

Chemical composition and ethnobotanical uses of *Acacia jacquemontii* Benth. in the Thal desert in Pakistan

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Photo 1.
Distribution of *Acacia jacquemontii* plants during dormant season in Thal desert landscape.
Photo F. Rasool, 2014.

RÉSUMÉ

COMPOSITION CHIMIQUE ET USAGES ETHNOBOTANIQUES DE *ACACIA JACQUEMONTII* BENTH. DANS LE DÉSERT DE THAL AU PAKISTAN

Cette étude s'est déroulée en 2014 à la Faculté de botanique et au Laboratoire de nutrition de l'Université agricole de Faisalabad, pour évaluer la composition chimique de l'arbuste *Acacia jacquemontii* Benth. et ses usages ethnobotaniques parmi les communautés du désert de Thal au Pakistan. Des échantillons composites de feuilles matures et de gousses recueillies sur le terrain ont été préparés afin d'en déterminer la composition en protéines brutes, matières grasses, fibres, cendres, micro- et macro-éléments, composés phénoliques totaux, flavonoïdes, tannins totaux, alcaloïdes et saponine. Un protocole d'enquête a été élaboré pour évaluer les utilisations ethnobotaniques (alimentation, abris et médicaments) de *A. jacquemontii* par les communautés locales. Des entretiens ont eu lieu avec treize membres des communautés locales et treize praticiens traditionnels Hakim utilisant la plante. Nos résultats indiquent les teneurs suivantes pour les feuilles et les graines de l'essence : 22 % et 33 % de protéines brutes ; 49 % et 15 % de fibres brutes ; 17 % et 28 % de matières grasses. Les feuilles contiennent 0,1 % de phosphore, 0,6 % de potassium, 1,2 % de calcium, 0,1 % de sodium et 0,6 % de magnésium. Les teneurs en micro-éléments s'établissent à 246 ppm pour le fer, 29,2 ppm pour le manganèse, 27,9 ppm pour le zinc et 14,4 ppm pour le cuivre. Les teneurs en alcaloïdes, flavonoïdes, saponines, tannins et composés phénoliques totaux dans les feuilles s'établissent à 5,8, 168, 196, 124 et 137 respectivement. Nos résultats ethnobotaniques indiquent qu'au-delà des utilisations de l'essence comme brise-vent et pour le bois de feu, le fourrage et les médicaments, les communautés locales, très croyantes, appellent *A. jacquemontii* « l'arbre des esprits » et sont convaincues de ses vertus « magiques » dans la pratique de la nécromancie. La plante était autrefois utilisée dans la région par des praticiens grecs dans le traitement de maladies banales.

Mots-clés : composés chimiques, utilisations locales, substances nutritives, composés phénoliques, désert de Thal, Pakistan.

ABSTRACT

CHEMICAL COMPOSITION AND ETHNOBOTANICAL USES OF *ACACIA JACQUEMONTII* BENTH. IN THE THAL DESERT IN PAKISTAN

This study was conducted in 2014 at the department of botany and the nutritional laboratory of Faisalabad University of Agriculture, in order to assess the chemical composition of *Acacia jacquemontii* Benth. and its ethnobotanical uses in local communities of the Thal desert in Pakistan. To determine its chemical composition, mature leaves and pods of the species were collected in the field and composite samples were prepared. Their chemical composition was then determined for crude protein, fat, fibre, ash, micro and macro-elements, total phenolics, flavonoids, total tannins, alkaloids and saponin. An interview schedule was developed to assess ethnobotanical uses of *A. jacquemontii* by local communities for food, shelter and medicine. Thirteen local people and thirteen Hakims involved in traditional uses were interviewed. Our results showed that the leaves and seeds of the species contained respectively 22% and 33% of crude proteins and 49% and 15% of crude fibre. Fats in the leaves and seeds amounted to 17% and 28%. The leaves contained 0.1% phosphorus, 0.6% potassium, 1.2% calcium, 0.1% sodium and 0.6% magnesium and micro-elements: iron (246 ppm), manganese (29.2 ppm), zinc (27.9 ppm) and copper (14.4 ppm). The amounts of alkaloids, flavonoids, saponins, tannins and total phenolics found in the leaves were 5.8, 168, 196, 124 and 137 respectively. Our results for ethnobotanical uses showed that besides using this shrub for shelter-belts, firewood, fodder and medicines, local people have strong religious beliefs, calling *A. jacquemontii* the 'shrub of the ghosts' and believing in its "magic" powers in the practice of necromancy. It was used in the past by Greek practitioners in this area to treat common ailments.

