



REVIEW ARTICLE

Present status and challenges in the perfume industry: A review

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Abstract

The perfume industry is undergoing a transition driven by changing consumer preferences, technological advancements and regulatory adjustments. The U.S. remains the largest cosmetics market, while France leads in cosmetic exports. From 2023 to 2030, the industry is projected to grow at a 5.9 % compound annual growth rate (CAGR). About 95 % of global flavour and scent use comes from 110 natural ingredients such as spices, jasmine, sandalwood, menthol mint and tuberose essential oils. In India, the Uttar Pradesh government launched the One District One Product initiative to promote the production of aromatic compounds, to boost the local economy and create job opportunities. However, the COVID-19 pandemic significantly impacted the industry, with LVMH group reporting a 20 % drop in perfume revenue in 2020 compared to 2019. The sector also faces ongoing challenges, including climate change, limited airport cold storage, labour shortages, unstable sales, insufficient government support and low-quality floral raw materials, affecting both imported and domestic products. Additional concerns include economic fluctuations, marketing competition, brand rivalry and risks from neglecting safety and regulatory standards. The industry's growth relies on improving production and marketing systems, increasing the essential quality of flowers, medicinal herbs and other aromatic plants. Ultimately, global fragrance output became more widespread, resulting in greater profitability.

Keywords: cold storage; compound annual growth rate; Louis Vuitton Hennessy; marketing; Ministry of Micro, Small & Medium Enterprises; perfume industry

Introduction

The synthetic fragrance emerged at the end of the nineteenth century with the first recognised perfume factory constructed in Pyrgos and Cyprus around 2000 BCE, coinciding with the discovery of some scent compounds. The first flavour and scent business organisations were established at that time by innovative entrepreneurs. Luxurious fragrance and consumer fragrances are the two main categories of the fragrance industry, which are being used in personal care products such as soaps, deodorants and shampoos. The market shares for the two segments of the fragrance industry, such as flavours and fragrances, are nearly similar and were €6.5 billion. The global market includes North America (32 %) and Europe, Africa and the Middle East region (36 %), followed by Asia-Pacific (26 %) and South America (6 %) (1). The most fascinating emerging markets are those in China, India, Central America and Russia. Around 60 % of the global market is divided between eight significant global companies. Firmenich and Symrise, Quest International, Takasago, Sensient Technologies, Mastertaste, Danisco and Mane are the firms that produce flavours and fragrances, followed by Givaudan and International Flavours and Fragrances. The top two firms have a

combined turnover of more than \$2 billion. The remaining companies' yearly turnover was more than \$1 billion. The recent 53.44 billion US dollars were made worldwide in the fragrance business. The perfume city of India is Kannauj in Uttar Pradesh (2). The Indian perfume market is expected to reach USD 657.72 million by 2030, followed by a value of USD 211.6 million in 2022 (1). The perfume industry faces several challenges, including sustainability concerns, regulatory compliance, supply chain disruptions, evolving consumer trends and preferences, intense competition, counterfeiting and brand protection issues, digital disruption and global economic uncertainty, as shown in Table 1 (3).

Present status in the fragrance industries

The biggest market and the world's top exporter of cosmetics are the US and France. This market's expansion has shifted from the western hemisphere to emerging markets in China, Eastern Europe, South America and Asia. The cosmetics industry has performed well despite the global economic downturn, with an average growth rate of more than 5 % in this sector (4). According to a grand view research report based on the market for perfumes was estimated to be worth USD 50.85 billion globally in 2022 and between 2023 and 2030, it is projected to rise at a compound

Table 1. Different perfume varieties with percentages of alcohol and essential oils

