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Status and Need of Research on Desert Truffles in Saudi Arabia

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Desert Truffles are being used in Saudi Arabia and many other Arabian Gulf countries for both food and medicine purposes for centuries. There is a lack of scientific knowledge about the biotechnology, ethnomycology, taxonomy, biodiversity, physiology, preservation, mycorrhization, cultivation, conservation etc of desert truffles in Kingdom of Saudi Arabia (KSA). We made an extensive survey on literatures of different aspects of research on desert truffles both in KSA and other desert truffle growing countries of the World. In this review, we try to focus on the present status of research on desert truffles in KSA in relation to world literatures and then on the basis of the present literatures, we also suggested areas where immediately research may be conducted in KSA. The suggested areas are i) ethnomycological survey in different parts of KSA, which will provide baseline information about the truffles research, ii) Conventional taxonomic identification as well as molecular identification of the desert truffles to find out the biodiversity of desert truffles, iii) Biotechnology as well as physiological, biochemical and growth behavior of desert truffles, iv) methods of short and long term preservation, v) mycorrhizal association of the desert truffles and their dependency with different Helianthemum species to find out the conservation strategy and sustainable use, vi) development of methods of cultivation etc. The study of desert truffles will have many impacts on Saudi society like sustainable use of biodiversity, mycorrhization, taxonomy, in-situ conservation and the use of indigenous knowledge and also to improve the likelihood of the stakeholders especially the Bedouin community in KSA.

Key words: Desert truffles; literatures; potential research needed; Saudi Arabia.

Desert Truffles are socio-economically important fungi and are being utilized in Arabian Gulf countries including Saudi Arabia and several other countries of the world, for both food and medicine for centuries. Many studies showed that the desert truffle extracts have anti-bacterial properties against a wide range of bacteria and sterilized aqueous truffle extract has long been used in the treatment of trachoma. The desert truffles are not as flavored as European truffles1; but these mushrooms are highly prized for their unique musky flavor as reported by Omer *et al.,*[2] and they have high content of proteins, amino acids, fiber, fatty acids, minerals, carbohydrates etc. (see the review section for refs.). The protein content of desert truffles is as high as 20 % of its dry weight, which is higher than the protein content of many vegetables and other fungi[3]. The desert truffles have been valued as edible resource in many parts of Saudi Arabia, where this crop is growing for long time and constituting an important food for the local community, characterized by a low-income level.

Many parts of the country are experienced in collecting desert truffles growing under natural conditions. Continuous harvesting

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of these valuable crops without considering the conservation may cause biodiversity deterioration and will be harmful for the future of the crops. For sustainable use of these natural resources, we need basic and applied research. The present literature review mentioned in this article indicated that so far very little is known about desert truffles in Saudi Arabia. We have made an extensive review on desert truffles considering their present status on ethnomycology, geographical distribution and ecology; biochemical and physiological studies; both morphological and molecular level of identifications; preservation of the truffles by following the conventional and modern techniques; the role of mycorrhiza and finally methods of cultivation. We have discussed in relation to the present status and the lack of research in KSA. We also highlighted the present need of research on desert truffles in Saudi Arabia. The promotion of applied research, taxonomy, biodiversity, mycorrhization and conjunction with natural resource management are urgently needed in Saudi Arabia.

Limited research activities are available on desert truffles throughout the world and especially in arid and semiarid areas around the Mediterranean basin and in Arabian Peninsula where this crop is growing. Most of the research was done with European and Australian truffles and very little is known in Gulf countries especially in Saudi Arabia.

