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## Turkey Rose Oil Production and Marketing: A Review on Problem and Opportunities

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**Abstract:** Essential oils are primarily used in food and perfume production. Rose oil, a member of this group, is especially important in the cosmetic industry. Turkey and Bulgaria are the most important producers in the world. The rose flowers have produced for many years in Turkey. Most of them are grown as organic products and processing. In this study, we review the production, cultivation, trade and marketing of rose oil, with a primary focus on Turkey as a major producer. In addition, problems and proposed solutions relating to the rose oil business in Turkey are also presented.

**Key words:** Essential oils, rose, cultivation, trade, processing

### INTRODUCTION

Essential oils are aromatics or odorous oily liquids obtained from plant material. These oils are mainly used as food flavoring agents, perfume fragrances and in pharmaceuticals, to add taste or odor or suppress unpleasant tastes. In addition, many people are now using oils in cosmetics to maintain health and beauty. Examples are for preventing wrinkles and impeding hair loss.

Because of Turkey's location and climate, many medical and aromatic plants are cultivated or obtained from the wild and many of these are specifically cultivated organically. Essential oils are obtained from plant flowers, leaves, fruit, seeds, stems and roots. There are many essential oil yielding plants grown in Turkey and the rose is among the most important and popular. In this study, we summarize Turkey's rose oil production and marketing potential within the context of world rose oil market and review problems and present suggestions on how to improve Turkey's rose oil production and marketing.

**Characteristics and production of rose oil:** Turkish *Rosa damascena* products can be grouped in four categories: Rose Oil, Rose Concrete, Rose Water and Rose Absolute. The physical and chemical characteristic of Turkish rose oil is as follows<sup>[1]</sup>:

Odour description	Strong and sweet rosaceous characteristics
Appearance	Liquid
Color	Light yellow-green
Specific gravity	0.844-0.868 (25°C)
Refractive index	1.4520-1.4630 (25°C)
Optical rotation	-3.3 to -5.9 (25°C)
Flash point	Not determined
Solubility	90% in alcohol
Purity	100% Natural
Intended use	Perfumery-Flavor production

Rose oil, our specific topic, is produced by processing the rose flower. Roses are gathered in May-June when a 40-day flowering season occurs. Humidity and cloudiness during the season have an effect on the yield and quality of rose oil. The content of essential oil in the rose petals is poor- far below 1%. Because of the volatility of rose oil, content is the highest first thing in the morning when the flowers open; therefore, rose flowers used for distillation are picked manually, daily and before or at sunrise<sup>[2]</sup>. Roses used for oil production are usually grown without using chemicals. There are two methods for rose oil distillation in Turkey: the traditional but slowly disappearing village-type distillations using long-fired crude copper still known as Imbeks and the modern factory production method using hydro-steam distillations called Kanas. The quality of rose oil produced by these two methods is same<sup>[1]</sup>.

Characteristic components of rose oil are acyclic monoterpene alcohols, geraniol (up to 75%), citronellol (20%) and nerol (20%) and long-chain hydrocarbons like nonadecane or heneicosane (up to 10%)<sup>[2,3]</sup>.

An important trace component of rose oil is  $\beta$ -damascenone: Despite its low concentration (0.01%),  $C_{13}$ -norisoprenoid has a notable influence on the quality of the oil; together with the structurally related compounds  $\beta$ -damascone and  $\beta$ -ionone, it is enzymatically generated from carotenoids<sup>[3]</sup>. Similarly, in both saffron and pandanus leaves, the dominant aroma molecules derive from enzymatic degradation of carotenoids<sup>[2]</sup>.

Characteristic of the fresh flower's odour is 2-phenyl ethanol, which, though lost during steam distillation, accumulates in the rose water. Rose oil is obtained from the flowers of the oil-bearing rose (*Rosa damascena*) through water distillation. Thus, rose oil and rose water

do not equal each other exactly. Even in the best case, only 10 g of the essential oil are distilled from as much as 100 kg fresh rose flowers (0.01%)<sup>[2]</sup>.

The most important rose oil producer countries are Turkey and Bulgaria. Combined, these two countries produce 80% of total rose oil supply. In 2001, world-wide rose oil production was 4.5 tons and 2-2.5 tons of this were from Turkey. Bulgaria produced 1.5 tons of the world wide total and an additional ton was supplied by Morocco, Iran and Mexico combined<sup>[15]</sup>.