Type of perfume	Fragrance/essential oil	Alcohol
Eau de perfume	8–15 %	80–90 %
Splash colognes	1–3 %	80 %
Eau de cologne	3–5 %	70 %
Eau de toilette	4–8 %	80–90 %

annual growth rate (CAGR) of 5.9 %. The growing popularity of personal grooming and the rising desire for upscale and exotic perfumes are credited with the markets' expansion (5). With the increasing popularity of personal care products, perfumes have become a necessary item that people wear with confidence and pride, not only for themselves but also (6, 7). The use of natural fragrances, such as essential oils, has increased over synthetic ones due to their many health benefits and consistent demand in aromatherapy. This trend is predicted to fuel the markets' expansion in the upcoming years. As a result, the global fragrance market is expanding rapidly. For example, it was estimated that the worldwide essential oils market was worth over USD 7.51 billion in 2018 and is projected to expand at a compound annual growth rate (CAGR) of more than 9 % between 2019 and 2026 (8). Most perfumes are made using alcohol and the varieties of perfumes are determined by the quantity of essential oil they contain, such as Eau de perfume, Eau de cologne and Eau de toilette, as shown in Table 2 (9).

Indias' present scenario

Essential oils are widely recognised to be abundant in flowers such as tuberose, jasmine and roses. The primary goal to cultivate *Rosa damascena* is to extract essential oils, rose water, attar, gulkand and other products in Haldighati, Rajasthan, as well as in some areas of Kannauj, Uttar Pradesh and Himachal Pradesh (10). Using e-commerce as a platform to connect with customers is surging despite the shifting trends in the Indian market. PEST and SWOT analyses are two methods for assessing both internal and external aspects that provide credible inference. PEST determines the interpretation of political, economic, social and technological factors. The SWOT analysis was used to determine e-commerce's advantages and disadvantages in relation to the Indian business climate (11).

Nisarga Biotech Pvt. Ltd is the first company in India to have developed SCFE (supercritical fluid extraction) technology entirely in-house and the products are herbal extracts and natural extracts. The products from their factory have received recognition on a global scale. The company exports agricultural inputs to Greece, Spain and France, in addition to supercritical extracted oils and extracts to the United States (11, 12). Perfumery products are bakul extract, champaka extract, patchouli oil, sandalwood oil, ambrette seed oil and davana Cyprus root oil and the products made from herbs were neem leaf extract, turmeric extract and Indian Valerian oil and spikenard oil extract (11). IIT-Bombay had standardised the SCF (supercritical fluid) based extraction of natural products is spices, medicinal herbs, natural colours and fragrances. The lowest consultation charge is Rs. 10000 (11, 12).

The National Institute of Pharmaceutical Education and Research, S.A.S. Nagar, is engaged in the extraction of natural products or herbs. The Institute of Natural Products Field Laboratory and the Department of Natural Products have these two SCFE (supercritical fluid extraction) systems. Charges for these services are laboratory scale-based Rs. 4000 per sample or instrument hour, plus service tax and pilot scale-based Rs. 8000 per hr of instrument time or per sample, as shown in Table 3 (11).

Possibilities for India

India has had a significant worldwide impact; approximately 300 significant natural fragrance raw ingredients are used globally. About 50 % of them are cultivated and the remaining 50 % are located in areas where people live in the wild, such as Nagarmotha and Kewra. The raw materials that are grown include 110 naturally fragrant ones, which account for 95 % of the worlds' current consumption of flavour and aroma. These materials include essential oils of menthol mint, sandalwood, jasmine, tuberose and spices (13).

Menthol mint

In 1954, menthol mint was first introduced in India. Subsequently, CSIR-CIMAP produced many variations and various agencies, notably FFDC Kannauj, worked on extension projects. India became the worlds' top producer of mint oil in 2007, when FFDC, Kannauj, partnered with MCX to analyse the oil for forward trading. This led to a sharp increase in the price of mint oil, with a 20–30 % increase in farmer benefits and increased production to roughly 40000 tonnes of oil, making India the world leader in output. One third comes from Bihar, thirteen per cent from Madhya Pradesh and eighty per cent comes from Uttar Pradesh alone (13).

Fragrance and flavour development centre

The Government of India established the Fragrance and Flavour Development Centre, Kannauj (FFDC) in 1991 with support from the Government of Uttar Pradesh and UNDP/UNIDO. The technology has been provided by UNDP/UNIDO- land, buildings and infrastructure by the U.P. government- indigenous, recurring, non-recurring apparatus and equipment by the Indian government. The centre was established to provide an outlet or interface between the industries and research surrounding essential oils, fragrances and flavours (13).