Ethnomycology, Geographical Distribution and Ecology of Desert Truffles

The term "desert truffles" includes species of different hypogeous Ascomycetes genera, such as *Terfezia, Picoa, Balsamia, Delastreopsis, Delastria, Leucangium, Mattirolomyces, Phaeangium* and *Tirmania,* and some *Tuber* species. Desert truffles are available throughout the world except in Antarctica and it is important as a seasonal commercial crop in many countries of the world including Arabian Peninsula[4]. The name "desert truffles" matches the nature of its distribution, which is typical of countries or territories with arid and semiarid conditions. The development of truffles mainly depends on factors like amount and timing of rain, physical and chemical properties of soil, climatic conditions etc.[5, 6]. Trappe *et al.,*[7,8] reported the desert truffles of the Australian Outback and African Kalahari and their ecology and ethnomycology (Trappe *et al.,*[9]). The geographical distribution of desert truffles is limited to arid and semiarid lands, mostly in countries around the Mediterranean basin, such as Southern Spain, Portugal, Italy, France, Hungary, Turkey, from Morocco to Egypt, Israel, the Arabian Peninsula, Iran, Iraq, Libya, Syria, Saudi Arabia and Kuwait. In addition, some desert truffles species have been found in South Africa (Botswana)[10], in North America and Japan[11]. The annual rainfall ranges from 50 to 380 mm in desert truffles growing regions of the world. Morte *et al.,*[12] reported that the truffle season produces good yields if rainfall ranges from 70 to 120 mm in North African countries, and from 100 to 350 mm in countries of Southern Europe. They also mentioned that the distribution of this rainfall is as important as the quantity; that is, rain is necessary no later than the beginning of December in North African and Middle Eastern countries and no later than the beginning of October in the countries of South Europe. Since the desert truffles establish mycorrhizal symbiosis with different species of the *Helianthemum*, their distribution and ecology are related to those of their host plants. Morte *et al.,*[13] has given a short description of different species recorded from Spain and their occurrence, soil conditions, climatic conditions, distribution, seasonal variation, morphological characteristics, associated hosts etc. The genus *Terfezia* has five generally known species[9,14-16] of which few species are known from Saudi Arabia [5, 6]. *T. claveryi* Chatin has also been found in the Canary Islands, specifically in Lanzarote. It was first reported under the name *Tir. pinoyi* (Maire) Malen by Rodríguez *et al.,*[17] and later by Calonge[18] as *T. claveryi*.

Desert Truffles from Saudi Arabia, locally known as Fagaa or Alkamah, are grown as a wild crop in almost half of the upper part of Saudi Arabia[5]. In Saudi Arabia, desert truffles usually appear after the rainy season in the months of February to April[6]. About 25 years back, five different species (*T. claveryi, T. boudieri* Chatin, *T. nivea* (Desf.) Trappe*, Tir. pinoyi* and *P. lefebvrei* (Pat.) Maire) of desert truffles were reported from Saudi Arabia[5, 6]. Feeney[19] reported an abundance of desert truffles in Saudi Arabia. *P. lefebvrei* another desert truffles fungi was reported from Kuwait by Al-Sheikh & Trappe[1]. In Saudi Arabia,

P. lefebvrei was reported only from the northern part (Harrat Al-Harra) by Bokhary & Parvez[6,20]. After about 15 years of report of Bokhary & Parvez[6,20], only two species belonging to the genus *Terfezia* i.e. Kamaeh or Khlassi (*T. claveryi* and *T. hafizi*) and one species belonging to the genus *Tirmania* i.e. Zabide (*Tir. nivea*) have been reported in the Arabian Peninsula[21]. Although desert truffles of different types were reported from various part of the World[7, 8, 10, 22-30], little is known from the vast area of Saudi Arabia.

Ethnomycological studies on desert truffles[31-34] indicated that the cultivation of truffles could contribute to improving the rural economic development in the semiarid Mediterranean areas where they can be cultivated. Limited scientific studies have been made in this part of the world on the biology, cultivation and nutritional status of desert truffles[5, 35 - 37]. Also, indigenous knowledge about edible and medicinal truffles has not been given significant attention among desert inhabitants[21]. Mandeel & Al-Laith [34] has done an extensive study in Bahrain about the ethnomycological aspects and has given valuable information. They have also mentioned the importance and value of studying the ethnomycological aspects of desert truffles. Their views may be implemented in Saudi Arabia to get indigenous knowledge about desert truffles in this country. Not much is known about the ethnomycological aspects, biodiversity, and distribution of desert truffles in Saudi Arabia until now. Limited scale survey work is underway in Riyadh region from this season, with the resources available in the Plant Production Department of King Saud University.

