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A Critical Examination of Dan Gibson's Botanical Argument against Makkah as the Sacred Center of Early Islam

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ABSTRACT

This study critically examines Dan Gibson's botanical argument against identifying Makkah as the sacred center of early Islam. Gibson argues that references in early Islamic sources to grasses growing in Makkah, particularly idhkhair and jalīl, are difficult to reconcile with the city's predominantly arid landscape and therefore raise doubts about the identification of present-day Makkah with the Makkah described in the early Islamic tradition. This study reassesses this claim through an interdisciplinary analysis of Qur'ānic and Prophetic evidence, botanical classification, ecological characteristics, and modern studies of the flora of the Makkah region. Particular attention is given to the distinction between an uncultivated or non-arable environment and a landscape entirely devoid of natural vegetation. The analysis demonstrates that the Qur'ānic description of Makkah as wādīn ghayrī dhī zar' ("an uncultivated valley") does not logically entail the absence of naturally occurring grasses, shrubs, or trees. Furthermore, idhkhair (Cymbopogon schoenanthus) and jalīl (Panicum turgidum) are arid-adapted grasses whose ecological characteristics are compatible with the environmental conditions of Makkah. Modern botanical evidence further strengthens this conclusion. A 2014 study of the Makkah flora documented 184 plant species belonging to 125 genera and 44 families, with Poaceae—the family to which both idhkhair and jalīl belong—representing 16.94% of the recorded flora. The documented presence of Panicum turgidum among the relatively abundant species is particularly significant for evaluating Gibson's claim. The study concludes that Gibson's botanical argument depends upon an unwarranted conflation of aridity, non-arability, and complete absence of vegetation. Consequently, botanical evidence does not provide sufficient grounds for rejecting Makkah as the sacred center of early Islam. More broadly, the study demonstrates the importance of integrating textual, historical, ecological, and botanical evidence when evaluating revisionist claims concerning early Islamic sacred geography.

Introduction

Makkah occupies a central position in the religious and sacred geography of Islam. According to the Qur'ān and early Islamic tradition, it is the location of the Ka'bah and the Sacred House of God and the principal sanctuary associated with the emergence of Islam. Nevertheless, the historical identification of Makkah has been questioned by modern revisionist scholars, particularly Dan Gibson, who argues that the original sacred center of Islam was located elsewhere.

Among Gibson's arguments is a botanical objection based on references in the Prophetic traditions to grasses growing in Makkah, particularly idhkhir and jalīl. He argues that these references are difficult to reconcile with the apparently barren and arid landscape of present-day Makkah and therefore casts doubt on its identification with the Makkah described in the early Islamic sources.

This argument, however, appears to rest on a conflation of uncultivated land with vegetation-free land. The Qur'ānic description of Makkah as an uncultivated valley does not necessarily imply the absence of naturally occurring grasses and plants. Moreover, botanical evidence identifies idhkhir as *Cymbopogon schoenanthus* and jalīl as *Panicum turgidum*, both of which are adapted to hot and arid environments and are documented in the flora of the Makkah region.

This study therefore critically examines Gibson's botanical argument through Qur'ānic and Prophetic evidence alongside modern botanical research on Makkah. It argues that the presence of idhkhir, jalīl, and other naturally occurring vegetation is not inconsistent with Makkah's characterization as an uncultivated and arid region and, consequently, does not provide sufficient evidence for challenging its identification as the sacred center of early Islam.

Dan Gibson's Argument

Dan Gibson argues that, if we examine the present-day landscape of Makkah, it appears to be an entirely arid and barren environment in which little or no vegetation grows. On the other hand, a number of Prophetic traditions (aḥādīth) indicate that various types of grasses and vegetation were found in Makkah. Gibson therefore contends that this apparent discrepancy raises questions about the identification of the sacred city described in the early Islamic traditions with present-day Makkah. According to his argument, the sacred city referred to in these traditions may not have been Makkah but rather another location.

In support of this argument, Dan Gibson cites the following ḥadīth from Ṣaḥīḥ al-Bukhārī:

قالت عائشة: أرق النبي صلى الله عليه وسلم ذات ليلة، فقال: «لأيت رجلا صالحا من أصحابي يحرسني الليلة» إذ سمعنا صوت السلاح، قال: «من هذا؟»، قال سعد: يا رسول الله، جئت أحرسك، فنام النبي صلى الله عليه وسلم حتى سمعنا غطيته، قال أبو عبد الله: وقالت عائشة: قال بلال: «ألا لأيت شعري هل أبيتن ليلة ... بواد وحولي إنخر وجليل»، فأخبرت النبي صلى الله عليه وسلم¹

ʿĀ'ishah (may Allah be pleased with her) reported: "One night, the Prophet (peace be upon him) was unable to sleep and said, 'I wish that a righteous man from among my Companions would keep watch over us tonight.' Meanwhile, we heard the sound of weapons. He (peace be upon him) asked, 'Who is that?' Sa'd ibn Abī Waqqāṣ (may Allah be pleased with him) replied, 'O Messenger of Allah, it is I. I have come to keep watch over you.' The Prophet (peace be upon him) then went to sleep, until we could hear his snoring." Imām al-Bukhārī further relates that ʿĀ'ishah said that Bilāl stated:

«ألا لأيت شعري هل أبيتن ليلة ... بواد وحولي إنخر وجليل»

"I wish I could spend a night in one of the valleys of Makkah, surrounded by Idhkhir and Jalīl

[types of grass].”

‘Ā’ishah states that she conveyed this statement to the Prophet (peace be upon him).

Furthermore, numerous other ḥadīths mention the presence of grass and vegetation in Makkah. However, Dan Gibson does not cite these traditions in his discussion. After presenting the aforementioned ḥadīth, Gibson writes:

It is hard to believe that this was written about the Mecca we know today, as the area around Mecca is completely desert sand where no grass grows naturally, nor is there any evidence that the area was ever irrigated and able to support grass and fields in the past.ⁱⁱ

A Critical Examination of Dan Gibson’s Argument

Makkah is an arid and non-agricultural region, characterized by the absence of cultivated fields and orchards. It is not naturally suited to the cultivation of crops or the production of agricultural produce. The Qur’ān itself describes the land in which Makkah is situated as a non-cultivated or barren valley.

The Qur’ān recounts the episode in which Prophet Ibrāhīm (Abraham, peace be upon him), after leaving his wife Hājar (Hagar) and his son Ismā‘īl (Ishmael, peace be upon them) in the vicinity of Makkah, supplicated to Allah, saying that he had settled part of his offspring in a valley that was not suitable for cultivation. He then prayed to Allah to provide them with sustenance and to cause people’s hearts to incline toward them.

Thus, the Qur’ānic description of Makkah as an uncultivated valley does not necessarily imply the complete absence of vegetation. Rather, it primarily indicates the absence of conventional agriculture, cultivated fields, and fruit-bearing orchards. Consequently, Gibson’s inference that references to grass and vegetation in the ḥadīth literature are incompatible with the geographical environment of Makkah requires further examination.