Essential oil production in India and the world

In India, over 90 % of the production is from mints, eucalyptus, lemongrass, *Mentha citrate* and *Mentha spicata*. The production of mint oils increased in recent days for medicinal purposes and davana, jasmine and tuberose (concretes) were among the new essential oils that were released into the market and transferred overseas. Additionally, India produces wheat bran, coffee beans

Table 2. Perfume Industries in world

North America (33.3–35.47 %)	Europe (32 %)	Asia-Pacific (44–55 %)	Latin America (31 %)	Middle East (12–18 %)
Ultra International Ltd	Albert Vieille SAS	Kanta Group	Aroma Chemical Services	El-Khalil Fragrances
Vigon International Inc	Nactis Flavours	Shanghai Pu-Jie Fragrance Co., Ltd	International SAS	Rasasi Perfumes Industry LLC
Phoenix Aromas & Essential Oils LLC	Elixens France SAS	PT. Indesso Aroma	Indukern Fragrance Division	Swiss Arabian Perfume
Essential Ingredients	Ernesto Ventos SA	Aromatherapy Ltd.	Comercio de Fragancias Ltd.	Mane Egypt S.A.E

Table 3. Essential oil production in India and world

S. No	Essential oil	India (MT)	World (MT)
1	Agar oil	0.1–0.15	230.0
2	Basil oil	200.0	250.0
3	Cedarwood oil	60.0	2000.0–2500.0
4	Celery seed oil	20.0	25.0
5	Cinnamon leaf oil	8.0–10.0	100.0
6	Citronella Java oil	500.0–600.0	2300.0
7	Citrus oils (Orange, lemon, lime, etc.)	Negligible	15000.0–16000.0
8	Clary sage oil	1.0	55.0
9	Coriander seed oil	Negligible	20.0–25.0
10	Cumin oil	Negligible	10.0
11	Davana oil	2.0	2.0
12	Eucalyptus oil (cineole type)	600.0–700.0	2000.0
13	Eucalyptus oil (citronellal type)	80.0–100.0	400.0
14	Geranium oil	20.0	130.0–150.0
15	Jamorosa oil	20.0–40.0	20.0–40.0
16	Jasmine/Tuberose concrete	2.0	13.0–15.0
17	Lavender oil	Negligible	200.0
18	Lemongrass oil	400.0–500.0	600.0–700.0
19	Linaloe berry oil	4.0–5.0	Not available
20	Mentha citrata oil	80.0	200.0
21	Nutmeg oil	5.0	180.0
22	Peppermint oil	5000.0	13000.0
23	Peppermint oil	100.0	2000.0
24	Palmarosa oil	60.0–80.0	80.0–100.0
25	Patchouli oil	Nil	500.0
26	Rose oil and concrete	Negligible	15.0
27	Sandalwood oil	60.0	70.0–100.0
28	Spicate oil	150.0	1500.0
29	Spice oils	200.0–225.0	2000.0–2500.0
30	Vetiver oil	30.0–50.0	270.0–300.0

and cocoa, which lately have been proposed for use in perfumery (14, 15). The rose geranium oil is mostly made in Egypt, India, the Peoples' Republic of China and Reunion Island. A few kilograms are shipped from Madagascar with entities of France, while smaller amounts are occasionally made in Russia, Algeria and Morocco. The worlds' largest producer of geranium oil at present is China (16). The Binchuan district in Yunnan Province owns the majority of the cultivation and 60 to 80 tonnes of fragrances are exported from the Chinese domestic market every year (17). The second-largest producer is Egypt, with the main production regions including Bani Sweif and Fayoum in Upper Egypt. The production during the last ten years (2015) has averaged between fifty and fifty-five tonnes annually. In India, the south hills and plains of Palani hills and Nilgiri hills have a tiny production (2 tonnes), which is used for its global market (18).

Rosa damascena is a member of the genus *Rosa* and family Rosaceae, which comprises over 18000 cultivars and 200 distinct species. The two nations that process rose petals the most globally are Bulgaria and Turkey (19). *Rosa damascena* is a significant essential oil crop and highly valued substance used in the food, cosmetics, medicine and perfumery industries (20).