Biochemical and Physiological Studies

Several studies with limited elaboration about chemical composition of desert truffles have shown that the desert truffles are rich in proteins, amino acids, fiber, fatty acids, minerals, carbohydrates etc[3, 20,38-50]. The protein content, which averages 20% of the dry weight in desert truffles, is significantly higher than in most vegetables and other fungi, therefore, the consumption of these truffles is recommended[3]. Desert truffles comprise a vast unexploited source of therapeutic compounds with anti- inflammatory, immunosuppressor, antimutagenic and anticarcinogenic characteristics[51], as well as antioxidant properties[52-54] and antibacterial activities[55]. In addition, the presence of enzymes was recorded in the ascocarps of some desert truffle[54]. Promising antibiotic and antimicrobial activities have been detected in desert truffles by Rougieux[56]; Chellal & Lukasova,[57] and Janakat *et al.,*[58, 59]. The study reported by Slama *et al.,*[60] reveals that the desert truffles fruit bodies contain 15.4% total sugars, 2.02 % soluble sugars, and 10.5% protein on a dry weight basis. *T. boudieri* is rich in Ca, K, P and Mg. This truffle contains high contents of Fe and Na. Desert truffle contains more calcium than *Tuber melanosporum* and *T. magnatum* species. Very shallow research works were made in Saudi Arabia with Saudi desert truffles in respect of their chemical composition and other properties. A comprehensive study will be made to have complete knowledge of desert truffles available in Saudi Arabia. All these findings make desert truffles very remarkable for future researchers of these valuable fungi.

Al-Sheikh & Trappe[61] reported the features and analysis of spore germination in the brown Kame truffle, *T. claveryi*. Morte & Honrubia[62, 63] found best growth of desert truffles mycelium in MMN (Modified Melin-Norkrans) agar medium and PDA (Potato dextrose agar) medium, both at pH 7.0 and they can be used directly from the plates as inoculum for in vitro mycorrhization synthesis. The growth of desert truffles under laboratory conditions and their physiological requirements are elaborately mentioned[12] . Pervez-Gilabert *et al.,*[64] did the partial purification, characterization and histochemical localization of fully latent desert truffle (*T. claveryi*). Navarro-Ródenas *et al.,*[65] assessed the ability of two species of desert truffles, *T. claveryi* and *P. lefebvrei,* for their tolerance to water stress in pure culture. Growth under low water potential conditions, induced using polyethylene glycol (PEG) as reported by Mexal & Reid[66] and Coleman *et al.,*[67] should, in theory, reflect the ability of the fungi to grow in dry soil and possibly to obtain water for the associated plant. Studies on the effect of water stress on *in vitro* mycelial growth have been carried out with different types of fungi[65] but not with these fungi until now.

Taxonomy

Truffles are hypogeous Ascomycetes[68-70]. There is no definitive way to determine, without

using a microscope, whether a mushroom belongs to the Ascomycetes or the Basidiomycetes. The morphometric difference in microscopic study of spore ornamentation of desert truffles will not sufficient to separate between the species[71]. The key presented by Castellano *et al.,*[68] and Trappe & Castellano[71] will be very useful for morphological identification. Nonetheless, molecular studies of gene sequencing have detected notable differences between populations of the species.

In Saudi Arabia, desert truffles were recorded as early as quarter of a century back[5, 6, 20,35] and about 10 years before[72]. There is a huge gap between the record of desert truffles from Saudi Arabia and current literatures of desert truffles now. The common species of desert truffles are recorded from Bahrain[37], Algeria[57], Kuwait[1,73], Qatar[74], Iraq[75], Jordan[58], Egypt[2], Libya[36] and Iberian Peninsula[76] .

For both *Terfezia* and *Tirmania*, two common desert truffles species are described and illustrated by Al -Sheikh &Trappe[77], Gilkey[78] and Trappe & Sundberg[11]. Only the Mediterranean and Middle East *Terfezias* are true *Terfezias*[16, 79]. Awameh & Al-Sheikh[80],Bokhary[5] and Bokhary & Parvez[6] have identified few species of desert truffles from Saudi Arabia with limited scale descriptions. Moreno, *et al.,*[81] studied the *P. lefebvrei* and *Tir. nivea*, two rare hypogeous fungi from Spain and reported their occurrence.

