

## **Vegetation along Makkah - Taif Road (Saudi Arabia)**

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**ABSTRACT.** This is a survey of the plant growth of Makkah-Taif road (Saudi Arabia) that covers a distance of about 100 km, with a sharp rise from 300 to 1500 m above sea level. 109 species of vascular plants, belonging to 36 families, are recorded. Twentytwo plant communities are recognized, two of which dominated by ephemerals. Relations between communities and their habitat types are briefly discussed.

Saudi Arabia, about four-fifths of the Arabian peninsula, is botanically the less known area of SW Asia (Qaiser & Lack, 1985). Our knowledge of the vegetation and habitat features are not extensive. Works that deal with the vegetation of Saudi Arabia include: Vesey-Fitzgerald (1957 a,b), Mandaville (1965), Migahid & El-Sheikh (1977), Migahid (1978), Batanouny (1979), Batanouny & Baeshin (1983), Zahran (1983), Baierle, El-Sheikh & Frey (1985), Collenette (1985) and several others.

The present work deals with the vegetation along Makkah-Taif road, a sector of about 100 km with a sharp rise from about 300 to 1500 m above sea level.

### **Location and Physiography**

The study area crosses the Asir Mountains, a range formed of crystalline and metamorphic basement materials and volcanic rocks (Brown 1960). It extends

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along Makkah-Taif road for a distance of about 100 km ( $21^{\circ} 22' - 21^{\circ} 40'N - 40^{\circ} 00' - 40^{\circ} 22'E$ ). The western part of the road lies at the level of 277 m above mean sea level at Makkah, then rises sharply to reach 1540 m at Taif city (Fig. 1.).

Three main sectors may be distinguished in the study area according to the soil type, topography and climatological conditions.

a) The area extending up to km 40 from Makkah: the soil is relatively deep, consisting of alternate layers of alluvium with different textures. The area is bordered by almost continuous, granite and granite gneiss ridges (Brown *et al.* 1962).

b) The area extending between km 40 and 90 from Makkah: the landscape is characterized by its meanders, steep ridges crossed by numerous runnels and narrow wadies. Generally, the habitat is rocky and subjected to severe erosion. The soil is coarse-textured and shallow except in some sites where fine sediments are found.

### Climate

Available climatological data show wide differences among sectors of the study area. Rainfall is characterized by irregularity and variability both in time and location *i.e.* having sporadic rain with a prolonged rainless period. Wide altitudinal range (227 to 1450 m) affect the total amount of rain. Hence the mean annual rainfall is about 86.6 mm, 127.9 mm and 208.4 mm at Makkah, Al Sail Al Kabir and Taif respectively (Table 1).

Eastwards from Makkah to Taif, air temperature decrease. In Makkah, the mean monthly temperature ranges from  $23.3^{\circ}C$  in January to  $36.4^{\circ}C$  in July. In Al Sail Al Kabir ranging from  $15.4^{\circ}C$  to  $31.9^{\circ}C$  and in Taif from  $13.6^{\circ}C$  to  $28.7^{\circ}C$ . The mean maximum air temperature during July is normally higher than  $40^{\circ}C$  in Makkah,  $38.1^{\circ}C$  in Al Sail Al Kabir and  $24.9^{\circ}C$  in Taif. On the other hand, the mean minimum temperature during January are  $17.7^{\circ}C$ ,  $8.2^{\circ}C$  and  $9.0^{\circ}C$  in the above mentioned localities respectively.

### Methods and Techniques

The present reconnaissance survey was carried during the period from February to May 1986. 65 stands were randomly chosen at locations where variations in vegetation were observed. Plant growth in the study area comprises units that are recognizable on the bases of composition, structure and ecological

relationships. According to the concepts given by Kassas & Girgis (1965), these units are referred to as community types or communities; each is a unit of an ecosystem (an ecocoenosis) and is named after the species that dominates the phytocoenosis. The community types associated with certain habitats are repeated in the area wherever the habitat features are repeated.

Plant collections were mainly identified in the Herbaria of Cairo University (Egypt) and Royal Botanic Garden, Edinburgh (United Kingdom). Duplicates of the collections are kept in the above mentioned Herbaria.

### Plant Communities and Habitat Features

Twenty two communities were recognized. Trees, shrubs or undershrubs dominated 20 communities, two communities were dominated by ephemerals.