The Qur’ān states in Sūrat Ibrāhīm:

رَبَّنَا إِنِّي أَسْكَنْتُ مِنْ ذُرِّيَّتِي بِوَادٍ غَيْرِ ذِي زَرْعٍ عِنْدَ بَيْتِكَ الْمُحَرَّمِ رَبَّنَا لِيُقِيمُوا الصَّلَاةَ فَاجْعَلْ أَفْنِدَةً مِنَ النَّاسِ تَهْوِي إِلَيْهِمْ وَارْزُقْهُمْ مِنَ الثَّمَرَاتِ لَعَلَّهُمْ يَشْكُرُونَⁱⁱⁱ

(Abraham (peace be upon him) prayed) “Our Lord, I have settled some of my offspring in an uncultivated valley near Your Sacred House, our Lord, so that they may establish prayer. So incline some of the hearts of people toward them and provide them with fruits for sustenance, so that they may be grateful.”

In fact, the characterization of Makkah as non-arable land means that crops and cultivated orchards do not generally grow there. However, it is incorrect to infer from this that no vegetation, grasses, or trees can grow in the region. We have all observed repeatedly in our daily lives that land may be infertile, barren, or unsuitable for cultivation and yet still support the growth of grasses, shrubs, or trees. The ḥadīth cited by Dan Gibson mentions two types of grass, one called *idhkhir* and the other *jalīl*. Other Prophetic traditions indicate that, in addition to *idhkhir* and *jalīl*, other types of grasses also grew in Makkah. Therefore, the presence of *idhkhir*, *jalīl*, or other grasses in Makkah is by no means inconsistent with its characterization as non-arable land.

Even today, if we observe the mountains surrounding Makkah, we can find various forms of grass growing there. Dan Gibson, however, has apparently never visited Makkah in his lifetime and therefore lacks first-hand knowledge of its vegetation. On the basis of this apparent lack of knowledge, he raises the objection that the ḥadīth mentions *idhkhir* and *jalīl*, whereas these grasses

are allegedly absent from present-day Makkah. From this, he concludes that Makkah cannot be the sacred city from which Islam originated and to which the early Islamic traditions refer. Had Gibson consulted a botanist or a specialist in the flora of the Makkah region, this objection might never have arisen. His argument appears to have emerged, at least in part, from the absence of a botanical assessment of the vegetation of Makkah.

The Arabic term *idhkkhir* is referred to in English as “lemon grass” and “Straw of Mecca.”^{iv} It is called “lemon grass” because of its lemon-like fragrance, while the designation “Straw of Mecca” is particularly significant in the present discussion because it reflects the association of this grass with Makkah. The term *jalīl*, on the other hand, is rendered in English as “camel grass” and “desert grass.”^v It is called “camel grass” because it serves as food for camels, and “desert grass” because it grows naturally in desert environments. *Idhkkhir* itself is also sometimes referred to as “camel grass,” in addition to “lemon grass” and “Straw of Mecca,” because it too is used as camel fodder.^{vi}

For responding to Gibson’s objection, the English designations “Straw of Mecca” for *idhkkhir* and “desert grass” for *jalīl* are particularly noteworthy. Gibson’s claim is that *idhkkhir* and *jalīl* do not grow in Makkah. Yet, historically, *idhkkhir* appears to have grown in Makkah in sufficient abundance for it to become associated in English nomenclature with the expression “Straw of Mecca.” This designation is important because it suggests a historical botanical association between the plant and the Makkah region. Likewise, *jalīl* is known as “desert grass” because of its natural occurrence in arid and desert environments, and Makkah historically constituted an arid desert environment. Furthermore, both *idhkkhir* and *jalīl* have been referred to as “camel grass” because they can serve as camel fodder—an especially relevant observation in the context of the historical Arabian environment, where camels played a central role in transportation and pastoral life.

In botanical terminology, *idhkkhir* is identified as *Cymbopogon schoenanthus*, while *jalīl* is identified as *Panicum turgidum*. Both *idhkkhir* and *jalīl* belong to the grass family Poaceae. They are plants characteristically adapted to hot temperatures and relatively dry environments. Both species are also reported to occur in the Makkah region today.

The Poaceae family is one of the largest families of angiosperms and comprises approximately 707 genera and 11,337 species.^{vii} A recent study indicates that Poaceae is the most abundant plant family in terms of species representation in the flora of Makkah. Approximately 16.94% of the plant species recorded in the Makkah region belong to this family. In terms of species abundance, *Panicum turgidum* (*jalīl*) ranks among the most frequently occurring plant species in Makkah, reportedly occupying third place in the regional flora.^{viii}

Taken together, these botanical observations significantly weaken Gibson’s argument. The presence of *idhkkhir* and *jalīl* in Makkah is not incompatible with the city’s description as a non-arable or agriculturally unproductive environment. On the contrary, the ecological characteristics of these grasses are entirely compatible with the hot and arid conditions of the Makkah region. Consequently, the mere presence or absence of cultivated vegetation cannot reasonably be employed as decisive evidence against the traditional identification of Makkah as the sacred center of early Islam. A sound historical argument concerning the geographical identity of Makkah must take into account the distinction between agricultural productivity and natural vegetation, as well as the botanical evidence concerning the region’s actual flora.



(idhkkhir)

Cymbopogon Schoenanthus



(jalīl)

Panicum Turgidum

According to a recent study, 184 plant species have been recorded in Makkah, including both herbaceous plants and trees. These species belong to 125 genera and 44 families. Among the most abundant plant families, Poaceae ranks first, accounting for 16.94% of the recorded flora. It should be noted that both *idhkkhir* (*Cymbopogon schoenanthus*) and *jalīl* (*Panicum turgidum*) belong to this family. Fabaceae ranks second, representing 13.11%, while Amaranthaceae ranks third, accounting for 4.92%. In addition, 41 other plant families are represented in the flora of Makkah.

The 184 recorded species belonging to these 44 families are distributed across the region in varying proportions. Among the most frequently recorded species, *Calotropis procera* ranks first, accounting for 4.21% of the recorded flora; *Aerva javanica* ranks second, with 3.93%; while *Panicum turgidum* and *Dipterygium glaucum* jointly rank third, each accounting for 3.37%.^{ix}

The findings of this study therefore challenge Dan Gibson's assertion that Makkah does not support the growth of vegetation or trees. On the contrary, the botanical evidence demonstrates that

Makkah possesses a diverse flora comprising numerous species, genera, and plant families. More importantly, the presence of *Panicum turgidum* (*jalil*)—one of the grasses mentioned in the Prophetic traditions—among the relatively abundant species recorded in the region provides significant botanical evidence against Gibson’s claim.

The following graph presents the complete distribution of the plant species and genera recorded in Makkah, together with their respective locations. The study on which this data is based was conducted in 2014.

