a biodiesel source either for domestic consumption or for export to European Union or other destinations.

Table 2. Physical and Chemical Properties of Oil [1]

Oil Type	Iodine Value	Cetane Number	Lower Heating Value (kJ/kg)	Viscosity (mm2/sn)	Cloud Point (ºC)	Pour Point (ºC)	Flashing Point (ºC)
Normal Diesel	115-120	40-55	43-45.000	1,3-4.1	-15 - 5	-35 - 15	120-130
Biodiesel US ASTM standard	93	45	-	1.9-6.0	-	-	>130
EU Biodiesel standard	115	49	-	3.5-5.0	-	-10	100
Canola Oil	94-120	37.6	39.709	3,7	-3.9	-31.7	246
Mid Oleic Sunflower Oil	**94 – 122**		**-**	**4,1**	**-**	**-33**	**250**
High Oleic Sunflower Oil	**88-115**	**49-53**	**-**	**4.8**	**-10**	**-27**	**270**
Linoleic type sunflower Oil	110-143	37.1	39.575	3,7	7.2	-15	274
High oleic Safflower Oil	90-100	49.1	39.516	4,1	-12.2	-20.6	293
Safflower Oil	126-152	41.3	39.519	3,1	18.3	-6.7	260
Sesame Oil	104-120	40.2	39.349	3,5	-3.9	-9.4	260
Cottonseed Oil	90-119	41.8	39.468	3,35	1.7	-15	234
Palm Oil	36-61	42.0	-	-	-	-	-
Soybean Oil	117-143	37.9	39.623	3,3	-4.9	-12.2	254

[1]Albiyobir, 2007

Turkey is one of the biggest crude petroleum importer countries in the world. Import demand is getting higher year by year and Turkey imports about 23 million t crude petroleum each year. Furthermore, with record crude petroleum prices over 100 $/barrel, the invoice of crude petroleum imports in the Turkish budget has reached 12 Billion USD in recent years. When vegetable oil imports are added to petroleum products, both items incur the largest amount of costs to the Turkish Economy (Table 3).

At the present time, Turkish biodiesel production capacities exceed over 1.5 million t and Turkey ranks second with this capacity in Europe after Germany (Albiyobir, 2007). However, the capacity usage ratio never exceeds 20% due to supply shortages. Currently, canola is the main biodiesel oilseed raw material while canola production is just 25–50.000 t in Turkey. Therefore, the largest part of the raw material is provided via imports (245.000 t, 104 million USD in 2007). Based on PETDER report (2007), Turkish annual diesel consumption was around 16 million m^3 in 2006 and in Jan / Sep 07 consumption already reached 11.53 million m^3. From these figures, the current annual Turkish diesel production could be reckoned to be around 15–16 million m^3.

By Turkish Cabinet Decree No. 2006/11202, announced in Official Gazette No. 26370 dated December 8th, 2006, the Government lowered by 2% the biodiesel OTV/Special Consumption Tax (957 YTL/m^3 for Diesel 50) (PETDER Report, 2007) if the biodiesel was manufactured from domestically raised oilseeds.

Table 3. Vegetable seed and oil as well as crude petroleum imports (USD) by years in Turkey[1]

Years	Vegetable Seed + Oil +Meal	Crude Petroleum	Total
	Million USD	Million USD	Million USD
2004	985	6,092	7,077
2005	1,286	8,650	9,936
2006	1,354	10,707	12,061
2007[2]	1,588	12,000*	13,588

[1] TUIK, Turkish Statistical Institute, [2]Forecast

Even with 2% biodiesel directives (unfortunately there are still no directives in Turkey), Turkish biodiesel requirement should be a minimum of 275.000 t. If biodiesel directives are increased to 5.75% like the EU-27 2010 target rate, the requirement should be increased to around 900.000 t. Aside from Turkey, EU requirement with 5.75% directives will reach 18 million t in 2010 and it is totally impossible to produce this quantity in EU arable lands. Please note that current EU biodiesel manufacturing is around 6-6.5 million t and will be increased to 8–9 million t maximum in 2010. In other words, at least half of the EU requirements have to be supplied by imports. At this point, Turkish biodiesel production could play a big role by using its logistics advantages both for Europe and also higher domestic consumption and reduced high import costs (Kleindorfer and Oktem, 2007).