Keywords: chemical compounds, local uses, nutrients, phenolics, Thal desert, Pakistan.

RESUMEN

COMPOSICIÓN QUÍMICA Y USOS ETHNOBOTÁNICOS DE *ACACIA JACQUEMONTII* BENTH. EN EL DESIERTO DE THAL EN PAKISTÁN

Este estudio se desarrolló en 2014 en la Facultad de Botánica y el Laboratorio de Nutrición de la Universidad Agrícola de Faisalabad, para evaluar la composición química del arbusto *Acacia jacquemontii* Benth. y sus usos ethnobotánicos entre las comunidades locales del desierto de Thal en Pakistán. Se prepararon muestras compuestas de hojas maduras y vainas recogidas en el campo para determinar su contenido de proteína bruta, materia grasa, fibra, cenizas, micro y macroelementos, compuestos fenólicos totales, flavonoides, taninos totales, alcaloides y saponina. Se elaboró un protocolo de encuesta para evaluar los usos ethnobotánicos (alimento, refugio y medicamentos) de *A. jacquemontii* por las comunidades locales. Se celebraron entrevistas con trece miembros de las comunidades locales y trece terapeutas tradicionales (hakim) que usaban la planta. Nuestros resultados indican los siguientes contenidos en hojas y semillas de la especie: 22% y 33% de proteína bruta; 49% y 15% de fibra bruta; 17% y 28% de materia grasa. Las hojas contienen 0,1% de fósforo, 0,6% de potasio, 1,2% de calcio, 0,1% de sodio y 0,6% de magnesio. Los contenidos de microelementos son de 246 ppm de hierro, 29,2 ppm de manganeso, 27,9 ppm de zinc y 14,4 ppm de cobre. Los contenidos de alcaloides, flavonoides, saponinos, taninos y compuestos fenólicos totales de las hojas son, respectivamente, de 5,8, 168, 196, 124 y 137. Nuestros resultados ethnobotánicos muestran que, además de la utilización del arbusto como rompevientos, leña, forraje o medicamento, las comunidades locales, muy creyentes, denominan *A. jacquemontii* "el árbol de los espíritus" y creen que tiene poderes mágicos en la práctica de la necromancia. En el pasado, esta planta fue utilizada por terapeutas griegos para el tratamiento de dolencias comunes.

Palabras clave: compuestos químicos, usos locales, sustancias nutritivas, compuestos fenólicos, desierto de Thal, Pakistán

Introduction

Acacia jacquemontii Benth., locally known as Bable or Kikri, is one of the most valuable multiuse shrub of arid and semi-arid of Pakistan. It is hardy in nature and well-adjusted to the severe climatic conditions. It is an excellent source of fuel, forage, gum tannin, small poles and has numerous medicinal uses for livestock as well as for human beings (Rao and Chaudhary, 2002). This plant species mainly occurs in desertic regions of Australia and Africa. In Asia it is widely distributed in Pakistan, India, Afghanistan, Iran and Iraq (Mertia *et al.*, 2009). On sand dunes and interdunal sandy plains, it naturally distributes in patches, but on bare undulating sand dunes its frequency and density are higher. It is a potential but lesser known multipurpose shrub of arid and semi-arid regions (Singh *et al.*, 2003).