Specimens number	Family	Scientific name	Coordinates	Locality	Date
326, 361	Acanthaceae	<i>Blepharis ciliaris</i> (L.) B. L. Burtt	N21°24.051' E039°54.913'	18	04/18/14
84		<i>Blepharis ciliaris</i> (L.) B. L. Burtt	N21°27.039' E039°57.254'	19	04/18/14
83, 84		<i>Blepharis ciliaris</i> (L.) B. L. Burtt	N21°27.331' E039°51.710'	24	04/19/14
211, 379		<i>Blepharis ciliaris</i> (L.) B. L. Burtt	N21°24.595' E039°52.210'	30	04/21/14
347		<i>Blepharis ciliaris</i> (L.) B. L. Burtt	N21°36.738' E040°06.913'	43	04/25/14
169, 171		<i>Blepharis ciliaris</i> (L.) B. L. Burtt	N21°32.103' E040°07.671'	45	04/25/14
210		<i>Peristrophe paniculata</i> (Forssk.) Brummitt	N21°27.039' E039°57.254'	19	04/18/14
232		<i>Ruellia malacosperma</i> Greenman	N21°23.042' E039°52.144'	46	04/26/14
4	Aizoaceae	<i>Sesuvium verrucosum</i> Raf.	N21°23.042' E039°52.144'	46	04/26/14
232		<i>Sesuvium verrucosum</i> Raf.	N21°19.464' E040°02.992'	4	04/08/14
389		<i>Sesuvium verrucosum</i> Raf.	N21°20.463' E039°57.379'	13	04/13/14
155		<i>Trianthema protulacaotrum</i> L.	N21°20.463' E039°57.379'	13	04/13/14
423		<i>Trianthema crystallinum</i> (Forssk.) Vahl	N21°20.463' E039°57.379'	13	04/13/14
317	Amaranthaceae	<i>Aerva javanica</i> (Burm. f.) Juss.	N21°20.401' E039°56.933'	11	04/13/14
32, 351		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°54.560' E039°16.807'	8	04/12/14
249, 402		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°24.051' E039°54.913'	18	04/18/14
87		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°27.449' E039°57.361'	20	04/18/14
128, 255		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°25.199' E039°53.070'	22	04/19/14
103		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°26.313' E039°51.374'	23	04/19/14
203, 256		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°23.212' E039°51.136'	27	04/21/14
378		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°22.639' E039°52.258'	31	04/22/14
51		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°21.122' E039°52.270'	33	04/22/14
77		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°19.347' E039°53.034'	34	04/22/14
149		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°23.620' E039°49.535'	40	04/24/14
381		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°36.738' E040°06.913'	43	04/25/14
176, 184, 185		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°32.103' E040°07.671'	45	04/25/14
403		<i>Aerva javanica</i> (Burm. f.) Juss.	N21°26.754' E039°45.199'	47	04/27/14
419		<i>Aerva persica</i> (Burm. f.) Merr.	N21°19.650' E040°01.286'	3	04/08/14
303		<i>Alternanthera bettzickiana</i> (Regel.) Voss.	N21°19.464' E040°02.992'	4	04/08/14
79, 411		<i>Alternanthera pungens</i> Kunth	N21°19.347' E039°53.034'	34	04/22/14
403		<i>Amaranthus albus</i> L.	N21°20.463' E039°57.379'	13	04/13/14
98		<i>Amaranthus graecizans</i> L.	N21°27.331' E039°51.710'	24	04/19/14
402		<i>Amaranthus graecizans</i> L.	N21°20.463' E039°57.379'	13	04/13/14
114		<i>Amaranthus hybridus</i> L.	N21°23.204' E039°52.041'	21	04/19/14
252		<i>Amaranthus hybridus</i> L.	N21°26.150' E039°46.046'	48	04/27/14
177, 192		<i>Amaranthus lividus</i> L.V.	N21°32.103' E040°07.671'	45	04/25/14
363, 386		<i>Amaranthus lividus</i> L.V.	N21°20.463' E039°57.379'	13	04/13/14
107		<i>Amaranthus lividus</i> L.V.	N21°27.039' E039°57.254'	19	04/18/14
372		<i>Amaranthus lividus</i> L.V.	N21°25.199' E039°53.070'	22	04/19/14
332		<i>Amaranthus lividus</i> L.V.	N21°20.493' E039°52.401'	32	04/22/14
38, 132, 133		<i>Amaranthus lividus</i> L.V.	N21°26.609' E039°47.611'	36	04/24/14
288		<i>Amaranthus lividus</i> L.V.	N21°26.807' E039°48.560'	37	04/24/14
371		<i>Amaranthus lividus</i> L.V.	N21°26.572' E039°46.758'	38	04/24/14
287		<i>Amaranthus lividus</i> L.V.	N21°26.363' E039°49.002'	39	04/24/14
233	Apiaceae	<i>Anethum graveolens</i> L.	N21°26.363' E039°49.002'	39	04/24/14

101		<i>Catharathus roseus</i> G. Don	N21°27.331' E039°51.710'	24	04/19/14
237		<i>Catharathus roseus</i> G. Don	N21°23.042' E039°52.144'	46	04/26/14
157, 159		<i>Rhazya stricta</i> Decne.	N21°22.801' E039°49.812'	41	04/24/14
8, 355	Apocynaceae	<i>Rhazya stricta</i> Decne.	N21°19.650' E040°01.286'	3	04/08/14
125		<i>Rhazya stricta</i> Decne.	N21°20.590' E039°44.101'	15	04/16/14
119		<i>Rhazya stricta</i> Decne.	N21°20.903' E039°41.694'	16	04/16/14
360		<i>Rhazya stricta</i> Decne.	N21°20.456' E039°41.559'	17	04/16/14
91		<i>Rhazya stricta</i> Decne.	N21°27.331' E039°51.710'	24	04/19/14
17		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°19.464' E040°02.992'	4	04/08/14
134		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°20.401' E039°56.933'	11	04/13/14
173		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°20.456' E039°41.559'	17	04/16/14
127		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°26.313' E039°51.374'	23	04/19/14
122		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°27.331' E039°51.710'	24	04/19/14
267		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°23.212' E039°51.136'	27	04/21/14
331		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°20.493' E039°52.401'	32	04/22/14
55		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°21.122' E039°52.270'	33	04/22/14
66		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°19.347' E039°53.034'	34	04/22/14
67		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°26.609' E039°47.611'	36	04/24/14
325		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°26.807' E039°48.560'	37	04/24/14
354		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°36.738' E040°06.913'	43	04/25/14
241		<i>Calotropis procera</i> (Ait.) Ait. f.	N21°23.042' E039°52.144'	46	04/26/14
397		<i>Glossonema varians</i> Benth. ex Hook. f.	N21°54.560' E039°16.807'	8	04/12/14
6	Asclepidaceae	<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	N21°19.448' E039°58.002'	2	04/08/14
34, 29		<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	N21°56.220' E039°01.617'	7	04/12/14
295		<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	N21°54.560' E039°16.807'	8	04/12/14
93		<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	N21°27.331' E039°51.710'	24	04/19/14
92		<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	N21°22.639' E039°52.258'	31	04/22/14
153		<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	N21°22.801' E039°49.812'	41	04/24/14
250		<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	N21°26.754' E039°45.199'	47	04/27/14
34		<i>Odontanthera radians</i> (Forssk.) D. V. Field	N21°54.560' E039°16.807'	8	04/12/14
89, 104		<i>Pergularia tomentosa</i> L.	N21°27.331' E039°51.710'	24	04/19/14
34		<i>Pergularia tomentosa</i> L.	N21°54.560' E039°16.807'	8	04/12/14
329		<i>Periploca visciformis</i> K. Schum.	N21°24.051' E039°54.913'	18	04/18/14
406		<i>Steinheilina radicans</i> Decne.	N21°54.560' E039°16.807'	8	04/12/14
73		<i>Arnebia decumbens</i> (Vent.) Coss. and Kral.	N21°21.122' E039°52.270'	33	04/22/14
180		<i>Gastrocotyle hispida</i> (Forssk.) Bunge	N21°20.463' E039°57.379'	13	04/13/14
227		<i>Heliotropium bacciferum</i> Forssk.	N21°27.449' E039°57.361'	20	04/18/14
312	Boraginaceae	<i>Heliotropium bacciferum</i> Forssk.	N21°24.946' E039°59.447'	14	04/13/14
348		<i>Heliotropium bacciferum</i> Forssk.	N21°36.738' E040°06.913'	43	04/25/14
23		<i>Heliotropium crispum</i> Desf.	N21°19.464' E040°02.992'	4	04/08/14
58		<i>Heliotropium crispum</i> Desf.	N21°23.620' E039°49.535'	40	04/24/14
168		<i>Heliotropium crispum</i> Desf.	N21°32.103' E040°07.671'	45	04/25/14