World rose oil annual consumption is much lower than the combined annual production total; in fact, yearly consumption is between 3.5 and 4.0 tons<sup>[4]</sup>. This causes rose oil producer companies to carry product (stock) over from year to year. As a result, fluctuations in prices are encountered, with the severity of these fluctuations dependent on how aggressively companies compete for business and find additional customers for their products.

In fact, the price of rose oil on the world market was 1.800 to 2.000 \$ kg<sup>-1</sup> during 1991-1994. It increased to 3.500 to 4.000 \$ kg<sup>-1</sup> during 1998-1999, but then regressed to between 3.200 to 3.500 \$ kg<sup>-1</sup> during 2000-2001.

Gulbirlik, the successful Turkish rose market cooperative, determines rose oil pricing for Turkey's private sector. The export price of rose oil is the main factor in determining the flower price. The flower's share of total price of rose oil is 55%<sup>[5]</sup>. It is reported that the total cost for rose flower production is 52.3% for labor, 17.7% for machinery, 12.8% for materials, 11.8% for field rent and 5.5% for draft animal power in Turkey<sup>[6]</sup>.

Turkey is one of the leading rose flower producing countries, surpassed only by Bulgaria. For over 100 years, roses have mainly been grown in Turkey in Isparta county, in the Southwest part of Anatolia. Roses are also grown in some other parts of Turkey such as Afyon, Burdur and Denizli district. The production of oil rose (*Rosa damascena*) started in Isparta in 1888 and the first commercial production of rose oil was accomplished in 1892. In addition the first modern plant for rose oil production was build (established) as cooperative in 1953<sup>[7]</sup>.

Currently, approximately 2-2.5 tons of rose and 4-4.5 tons of rose concrete are annually produced in Turkey<sup>[5]</sup>. 8.200 families grow oil roses and 0.5-1.0% of total cultivated land in Turkey is used for rose production<sup>[8]</sup>.

However, the amount of land devoted to rose production in Turkey continuously fluctuates based on the market's demand for rose oil, the amount of land devoted to rose production in other countries and other factors. In recent years, Turkey's world wide market share

has increased because of a near-constant level of world demand, coupled with a decrease in rose flower production in other countries, especially in Bulgaria.

In spite of this seemingly advantageous position, however there are also large reductions in the amount of land devoted to rose cultivation in Turkey. The main reasons for this are the problems that occur during rose flower production and harvesting, rose orchards established on mainly unfertile soils and insufficient and irregular rainfall. While the rose flower cultivation area was 5.000-6.000 ha at the beginning of 1990s, this has decreased to as little as 2.000 ha after 1995. Based on the 2001 values, 8.538 tons of rose flowers were obtained from 2.300 ha. By region, 65% of this production was from Isparta, 25% from Burdur, 10% from Afyon and 1% from Denizli<sup>[9]</sup>.

On average, 1 kg of rose oil is extracted from 3 to 5 tons of rose flower leaf. Rose oil is steam distilled from *Rosa damascena* flowers and rose oils, extracts and derivates are among the most important natural perfume ingredients<sup>[5]</sup>. These have remarkable diffusive power and are used in many types of perfume bases, blending particularly well with other florals. Rose oil is very expensive oil<sup>[3]</sup>. In fact, the price of the rose oil has averaged between 3.800 and 4.000 \$ kg<sup>-1</sup> and its highest price was 4.200 \$ kg<sup>-1</sup>. The short flowering time of the *Rosa damascena* is a key reason for its high price<sup>[10]</sup>. There is competition between Turkey and Bulgaria for this market. Earlier maturation in Bulgaria<sup>[11,12]</sup> leads oil producers to prefer Bulgaria and this affects world rose oil price fluctuations.

In plants with modern techniques 96.92% of rose flowers is processed<sup>[8]</sup>. The rose oil produced is mostly exported to foreign countries especially in the EU. This is one of the main reasons for an inadequate cosmetic industry in Turkey (Fig. 1).

