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AN OVERVIEW OF ROSEWATER & ITS PRODUCTION

[1]Anuja Rana, [2]Nidhi Shah, [3]Shuchi Mitra, [4]Usha Sharma

[1-2] P.G Scholar, P.G Department of Ras Shastra evam Bhaishajya Kalpana, Uttarakhand Ayurveda University, Rishikul Campus, Haridwar.
[3]Associate Professor, Department of Ras Shastra evam Bhaishajya Kalpana, Uttarakhand Ayurveda University, Rishikul Campus, Haridwar.
[4]Associate Professor, Department of Ras Shastra evam Bhaishajya Kalpana, Uttarakhand Ayurveda University, Rishikul Campus, Haridwar.
P.G Department of Rasa Shastra evum Bhaishajya Kalpana, Uttarakhand Ayurved University, Rishikul Campus Haridwar Pin Code: 249401

Corresponding Author: aranurana7@gmail.com

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ABSTRACT

The distinct fragrance, versatility, and attractiveness of roses make them highly valued and appreciated. Not only are they aesthetically pleasing, but they also have a range of health benefits and are used in culinary and cosmetic products. Rose preparations have been utilized in the Indian system of medicine for their various properties, including their astringent, tonic, and mildly laxative effects. They have also been used as an antibacterial agent and to treat sore throat, enlarged tonsils, and eye diseases. Additionally, they have been used as a cooling agent and a vehicle for other medications. Also, rose extract/isolates have been reported to have anti-HIV, anti-bacterial, and hypnotic properties. This review article provides an extensive overview of the history and cultural significance of roses, their various varieties, and the products derived from them, with a particular emphasis on rose water. The production of rose water is discussed in detail, including the various methods used for its production. By exploring the different aspects of rose water production and its applications in various fields, this article aims to provide a comprehensive resource for those interested in using this natural and versatile ingredient.

Keywords: Rose, Rose water, Gulab Arka, Damask rose

INTRODUCTION

Rose is a timeless flower and is considered a symbol of beauty and love. The oldest rose flower fossil evidence date back to about 35 million years[1]. Throughout history, it has been highly valued for its beauty, fragrance, and symbolic significance. Cultivated and prized by ancient civilizations, including the Greeks and Romans, the rose was associated with goddesses of love, such as Aphrodite and Venus[2]. During the Middle Ages, the rose became a symbol of the Virgin Mary and played a significant role in Christian religious ceremonies. It was also highly valued in Islamic culture, where it represented the love between humans and Allah[3]. In addition to its cultural significance, the rose has also been used for its medicinal properties throughout history. Even today, the rose remains one of the most popular flowers in the world, with over 150 species and countless cultivars. In India, the total production of roses was 19.947 MT, with the major rose-growing states being Maharashtra, Karnataka, Tamil Nadu, Rajasthan, Uttar Pradesh, and West Bengal[4]. Kannauj and Hathras, located in Uttar Pradesh, are the regions where the highest production of roses occurs. The flowers grown in these areas are renowned throughout the country. The former Chief Minister of Uttar Pradesh, Akhilesh Yadav, took steps to establish Kannauj Attar as a global brand. Kannauj is famous for its traditional perfume industry and is known as "India's Perfume Capital[5]." Roses have become a lucrative source of income for self-employed individuals due to their profitability. Throughout history, the plant has been utilized in traditional medicine to treat various ailments, including stress, nervous tension, peptic ulcers, and heart disease. India boasts over 150 original varieties and more than 2500 hybrid varieties of roses[6]. Currently, three species of roses, namely Rosa damascena, Rosa centifolia, and Rosa gallica, are employed in the production of high-quality rose perfumes.

Damask Rose

One of the most important rose species is the damask rose (Rosa damascena Mill.). It is a perennial bushy shrub reaching approximately 1 to 2 meters in height with large, showy, and colourful flowers. This plant can grow in different climatic regions, but it thrives best in arid and semi-arid regions with low temperatures. The optimal temperature for the damask rose is between 15-21 degrees, and these climatic conditions can significantly improve the flower quality and the resulting Damask Rose perfume[7]. There are different products from *R. damascena* in the world. The major products are Rose water, Rose oil, Rose Concrete & Rose absolute. The process of obtaining rose oil and rose water involves steam distillation, while the extraction of the solvent yields concrete. Absolute, on the other hand, is obtained through the re-extraction of concrete with alcohol.[8]