Turkey has a significant role in the production of rose oil worldwide. Isparta (Turkey) is where the majority of rose oil production takes place. The cities of Afyonkarahisar, Burdur and Denizli are also significant for the production of rose oil (21). Even though there are very few oil production, rose is harvested in all places of the agricultural land, being the most economically significant agricultural crop in Isparta (22, 23). Although the province of Isparta is well-known for its rose oil, it also enjoys an advantageous position because of its exports, employment prospects and profit per unit area, as shown in Table 4 (19).

Various challenges in fragrance industries

The COVID-19 pandemic negatively impacted the global industry due to a decline in revenue among industry leaders. One of the biggest producers of perfume products, LVMH Group, for example, saw a 20 % decrease in perfume revenue in 2020 compared to 2019 (24). The main obstacles to jasmine cultivation include climate change, lack of cold storage units in airports, labour shortages, erratic sales and limited government backing. The quality of jasmine blossoms is the primary determinant and low-quality blooms will affect both imported and domestic goods, as shown in Fig. 1 (25).

Table 4. Top 11 MNC company shares

Company	2008 %	2009 %	2010 %	2011 %	2012 %
Givaudan	18.90	19.10	20.60	19.10	20.30
Firmenich	12.20	13.90	13.50	12.90	13.80
IFF	11.80	11.60	11.90	12.80	12.30
Symrise	9.10	9.80	9.60	9.40	10.00
Takasago	6.70	6.10	6.40	6.80	6.00
Wild flavors	NA	NA	NA	3.90	4.80
Mane SA	2.30	2.70	2.90	3.20	3.70
Sensient flavors	2.90	2.70	2.60	2.80	3.20
Frutarom	2.30	2.10	2.10	2.40	2.70
Robert SA	2.10	2.20	2.20	2.20	2.30
T. Hasegawa	2.50	2.30	2.50	2.60	2.20
Top 11 totals	70.70	72.60	74.50	78.70	81.30
All others	29.30	27.40	25.50	21.30	18.70
Total market in billion US\$	20.3	20.00	22.00	21.80	22.90