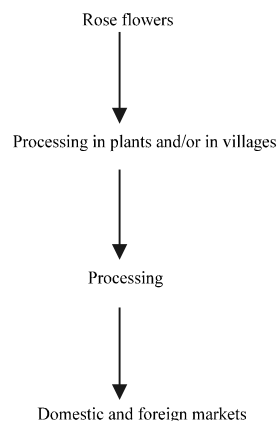


Fig. 1: The processing and marketing system of rose oil in Turkey

**Export of essential oils and rose oil in the world and Turkey:**

Based on the 2001 values, the essential oil world-wide export and import markets realized 7.3 and 5.5 billion \$, respectively. Difference between these two values were caused by the re-export of different derivatives of essential oils and exports in the last months of any year taking the place of import values in the next year. Sometimes, transportation takes a few months. Consequently, this results in significant differences between the product and monetary amount. It is possible to follow a similar situation between FOB prices in export and CIF prices in import and also in the monetary values of exports and imports. The monetary values of essential oil trade in the world are shown in Table 1.

The EU countries, plus the USA and Japan, are the main importers of essential oils, accounting for 80% of total imports. Turkey's worldwide essential oil export trade reached 8.6 million \$ in 2000, 9 million \$ in 2001 and 11.6 million \$ in 2002 year. In addition, the import value was 3.3 million \$ in 2000 and 2001 and reached 5.6 million \$ in 2002<sup>[13]</sup>.

Turkey's share of the world essential oil trade has been as low as 0.16% with a value of 11.6 million \$; but her rose oil export share is a much higher 40-45%.

Turkish essential oil exports are on an upward trend. The value of essential oil exports reached

approximately million US \$ 9 in 2001, an increase of 3.5% over 2000 (Table 2)<sup>[13]</sup>. The major Turkish essential oil export is rose oil. In terms of volume, rose oil accounted for 67% of the total essential oils exports.

Essential oils are mainly exported to European Union countries and North America. Major export locations are France, Germany, Switzerland and USA. These four countries combined buy 94% of Turkish origin essential oils.

The Turkish rose oil industry is a major producer for the worldwide market. Turkish Agricultural Sales and Processing Cooperatives such as Gulbirlik-Gul Gulyagi and Yagli Tohumlar Tarim Satis Kooperatifleri Birliđi are the main rose oil producers. Gulbirlik was established in 1953 as the union of nine founder cooperatives. It now consists of six cooperatives, 7.392 producing members, 6 different rose oil factories in 3 separate locations and a rose concrete factory. Gulbirlik process 300 tons of rose flowers daily in its factories, following Turkish and world standards; in fact, it is the largest manufacturer and exporter in the world<sup>[14]</sup>. In addition to Gulbirlik, there are many medium and small size private plants and companies in the sector. Approximately 30 companies, many of them in Turkey and especially in Isparta, produce and trade rose oil. There are also two companies in Turkey in this sector funded with foreign capital. The working season of the plants is limited to the rose flower harvest season June 1-July 1<sup>[1]</sup>.

Demand for rose oil products has been nearly constant, with a recent slight decrease. Today, the consumer tends to demand organically produced rose oil and this has encouraged Turkish producers to supply an

Table 1: Essential oil trade in the world

Years	Export (1000 \$)	Import (1000 \$)
1997	6.089.153	5.954.161
1998	6.577.024	6.423.577
1999	6.801.893	6.140.368
2000	7.662.697	6.159.664
2001	7.310.696	5.490.101

Source: Under secretaries for foreign trade, 2002

Table 2: The export value of rose oil in Turkey by countries

Essentials oils products	Years			Major exports markets in 2001 (US \$)
	1999	2000	2001	
Bergamot oil	1.646	3.721	8.000	Saudi Arabia (8)
Orange oil	850.0	12.483	2.174	Iran (721), Uzbekistan (601), Turkish Republic of Northern Cyprus (428), Azerbaijan (200)
Lemon oil	467.641	70.705	83.655	UAE (20.385), Kazakhstan (11.056), Macedonia (9.760), Saudi Arabia (6.964), Germany (4.983)
Lime oil	28.750	62.756	2.370	Turkish Republic of Northern Cyprus (2.370)
Other citrus oil	2.550	5.500	1.831	Netherlands (1.831)
Lavender oil	12.537	1.303	7.842	Aegean Free Zone (7.044), France (798)
Mentha piperita oil	7.578	10.990	3.055	Albania (2.873), Azerbaijan (180)
Vetiver oil	713.00	539.00	892.00	United Kingdom (892)
Clove oil	611.00		16.00	UAE (16)
Stearopten oil	1,405.917	756.198	680.364	France (679.782), Germany (580)
Origanum oil	606.655	486.185	630.330	France (343.986), USA (239.530)
Rose oil	3,237.514	5,870.505	6,008.586	France (4.493.962), Germany (670.167), Switzerland (561.185), USA (152.110)
Other				France (548.027), Germany (519.210), Netherlands (138.604)
Essential oils	1,698.719	1,099.814	1,334.887	
Resinoid	168.00	2.110	348.00	Turkish Republic of Northern Cyprus (348)
Terpenic by-products of Essential oil	48.221	257.150	194.206	France (150.504), Germany (17.521), Israel (16.920)
Total	7,520.070	8,639.959	8,950.564	