Acacia species are extremely drought-tolerant and are very important for soil conservation. The plant species reproduce naturally by seed germination. Most of the *Acacia* species grow in the arid and semi-arid regions, with an average temperature of 40-45°C in summer and less than 5°C in winter. These plants species are equipped with most of the features required to withstand severe climatic conditions, therefore they are considered as the most successful “survivors” in the arid regions (Aref, 2000; Ibrahim and Aref, 2000).

Acacia jacquemontii is an erect, multi-stemmed, and small to large shrub. It can attain a height ranging from 1.5 to 4.5 m in different habitats and soil types. The crown is variable in size, flattened, spreading and erect. The number of stems or branches on the individual plant varies from 4 to 46. Due to multi-stem growth characteristics, the plants attain a good canopy spread within four to five years. The growth of shrub is very fast in early stage while it slows down after five to six years. Plant stems are stiff, smooth and brown in color. Thickness of stem varies from 1.0 to 5.9 cm. Twigs are zigzag with grayish brown bark. Young shoots of the stems are slightly short and soft. Spines are arranged in paired, straight, slender and 2.0 to 5.0 cm long. They are white in color and most often smooth. Leaves are bipinnate 2.5-5.0 cm long with 2-4 pairs of pinnae. The leaflets of this species are in 5-10 pairs, sessile, 2.5-3.0 mm long, linear oblong, obtuse, and glabrous. Common petiole is 2.5 to 5.0 cm long with small or indistinct glands between the upper pair of pinnae (Mertia *et al.*, 2009).

Acacia species are very suitable for the production of paper and have similar pulping properties to a range of other tropical timbers (Nasroun, 1979). Their dark brown wood is strong,

durable, nearly twice as hard as teak, very shock resistant and is used for construction, tool handles and carts. Leaves and pods contain highly digestive proteins and are rich in minerals and generally used for feeding sheep and goats in certain parts of South Asia. *Acacia* species also have a wide range of secondary compounds including tannins, oxalates, cyanides, saponin, amines, alkaloids, fluoroacetate and other toxins. The leaves of many species have usually large amounts of tannins and are commercially important for tanning leather (Pandey and Sharma, 2005). *Acacia* species have significant pharmacological and toxicological effects. The decoction of the leaves is used for astringent to the bowels, cure of bronchitis, heals fracture and is good for eye diseases (Rushd and Kulliyat, 1987). Bruised leaves of the plants are applied to sore eyes of children. Paste of burnt leaves is an effective ointment for itching. Tender leaves beaten into a pulp are used as a gargle in spongy gums, sore throat and as wash in hemorrhagic ulcers and wound (Said, 1997). Leaves extract is an astringent and injected to allay irritation in acute gonorrhoea and leucorrhoea. Further, bruised leaves formed into a poultice and applied to ulcer act as a stimulant and astringent. The tender leaves growing tops rubbed into a paste with sugar and water act as a demulcent useful in coughs. The tender leaves beaten into a pulp are given in diarrhea as astringent (Nadkarni, 2005).

Lack of conservation efforts and heavy removal of this shrub by local people have become a great threat for the existence and survival of this species. In spite of its high significance, very little research work has been done on this shrub in the world. Need of the time is to study and conduct more research on this threatened plant species. Therefore a study on this species in Thal desert area was conducted with following main objectives: (i) to assess chemical composition of this species, and (ii) to investigate the ethnobotanical/traditional uses of the shrub by local communities.



Photo 2.
Acacia jacquemontii plants during peak growing season in Thal desert landscape.
Photo F. Rasool, 2014.



Photo 3.
Leaves of *Acacia jacquemontii*.
Photo F. Rasool, 2014.

