Coffee Arabica in Saudi Arabia: An Overview

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ABSTRACT

The Kingdom of Saudi Arabia is a country that constitutes a major portion of the Arabian Peninsula. It is a large land composed mainly of arid soil encompassing the area of around 2.15 million km^2. The land is approximately located in-between 15º45'N to 34º35'N and 34º40'E to 55º45'E latitude and longitude respectively. The Saudi Arabian climate is extremely dry and hot. The temperature here can reach as high as 50ºC during summers which happen only in few countries around the world. In summer seasons, the inland regions of Saudi Arabia experience an average temperature of about 27°C-43°C while the temperature range of coastal areas is in-between 27-38°C. More than a hundred-year-old trees are found in the south-western region of Saudi Arabia (provinces of Jazan, Al-Baha, and Aseer) which is considered as a traditional area for the cultivation of coffee. Arabica coffee is an inhabitant of hilly mountains and cultivates best in the regions of high altitudes. It is widely grown on the slopes of terraced mountains situated in the highlands of south-western Saudi Arabia, mainly on the mountains of Hada and Al-Dayer Bani Malek situated in Aseer and Jazan regions respectively. Arabian coffee is widely used for medicinal purposes and as a basic beverage in Saudi Arabia.

Key Words: *Medicinal Plants, coffee beans, Coffee fruit, Vegetation.*

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INTRODUCTION

The Kingdom of Saudi Arabia is a country that constitutes a major portion of the Arabian Peninsula. It is a large land composed mainly of arid soil encompassing the area of around 2.15 million km^2. The Saudi Arabian climate is extremely dry and hot. In summer seasons, the inland regions of Saudi Arabia experience an average temperature of about 27°C-43°C while the temperature range of coastal areas is in-between 27-38°C [1]. Plant cover in Saudi Arabia is limited and sparse and is essentially represented by annual species, except for the western and south-western areas, where trees and shrubs form nearly two-thirds of the entire flora [2, 3]. An extensive variety of therapeutic plants is present in Saudi Arabia whose medicinal values are not yet evaluated [4]. For many years, the Saudi Arabian people are using therapeutic plants (such as a coffee plant) as a source of traditional medicine for treating various human, as well as livestock diseases [5-7]. Many factors contribute to health such as nutrition, physical activity, level of stress, personality, and behavior [8, 9]. The family of the coffee plant is *Rubiaceae*. The genus *Coffea* comprises about 103 species, which are segregated into subgenera *Coffea* and *Baracoffea*. The subgenus *Coffea* includes species that are used in coffee production [10]. Arabica coffee (*Coffea arabica*) and robusta coffee (*Coffea canephora*) have been regarded as the most commercially and economically used among other species [11]. Ethiopia (Africa) is considered as the place of origin for Arabian coffee and as Saudi Arabia is situated in close affinity with Ethiopia, the widespread growth of Arabian coffee is observed all over the southern region of the Arabian Peninsula [12]. The southwestern end of the Arabian Peninsula (Yemen and southwestern Saudi Arabia) has been cultivating *C. Arabica* L for the last few centuries [13]. In KSA, Arabian coffee is chiefly grown in the Jazan region (Al-Dayer Bani Malek province) and the Asser area (Hada Mountain region). These areas are famous for producing high-quality coffee, named Khoulani coffee which is popular throughout the world. Arabian coffee is widely used for medicinal purposes and as a basic beverage in Saudi Arabia.

Geographical Setting

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Saudı Arabıa

The Kingdom of Saudi Arabia is a country that constitutes a major portion of the Arabian Peninsula. It is a land of large desert composed mainly of arid soil encompassing the area of around 2.15 million km^2. The land is approximately located in-between 15º45'N to 34º35'N and 34º40'E to 55º45'E latitude and longitude respectively [14, 15]. It consists of four topographic areas: the coastal plains, the south and west escarpments, the plateaus, and the deserts. The south and west escarpments consist of two main mountain chains, the Hejaz mountain chain in the north and the Aseer mountain chain in the south. The highest point in northern Saudi Arabia is about 2000 m above sea level, while in the south, the Sooda Mountain is the highest peak at about 3200 m altitude. Several distinct physiographical regions such as valleys (wadis), mountains, sand and rock deserts, lava areas (Harrats), salt (Sabkhas), etc., also covers Saudi Arabia [16].