#### 1. *Acacia raddiana* community

The community dominated by this tree abounds in open beds with more or less plain landscape. The soil is relatively deep, fine-textured and covered with gravels and pebbles of various colour. The plant cover is about 25%, contributed mainly by the dominant species. Palatable species were stunted due to grazing effect.

In addition to *Acacia raddiana*, scattered individuals of *Maerua crassifolia* form the tree layer of this community. Associated species are: *Indigofera spinosa*, *Fagonia acerosa*, *Eragrostis minor*, *Euphorbia granulata*, *Blepharis ciliaris*, *Tribulus terrestris*, *Caralluma quadrangula*, *Spergula fallax*, *Aizoon canariense*, *Rhazya stricta*, *Citrullus colocynthis*, *Cissus quadrangularis*, *Andrachne aspera*, *Commicarpus grandiflorus* and *Oxalis corniculata*.

#### 2. *Acacia tortilis* community

This community abounds on the terraces, narrow wadis and gentle slopes. The ground surface is compact, covered with gravels, pebbles and varnished rock fragments underlain by fine sediments. The plant cover varied between 20 and 35%. The tree and shrub layer comprises *Acacia tortilis*, *A. ehrenbergiana*, *A. hamulosa* and *Ochradenus baccatus*. Associated species are: *Arnebia hispidissima*, *Caralluma quadrangula*, *Caralluma retrospiciens*, *Boerhavia coccinea*, *Ecbolium viridi*, *Chenopodium murale*, *Argemone mexicana*, *Indigofera spinosa*, *Blepharis ciliaris*, *Tribulus terrestris*, *Withania somnifera*, *Convolvulus arvensis*, *Eragrostis aspera*, *Commicarpus grandiflorus* and *Lamarckia aurea*.

### 3. *Acacia ehrenbergiana* - *A. hamulosa* community

This community is very common in downstream shallow runnels dissecting rocky slopes. The soil supporting the growth of this community is covered by angular rock fragments of different size. The plant cover ranges between 10 and 40%, mainly of *Acacia*-species. The tree layer is composed, in addition to the dominant *Acacia*-species, of *Euphorbia cuneata* and *Dolenix elata*. Other associates, with negligible cover, include: *Abutilon pannosum*, *Cassia senna*, *Asphodelus tenuifolius*, *Cleome droserifolia*, *Euphorbia arabica* and *Indigofera spinosa*.

### 4. *Acacia hamulosa* - *Euphorbia cuneata* community

The community is of wide distribution, and inhabits gentle rocky slopes and shallow runnels and not the sandy plains along the surveyed area. The habitat is subjected to severe erosion. Plant cover is apparently poor, not exceeding 15%. Associated species are confined to crevices between rocks where fine sediments occur, and include: *Acacia tortilis*, *Cleome droserifolia*, *Panicum turgidum* and *Lycium shawii*.

### 5. *Acacia asak* - *A. hamulosa* community

This assemblage abounds on gentle and sharp slopes with barren and fissured rocks. Trees of *Acacia asak* inhabit the upper parts of the slopes, while those of *Acacia hamulosa* grow in the lower parts of the slopes where the soil is more or less fine-textured and with rock fragments. Plant cover ranges from 25 to 35%. The recorded associate species are: *Acacia ehrenbergiana*, *A. tortilis* (climbed by *Cocculus pendulus*), *Lycium shawii*, *Pergularia daemia*, *Erodium cicutarium*, *Lactuca* sp., *Morettia canescens*, *Tribulus terrestris* and *Capparis decidua*. Other species with negligible cover include: *Aizoon canariense*, *Solanum carense*, *Otostegia fruticosa*, *Teucrium polium* and *Grewia erythraea*.

### 6. *Acacia gerrardii* community

This community is confined to depressions where deep alluvium with high water-retaining capacity prevails. The plant cover ranges between 35 and 50%. The tree layer is partly and sometimes completely covered by the climbers: *Ochradenus baccatus* and *Commicarpus grandiflorus*. Associated species include: *Barleria prionitis* subsp. *appressa*, *Lycium shawii*, *Argemone mexicana*, *Pulicaria crispa*, *Fagonia indica*, *Blepharis ciliaris*, *Otostegia fruticosa*, *Peganum harmala* and *Verbesina encelioides*. In addition several ephemerals are recorded including: *Ifloga spicata*, *Filago desertorum*, *Malva parviflora*, *Solanum carense*, *Erodium cicutarium*, *Rumex vesicarius*, *Cucumis prophetarum*, *Sisymbrium irio*, *Fagonia bruguieri*, *Boerhavia coccinea*, *Crotalaria* sp., *Echinops* sp., *Zeleya pentandra* and *Themeda triandra*.