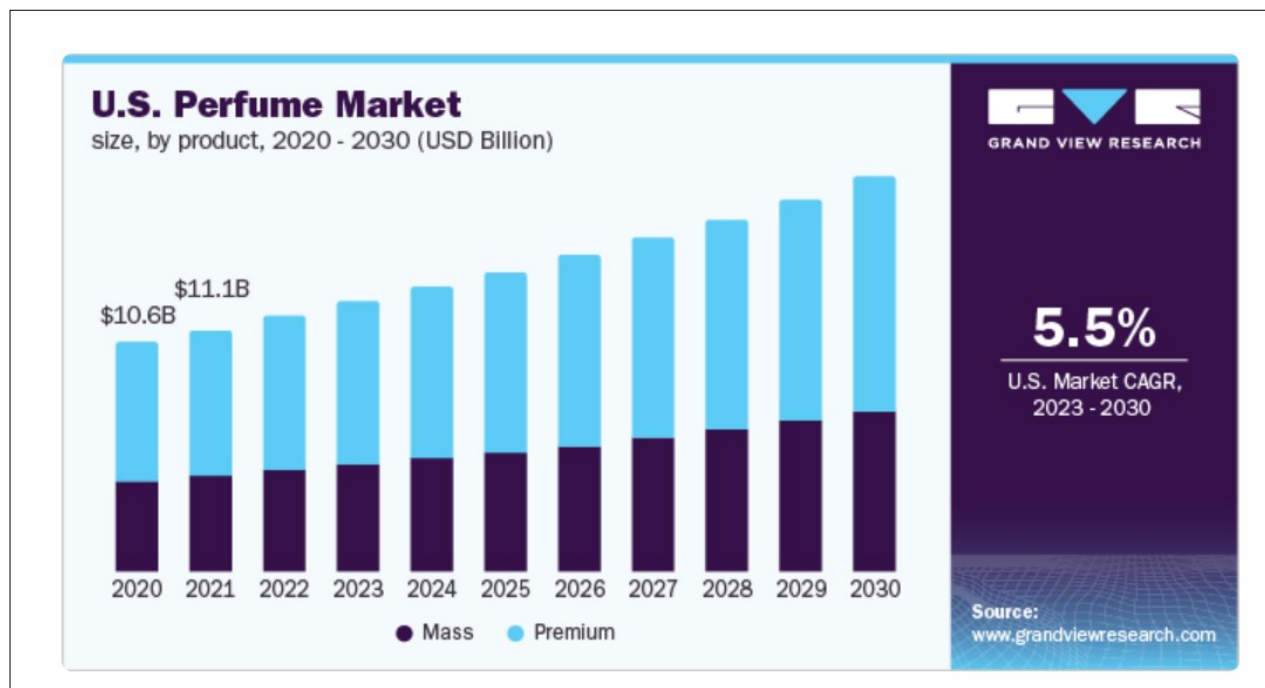


Fig. 1. The report for US perfume market (2020–2030).

Challenges for the essential oil extraction unit

Environmental challenges

Due to their unstable nature and the presence of delicate, volatile ingredients, these compounds are easily degraded by heat, light, oxidation and volatilisation if not properly protected from the external environment (19, 26).

Role of temperature in the essential oil unit

To prepare a cyclodextrin inclusion complex, equal amounts of water and cyclodextrin are added to a flask placed on a magnetic stirrer and maintained at a constant temperature of 40–50 °C. After stirring for 1 hr, a saturated cyclodextrin solution is formed. An ethanolic solution of the essential oil or active compound is then added dropwise to this saturated solution and stirred continuously for another hour at the same temperature and stirring rate (27). The resulting mixture is then gradually cooled to room temperature while stirring and subsequently stored at 4 °C overnight. The cold, precipitated inclusion complex is collected by vacuum filtration. Finally, the filtrate is washed with a suitable organic solvent to remove any free guest molecules from the cyclodextrin surface and is freeze-dried (28, 29).

The adulterations problem

Utilising less costly synthetic elements or volatiles sourced from different natural sources might occasionally be indicative of falsification (30). Plant-based oils may gain weight through adulteration, which can involve partially or fully substituting the original plant source with a different one (31). By adding one or more synthetic components, all of these adulteration methods carry the risk of lowering quality and falling short of the natural grade. Verification is therefore a critical issue for the security of consumers (32). Adulterants are frequently provided in small concentrations (5–8 %) to avoid being detected by standard analytical techniques (33, 34). Essential oils that have been adulterated may no longer meet standardisation requirements, which will influence the regulatory side as well. In order to evade detection by standard analytical techniques, adulterants are typically supplied at low levels of 5–8 % (21, 22).

The state of the economy

The analysis of the financial circumstances of jasmine, davana, rose, tuberose cultivators - including revenue, expenses, savings, debt, irrigation and issues- was attempted by the Indian government. Many governments have established state marketing boards, whose members include small and marginal farmers. They should have both greater authority and access to the necessary facilities and resources (35).

Difficulties in marketing and cultivation

The study finds that most growers and producers of jasmine depend primarily on market intermediaries to sell their produce, making them small-scale, marginal farmers. In addition to being illiterate or having only a minimal education, most farmers are unaware of the market. Therefore, their earnings should be limited or occasionally even negative. That's why agricultural issues need to be addressed by the government right away (36).

Brands of perfumes for competition

It is crucial to identify customer needs and the variables that influence their behaviour in a market that is as fiercely competitive as the niche perfume business. Investigating consumer preferences for major perfume brands was the focus of this study. More information about the market than could be revealed by major market forces is provided by the customers' favourite and preference levels. To obtain an advantage over competitors, the suggested company should create a brand that embodies both its own distinctive traits and those of the most favoured brand in the industry (37).