Jazan Regıon

Jazan region is located in the south-western area of Saudi Arabia, adjacent to Yemen. Jazan experiences high rainfall (approx. 90 mm annually) which makes it an important agricultural region of Saudi Arabia. The area has several types of soil and a wide variety of vegetation, which reflects the geographical diversity. The most significant type of soil is "soft soil" which makes up the premium agricultural region as it can retain water and contain abundant nutritional components that are essential for the growth of the plant. The Jazan region encompasses more than a hundred different-sized forests and a wide range of trees. The total parts of land appropriate for cultivation here are above 240,000 hectares, which is sufficient enough to meet the requirements of the entire kingdom. The area has nearly 3200 well-irrigated farms, which includes 1200 vegetable farms and 2000 fruit farms. Along with this, fodder and other vegetation are also cultivated in this region [17].

Aseer Regıon

The region of Aseer is situated in the center of south-west Saudi Arabia. The altitude in this region varies from sea level (zero elevation) up to 3015 meters above sea level [18].

The Clımate in Saudı Arabıa

Saudi Arabia is situated in the tropical region between 16°-32° N latitudes and 37-52° E longitudes. It is a large peninsula, which is situated between the huge continents of Asia and Africa. These features make the kingdom of Saudi Arabia as one of the hottest nations in the entire world, having less humid environment except for summer seasons along the coasts. The Saudi Arabian climate consists mainly of extreme heat and aridity. The temperature here can reach as high as 50ºC during summers, which happens only in a few countries around the world. In summer seasons, the inland regions of Saudi Arabia experience an average temperature of about 27°-43°C while the temperature range of coastal areas is in-between 27-38°C. Apart from the south-western mountains; Saudi Arabia is well-known for its dry weather, hot climate, and deserts. The significant characteristic of its climatic condition lies in its extremity, i.e. it experiences extremely hot days and a rapid drop of temperature with the advent of night. The country does not encounter much rainfall and the annual precipitation reaches up to 100 mm. The kingdom of Saudi Arabia witnesses province-wise variation in its climatic conditions. Extreme temperatures are witnessed in the areas situated at the north of the Tropic of Cancer (23°26'N, 38° 38'E) along with the islands and extreme northern regions of Saudi Arabia. Conversely, the highlands located in south-western regions experience normal temperatures. The very little average precipitation also demonstrates spatial variability with the high amount of rainfall in south-western highlands. Besides the topographical factors, the climate of Saudi Arabia is also influenced by the latitude, tropical winds, altitude, proximity to the sea, etc. [1]. The south-west Mountains of Saudi Arabia experience the maximum precipitation in the entire country. The maximum average rainfall per year in this region is recorded as 357 mm at Abha and 577 mm at Fyfa Mountain. The precipitation at all times is inconsistent is this region as it is located along the boundaries of arid land. Maximum precipitation is observed from April to September while infrequent rainfalls can also be experienced in cold months. Nevertheless, the western slopes experience the highest amount of precipitation, while the east-facing slopes experience decreased and unpredictable rainfall all the year-round. Cool summer seasons and cold winters are the characteristic features of the mountainous regions. The Fyfa Meteorological Station obtained climatic data from 1984 to 1998, which demonstrated the occurrence of the highest monthly temperature in June (33˚C) and the lowest monthly temperature in January (14˚C). The highest average rainfall (220 mm) was recorded in April and the lowest average rainfall in November at the same time. In summer, the average relative humidity ranges from 60.9% in June to 79% in July, while in the winter season, it varies from 74.1-70.9% in December to March respectively [19]. South-west Saudi Arabia is affected by a tropical arid climate.

Vegetatıon and Forests in Saudı Arabıa

Plant cover in Saudi Arabia is limited and sparse and is essentially represented by annual species, except for the western and south-western areas, where trees and shrubs form nearly two-thirds of the entire flora [2, 3]. The area of Jazan experiences a wide range of vegetation because of

the diverse mountain ranges, coasts, and plains. The coastal area is mainly dominated by mangrove vegetation. The plateaus and slopes situated in the middle-east regions of Jazan are well-known for Ziziphus trees, El-Summer, El-Selm, Alorak, and various other pastoral plants such as Juniper trees, El-Atm and Albizia lebbeck which are present on both sides of the mountains [17].