78		<i>Heliotropium crispum</i> Desf.	N21°19.347' E039°53.034'	34	04/22/14
24		<i>Heliotropium europaeum</i> L.V.	N21°19.464' E040°02.992'	4	04/08/14
416		<i>Heliotropium digynum</i> Desf.	N21°30.993' E040°02.958'	42	04/25/14
175		<i>Heliotropium supinum</i> L.	N21°32.103' E040°07.671'	45	04/25/14
220		<i>Trichodesma africanum</i> (L.) R. Br.	N21°27.039' E039°57.254'	19	04/18/14
1		<i>Dipterygium glaucum</i> Decne.	N21°21.313' E039°55.503'	1	04/08/14
29		<i>Dipterygium glaucum</i> Decne.	N21°56.607' E039°01.742'	5	04/12/14
309, 314		<i>Dipterygium glaucum</i> Decne.	N21°24.946' E039°59.447'	14	04/13/14
121		<i>Dipterygium glaucum</i> Decne.	N21°20.590' E039°44.101'	15	04/16/14
166		<i>Dipterygium glaucum</i> Decne.	N21°20.456' E039°41.559'	17	04/16/14
225		<i>Dipterygium glaucum</i> Decne.	N21°27.449' E039°57.361'	20	04/18/14
269	Capparaceae	<i>Dipterygium glaucum</i> Decne.	N21°23.160' E039°50.086'	28	04/21/14
296		<i>Dipterygium glaucum</i> Decne.	N21°22.639' E039°52.258'	31	04/22/14
156		<i>Dipterygium glaucum</i> Decne.	N21°22.801' E039°49.812'	41	04/24/14
165, 345		<i>Dipterygium glaucum</i> Decne.	N21°32.103' E040°07.671'	45	04/25/14
251		<i>Dipterygium glaucum</i> Decne.	N21°26.754' E039°45.199'	47	04/27/14
188		<i>Maerua crassifolia</i> Forssk.	N21°56.220' E039°01.617'	7	04/12/14
431, 294, 421		<i>Maerua crassifolia</i> Forssk.	N21°22.639' E039°52.258'	31	04/22/14
183, 189		<i>Maerua crassifolia</i> Forssk.	N21°36.738' E040°06.913'	43	04/25/14
159, 180, 196		<i>Maerua oblongifolia</i> (Forssk.) A. Rich	N21°36.767' E040°05.869'	44	04/25/14
313		<i>Loaflingia hispanica</i> L.	N21°24.946' E039°59.447'	14	04/13/14
413		<i>Minuartia hybrida</i> (Vill.) Schischk.	N21°19.464' E040°02.992'	4	04/08/14
308		<i>Polycarpae repens</i> (Forssk.) Aschers. Schweinf.	N21°19.650' E040°01.286'	3	04/08/14
303	Caryophyllaceae	<i>Polycarpon tetraphyllum</i> L.	N21°27.449' E039°57.361'	20	04/18/14
41		<i>Polycarpea robbaire</i> Kuntze.	N21°23.160' E039°50.086'	28	04/21/14
307		<i>Spergularia diandra</i> (Guss.) Boiss.	N21°19.650' E040°01.286'	3	04/08/14
68		<i>Spergularia diandra</i> (Guss.) Boiss.	N21°26.572' E039°46.758'	38	04/24/14
73		<i>Telephium sphaerospermum</i> Boiss.	N21°26.572' E039°46.758'	38	04/24/14
144		<i>Atriplex farinosa</i> Forssk.	N21°20.463' E039°57.379'	13	04/13/14
138		<i>Chenopodium album</i> L.	N21°20.463' E039°57.379'	13	04/13/14
414	Chenopodiaceae	<i>Chenopodium murale</i> L.	N21°22.801' E039°49.812'	41	04/24/14
30		<i>Halocnemum strobilaceum</i> (Pak.) M. B	N21°56.607' E039°01.742'	5	04/12/14
35		<i>Salsola vermiculata</i> L.	N21°56.607' E039°01.742'	5	04/12/14
69, 70		<i>Suaeda aegyptiaca</i> (Hasselq.) Zohary	N21°19.347' E039°53.034'	34	04/22/14
367		<i>Launaea capitata</i> (Spreng.) Dandy	N21°26.363' E039°49.002'	39	04/24/14
41, 42, 367		<i>Launaea intybacea</i> Beauverd	N21°56.607' E039°01.742'	5	04/12/14
368		<i>Launaea nudicaulis</i> (L.) Hook. f.	N21°26.363' E039°49.002'	39	04/24/14
370	Compositae	<i>Launaea procumbens</i> (Roxb.) Ram. and Rajg.	N21°26.363' E039°49.002'	39	04/24/14
112		<i>Pulicaria schimperi</i> D. C.	N21°25.199' E039°53.070'	22	04/19/14
4		<i>Senecio flavus</i> (Decne.) Sch. Bip.	N21°21.313' E039°55.503'	1	04/08/14
151		<i>Sonchus oleraceus</i> L.	N21°26.363' E039°49.002'	39	04/24/14
369, 405		<i>Urospermum picroides</i> (L.) F. W. Schmidt	N21°26.363' E039°49.002'	39	04/24/14
262, 412, 427	Brassicaceae	<i>Farsetia stylosa</i> R. Br. Sehweinf.	N21°54.560' E039°16.807'	8	04/12/14