The traditional criteria of macro and micromorphological characteristics of the fungi fruit bodies should be sufficient for the characterization and identification of these fungi. Contrary to this, the morphological identification of these fungi from their mycorrhizal structures is quite difficult. Because of that, it is necessary to follow the molecular methods[82]. Farmer & Sylva,[83] made DNA analysis by use of polymerase chain reaction (PCR) and it proved to be an instrument for identification of mycorrhizal fungi from their colonized root tissues. Furthermore, this technique reveals the intraspecific genetic variability[84]. Genetic sequence amplification by random amplification of polymorphic DNA (RAPD) permits the establishment of differences between species and individuals at molecular level[85,86]. Desert truffles are found in many different countries of the World[9, 87-89]. Morte *et al.,*[13] has given short description of the characteristics of the main desert truffles collected in Spain. Kovács *et al.,*[14] has done molecular taxonomic study of several members of the *Terfezia* genus of different continents and reported that probably only the species from the Mediterranean region and the Middle East belong in *Terfezia* s. str. The genus *Imaia*[14] and *Kalaharituber* [88] were introduced to accommodate, respectively, *T. gigantea* Imai from North America and Japan and *T. pfeilii* Henn. from South Africa. The American *T. longii* Gilkey and *T. spinosa* Harkn. also, belong to different genera[15] , while *T. austroafricana* Marasas & Trappe from South Africa belong to *Mattirolomyces*[9, 89]. Montecchi & Sarasini[90] mentioned that five *Terfezia* species have been reported regularly from the Mediterranean region and the Middle East; they are *T. arenaria* (Moris) Trappe, *T. boudieri* , *T. claveryi* and *T. leptoderma* Tul. and *T. olbiensis* Tul. & C. Tul. Additional *Terfezia* species have been described from the region but are treated mostly as synonyms of these five species. *T. claveryi* and *T. boudieri* have been used as model organisms for molecular biological studies[12, 91, 92] . Montecchi & Sarasini[90] and Al- Sheikh[93] have mentioned that *T. arenaria, T. claveryi* and *T. boudieri* can be easily separated by morphological characters, whereas the separation of *T. olbiensis* and *T. leptoderma* are less clear, judging from keys to species of the genus . *T. olbiensis* and *T. leptoderma* and the other spiny- spored *Terfezia* species have been considered as different developmental stages and treated as synonyms by several authors. Diez *et al.,*[87] studied Mediterranean *Terfezia* species by both morphological and molecular phylogenetic methods. The ITS regions of 11 specimens of four species were sequenced and analyzed by Diez *et al.,*[87]. They found considerable variation of the ITS sequences of those *T. leptoderma* specimens and hypothesized that this variation might relate to edaphic and/or biotic factors such as soil types and/or host plants. Kovács *et al.,*[16] mentioned that because of the small number of specimens studied the question was left unresolved. Intrahyphal, heterokaryotic variation of the nrDNA was found in *T. boudieri*[94] and intraspecific genetic variability was interpreted as a cryptic speciation in the taxon[95]. Kovács *et. al*.[16]studied the *Terfezia* specimens deposited in the Mycological Collection of the Herbarium of the Real Jardý´n Bota´nico, Madrid, (MA-Fungi) to test whether (i)

the morphological criteria of species regularly collected in Spain enable their unambiguous separation and (ii) the previously hypothesized background of the intraspecific variation of the ITS region of nrDNA could be confirmed by study of a larger number of specimens. They also mentioned that in addition, some specimens with distinctive anatomical features found during this research, formed a distinct group in the molecular phylogenetic analyses; for these they propose a new *Terfezia* species. Nevertheless, their results indicate there might be much more distinct lineages/species of *Terfezia* sensu stricto, represented by desert truffles in the Mediterranean region and the Middle East, than the four or five *Terfezia* species generally accepted in the literature. They found a high intraspecific and intrasporocarpic variation of both morphological characters and nrDNA ITS sequences. It was also reported by them that together with a lack of edaphic or biotic specificities, this variation might indicate ongoing diversification within some lineages of *Terfezia*.

Preservation

Because of the limited shelf life of truffle as fresh product and as storage caused deterioration of its taste, aroma and hence marketability, which needs especial attention. Information on preservation and increasing the shelf life by applying different preservation methods are limited.