ROSE WATER

Rosewater is in high demand both domestically and internationally, with the global rosewater market projected to experience a compound annual growth rate of 6.9%[9], from $319.1 million in 2018 to $510 million by 2025. This has led to the emergence of rose and rosewater tourism[10], which falls under various categories such as agricultural, rural, recreational, and special interest tourism. The process of making rosewater involves distilling rose petals to extract the volatile compounds that give it its fragrance and flavour. In the Indian system of medicine, it is known as *Gulab arka*. Rosewater has been used for centuries in perfumes, cosmetics, and food items such as chocolates, sweets, preserves, and liqueurs. It is also used in religious ceremonies of the Muslim, Zoroastrian, and Hindu faiths, including the washing of the Holy Kaaba of Mecca twice a year[11]. According to a VCRP 2020 survey, Rosa Damascena Flower Water is used in 410 formulations, with a maximum concentration of 37.7% in skincare products[12]. The rise in popularity of rosewater can be attributed to its ability to soothe damaged skin, act as an antibacterial, maintain

skin hydration, and alleviate sore throats and weary eyes, among other benefits, without the need for costly chemical-based cosmetics and medicines.

Chemical composition of Rose Water

The chemical composition of rose water has been examined using various methods and solvents in research conducted by Agarwal et al. (2005). When ethanol was used as a solvent, the main ingredients of the hydrosol were found to be phenethyl alcohol (69.7% to 81.6%), citronellol (1.8% to 7.2%), and geraniol (0.9% to 7%). The same components were also discovered through hydro distillation, albeit in different percentages (phenethyl alcohol: 30.8%, citronellol: 15.6%, geraniol: 16.8%). Additionally, simultaneous distillation-extraction was employed to determine the contents of rose water, with phenethyl alcohol (81.27%), citronellol (5.72%), and geraniol (4.43%) being reported as the primary constituents[13].

Production of Rose Water

In the 10th century, the famous Persian physician Avicinna may have been the first to use steam distillation to produce rosewater (known as Golab in Persian) for medical purposes. There is also evidence of commercial distilleries in Shiraz, Fars Province, dating back to 1612[10]. In Ayurveda and the Unani system of medicine, this rose water is known as *Gulab arka* or *Arq-e-gulab*, respectively. *Arka*[14] or hydrosol is a liquid preparation of drugs with medicinal properties obtained by distillation. *Arka* is equivalent to Western medicine's Aromatic waters/Medicated waters. Traditional methods for the preparation of *arka* involve soaking coarsely grounded drugs in water overnight, distilling the mixture using *arkayantra* or other modern apparatus, and discarding the 1st and last distillates as they may not contain therapeutically essential principles. However, this method does not account for the amount of water added and the amount of *arka* recovered, and there are no known pharmacopoeial standards for the preparation produced in this manner.

Materials And Methods

Apparatus used in Arka preparation[15].

The mixture used in the creation of *the arka* apparatus involves a combination of various ingredients, including equal parts of iron powder, *gairik*, alum, *bhrushta mruttika*, red clay, bone powder, glass powder, and *kaseesa*, among others. These ingredients are mixed with equal amounts of urine from cow, horse, buffalo, goat, and elephant (known as *panchamutras*), then dried in sunlight until all traces of urine smell are eliminated. The *arka* is prepared in a vessel that is round and shaped like a *surya mandala*, with an entrance no smaller than 3 *angula* and a lid of the same size for covering (with lips measuring 3 *angula*). The vessel must be air-tight, which is achieved through the sealing of *jeernasthi mruttika*. A hole of 3 *angula* is made on the upper lid and sealed, and a circumference of 4 *angula* is created over the upper lid for water to be poured in. Additionally, an opening with a valve (and sealing) is created at the base of the circumference for the removal of warm water. A vessel called an *arka patra* is placed below a large tube attached over the upper lid, which is then placed in cold water. The fumes produced from the vessel are condensed and collected in the *arka patra*. *Arkaprakash* recommends using dry but weighty wood that can be comfortably held in one's hand (like the bark of khadir or babul trees) for burning purposes. The extracted arka is collected in a container made of *jeernasthi mruttika patra* (clay pot with tiny holes), glassware, stoneware, or earthenware.