Materials and Methods

Description of the study site

The study was conducted at Thal desert of Pakistan, with sites in South-Central Thal (Choubara site and Kharewala site), and sites in North-Central Thal (Northern Dagar Kotli site and Southern Dagar Kotli site). Thal desert comprises of about 2.5 million hectares in the Punjab Province. It lies between 71.07° E and 31-33° N latitude at an altitude of 200 meters. This desert is generally consisted of the districts Bhakkar, Layyah, Mianwali, Muzaffargarh and some parts of Sargodha, Khoshab, and Jhang districts. Around about 50-60% of the desert is under sand dunes and the remaining of the area is almost levelled (Quraishi *et al.*, 2006). In winter season the temperature of the desert goes down up to 0 °C and rises up to 44 °C in summer season of the year. Strong winds are very frequent and cause severe soil erosion. The soil is moderately calcareous, alkaline clay loam and alluvial with sandy texture (Sultani *et al.*, 1985).

Chemical Composition of *Acacia* Plants

Mature leaves and pods of the species were collected from the field from all selected sites (Choubara site, Kharewala site, Northern Dagar Kotli site and Southern Dagar Kotli site) and their composite samples were prepared accordingly. After this, chemical composition was determined for following compounds by using specific techniques of analysis.

The percentage of nitrogen in each sample was determined by using Kjeldahl's method as given in AOAC (2003). The nitrogen content was calculated according to the following formula:

$$N (\%) = \frac{\text{Vol. of } H_2SO_4 \text{ used} \times 0.0014 \times 250 \times 100}{\text{Wt. of sample} \times \text{Vol. of sample taken}}$$

Crude protein was calculated as follows:

$$\text{Crude protein} (\%) = N (\%) \times 6.25$$

The crude fiber contents were calculated by using the following formula:

$$\text{Crude fiber} (\%) = \frac{\text{Weight of residue after acid/alkali treatment} - \text{weight after ignition}}{\text{Total weight of sample}} \times 100$$

The total fat content was determined by using n-hexane solvent in Soxhlet apparatus according to the method described in AOAC (2003). Extra n-hexane was evaporated by putting the fat extract in the drying oven and the crude fat was determined according to the following formula:

$$\text{Fat} (\%) = \frac{\text{Weight of fat in sample} \times 100}{\text{Weight of sample}}$$

The oven dried plant sample (1 gram) was taken in an already weighed crucible. The crucible was placed in a furnace for ignition at 600°C for one hour, cooled and weighed to calculate the percentage of ash contents (AOAC, 2000):

$$\text{Ash contents} (\%) = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

Plant samples (comprising of leaves) of *A. jacquemontii* were collected and then oven-dried for 48 hours at 70°C. After this, these samples were ground in mortar with the help of pestle. Then dried samples (100 mg) were boiled in 10 ml of 1.4N HNO₃ on hotplate (TH-550; Advantec, Tokyo, Japan) 100°C for 30 min. After cooling, the suspension was diluted 250 times with distilled water and afterward it was analyzed for the determination of N, P, K, Na, Ca, Mg, Cu, Mn and Zn following Bhargava and Raghurpathi (1995) method. To determine phosphorus, 0.1 ml of sample solution already prepared by wet digestion method was taken in a volumetric flask. Then 8.6 ml of distilled water was added along with 1ml of ammonium molybdate reagent. After swirling the flask to mix solution, 0.4 ml of aminonephthol sulphonic acid was added. The absorbency was measured using distilled water as reagent blank in place of sample solution at 720 nm on a spectrophotometer. Phosphorus concentration was determined by comparing the absorbency to a previously prepared standard curve (Bolts and Mellon, 1948). Potassium and sodium were measured by flame photometer following AOAC (2000) method. Calcium (Ca), magnesium (Mg), iron (Fe), copper (Cu) and zinc (Zn) from samples of *A. jacquemontii* leaves were determined by using spectrophotometer following Bhargava and Raghurpathi (1995) method. All the secondary metabolites in this study were determined as per standard procedures. The method for the preparation of fat-free samples for the determination of tannins, alkaloids and saponin is the same as mentioned above. Contents of total phenolics were determined as reported by Julkenen-Titto (1985) pipet Folin-Ciocalteu reagent method. The total flavonoids content was measured by using the colorimetric assay (Zhishen *et al.*, 1999) with minor modifications. The total flavonoids content of the samples was calculated by using the following linear equation based on calibration curve:

$$Y = 0.0205X + 1494; r = 0.9992$$

where Y is the absorbance, and X is the flavonoid content in µg/g.