Medıcınal Plants in Saudı Arabıa

The Saudi Arabian vegetation offers an abundant reserve of therapeutic plant species and a lot of them are commonly used as traditional medicines [20, 21]. The vegetations present in the mountainous regions, deserts, and semideserts demonstrate various characteristics of the Afrotropical realm (Sub-Saharan Africa), Indo-Malayan realm, and Palaearctic realm (Asia and Europe) [20, 22]. Therefore, these regions are regarded as a natural reservoir for collecting wild medicinal plants. Nearly six hundred species (about 27% of the total flora) are essentially used in conventional heating systems and are accounted for having medicinal properties [20, 23]. The regions located in the south-west of the country are said to be the richest among others regarding species diversity, along with the presence of the highest number of traditionally common species [24]. In these areas, the utilization of therapeutic flora by the traditional healers (Tib Arabi or Hakim) and indigenous tribal communities goes far back to thousands of years and plays a key role in Arab's culture even now and hence, described the collection of exceptional traditional knowledge of the entire area [24, 25]. Despite the existence of contemporary hospitals and compliant health-care staff, local Arab people still use traditional therapeutic vegetations as an alternate for allopathic medication for the treatment of various chronic diseases and routine problems such as skin-related ailments, bone fracture, rheumatism, asthma, stomach problems, diabetes, constipation, ENT (ear, nose, and throat) problems, respiratory tract infections, colds, cough and fever, urological diseases, measles, hepatic and spleen diseases, typhoid, epilepsy, toothache, tuberculosis, anemia, hypertension, nervous system disorders, snake bites and scorpion stings along with many other tropical diseases including leishmaniasis, rift valley fever, malaria, and schistosomiasis. Particularly, the tropical diseases with snake and scorpion bites are serious health and socio-economic difficulty in Saudi Arabia along with various other tropical and subtropical territories [26, 27].

Coffee Arabica in Saudı Arabıa

The coffee fruit is known to have many parts beneath its uppermost red-violet skin. Those parts exist according to the following sequence. At first, the yellowish pulp is present, followed by parchment (yellow-colored), then seed coat is present (silver skin or silver color) and at last, the green-colored coffee bean is present in the core [28]. The coffee bean is an essential product and chief harvest in the highlands of several nations [29, 30]. It represents a vast source of earning in many countries as coffee beans are one of the most traded commodities of the agricultural business worldwide. It is cultivated on approximately10 million hectares land in nearly 50 nations [31] and about 125 million people in Asia, Latin America, and Africa depend on coffee cultivation for their income [32]. The two major coffee producing species are *Coffea arabica* L. (Arabica coffee) and *Coffea Canephora* Pierre ex A. Froehner (Robusta coffee) that represents 70% and 30% of overall commercial production of coffee respectively. Out of all the other species, *C. arabica* is the only known tetraploid species in the genus *Coffea* which is native to the Ethiopian highlands situated in the south-western region, Saudi Arabia, Yemen, south-eastern Sudan [33, 34]. It is of considerable importance to know that coffee is not new to Saudi Arabia. The cultivation of Arabica coffee on the narrow valleys and terraced mountain slopes at altitudes as high as 1200 m to 1800 m of Yemen and Saudi Arabia are dated back to the last four or five centuries [19]. Coffee arabica is mostly cultivated in highlands present in tropical regions. As Ethiopia (Africa) is considered as the place of origin for Arabian coffee and Saudi Arabia is relatively situated in close affinity with Ethiopia, therefore, the widespread growth of Arabian coffee is observed all over the southern region of the Arabian Peninsula. Coffee (*Coffea arabica*) is a major crop grown on the terraced mountain slopes and valleys of south-west Saudi Arabia.

Coffee production in southern Saudi Arabian highland

More than a hundred-year-old trees are found in the south-western region of Saudi Arabia (provinces of Jazan, Al-Baha, and Aseer) which is considered as a traditional area for the cultivation of coffee. According to Fyfa Development Authority (FDA, governmental organization), about 78,000 trees are present in these regions in which Addayer district, Jazan alone covers 84% of the total plantation. These tree covers produce nearly 500 tons of coffee beans every year. The total number of trees is still not estimated fully as FDA also manages a huge nursery that offers thousands of coffee seedlings free of cost to the native farmers annually (in 2016, over 40,000 coffee saplings were distributed). Hence, Saudi Arabia is continuously producing some of the world's best coffee [30, 35] as it is mostly grown under organic cultivation practices without using any synthetic pesticides, herbicides or fertilizers and the farmers often use organic goat manure along with stone mulching for better results [36]. Almost all Yemeni and Saudi Arabian coffee grows from prehistoric 'heirloom' variety of *Coffea arabica* which was naturalized centuries ago for the very first time. This is the only known information for the concurrence of coffee over