Method of Preparation of *Arqe Gulab* (AG)

Khan et al (2017) conducted a study in which 500 grams of sepals and petals were immersed in 8 litres of water to prepare the Arq using steam distillation. This method of steam distillation simulates the Unani Classical method "*Hammame Nariya*" for the preparation of *Arq* from drugs having essential oils. Out of 8 litres of water, 2 litres of *Arqe Gulab* were collected[16].

Rosewater extraction in Contemporary science[17]

Rosewater, which is commonly referred to as the hydrosol part[18] of the distillate of rose petals, can be obtained through various methods. The most commonly used and cost-effective method is distillation, which involves heating the rose flowers in stills through either hydro distillation or steam distillation. The heat and steam cause the cell structure of the plant material to rupture, releasing the essential oils. The resulting mixture of oil and water is collected in

a special tank, and the essential oils are easily separated from the water since they are not water-soluble. The rose petals are sometimes allowed to decompose slightly before distillation to enhance the aromatic quality of the essential oil. Copper stills with a capacity of 500 kg of flowers and 1500 litres of warm water are typically used for distillation, and the process takes about 1.5 hours. Essential oils are extracted during hydrodistillation by diffusing from the structures within the petals where they are stored. To prevent the deposition of waxes in the condenser, the condenser temperature is maintained at 35-45°C, and the distillate is collected in 200-liter Florentine flasks. Rosewater is a by-product of the hydro-distillation of rose flowers to produce rose oil, and it contains minimal amounts of rose oil. The primary essential oil compound in rosewater is phenyl-ethyl alcohol[19].

Recent advancements in Rose water extraction

CIMAP[20], the Central Institute of Medicinal and Aromatic Plants in India, has created a small and mobile distillation device called 'Asvika' for use by small-scale businesses, farmers, and research institutions. Its primary purpose is to manufacture high-quality natural rose water, and it has a volumetric capacity of 60 litres, allowing for the handling of 12-15 kilograms of rose petals per batch. The device uses Calandria-type flue gas pipes to heat water and can run on biomass, LPG, or kerosene.

Fig. Distillation unit for rosewater manufacturing developed by CIMAP.

To a certain degree, renewable energy presents a feasible alternative to fossil fuels. The solar distillation system has the potential to utilize rose petals in the production of rosewater[21], and functions in a manner that mimics the natural hydrological cycle. It comprises a water basin, a dark absorber plate for capturing solar radiation, a support structure, a glass cover for the condensation of vapours, and insulation. Additionally, a solar still of any magnitude can be constructed and operated inexpensively by a moderately skilled individual.

DISCUSSION

Rosewater is a clear liquid that has a distinct aroma, with 0.075% essential oil and 3.81% ethyl alcohol content. At 20ºC, its relative density is 0.9927, and it has a pH of 6.55. It contains beneficial phytoconstituents that aid in maintaining healthy skin. Flavanoids are definitely valuable for the skin and act as an antioxidant, counteracting the effect of aging or regenerating tired stress-ridden skin and pink cheeks and unblemished skin, fewer lines, minimized pores, and strengthen skin. However, there are ambiguities and practical variations in the preparation of rose water throughout the world. In Ayurvedic Pharmacopeia, the method of preparing Gulab arka does not take into account the amount of water added or the amount of Arka recovered. A study conducted by Khan et al demonstrated a 1:16 ratio of sepals to water. It is also noted that one kilogram of Damask rose is used to produce every litre of rosewater.

CONCLUSION

Rosa damascena Mill. is a well-known ornamental herb that has been extensively utilized in traditional medicine. Various pharmacological studies have demonstrated its potential therapeutic advantages in treating different diseases, as well as its usefulness in cosmetics, which has yielded results similar to those of standard medications. There is a great need to investigate its medicinal and cosmeceutical properties at the molecular level, utilizing the latest biotechnology tools and techniques to provide evidence of its efficacy. The preparation of high-quality rose water remains an ambiguous and complex process, with varying techniques and standards across different regions and cultures. While some traditional methods emphasize the use of pure, hand-picked rose petals and distillation through copper vessels, others incorporate modern technology and additives to improve efficiency and aroma. The quality and purity of the rose petals used can also affect the final product. Further research and standardization in the industry may also be necessary to address this ambiguity and ensure consistent quality across the market.

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