179		<i>Morettia parviflora</i> Boiss.	N21°32.103' E040°07.671'	45	04/25/14
100		<i>Schouwia purpurea</i> (Forssk.) Muschl.	N21°23.212' E039°51.136'	27	04/21/14
16, 400		<i>Citrullus colocynthis</i> (L.) Schrad.	N21°19.464' E040°02.992'	4	04/08/14
167, 399		<i>Citrullus colocynthis</i> (L.) Schrad.	N21°32.103' E040°07.671'	45	04/25/14
80	<i>Cucurbitaceae</i>	<i>Cucumis prophetarum</i> L.	N21°27.331' E039°51.710'	24	04/19/14
271		<i>Momordica balsamina</i> L.	N21°23.160' E039°50.086'	28	04/21/14
430		<i>Momordica charantia</i> L.	N21°23.160' E039°50.086'	28	04/21/14
418		<i>Cyperus bulbosus</i> Vahl	N21°54.560' E039°16.807'	8	04/12/14
30		<i>Cyperus conglomeratus</i> Rott.	N21°56.607' E039°01.742'	5	04/12/14
56	<i>Cyperaceae</i>	<i>Cyperus longus</i> L.	N21°54.560' E039°16.807'	8	04/12/14
27		<i>Cyperus rotundus</i> Benth.	N21°21.9' E040°11.10'	10	04/10/14
44, 45		<i>Cyperus schimperianus</i> Spreng.	N21°21.122' E039°52.270'	33	04/22/14
28		<i>Euphorbia cuneata</i> (Vahl) P.V.Heath	N21°54.560' E039°16.807'	8	04/12/14
25		<i>Euphorbia granulata</i> Forssk.	N21°19.464' E040°02.992'	4	04/08/14
219		<i>Euphorbia hirta</i> L.	N21°26.572' E039°46.758'	38	04/24/14
305	<i>Euphorbiaceae</i>	<i>Chrozophora oblongifolia</i> (Del.) A. Juss.	N21°19.464' E040°02.992'	4	04/08/14
431		<i>Chrozophora oblongifolia</i> (Del.) A. Juss.	N21°54.560' E039°16.807'	8	04/12/14
373		<i>Euphorbia serpens</i> Kunth.	N21°32.103' E040°07.671'	45	04/25/14
12		<i>Aristida adscensionis</i> Walter	N21°19.650' E040°01.286'	3	04/08/14
390		<i>Aristida adscensionis</i> Walter	N21°20.463' E039°57.379'	13	04/13/14
275		<i>Aristida adscensionis</i> Walter	N21°24.595' E039°52.210'	30	04/21/14
248, 273		<i>Arundo donax</i> L.	N21°23.160' E039°50.086'	28	04/21/14
222		<i>Cenchrus biflorus</i> Roxb.	N21°23.160' E039°50.086'	28	04/21/14
62		<i>Cenchrus ciliaris</i> L.	N21°21.122' E039°52.270'	33	04/22/14
152		<i>Cenchrus ciliaris</i> L.	N21°23.620' E039°49.535'	40	04/24/14
182		<i>Cenchrus echinatus</i> L.	N21°36.738' E040°06.913'	43	04/25/14
3		<i>Cenchrus setigerus</i> Vahl	N21°21.313' E039°55.503'	1	04/08/14
61		<i>Cenchrus setigerus</i> Vahl	N21°21.122' E039°52.270'	33	04/22/14
382		<i>Chloris barbata</i> Sw.	N21°20.401' E039°56.933'	11	04/13/14
226		<i>Cynodon dactylon</i> (L.) Pers.	N21°27.449' E039°57.361'	20	04/18/14
88		<i>Cynodon dactylon</i> (L.) Pers.	N21°26.807' E039°48.560'	37	04/24/14
81	<i>Poaceae</i>	<i>Cynodon dactylon</i> (L.) Pers.	N21°26.363' E039°49.002'	39	04/24/14
44		<i>Cynodon dactylon</i> (L.) Pers.	N21°21.122' E039°52.270'	33	04/22/14
129		<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	N21°27.331' E039°51.710'	24	04/19/14
320		<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	N21°20.401' E039°56.933'	11	04/13/14
75		<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	N21°19.347' E039°53.034'	34	04/22/14
224		<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	N21°21.122' E039°52.270'	33	04/22/14
321		<i>Dichanthium annulatum</i> (Forssk.) Stapf	N21°20.401' E039°56.933'	11	04/13/14
52		<i>Dichanthium annulatum</i> (Forssk.) Stapf	N21°21.122' E039°52.270'	33	04/22/14
139, 140, 141		<i>Eleusine indica</i> (L.) Gaertn	N21°26.609' E039°47.611'	36	04/24/14
333		<i>Eleusine indica</i> (L.) Gaertn	N21°26.572' E039°46.758'	38	04/24/14

392	<i>Echinochloa coloum</i> (L.) Link	N21°20.401' E039°56.933'	11	04/13/14
254	<i>Echinochloa coloum</i> (L.) Link	N21°26.150' E039°46.046'	48	04/27/14
137, 408	<i>Eragrostis barrelieri</i> Dav.	N21°20.672' E039°57.247'	12	04/13/14
53, 54	<i>Eragrostis japonica</i> Tunb.	N21°21.122' E039°52.270'	33	04/22/14
394	<i>Parapholis incurva</i> L.	N21°54.560' E039°16.807'	8	04/12/14
154, 155	<i>Panicum turgidum</i> Forssk.	N21°22.801' E039°49.812'	41	04/24/14
13	<i>Panicum turgidum</i> Forssk.	N21°19.650' E040°01.286'	3	04/08/14
24, 31	<i>Panicum turgidum</i> Forssk.	N21°56.607' E039°01.742'	5	04/12/14
115, 123	<i>Panicum turgidum</i> Forssk.	N21°20.590' E039°44.101'	15	04/16/14
311, 207	<i>Panicum turgidum</i> Forssk.	N21°20.456' E039°41.559'	17	04/16/14
213	<i>Panicum turgidum</i> Forssk.	N21°27.449' E039°57.361'	20	04/18/14
127	<i>Panicum turgidum</i> Forssk.	N21°25.199' E039°53.070'	22	04/19/14
302	<i>Panicum turgidum</i> Forssk.	N21°23.202' E039°50.836'	25	04/20/14
74	<i>Panicum repens</i> L.	N21°19.347' E039°53.034'	34	04/22/14
65	<i>Pennisetum ciliare</i> (L.) Link	N21°21.122' E039°52.270'	33	04/22/14
383	<i>Pennisetum ciliare</i> (L.) Link	N21°20.401' E039°56.933'	11	04/13/14
425	<i>Pennisetum ciliare</i> (L.) Link	N21°20.672' E039°57.247'	12	04/13/14
210	<i>Pennisetum ciliare</i> (L.) Link	N21°25.199' E039°53.070'	22	04/19/14
108	<i>Pennisetum ciliare</i> (L.) Link	N21°26.313' E039°51.374'	23	04/19/14
21	<i>Pennisetum divisum</i> (J. F. Gmel.) Henrard	N21°19.464' E040°02.992'	4	04/08/14
328	<i>Pennisetum divisum</i> (J. F. Gmel.) Henrard	N21°24.051' E039°54.913'	18	04/18/14
208	<i>Pennisetum divisum</i> (J. F. Gmel.) Henrard	N21°27.039' E039°57.254'	19	04/18/14
130	<i>Pennisetum divisum</i> (J. F. Gmel.) Henrard	N21°27.331' E039°51.710'	24	04/19/14
57	<i>Leptochloa fusca</i> (L.) Kunth	N21°25.199' E039°53.070'	22	04/19/14
36, 417	<i>Phragmites australis</i> (Cav.) Steud.	N21°54.560' E039°16.807'	8	04/12/14
276, 277	<i>Rostraria pumila</i> (Desf.) Tzvelev	N21°24.595' E039°52.210'	30	04/21/14
248, 273	<i>Sorghum bicolor</i> (L.) Moench	N21°23.160' E039°50.086'	28	04/21/14
422	<i>Stipa capillata</i> Hook.	N21°36.738' E040°06.913'	43	04/25/14
67	<i>Stipa tenacissima</i> L.	N21°36.767' E040°05.869'	44	04/25/14
323	<i>Stipa capensis</i> Thunb.	N21°32.103' E040°07.671'	45	04/25/14
324	<i>Stipa capensis</i> Thunb.	N21°32.103' E040°07.671'	45	04/25/14
207	<i>Stipagrostis ciliata</i> (Desf.) De Winter	N21°27.039' E039°57.254'	19	04/18/14
82	<i>Stipagrostis hirtigluma</i> (Steud.) De Winter	N21°27.331' E039°51.710'	24	04/19/14
392	<i>Stipagrostis hirtigluma</i> (Steud.) De Winter	N21°20.463' E039°57.379'	13	04/13/14
409	<i>Stipagrostis hirtigluma</i> (Steud.) De Winter	N21°22.801' E039°49.812'	41	04/24/14
22	<i>Stipagrostis raddiana</i> (Savi) De Winter	N21°21.9' E040°11.10'	10	04/10/14
222	<i>Stipagrostis raddiana</i> (Savi) De Winter	N21°27.039' E039°57.254'	19	04/18/14
270	<i>Setaria verticillate</i> (L.) P. Beauv.	N21°23.160' E039°50.086'	28	04/21/14
76	<i>Setaria verticillate</i> (L.) P. Beauv.	N21°19.347' E039°53.034'	34	04/22/14
10	<i>Tragus racemosus</i> (L.) All	N21°19.650' E040°01.286'	3	04/08/14
148, 374	<i>Ocimum basilicum</i> L.	N21°23.620' E039°49.535'	40	04/24/14
289	<i>Ocimum basilicum</i> L.	N21°26.609' E039°47.611'	36	04/24/14
97	<i>Ocimum canum</i> Sims	N21°27.331' E039°51.710'	24	04/19/14
315	<i>Plectranthus arabicus</i> E. A. Bruce	N21°20.672' E039°57.247'	12	04/13/14
282	<i>Plectranthus asirensis</i> J. R. I. Wood	N21°24.595' E039°52.210'	30	04/21/14