Safeties (rules and regulations)

Government rules (about floor cleaners and some fragrance compounds), or severe safety norms in the fragrances and flavours business, limit the use of numerous chemicals. Through the publication of safety criteria for fragrance ingredients, which are defined and published by the International Fragrance Association (IFRA), the fragrances and flavors business is guided. In the journal Food & Chemical Toxicology, RIFM publishes the findings as monographs. The Geneva, Switzerland-based "International Organisation of the Flavour Industry (IOFI)", to improve the business

and the interests of the customer, provides its members with guidelines, recommendations, draft regulations and makes its knowledge available throughout the world, as shown in Fig. 2 (4).

Rose-scented geranium and production risks

Geranium is mostly farmed for its oil in Russia, Madagascar, Algeria, southern France, Spain, Morocco, Reunion and originating from the arid rocky slopes of South Africa's Cape Province. Several species, some of which are found in the Nilgiri hills, have been brought to India and are now grown in gardens (38). There are many species of scented leaves in the genus *Pelargonium* (Geraniaceae), with scents ranging from mildly fruity or flowery to overpoweringly balsamic. Without a question, the several rose-scented geranium types are the most widely used *Pelargonium* species. Their essential oils have a pleasant, rose-like scent with

prominent notes of citrus and mint. In perfumery and cosmetic compositions, they are crucial and frequently used as an alternative to the pricey rose essential oil, as shown in Table 5 (39). Geranium oil of superior quality is utilised in luxury fragrances, whilst oil of inferior quality is used to scent lotions, soaps and toiletries (40, 41). GULAR (Rose and Rose Products Research and Application Centre), established in 2005 under the guidance of Suleyman Demirel University (SDU), carries out research and development activities regarding roses and rose-related products that are significant in the area (42, 43). Producers asked for research on the survival against diseases and pests, particularly those that affect *Aurigena chlorana*, *Capnodis species*, *Agrilus chrysoderis* and *Parthenolecanium spp.* It was noted that several growers' vineyards had dead plants. Producers have needs for solutions to these issues, as shown in Table 6 (44, 45).

Table 5. Challenges for rose scented geranium

Problems	N*	%
No idea	23	13.0
Lower the price of roses	95	53.7
To find the problem at harvest workers	61	34.5
Rose diseases pests	61	34.5
Production cost is high	57	32.2
Input prices are high	35	19.8
Uncertainty of the rose price/Price is not disclosed on harvesting season	30	16.9
Labours request is very much/care difficult	25	14.1
Weather conditions-drought	22	12.4
technical knowledge is insufficient	20	11.3
The lack of state support/the absence of minimum purchase prices	19	10.7
Irrigation	19	10.7
Problems of logistic	15	8.5
Unconscious production	12	6.8
Not given advance	9	5.1
Yield losses	9	5.1
Lack/limitation of market	8	4.5
Purchases are deducted over the tare	7	4.0
Inability to organize	7	4.0
In the early closing intake rose	6	3.4
Drip irrigation should be adopted	6	3.4
Not given importance to quality	5	2.8
Quota application	5	2.8
Excessive production	4	2.3
No service	3	1.7
Libra is not enough	1	0.6
Organic production	1	0.6
Soil analysis	1	0.6