Tannins were determined according to the method of Van-Burden and Robinson (1981) with some modifications. Alkaloids in the dried samples were estimated following the method of Harborne (1973). Saponin was determined according to the method of Chapagain and Wiesman (2005).

Ethnobotanical uses of shrub

Ethnobotanical uses of plant in the form of food, shelter, medicine etc. by the local communities were assessed by developing an interview schedule. Thirteen local people and thirteen hakims (practitioners of Unani/Greek medicines) involved in the traditional uses of various parts were interviewed near each study site (Choubara, Kharewala, Northern Dagar Kotli and Southern Dagar Kotli). During these visits, well prepared questionnaires were completed by individual interviews by getting pertinent information. Data were tabulated and analyzed.

Results

Chemical composition of *Acacia*

The mean values of the chemical analysis on dry matter basis of leaves and seeds of this shrub in the growing season of the year 2014 are given in Table I. The leaves and seeds of the species had about 22% and 33% crude proteins respectively. The leaves and seeds contained about 49% and 15% crude fiber respectively. The fats in leaves and seeds of the shrub were about 17% and 28% respectively. Over all, seeds of the species had relatively more crude proteins and fats than its leaves. In contrast, the leaves of the species had relatively more crude fiber than its seeds. Plant leaves of the species included macro-elements as well and had about 0.1% phosphorus, 0.6% potassium, 1.2% calcium, 0.1% sodium and 0.6% magnesium. Micro-elements in the plant leaves comprised of mainly iron (246 ppm), manganese (29.2 ppm), zinc (27.9 ppm) and copper (14.4 ppm).

Table I.
Chemical composition of *Acacia jacquemontii* on dry matter basis during the year 2014.

Nutrients	Leaves		Seeds	
	Means	SE*	Means	SE*
			Primary compounds (%)	
Crude protein	22.5	0.08	32.7	0.04
Crude fiber	48.9	0.04	14.9	0.04
Fat	17.2	0.04	27.8	0.06
Ash	4.1	0.06	13.6	0.04
			Macro-elements (%)	
Phosphorous	0.16	0.01	-	-
Potassium	0.58	0.01	-	-
Calcium	1.21	0.01	-	-
Sodium	0.14	0.00	-	-
Magnesium	0.64	0.00	-	-
			Micro-elements (ppm)	
Iron	246	0.60	-	-
Manganese	29.2	0.06	-	-
Zinc	27.9	0.06	-	-
Copper	14.4	0.06	-	-
			Secondary compounds (g/kg)	
Alkaloids	5.8	0.06	-	-
Flavonoids	168	0.85	-	-
Saponins	196	0.60	-	-
Tannins	124	0.60	-	-
Total Phenolic	137	0.60	-	-
Hydrogen cyanides	0.2	0.04	-	-

*Standard Error.

Table II.
Traditional/Common uses of *Acacia jacquemontii* as told by the local inhabitants in the vicinity of study area in 2014.

Sites	Respondents (No.)	Medicines	Forage/ Fodder	Common uses			Uses based upon religious beliefs	
				Firewood (smokeless flames gives more heat)	Sweeping material	Shelterbelts	Shrub of ghosts	Necromancy under this shrub
Choubara	13	6 (46)	11 (84)	11 (84)	3 (23)	9 (69)	2 (15)	0 (0)
Kharewala	13	7 (54)	10 (77)	10 (77)	4 (30)	10 (77)	0 (0)	3 (23)
Northern Dagar Kotli	13	8 (61)	11 (84)	10 (77)	5 (38.5)	11 (84)	1 (7.7)	4 (30)
Southern Dagar Kotli	13	9 (69)	12 (92)	12 (92)	7 (53.8)	10 (77)	3 (23)	0 (0)
Average	-	7.5 (57.7)	11 (84.6)	10.7 (82.7)	4.7 (36.5)	10 (76.9)	1.5 (11.5)	1.7 (13.5)

Note: Values in the parentheses are percentages.