The common methods used to store truffles include chilling, drying and freezing. Some Bedouins preserve clean truffles by pickling in 3-6% vinegar and salt[34]. Use of gamma rays, are potentially attractive to improve the shelf life and safeguard sensory characteristics of truffles. Effect of 1.5 k Gy gamma-ray dose on some biochemical and microbiological profiles of black truffles were monitored, immediately after treatment and after 30 days of storage at 4°C and found to be suitable for preservation[96]. Al-Ruqaie[72] mentioned that color, texture and flavor were well preserved by blenching in 4% boiling NaCl solution for 4 minutes. Freezing was superior to dehydration as a preservation method. Again Al-Ruqaie[97] concluded that when treated with acetic acid and sodium oxalate prior to irradiation, truffles had significant longer shelf life, which was further extended by storage under refrigeration. The effectiveness of radiation, heat and fungicides separately or synergistically to inactivate the fungal flora present on truffles was investigated by Al-Rawi & Aldin[98]. A trial of triple combination of 2000 ppm propionic acid at 56°C for 5 min and 150 krad of ionizing radiation brought complete sterilization against microbial spoilage. Adamo *et al*.,[99] found that synergistic effect of gamma radiation, packaging under vacuum and storage temperature resulted in a direct effect on the microbial load, spoilage and shelf life. They suggested that 1.5k Gy dose can be considered as the radiation dose threshold beyond which clear chemical modifications appear in truffles.

Storage at 4°C is the treatment that best preserves the biochemical and microbiological characteristics of fresh truffles[100]. Subjecting truffles to high CO_2 and low O_2 atmospheres reduce the polyphenol metabolism, anaerobic pathways and polyamine biosynthesis slowing senescence[101]. Falsconi *et al*.,[102] studied the relative change of the white truffle's aroma (*T. magnatum* Pico) in the days following the harvesting, in order to determine the maximum preservation time for the white truffles (Alba's truffle).

Mycorrhization and Cultivation

Desert truffles are hypogeous ascomycetes and mycorrhizal fungi forming mutualistic association with roots of *Helianthemum* spp.[34]. The desert truffles are exceptional in forming mycorrhizae: different species have been observed to engender different mycorrhizal types. Mycorrhizae of *H. ledifolium* (L.) Mill. and *H. salicifolium* (L.) Mill. with different *Terfezia* (*T. boudieri* and *T. claveryi*) and *Tirmania* species [*T. nivea* and *T. pinoyi* (Maire) Malençon] were described by Awameh *et al.,*[103] and Awameh & Al- Sheikh[4, 104]. It is known that plants of the genus *Helianthemum* are able to form ectomycorrhiza[105-107], arbuscular endomycorrhiza[108], and ectendomycorrhiza[105, 109]. In addition, they were able to form a sheathing ectomycorrhiza with both *T. claveryi* and *P. lefebvrei* in vitro conditions[110]. Endomycorrhizas lacking Hartig net and mantle but displaying undifferentiated intracellular hyphae have been observed in roots of *Helianthemum* species mycorrhized by different species of *Terfezia* and *Tirmania* [111, 112]; as well as in roots of *Citrullus vulgaris* mycorrhized by *Kalaharituber pfeilii*[113]. Thus, the desert truffle

could be regarded as transitional between true ectomycorrhizal and true endomycorrhizal. However, the boundaries between ecto and endomycorrhizal types are somewhat fluid, and the character of the mycorrhiza formed is often determined by external conditions. Mycorrhizal association is well adapted to arid and semiarid climates[114]. *T. claveryi* and *P. lefebvrei* are two very frequent hypogeous ascomycetes in marl-gypsum soils of the semi-arid areas, which establish mycorrhizal symbiosis with several annual and perennial species of the *Helianthemum* genus[115]. Kovács & Jakucs[106] exhaustively described" *Helianthemirhiza hirsuta"* ectomycorrhiza, from *H. ovatum* (Viv.) Dun, which is characterized by ochre to brown cottony, simple mycorrhizal systems with straight, slightly bent or tortuous ends. Kovács *et al.,*[116] mentioned an overview of the results of the studies made on the truffle, *T. terfezioides,* particularly the investigations related to the associations of this fungus with plants. Under aseptic conditions, the experiments were carried out on modified MMN substrates with different phosphate concentrations to study the interaction of *T. terfezioides* with *Robinia pseudoacacia* and *H. ovatum.* The colonization of the roots of black locust was always weaker than that of *Helianthemum*. The main characteristics were the intracellular coiled, branched, frequently septate hyphae in dead root cells. The intercellular hyphae formed Hartig-net with finger like structures only in *Helianthemum*, the interactions could not be considered unambiguously as mycorrhizae. They also reported that there was no difference between the RFLP profiles of the nrDNA ITS of nineteen fruit bodies collected at the same time from the same habitat and the ITS of three randomly chosen specimens were identical on sequence level, too. This invariability makes to design species-specific PCR primers possible to check unambiguously the host plants. Gutiérrez *et al.,*[109,117] made study on morphological characterization of the mycorrhiza formed by *H. almeriense* Pau with *T. claveryi* and *P. lefebvrei* and gave a comprehensive review of mycorrhization of desert truffles with *Helianthemum* genus and they have mentioned the detailed anatomical description of the mycorrhizal systems in *H. almeriense* Pau and the structure and ultrastructure of the mycorrhiza formed by this plant species with *T. claveryi* and *P. lefebvrei*. Biotechnological methods on fungal inocula and mycorrhizal plant production, as well as plantation management, have been developed to cultivate some of the species of *Terfezia*[118-121]. Morte and Honrubia[63, 122] and Zamora *et al.,*[123] developed micropropagation protocol for *Helianthemum* spp. to facilitate their good mycorrhization under laboratory conditions. Morte *et al.,*[124] and Morte & Honrubia[62, 63] mentioned that the inoculum developed in MMN and agar media can be used directly from the plates as inoculum for in vitro mycorrhization synthesis. The true *Terfezia* species are mycorrhizal and have been used for mycorrhizal experiments with plants in the Cistaceae, mainly *Helianthemum* spp.[125]. They investigated the *in vitro* interaction of the Truffles *T. terfezioides* with *R. pseudoacacia* and *H. ovatum* and made a detailed anatomical and ultrastuctural characterization of the fungi.