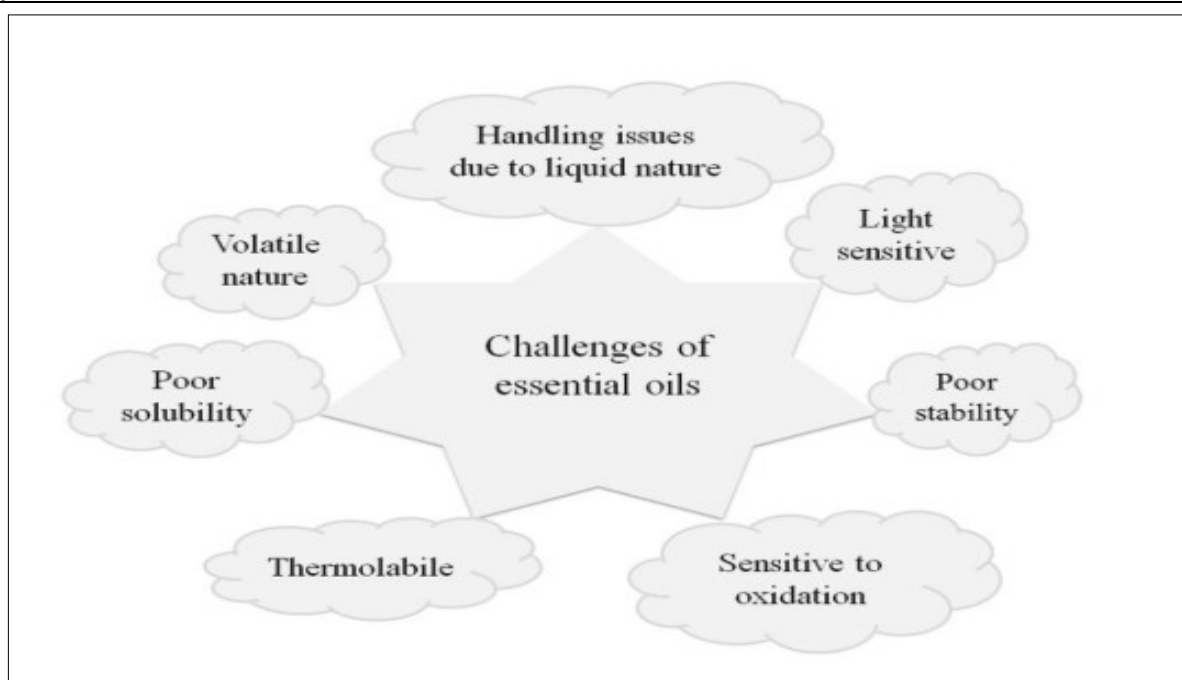


Fig. 2. Challenges for essential oil extraction unit.

Table 6. The growers' solution for these (rose scented geranium) problems

Suggestions	N	%
No idea	54	30.5
Purchase of rose should be at reasonable price	80	45.2
Prices should be announced early	33	18.6
Reductions in input prices	32	18.1
State support on rose production	30	16.9
Seminars should be on a regular basis subject rose/ farmers was educated	25	14.1
Government should give base price as hazelnuts	20	11.3
County agriculture officials must deal with rose harvested area/	19	10.7
Price should be based on the amount oil quality	9	5.1
The adoption of drip irrigation system	3	1.7
Organic production should be adopted	3	1.7
Technical and economical study should be done about the rose	2	1.1
Adsorbents that retain water in the soil, should be introduced to farmer and encouraged to use	2	1.1

Discussion

The "perfume city" is a common appellation for Kannauj. Existing since 1991 is the districts' "Suras" and "Aroma Development Centre" (FFDC). The Central Government, State Governments and UNIDO worked together to develop this agency. The district is mostly recognised in the global market for its essence, flavour and aroma. This organisation performs all aspects of "attar," including plant cultivation, processing, biotechnology, consulting and other associated tasks involving aromatic plants. In order to earn good profits from these cash crops, farmers are diversifying away from traditional crops and into the production of aromatic essential oil products. This concept is based on increased essence in Flowers, medicinal plants and other aromatic plants, as well as improved production and market channels. Finally, the yield of aroma was distributed globally and brought in more returns.

Conclusion

The perfume industry is at a turning point as it deals with a quickly evolving environment while striking a balance between innovation and tradition. Upon contemplating its present state and obstacles, numerous significant deductions become apparent. First, a rising focus on sustainability and transparency characterises the current state of the industry. Businesses are being forced to review their supply chains and production processes as a result of consumer demands for environmentally friendly products and materials that are sourced ethically. Prioritising sustainability will probably give brands a competitive advantage in the marketplace. Second, new developments in technology bring with them both possibilities and difficulties. Although e-commerce and digital marketing provide new ways for firms to connect with customers, they also increase competition and force them to adapt their strategy. Furthermore, developments in fragrance synthesis and personalisation present innovative opportunities for product creation and also demand.

Authors' contributions

SJ and KRR contributed to the writing of the original draft and conceptualisation, revision of the draft, inclusion of tables and figures, proofreading, revision, formatting and Supervision. AB, MMM, KK, SR, RRR, MIM and VR contributed to revision, formatting and Supervision. All the authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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