the south-west regions of Saudi Arabia [37-39]. The research conducted by Sayed [40] demonstrated that *Coffea arabica* L generally grows at altitudes of 1300-1400 m in the southern highlands of Saudi Arabia. Nearly 4-6 coffee plants/m^2 are grown in the fields which produce about 3 tons of coffee by using 100 kg mineral fertilizers per hectare of the land. The farmers practiced a two-day high-irrigation system during the dry season which became an environmental challenge due to the inadequate artesian water reserve in the area. Some changes occurred in the fluorescence of chlorophyll due to a 14-day separation irrigation system which in turn resulted in water stress that significantly reduces the efficiency of photo system-2 and quantitative yield and also increases the non-optical energy dissipation.

The results also indicated that the transformation of a two-to-seven-day irrigation system improves the agricultural ecology of coffee and directs coffee production towards sustainability [40]. Arabica coffee usually grows best at greater heights and is normally cultivated in mountainous areas. In Saudi Arabia, it is extensively harvested on the terraced mountain slopes of the south-western highlands of the Asser region and Al-Dayer Bani Malek region of Jazan.

Coffee Arabica in Jazan region

The mountains in the Jazan region experiences humid climatic conditions which are suitable for coffee cultivation. The Saudi Ministry of Agriculture has lately encouraged the cultivation of coffee in these mountains, especially in the mountains of Fayfa and Bani Malek [41]. The Arabic coffee is chiefly grown in the southern mountains of the Al-Dayer Bani Malek region of Jazan. One of the finest coffee of the world called 'Khoulani' is also cultivated on the narrow valleys and terraced mountain slopes at an altitude of about 1200-1800 m above sea level in this region [37].

Coffee Arabica in Aseer region

Arabica coffee is also grown in the highlands of the Aseer region, particularly on the Hada Mountains located in the middle of Tihama Balsamer (south-western Saudi Arabia) which is about 80 km north-west from the Abha city (Figure 1, 2). The height of these mountains rises 1927 m above sea level. Hada Mountain has been the base of the Balsamer tribe for centuries. It is considered as one of the most fertile mountains in the Kingdom of Saudi Arabia. The natives of this place have distinguished themselves from their neighbors by cultivating coffee for a living and the cultivation of high-quality Arabica coffee returns to this area because of the dependence of farmers on rainwater for irrigation. Figure 3-6 demonstrates the Arabica coffee plant and its different parts as found in the Hada mountains of the Aseer region.

Figure 1: Hada Mountain, Aseer region, Southwest of The Kingdom of Saudi Arabia (Map data at 2020 Google)

Figure 2: Coffee plantations (Hada Mountain, Aseer region, Southwest of The Kingdom of Saudi Arabia)

Figure 3: The plant Arabic coffee (Hada Mountain, Aseer region, Southwest of The Kingdom of Saudi Arabia)

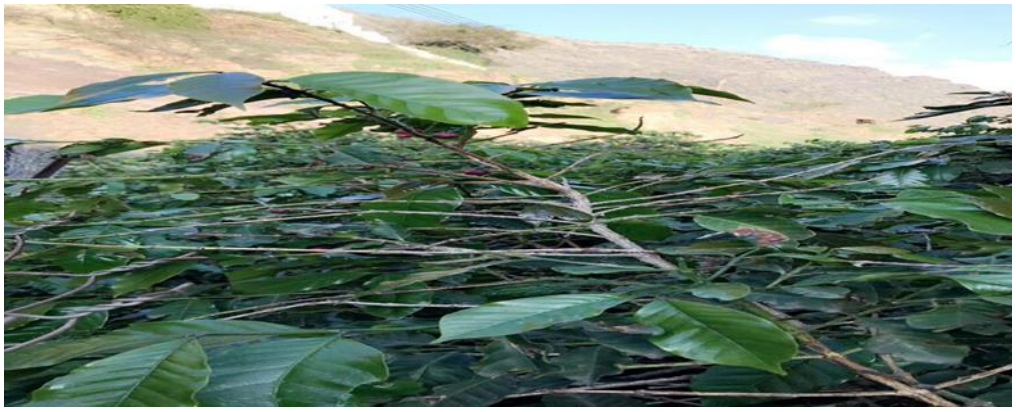

Figure 4. Coffee leaves (Hada Mountain, Aseer region, Southwest of The Kingdom of Saudi Arabia)