The secondary compounds in leaves consisted of mainly alkaloids, flavonoids, saponins, tannins, total phenolic and hydrogen cyanide. The amounts of alkaloids, flavonoids, saponins, tannins, total phenolics and hydrogen cyanide found in the leaves were 5.8, 168, 196, 124, 137 and 0.2 g kg, respectively.

Uses by rural people

Traditional uses of this shrub as told by the local people near the study sites are given in table II. On the average, about 85% of the local people of all sites revealed “forage/fodder” as the most common use of this shrub. The

second common use of the shrub as indicated by about 83% of the local people was in the form of firewood. About 77% of people mentioned the usage of shrub in the form of shelterbelts around their houses and farm crops. About 58% of the people depicted the medical use of this shrub against different ailments. Nearly 36% of people pointed out the usage of shrub in providing material for the sweeping purposes. Other uses as told by few people were related to the religious believes of local people about this plant species. About 12% of the people mentioned this plant as the “shrub of ghosts.” Nearly 14% of the people pointed out “necromancy” under this shrub.



Photo 4.
Immature and mature
flower clusters of *Acacia
jacquemontii*.
Photo F. Rasool, 2014.

Table III.
Medicinal uses of *A. jacquemontii* as told by Greek practitioners in 2014.

Sites	Respondents (No.)	Plant parts used for the treatment of ailments				
		Leaves Stomach pain/ kidney stone (No.)	Thorns Chicken pox/ Small pox (No.)	Roots Head lice killing (No.)	Pods and gum General/Sexual weakness and nightfall (No.)	Tooth sticks of branches Inflammation of tooth gums (No.)
Choubara	13	3 (23)	2 (15)	4 (30)	8 (61)	6 (46)
Kharewala	13	2 (15)	0 (0)	6 (46)	7 (53.8)	7 (53.8)
Northern Dagar Kotli	13	2 (15)	2 (15)	4 (30)	9 (69.2)	2 (15)
Southern Dagar Kotli	13	2 (15)	3 (23)	4 (30)	5 (38.5)	2 (15)
Average	-	2.2 (17.3)	1.7 (13.5)	4.5 (34.6)	7.2 (55.7)	4.2 (32.7)

Note: Values in the parentheses are percentages.

Uses by Greek practitioners (herbalist plant experts/herbal medicinal practitioners)

Medicinal uses of the shrub told by local Greek practitioners near the study sites are given in table III. Local Greek practitioners used parts of this shrub for the treatment of various ailments of local populations. The parts used for this purpose were leaves, thorns, roots, pods, gum and tooth sticks from branches. On the average, about 17% of the practitioners used to treat stomach pain/kidney stone problems of local people by providing them preserved leaves of the shrub. About 13% of the practitioners prescribed thorns of this shrub for the treatment of chicken pox or small pox

diseases in the people. For controlling and killing of lice in heads, nearly 35% of the practitioners recommended the root powder of the species. About 56% of the practitioners prescribed pods and gum of plant for the treatment of general/sexual weakness and nightfall. For controlling the inflammation of tooth gum, about 33% of the practitioners asked for the use of tooth sticks prepared from the plant branches. The rural people of the study area used to purchase above mentioned plant parts from the practitioners at very low costs.



Photo 5.
Immature and mature pods
of *Acacia jacquemontii*.
Photo F. Rasool, 2014.



Photo 6.
Profuse root system of *Acacia jacquemontii*.
Photo F. Rasool, 2014.

