

## **PART 4 – AROMA CHEMICALS DERIVED FROM ESSENTIAL OILS**

---

### **1 PROJECT HISTORY AND OVERVIEW**

---

#### **1.1 Brief**

The Terms of Reference required that the Consultant consider the potential synergy between a synthetic aroma, fragrance and flavour value chain and a value chain based on the exploitation of South African natural products.

This line of enquiry was based on the underlying assumption that South Africa is endowed with a wide diversity of plant material, which offers significant potential for exploitation as a source of aroma, fragrance and flavours fine chemicals. This section of the Study was ancillary to the main focus of the Study, which was the review of a basket of larger volume aroma and flavour chemicals to be derived from petrochemical feedstocks using technology developed by AECI (and now owned by CSIR), with a view to creating the core of a aroma fragrance fine chemical value chain.

#### **1.2 Decisions on Approach**

The initial desktop research performed by the Consultant highlighted the fact that although there are many different forms in which natural products enter the flavour and fragrance market, for example teas and tinctures, it is the essential oils industry that provides the chemical components that may form part of a suite of aroma, flavour and fragrance fine or speciality chemicals. The Consultant therefore recommended, and it was accepted, that the focus of this section of the Study be on essential oils.

Furthermore, the Consultant determined that the potential for exploiting essential oils from indigenous plant material was limited in the short term but held potential for the medium to long term. However, since the delivery systems for indigenous essential oils would be similar to those required to deliver the internationally accepted essential oils, it was proposed that the Consultant give consideration to the potential of developing the South African essential oils industry in respect of internationally accepted oils, with a view to it enhancing the prospects of developing the aroma, flavour and fragrance industry in South Africa. This approach was agreed.

The production system for essential oils is primarily an agricultural one. The down stream beneficiation involves chemical processes of a reasonably simple nature. The complexities arise when one becomes involved in the formulation aspects of the flavour and fragrance industry. From an agricultural perspective, crop selection is a key component of the essential oils industry. This is a reasonably complex issue relating to agronomics (climate, plant characteristics, yields, and organoleptic and chemical considerations). It was agreed

## **PART 4 – AROMA CHEMICALS DERIVED FROM ESSENTIAL OILS**

that this aspect of the essential oils value chain should only be dealt with in broad terms. It was agreed that a separate study would be undertaken to investigate the agricultural and horticultural issues that arise in respect of essential oils. In the circumstances, it was proposed and agreed that the Study concentrate on the broader strategic industry-wide issues and not on crop specific issues, except to the extent that these were illustrative.

The main objective was to address the potential for essential oils industry to contribute to the creation of an aroma, flavour and fragrance value chain in South Africa.

### **1.3 Definition and Relevance of Essential Oils**

Essential oils are naturally occurring volatile products obtained from various parts of plants. Essential oils are usually extracted from the plant material by steam distillation, expression, or solvent extraction. Essential oils are distinguished from the fatty vegetable oils, such as canola and sunflower, by the fact that they evaporate or volatilise in contact with the air and they usually possess a strong aroma. These products are complex mixtures of organic chemicals, the nature and relative proportions of which are determined by the genetics of the plant species, environmental factors (e.g. climate) and agricultural factors (e.g. soil conditions, nutrition, time and conditions of harvesting and methods of post harvest handling) and manner of extraction. The amount of oil extractable ranges from an infinitesimal quantity to as much as 1-2% of the dry weight of the plant material distilled.

The chemicals present in essential oils may be classified as follows:

- Hydrocarbons of the general formula  $(C_5H_8)_n$ -terpenes;
- Oxygenated derivatives of these hydrocarbons;
- Aromatic compounds having a benzenoid structure; and
- Compounds containing sulphur or nitrogen.

These constituents are synthesized by the plant during its normal development. Their presence can be optimized or manipulated by manipulating the factors mentioned above (i.e. environmental factors, agricultural factors and manner of extraction).

The essential oils industry is primarily an agricultural industry with the product being sold into several different markets (foods and beverages, aroma and fragrances in foods, nutraceutical applications, medicinal applications, cosmetics and personal hygiene products, pesticides). The technologies for distillation or extraction of the essential oils are reasonable accessible and simple to operate. The essential oils market is growing internationally as

## **PART 4 – AROMA CHEMICALS DERIVED FROM ESSENTIAL OILS**

there is a trend towards “naturals” in the flavour and fragrance industry. Most naturally derived chemicals have their synthetic counterpart; however there has always been a niche for the natural products. Only 20 to 25% of essential oils are chemically processed so as to isolate individual aroma chemicals. The majority are used in their original complex form.