Lamiaceae

300		<i>Acacia ehrenbergiana</i> Hayne	N21°23.202' E039°50.836'	25	04/20/14
205		<i>Acacia ehrenbergiana</i> Hayne	N21°23.149' E039°51.791'	29	04/21/14
335		<i>Acacia ehrenbergiana</i> Hayne	N21°22.639' E039°52.258'	31	04/22/14
198		<i>Acacia ehrenbergiana</i> Hayne	N21°36.738' E040°06.913'	43	04/25/14
373		<i>Acacia ehrenbergiana</i> Hayne	N21°36.767' E040°05.869'	44	04/25/14
338		<i>Acacia ehrenbergiana</i> Hayne	N21°20.672' E039°57.247'	12	04/13/14
384		<i>Acacia ehrenbergiana</i> Hayne	N21°20.401' E039°56.933'	11	04/13/14
327		<i>Acacia ehrenbergiana</i> Hayne	N21°24.051' E039°54.913'	18	04/18/14
398		<i>Acacia gerrardii</i> Benth.	N21°55.507' E039°18.707'	9	04/12/14
116		<i>Acacia gerrardii</i> Benth.	N21°20.903' E039°41.694'	16	04/16/14
88		<i>Acacia hamulosa</i> Benth.	N21°27.331' E039°51.710'	24	04/19/14
35		<i>Acacia tortilis</i> Hayne	N21°56.220' E039°01.617'	7	04/12/14
40		<i>Acacia tortilis</i> Hayne	N21°19.650' E040°01.286'	3	04/08/14
12		<i>Aristida adscensionis</i> Walter	N21°19.650' E040°01.286'	3	04/08/14
390		<i>Aristida adscensionis</i> Walter	N21°20.463' E039°57.379'	13	04/13/14
275		<i>Aristida adscensionis</i> Walter	N21°24.595' E039°52.210'	30	04/21/14
217		<i>Colutea istria</i> Miller	N21°26.572' E039°46.758'	38	04/24/14
19		<i>Clitoria ternatea</i> L.	N21°19.464' E040°02.992'	4	04/08/14
218, 283		<i>Delonix elata</i> (Torner) Gamble	N21°23.620' E039°49.535'	40	04/24/14
63, 405		<i>Indigofera spinosa</i> Forssk.	N21°21.122' E039°52.270'	33	04/22/14
298, 375		<i>Leucaena leucocephala</i> (Lam.) de Wit	N21°23.248' E039°51.796'	26	04/20/14
266		<i>Leucaena leucocephala</i> (Lam.) de Wit	N21°23.212' E039°51.136'	27	04/21/14
142		<i>Mimosa senegalensis</i> Forssk.	N21°26.572' E039°46.758'	38	04/24/14
330		<i>Onobrychis ptolemaica</i> (Del.) DC.	N21°24.051' E039°54.913'	18	04/18/14
330		<i>Onobrychis ptolemaica</i> (Del.) DC.	N21°21.122' E039°52.270'	33	04/22/14
365	Fabaceae	<i>Pithecellobium dulce</i> Benth.	N21°26.363' E039°49.002'	39	04/24/14
280, 283,		<i>Pithecellobium dulce</i> Benth.	N21°24.595' E039°52.210'	30	04/21/14
7		<i>Prosopis juliflora</i> D. C.	N21°19.448' E039°58.002'	2	04/08/14
9,		<i>Prosopis juliflora</i> D. C.	N21°19.650' E040°01.286'	3	04/08/14
33		<i>Prosopis juliflora</i> D. C.	N21°56.528' E039°02.402'	6	04/12/14
385		<i>Prosopis juliflora</i> D. C.	N21°20.401' E039°56.933'	11	04/13/14
135		<i>Prosopis juliflora</i> D. C.	N21°20.672' E039°57.247'	12	04/13/14
120		<i>Prosopis juliflora</i> D. C.	N21°20.590' E039°44.101'	15	04/16/14
117, 120		<i>Prosopis juliflora</i> D. C.	N21°20.903' E039°41.694'	16	04/16/14
179		<i>Prosopis juliflora</i> D. C.	N21°20.456' E039°41.559'	17	04/16/14
49, 50, 71		<i>Prosopis juliflora</i> D. C.	N21°21.122' E039°52.270'	33	04/22/14
260, 264		<i>Rhynchosia minima</i> (L.) DC.	N21°23.212' E039°51.136'	27	04/21/14
217		<i>Rhynchosia minima</i> (L.) DC.	N21°23.212' E039°51.136'	27	04/21/14
33, 395		<i>Rhynchosia schimperi</i> Hochst. ex Boiss.	N21°54.560' E039°16.807'	8	04/12/14
5, 352		<i>Senna alexandrina</i> Miller	N21°21.313' E039°55.503'	1	04/08/14
215		<i>Senna alexandrina</i> Miller	N21°55.507' E039°18.707'	9	04/12/14
118		<i>Senna alexandrina</i> Miller	N21°20.456' E039°41.559'	17	04/16/14
229		<i>Senna alexandrina</i> Miller	N21°27.449' E039°57.361'	20	04/18/14
72, 64		<i>Senna holosericea</i> (Fresen) Garsault	N21°19.347' E039°53.034'	34	04/22/14
336		<i>Senna italica</i> Miller	N21°22.639' E039°52.258'	31	04/22/14
178		<i>Senna italica</i> Miller	N21°30.993' E040°02.958'	42	04/25/14
11		<i>Senna italica</i> Miller	N21°19.650' E040°01.286'	3	04/08/14
278		<i>Senna italica</i> Miller	N21°24.051' E039°54.913'	18	04/18/14
95		<i>Senna italica</i> Miller	N21°27.331' E039°51.710'	24	04/19/14
57, 110		<i>Tephrosia nubica</i> (Bioss) Baker	N21°25.199' E039°53.070'	22	04/19/14