Discussion

Leaves and seeds of this shrub had about 23 and 33% crude proteins respectively. These findings are in line with those of Aganga *et al.* (1998) who reported that many *Acacia* species are quite rich in proteins and minerals. While studying the chemical composition of *Acacia nilotica* plants, Rubanza *et al.* (2005) found about 10-14% crude proteins in the leaves/seeds of this species. In another study, Abdullaha *et al.* (2014) reported 19% crude proteins in seeds and 10-20% crude proteins in the leaves of *Acacia nilotica*. Holechek and Herbal (1986) reported that diets having generally 6-12% crude proteins are required for maintenance and production of livestock. Sharif *et al.* (2006) reported that the green foliage of *Haloxylon recurvum* act as potent antifungal and has 13.4% crude protein, 20.7% crude fiber, and 22.8% ash. According to Chouhan *et al.* (1986) unripe green fruits and foliage of *Capparis decidua* contain 14.88% crude protein, 12.32% crude fiber, 0.18% P, 0.04% Fe, 0.09% Ca, 0.02% Zn, 0.02% Mn and 0.01% Cu. The findings of our study regarding total phenolic, flavonoids, alkaloids, tannins, saponins and hydrogen cyanides are in the line with the findings of Pengelly (2004) and Hameed *et al.* (2011). They reported higher amounts of total phenolic, tannins, saponins, flavonoids, alkaloids, and hydrogen cyanides while studying the various shrubs in Cholistan desert. Olafadehan *et al.* (2009) reported that the most difficult constraint in small ruminant production in the tropics is the inadequacy and poor quality of the energy and protein feed stuffs, partially during the dry season. In the arid and semi-arid zones, crude protein content in forage is poor, which is the major limiting factor of or livestock's production. This issue increases the cost of conventional protein supplements for livestock particularly for ruminants, which leads to loss of weights and high mortality rates (Abdullaha *et al.* 2014). *A. jacquemontii* had high amounts of crude proteins and adequate amount of minerals in its leaves. This indicates that this shrub is highly nutritious and palatable for



Photo 7.
Planting as bio-fence
or shelterbelt of *Acacia
jacquemontii* in Thal desert.
Photo F. Rasool, 2014.



Photo 8.
Coppicing behavior of *Acacia jacquemontii* in Thal desert.
Photo F. Rasool, 2014.

the ruminants. This plant species contained higher amounts of secondary compounds in its leaves and seeds. Such compounds lead to heavy consumption of this species by the herbivores in dry conditions in the Thal. Traditionally, rural populations had great dependence on this shrub. For raising livestock and food cooking, pastoral people depended largely (above 82%) on forage and firewood of this plant species. They preferred the firewood of this shrub because it gave smokeless flames and more heat during food cooking. Majority of people grew the shelterbelts of the shrub around their living places and used the branches of plant for sweeping purposes. Because of prevailing acute poverty in the study areas, local people used the parts of this shrub for the treatments of their ailments. For medicinal purposes, their dependency on this species was above 50%. Small fraction (11.13%) of the local people had religious beliefs/affiliations with this plant species. Such people called this species as shrub ghost and believed on necromancy under this shrub. Such beliefs/attachments with the shrub used to give mental satisfaction to local people against their various psychological disorders. The Greek practitioners in the area used to provide preserved parts of the species to the local people for treatments of their common ailments. The above findings on the ethnobotanical uses of this plant species are in the line with the findings of Azhar (2014), who reported the major share of medicinal shrubs in pastoral life in the Cholistan desert. He found that wild plants in this desert of Pakistan had multipurpose utilization as firewood, medicine, forage and use in religious ceremonies.

Conclusion

Nutritional findings of the study would guide the rangeland managers about the palatability of the shrub in the desert. Ethnobotanical findings provide the trend of rural human population dependence on various plant parts of the species for medical treatment of the different diseases common in the area. The study has thus provided important findings that were almost unknown before. Such findings would be very helpful for further research on *Acacia jacquemontii* as well as for better management and conservation of the species in the desert environment.

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