Morte and his group (see Morte *et al.,*[14]) in Spain developed methods of mycorrhizal synthesis between desert truffles and the *Helianthemum* species in different ways according to the fungal inocula (spores or mycelium), the plant sources (seedlings or micropropagated plantlets) and the cultural conditions (in vitro or in vivo). Both the fungi (*T. claveryi* and *P. lefebvrei*) are good candidates for desert truffle production. However, only *T. claveryi* has been successfully cultivated since 1999[14, 80]. To improve the ecological, biotechnological and agricultural activities in the desert and in semi-arid lands of Saudi Arabia, mycorrhizal technology may be used as an important component for many desert plants and needs considerable attention.

Research programme needed for KSA and their impact on the economy and environment of the country

Advance indigenous knowledge, developed methods for detection and analysis of microbes and their physiological and biochemical properties; molecular as well as morphological identifications and in vitro mycorrhization are some of the technologies very useful for conservation of biodiversity and environment of this very valuable natural resources or wealth of Saudi Arabia and that will ensure that the goals of the Kingdom's national strategic plan are achieved.

Field survey to identify the truffle

producing areas throughout the country to gather knowledge of ethnomycological aspects, occurrence of truffles and their distribution, habitat, hosts range, as well as different ecological studies etc. will provide baseline information about the truffles research in this country. Conventional taxonomic identification as well as molecular identification of the truffles are also needed to find out the biodiversity of desert truffles in Saudi Arabia for designing the future research programme.

Biotechnology as well as physiological, biochemical and growth behavior of desert truffles will provide knowledge about production of pure culture for inoculation to develop suitable methods of cultivation in Saudi Arabia and also for taxonomic studies to find out the diversity exists in respect of desert truffles in Saudi Arabia.

The soil samples around truffles needs to be studied for isolation of the soil borne mycoflora associated with the truffles and the rhizosphere soils for their role in production and longevity of the truffles in the soils. At present there is no good method for preservation of desert truffles in Saudi Arabia. The preservation methods may be developed for use of the Bedouin Community and others.

Mycorrhizal association of the truffles of Saudi Arabia and mycorrhizal dependency of different types of *Terfezia*, and *Tirmania* with different *Helianthemum* species is completely lacking in this country now. This is very much needed to find out the conservation strategy and sustainable use of the desert truffles.

Desert truffles are very important for ecological importance as well as agroforestry and as a commercial crop. Moreover, there is growing interest in introducing desert truffle cultivation into dry environments as a useful way of exploiting lands, which until now have been regarded as unproductive in Saudi Arabia. Their introduction would help to improve the social and economical level of these dry regions. In addition, the host plants of desert truffles are xerophytic species. They are usually growing in semiarid environments. The plantations of host plants for growing desert truffles may help in preserve lands from the ravages of erosion.

As a signatory to the UN Convention on Biodiversity, Saudi Arabia is expected to set an example in areas such as sustainable use of biodiversity, in-situ conservation and the use of indigenous knowledge about desert truffles and also to improve the likelihood of the stakeholders especially the Bedouin Community.

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