85		<i>Tephrosia nubica</i> (Bioss) Baker	N21°27.331' E039°51.710'	24	04/19/14
301		<i>Tephrosia nubica</i> (Bioss) Baker	N21°23.202' E039°50.836'	25	04/20/14
20		<i>Tephrosia purpurea</i> (L.) Pers.	N21°19.464' E040°02.992'	4	04/08/14
60		<i>Tephrosia villosa</i> (L.) Pers	N21°21.122' E039°52.270'	33	04/22/14
126	Lilaceae	<i>Aloe vera</i> L.	N21°20.456' E039°41.559'	17	04/16/14
37, 341		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°54.560' E039°16.807'	8	04/12/14
13, 14		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°19.650' E040°01.286'	3	04/08/14
340		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°36.767' E040°05.869'	44	04/25/14
231		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°36.738' E040°06.913'	43	04/25/14
286	Malvaceae	<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°26.182' E039°48.718'	35	04/24/14
337		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°22.639' E039°52.258'	31	04/22/14
259, 263		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°23.212' E039°51.136'	27	04/21/14
230		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°27.449' E039°57.361'	20	04/18/14
204		<i>Abutilon hirtum</i> (Lamk.) Sweet	N21°23.202' E039°50.836'	25	04/20/14
187		<i>Azadirachta indica</i> A. Juss.	N21°36.767' E040°05.869'	44	04/25/14
246, 247		<i>Azadirachta indica</i> A. Juss.	N21°26.807' E039°48.560'	37	
202	Meliaceae	<i>Azadirachta indica</i> A. Juss.	N21°23.212' E039°51.136'	27	04/21/14
199		<i>Azadirachta indica</i> A. Juss.	N21°23.248' E039°51.796'	26	04/20/14
353, 386		<i>Azadirachta indica</i> A. Juss.	N21°20.401' E039°56.933'	11	04/13/14
268	Moraceae	<i>Ficus carica</i> L.	N21°23.160' E039°50.086'	28	04/21/14
137		<i>Ficus elastica</i> Roxb.	N21°26.609' E039°47.611'	36	04/24/14
334	Moringaceae	<i>Moringa oleifera</i> Lam.	N21°20.493' E039°52.401'	32	04/22/14
73	Molluginaceae	<i>Telephium sphaerospermum</i> Boiss.	N21°19.347' E039°53.034'	34	04/22/14
404	Neuradaaceae	<i>Neurada procumbens</i> L.	N21°54.560' E039°16.807'	8	04/12/14
242, 243, 244, 245		<i>Bougainvillea spectabilis</i> Willd.	N21°26.807' E039°48.560'	37	04/24/14
150	Nyctaginaceae	<i>Boerhavia diffusa</i> L.	N21°26.572' E039°46.758'	38	04/24/14
415		<i>Commicarpus africanus</i> Lour.	N21°21.313' E039°55.503'	1	04/08/14
238	Oleaceae	<i>Jasminum sambac</i> (L.) Aiton	N21°23.042' E039°52.144'	46	04/26/14
265		<i>Phoenix caespitosa</i> Chiov.	N21°23.248' E039°51.796'	26	04/20/14
39	Palmae	<i>Phoenix caespitosa</i> Chiov.	N21°26.363' E039°49.002'	39	04/24/14
200		<i>Hyphaene thebaica</i> (L.) Mart.	N21°23.212' E039°51.136'	27	04/21/14
43		<i>Washingtonia robusta</i> H. Wendl.	N21°24.595' E039°52.210'	30	04/21/14
113	Plantaginaceae	<i>Plantago ciliata</i> Desf.	N21°25.199' E039°53.070'	22	04/19/14
304	Plumbaginaceae	<i>Limonium axillare</i> (Forssk.) O. Kuntze	N21°19.464' E040°02.992'	4	04/08/14
209		<i>Emex spinosus</i> L.	N21°27.039' E039°57.254'	19	04/18/14
376	Polygonaceae	<i>Rumex cyprius</i> Murb.	N21°27.039' E039°57.254'	19	04/18/14
201		<i>Rumex vesicarius</i> L.	N21°27.039' E039°57.254'	19	04/18/14
235, 236	Portulacaceae	<i>Portulaca oleraceae</i> L.	N21°23.042' E039°52.144'	46	04/26/14
46	Polygalaceae	<i>Polygala negevensis</i> Danin	N21°21.122' E039°52.270'	33	04/22/14
206		<i>Ziziphus spina-christi</i> (L.) Willd.	N21°23.149' E039°51.791'	29	04/21/14
65		<i>Ziziphus spina-christi</i> (L.) Willd.	N21°23.248' E039°51.796'	26	04/20/14
223		<i>Ziziphus spina-christi</i> (L.) Willd.	N21°27.449' E039°57.361'	20	04/18/14
158, 160	Rhaminaceae	<i>Ziziphus spina-christi</i> (L.) Willd.	N21°22.801' E039°49.812'	41	04/24/14
284		<i>Ziziphus spina-christi</i> (L.) Willd.	N21°26.609' E039°47.611'	36	04/24/14
291		<i>Ziziphus spina-christi</i> (L.) Willd.	N21°26.182' E039°48.718'	35	04/24/15
285		<i>Ziziphus spina-christi</i> (L.) Willd.	N21°24.595' E039°52.210'	30	04/21/14
146, 147	Rosaceae	<i>Rubus sanctus</i> Schreber. Icon.	N21°26.572' E039°46.758'	38	04/24/14
346	Rubiaceae	<i>Kohautia caespitosa</i> Schnizl.	N21°36.738' E040°06.913'	43	04/25/14
172		<i>Kohautia caespitosa</i> Schnizl.	N21°32.103' E040°07.671'	45	04/25/14

414		<i>Oldenlandia capensis</i> L. fil.	N21-26.572' E039-46.758'	38	04/24/14
433	Scrophulariaceae	<i>Schweinfurthia pterosperma</i> A. Braun	N21-23.620' E039-49.535'	40	04/24/14
339	Solanaceae	<i>Datura innoxia</i> Mill	N21-30.993' E040-02.958'	42	04/25/14
102		<i>Hyoscyamus deserforum</i> L.	N21-27.331' E039-51.710'	24	04/19/14
359		<i>Tamarix aphylla</i> (L.) H. Karst.	N21-23.248' E039-51.796'	26	04/20/14
60	Tamaricaceae	<i>Tamarix aphylla</i> (L.) H. Karst.	N21-21.122' E039-52.270'	33	04/22/14
191, 190, 193		<i>Tamarix aphylla</i> (L.) H. Karst.	N21-36.767' E040-05.869'	44	04/25/14
316		<i>Tamarix aphylla</i> (L.) H. Karst.	N21-24.946' E039-59.447'	14	04/13/14
391	Typhaceae	<i>Typha domingensis</i> Pers.	N21-20.463' E039-57.379'	13	04/13/14
111, 366		<i>Forsskaolea tenacissima</i> L.	N21-25.199' E039-53.070'	22	04/19/14
96	Urticaceae	<i>Forsskaolea tenacissima</i> L.	N21-27.331' E039-51.710'	24	04/19/14
257		<i>Forsskaolea tenacissima</i> L.	N21-23.212' E039-51.136'	27	04/21/14
279		<i>Urtica pilulifera</i> L.	N21-24.595' E039-52.210'	30	04/21/14
2, 228		<i>Fagonia bruguiei</i> DC.	N21-21.313' E039-55.503'	1	04/08/14
18		<i>Fagonia indica</i> Burm. f.	N21-19.464' E040-02.992'	4	04/08/14
345		<i>Fagonia indica</i> Burm. f.	N21-32.103' E040-07.671'	45	04/25/14
145, 393		<i>Fagonia indica</i> Burm. f.	N21-20.463' E039-57.379'	13	04/13/14
36		<i>Fagonia olivieri</i> DC.	N21-54.560' E039-16.807'	8	04/12/14
193, 194		<i>Fagonia olivieri</i> DC.	N21-36.767' E040-05.869'	44	04/25/14
214, 434		<i>Fagonia simplex</i> L.	N21-27.039' E039-57.254'	19	04/18/14
318		<i>Tribulus arabicus</i> H. Hosni	N21-20.672' E039-57.247'	12	04/13/14
128		<i>Tribulus arabicus</i> H. Hosni	N21-24.051' E039-54.913'	18	04/18/14
124		<i>Tribulus terrestris</i> L.	N21-20.590' E039-44.101'	15	04/16/14
221	Zygophyllaceae	<i>Tribulus terrestris</i> L.	N21-27.039' E039-57.254'	19	04/18/14
26, 306		<i>Tribulus terrestris</i> L.	N21-19.464' E040-02.992'	4	04/08/14
86, 94, 106		<i>Tribulus terrestris</i> L.	N21-27.331' E039-51.710'	24	04/19/14
162		<i>Maerua oblongifolia</i> (Forssk.) A. Rich	N21-32.103' E040-07.671'	45	04/25/14
99		<i>Tribulus terrestris</i> L.	N21-25.199' E039-53.070'	22	04/19/14
32		<i>Zygophyllum mandavillei</i> Hadidi	N21-56.607' E039-01.742'	5	04/12/14
90		<i>Zygophyllum simplex</i> L.	N21-21.313' E039-55.503'	1	04/08/14
181		<i>Zygophyllum simplex</i> L.	N21-36.767' E040-05.869'	44	04/25/14
46, 47		<i>Zygophyllum simplex</i> L.	N21-21.122' E039-52.270'	33	04/22/14
258		<i>Zygophyllum simplex</i> L.	N21-23.212' E039-51.136'	27	04/21/14
105, 109		<i>Zygophyllum simplex</i> L.	N21-25.199' E039-53.070'	22	04/19/14
131		<i>Zygophyllum simplex</i> L.	N21-20.401' E039-56.933'	11	04/13/14