The potential use of oleic type sunflower as edible oil in Turkey

Vegetable oils processed by crude-oil processing industries have an important role in human nourishment as well as human health. Turkish people consume 19.5 kg per capita vegetable oil (in 2005) per year. Turkish annual sunflower oil consumption is around 600–700.000 t and constitutes 70% of domestic liquid vegetable oil consumption (Table 4). Another use of sunflower oil in Turkey is in margarine using for direct consumption, for breakfast and other meals, and in the food industry too (Table 5). The most important objective, with the expansion of oleic-sunflower oil in the market, instead of unconscious and meaningless classifications like only sunflower oil, corn oil, soybean oil, is that building up consumer awareness, with a new classification like frying oil, cooking oil, salad oil or dressing etc, as it will really appear on the Turkish oil market.

Table 4. The using purposes of vegetable oils (t) in Turkey

	2002-2003	2003-2004	2004-2005
Refined sunflower oil	452,000	537,000	579,000
Refined corn oil	108,000	71,000	102,000
Refined Soybean Oil	57,000	35,000	81,000
Others	118,000	95,000	88,000
Liquid total	735,000	738,000	850,000
Margarine total	419,000	447,000	491,000
Total (t)	1,154,000	1,185,000	1,341,000

Table 5. The Using purposes of margarines (1,000 t) in Turkey

The Usage	1997	1998	1999	2000	2001	2002	2003	2004	2005
Breakfast Margarine	167	168	182	171	160	171	160	161	168
Meal Margarine	74	64	77	66	70	65	59	57	65
Industrial Use	163	136	161	162	163	183	200	229	258
Total	404	368	420	399	393	419	419	447	491

Despite there not being any typical research on this theme, it is assumed that at least half of sunflower oil consumption is via collective ways like catering firms, hotels, restaurants etc in Turkey. Therefore, there is a very big potential for this area too, and after introducing oleic sunflower oil, meal and frying quality will improve, because stomach problems frequently appear in Turkey due to the poor quality of the oil used in the restaurants.

Catering area has been one of the most popular sectors in Turkey in recent years and its capacity exceeds over 4.5 Billion $ in 2007. Catering firms which in Turkey have reached 5,000 in number and they serve over 7 million people (Celebi, 2007). However, the sector potential has been estimated as being about 22 million people in the near future. Therefore, oleic sunflower oil will also play an important role in improving served meal quality and rapidly developing this sector.

Furthermore, tourism is another booming sector in Turkey and Turkey has become one of the most preferred destinations in Europe in recent years presenting excellent landscapes, beaches, historical ruins and service in many hotels. Tourists visit Turkey in large numbers and the bed capacity has gradually increased each year, and the five star hotels exceeded over 500 in 2006 (Table 6). Turkish tourism income reached 14 million $ and tourist numbers exceeded over 23 million in 2007 (TUIK, 2007). The tourist sector has a high potential for edible sunflower oil consumption as oleic sunflower oil will contribute to increasing food quality of frying, meals and salad dressing, etc.

Table 6. Tourism potential of Turkey in recent years[1].

Years	No. of Hotels	No. of Rooms	No. of Beds	No. of Tourists	Tourism Income ($)
2001	3,235	284,054	597,866	11,618,969	8,090
2002	3,262	293,299	619,024	13,256,028	8,473
2003	3,370	314,233	663,300	14,029,558	9,676
2004	3,508	336,547	713,714	17,517,610	12,124
2005	3,451	359,128	761,585	21,124,886	13,929
2006	3,344	365,028	783,319	19,819,833	12,554

[1]TUIK

Oleic sunflower oil has multi-usage advantage (perfect frying and cooking performance) versus linoleic sunflower, so it may attract demands from this sector. Moreover, like in the USA, Fritolay/Turkey (Fritolay, 2007) also supports oleic sunflower oil usage in their products due to its longer shelf life and healthier characteristics. Consequently, high oleic sunflower oil has been in the chip products portfolio since November 2007. This will be gradually spread to all Fritolay products.

CONCLUSIONS

To popularize oleic-type of sunflower oil in Turkey vis-à-vis traditional linoleic sunflower oil is absolutely vital to achieve new trends in most major sunflower producer countries. There is no marketing problem as oleic sunflower oil can be easily consumed in both the food (as edible oil etc.) and non-food (as biodiesel etc.) sectors. As oleic sunflower has a price premium compared to linoleic-sunflower, Turkish farmers will also benefit from the cultivation of the oleic type. Oleic sunflower will also reduce the dependency of Turkey by lowering sunflower complex and crude petroleum imports and even increasing sunflower oil and biodiesel exports.

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