Source: Under secretaries for foreign trade, 2002

**Table 3: The rose oil export of Turkey**

Years	Export value (\$)	1990=100
1990	5.913.000	100.00
1991	4.706.000	79.59
1992	5.141.000	86.94
1993	5.196.166	87.88
1994	3.705.015	62.66
1995	5.526.054	93.46
1996	6.109.164	103.32
1997	4.974.087	84.12
1998	4.428.056	74.89
1999	3.237.514	54.75
2000	5.870.505	99.28
2001	6.008.586	101.62
2002	8.067.787	136.44

Source: Under secretaries for foreign trade, 2002

organically grown product. Turkish growers began organic production after studying their orchard conditions in collaboration with some ecological foundations and foreign companies such as the German Wala Company. Organic rose oil production started in Turkey 1994 and is based on the principals of developing pest resistant plants and using natural fertilization. Of the 147 tons of rose flowers bought from cooperatives in 1999, 48 kg was ecological thin rose oil<sup>[14]</sup>. The goal for the future is to increase ecologic rose oil production in Turkey.

Foreign trade of Turkish rose oil started long ago. The majority of Turkish rose oil exports between 1920 and 1921 were destined for France and USA. Current Turkish rose oil export values for 1990-2002 are shown in Table 3. Turkish rose oil exports ranged from 3.7 to 8.1 million \$ during 1990-2002, experiencing significant year-to-year fluctuations during that time frame. Turkish rose oil was exported to about 23 countries, with exports increasing at the rate of 1.6%. However, Turkey's exports greatly decreased in 1994. France is by far the most important external market for Turkish rose oil, accounting for 75% of rose oil exports. Recently, demand is increasing for Turkish rose oil, but this demand shows constant fluctuations.

### CONCLUSIONS AND RECOMMENDATIONS

There are some rose cultivation problems in Turkey, stemming from production costs, soil fertility, insufficient and irregular rainfall and price fluctuations. Low rose flower prices and higher profits in alternative product species result in decreasing rose cultivated areas. In addition, large fluctuations in prices can also result in increases in inventories carried by companies.

To solve these problems, companies should contract for production, or use futures contracts with rose

growers. It is possible to obtain a quantity and price guarantee for rose oil by using futures contracts. This helps rose growing farms develop sustainable and safe rose cultivation. Also, it is possible for the buyer companies to assure themselves that they be supplied with rose oil that has specific characteristics at desired quantity by using futures contracts. This, in turn, helps companies easily plan production and sales.

The general agreement among producers and companies is that they lack a stable market, especially, with regards to rose oil export demand. This situation causes big fluctuations in prices. To solve this, it we need to improve the futures marketing system. In addition, export companies need to work together in the foreign market to obtain good prices and develop sustainable markets. Additional study involving rose oil marketing is also needed to search for additional solutions.

Rose oil produced in Turkey is mostly exported because of insufficient Turkish cosmetic and perfume industries. Turkey obtains nearly 10 million \$ of income from rose oil exports, but it is also possible for Turkey to gain a share of the international cosmetic market, forecasted as 50 million \$, by using rose oil in its domestic cosmetic industry. New investments in the Turkish cosmetic industry are seriously needed reach this goal and increase income for Turkey.

Reductions in the rose cultivation area in Turkey will negatively affect development of rose oil sales to the worldwide cosmetic industry and this trend needs to be reversed. Based on consumer demand, the cosmetic industry prefers to process organically produced roses. Chemical fertilizers for plant nutrition and chemicals to ward off pests and diseases are used with increasing moderation during the all production stages of rose flower. It is well known that cosmetic products having pesticide or fertilizer residue at high levels are highly dangerous for human health. For this reason, the increasing tendency in Turkey over the last 10 years is to use biological techniques and natural fertilizers instead of chemical agents and chemical fertilizers for oil rose production. The consumer demand for rose products has increased in favor of organically produced products. Turkey has an opportunity to build on some advantages it has when it comes to meeting the increased demand for organically produced roses and some affective studies have been done on this subject.

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