This study was conducted in 2014 by two scientists affiliated with the University of Jordan, Dr. Daoud Mohammad Al-Eisawi and Dr. Saud Al-Rawashdeh.^x Their research provides important botanical data concerning the flora of the Makkah region, documenting the diversity and distribution of plant species, genera, and families found there. The findings are particularly relevant to the present discussion because they provide empirical botanical evidence against the claim that Makkah is devoid of naturally occurring vegetation.

Conclusion

This study has critically examined Dan Gibson's botanical argument against the identification of Makkah as the sacred center of early Islam. Gibson's argument rests primarily on an alleged discrepancy between the present-day arid landscape of Makkah and the references in early Islamic sources to grasses and vegetation growing in the sacred valley. In particular, his interpretation of the ḥadīth mentioning idhkhīr and jalīl leads him to question whether the Makkah described in the Islamic tradition can be identified with present-day Makkah. A critical examination of the Qur'ānic, ḥadīth, and botanical evidence, however, demonstrates that this inference is methodologically problematic.

The Qur'ānic description of Makkah as wādin ghayri dhī zar'—an “uncultivated valley”—does not

entail the complete absence of naturally occurring vegetation. Rather, the expression concerns the absence of conventional agriculture and cultivated crops. The distinction between agricultural productivity and natural vegetation is therefore essential to the interpretation of both the Qur'ānic and Prophetic descriptions of Makkah. The existence of grasses, shrubs, or naturally occurring plants in an arid and non-arable environment does not contradict its characterization as an uncultivated valley. Consequently, the presence of vegetation mentioned in the ḥadīth cannot, in itself, be regarded as evidence against the traditional identification of Makkah.

The Prophetic tradition cited by Gibson itself mentions *idhkhir* and *jalīl*, while other traditions provide additional indications of vegetation in Makkah. More importantly, the botanical identification of these plants provides a significant corrective to Gibson's interpretation. *Idhkhir*, identified botanically as *Cymbopogon schoenanthus*, and *jalīl*, identified as *Panicum turgidum*, are grasses adapted to hot and arid environments. Their ecological characteristics are therefore compatible with the environmental conditions of the Makkah region. The traditional and botanical evidence, rather than presenting a contradiction, can be understood as mutually compatible.

Particularly significant is the modern botanical evidence concerning the flora of Makkah. The 2014 study by Daoud Mohammad Al-Eisawi and Saud Al-Rawashdeh, affiliated with the University of Jordan, records 184 plant species belonging to 125 genera and 44 families in the Makkah region. The Poaceae family, to which both *Cymbopogon schoenanthus* and *Panicum turgidum* belong, constitutes the largest represented plant family, accounting for 16.94% of the recorded flora. Furthermore, *Panicum turgidum* (*jalīl*) is among the relatively abundant species documented in the region. These findings provide empirical botanical evidence that substantially challenges the assertion that the Makkah environment is incapable of supporting naturally occurring grasses and vegetation.

The significance of this evidence extends beyond the identification of individual plant species. Gibson's argument appears to rely on an overly binary understanding of the environmental categories "desert," "barren," and "uncultivated." Such categories should not be treated as synonymous with the complete absence of vegetation. Arid ecosystems can support a diverse range of drought- and heat-adapted plant species, even where agriculture is difficult or impossible. Therefore, the mere observation that Makkah is presently characterized by a predominantly dry and mountainous landscape cannot establish that grasses such as *idhkhir* and *jalīl* were historically absent from the region.

The study therefore concludes that Gibson's botanical argument does not provide sufficient grounds for rejecting Makkah as the sacred center of early Islam. His argument depends upon an inference from the contemporary visual appearance of Makkah to its historical botanical conditions, while the available Qur'ānic, ḥadīth, and botanical evidence does not warrant such an inference. On the contrary, the documented presence of diverse plant species in the Makkah region, including *Panicum turgidum*, demonstrates that an arid and non-agricultural environment can nevertheless sustain naturally occurring vegetation.

More broadly, this analysis highlights the methodological importance of interdisciplinary evidence in debates concerning early Islamic sacred geography. Historical claims about the geographical identity of Makkah cannot be adequately evaluated through isolated observations of contemporary landscapes or through selective readings of individual textual references. Such claims require the integrated examination of scriptural sources, ḥadīth literature, historical geography, ecology, and botanical evidence. When these bodies of evidence are considered together, Gibson's botanical objection appears insufficiently substantiated and cannot, by itself, support the alternative identification of the Islamic sacred city with another geographical location.

Accordingly, the botanical evidence examined in this study does not merely fail to disprove the traditional identification of Makkah; rather, it demonstrates that the environmental characteristics of Makkah are broadly compatible with the descriptions preserved in the Qur'ān and early Islamic tradition. The distinction between an uncultivated valley and a vegetation-free landscape is therefore central to resolving the apparent contradiction on which Gibson's argument is based. The evidence ultimately supports the conclusion that the presence of idhkhir, jalīl, and other naturally occurring vegetation in Makkah is not historically or ecologically anomalous and cannot reasonably be employed as decisive evidence against Makkah's status as the sacred center of early Islam.

References

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 - ii Quranic Geography, Pp:233
 - iii Al Qur'an, 14:37.
 - iv https://en.m.wikipedia.org/wiki/Cymbopogon_schoenanthus accessed on 30 December 2024
 - v <https://www.feedipedia.org/node/25357> accessed on 30 December 2024
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 - viii The flora of holy Mecca district, Saudi Arabia, Dawud Mohammad Al-Eisawi and Suad Al-Ruzayza (University of Jordan) International Journal of Biodiversity and Conservation, Vol.7 (3), pp. 173-189, March, 2015
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