Figure 5. Coffee fruit (berry/cherry) (Hada Mountain, Aseer region, Southwest of The Kingdom of Saudi Arabia)

Figure 6. Coffee flowers (Hada Mountain, Aseer region, Southwest of The Kingdom of Saudi Arabia

Uses of Arabic coffee in Saudi Arabia

In Saudi Arabia, coffee is a widely popular traditional drink that is found in almost every household and serves as a symbol for the country's deep-rooted culture. Arabic coffee, locally known as Qahwa has found its association with the hospitality and tradition of Saudi Arabia and various other Arabian countries. The Arabs serve coffee in almost every occasion of their life such as official meetings, get-togethers, weddings, funerals, and specifically on the two main Islamic festivals, Eid Al-Fitr and Eid Al-Adha. The coffee consumption rates often increase from the month of Ramadhan (the fasting season) till Hajj, the annual Islamic pilgrimage to the city of Makkah. During this time, the increment in the consumption rate happens because of two important reasons. Firstly, every year about two to three million Muslim pilgrims visit Saudi Arabia to perform Hajj. Secondly, the two major Islamic festivals i.e. Eid Al-Fitr and Eid Al-Adha occur in these months [42].

According to a report of 'The Economist' on the agricultural consumption of Saudi Arabia in 2011, the total coffee consumption reached up to 33.317 thousand tons (Country Watch, 2013). In the year 2014, an article printed in the 'Saudi Gazette' confirmed that the people of Saudi Arabia spend over 266 million dollars annually for drinking coffee and its various other components [43]. Unlike other coffees, Arabic coffee is often roasted and prepared at home. It is not like other coffees that are processed in the factories combined with stabilizers, preservatives, and various other harmful additives.

In the south-western region of the country, many Saudi women mix the outer layer of the coffee fruit (locally called as Gisher) which account for about 40% of coffee fruit (**Figure 5**) with hot water and use the extract as a drink, in which they believe to clear their wombs from the bad blood that is attached to the womb during or after the menstrual cycle or after childbirth. Also, since a long time ago, they use the extract for the production of more milk for the breastfeeding mothers. *Also, they believe that the extract is a p*owerful agent that reduces body fat, helps in maintaining a normal weight, and keeps the body fit, and slim.

In the past, the application of grounded coffee beans is also commonly practiced by the local people of the south-western part of Saudi Arabia to treat minor wounds and stop bleeding. Moreover, the dried and roasted coffee beans were extracted with hot water to form a thick dough which is often *used* in *cosmetics. It is applied* as a facial mask for cleaning and regeneration of the outer skin.

CONCLUSION

Coffee (*Coffea arabica*) is an important plant cultivated on the terraced mountain slopes and valleys of south-western Saudi Arabia. Arabica coffee usually grows best at higher altitudes (1200m-1800m), requires a humid climate, and an annual rainfall of about 90 mm. It is extensively harvested on the south-western highlands of the Aseer region and Al-Dayer bani Malek region of Jazan as these regions are situated at higher altitudes, have the optimum climatic conditions, and the perfect type of soil for coffee cultivation. Ethiopia (Africa) is considered as the place of origin for Arabian coffee and Saudi Arabia is relatively situated in close affinity with Ethiopia, therefore, the widespread growth of Arabian coffee is observed all over the southern region of the Arabian Peninsula. Coffee cultivation is not new to Saudi Arabia but dated back to the last four or five centuries. Coffee beans are considered as one of the most traded commodities of the agricultural business not only in Saudi Arabia but all over the world. According to Fyfa Development Authority (FDA), about 78,000 trees are present in Saudi Arabia in which the Addayer district and Jazan region alone cover 84% of the total coffee plantation. These tree covers produce nearly 500 tons of coffee beans every year. One of the finest coffees of the world called 'Khoulani' is also cultivated in Saudi Arabia. Coffee is a very popular traditional drink of Saudi Arabia which is found in almost every household and serves as a symbol for the country's deep-rooted culture. Apart from its use as a basic beverage, it has also been found helpful for medicinal purposes, cosmetics use, as a wound dressing material, and for curing menstruation-related problems.

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