### 7. *Maerua crassifolia* community

This community has a very limited distribution and is restricted to Al-Sharaya settlement, 30 km from Makkah. It occupies gentle slopes and sandy plains, the habitat supporting the community is characterized by the presence of stones, pebbles and gravels on the ground surface. The plant cover ranges between 15 and 25%. *Maerua crassifolia*, *Acacia raddiana* as well as *Acacia hamulosa* form the tree layer. Other associates include: *Calotropis procera*, *Indigofera spinosa*, *Cassia senna*, *Panicum turgidum*, *Boerhavia coccinea*, *Tribulus terrestris*, *Fagonia indica*, *Rhazya stricta*, *Euphorbia granulata*, *Dipterygium glaucum*, *Citrullus colocynthis*, *Commicarpus grandiflorus*, *Andrachne aspera*, *Eragrostis aspera*, *Themeda triandra* and *Cissus quadrangularis* (which grows climbing on *Maerua* trees).

### 8. *Calotropis procera* - *Acacia ehrenbergiana* community

This community inhabits the basal areas of ridges where the soil is sandy and mixed with stones and gravels. Plant cover is about 25%. Associated species include: *Rhazya stricta*, *Cenchrus ciliaris*, *Citrullus colocynthis*, *Capparis decidua*, *Fagonia acerosa*, *Picris longirostris*, *Morettia canescens*, *Cassia senna*, *Forsskalea tenacissima*, *Aerva javanica*, *Cucumis prophetarum*, *Argemone mexicana*, *Cadaba glandulosa*, *Morettia parviflora*, *Eragrostis minor*, *Pulicaria schimperii* and *Cleome brachycarpa*.

### 9. *Calotropis procera* community

This community is usually observed in disturbed habitats around settlements and in the vicinity of towns. It is widely distributed from Al Sharaya to Zeyamah (Fig. 1). The soil is deep and fine-textured. The ground surface is covered by fragmented boulders. Plant cover ranges between 30 and 50%, and consists mainly of *Calotropis procera*. *Acacia ehrenbergiana* and *A. tortilis* form the tree layer of the community. Associates are: *Rhazya stricta*, *Indigofera spinosa*, *Farsetia longisiliqua*, *Heliotropium bacciferum*, *Solanum carense*, *Datura innoxia*, *Pergularia daemia*, *Panicum turgidum*, *Cenchrus ciliaris*, *Cassia senna*, *Tribulus terrestris*, *Blepharis ciliaris*, *Stipagrostis plumosa*, *Lotononis platycarpa*, *Eragrostis aspera*, *Euphorbia granulata*, *Aizoon canariense*, *Themeda triandra*, *Lindenbergia sinaica* and *Fagonia bruguieri*.

### 10. *Stipagrostis plumosa* community

This community abounds on the sandy belt in the vicinity of Makkah mountains. *Stipagrostis plumosa*, the dominant plant, is the most common of several tussock grasses that produce a green cover after rain. The community is characterized by its openness and the absence of tree or shrub layers. The soil consists of wind blown sand with low water-retaining power. Plant cover is low, not exceeding 5%. Associates include: *Dipterygium glaucum*, *Indigofera spinosa*,

*Cassia senna*, *Forsskalea tenacissima*, *Euphorbia granulata*, *Aerva javanica*, *Zygophyllum simplex*, *Fagonia acerosa*, *Eragrostis minor* and *Fagonia bruguieri*.

#### 11. *Rhazya stricta* community

This community inhabits gravelly foothills and terraces where the ground is covered with gravels and boulders. The assemblage is characterized by its limited number of associate species and low cover. Associates are: *Acacia ehrenbergiana*, *Indigofera spinosa*, *Euphorbia granulata*, *Fagonia acerosa*, *Solanum carense*, *Calotropis procera*, *Panicum turgidum*, *Andrachne aspera*, *Eragrostis minor*, *Trichodesma africanum* and *Lamarckia aurea*.

#### 12. *Commicarpus grandiflorus* community

This community is common on the terraces bordering shallow wadis. The soil is sandy, relatively deep and covered with pebbles and gravels. Plant cover is about 30%, mainly of *Commicarpus grandiflorus* which grows either as climber or in patches of trailing growth. The widely spaced *Acacia gerrardii* forms a tree layer in this community. The main associates are: *Lycium shawii*, *Ochradenus baccatus*, *Blepharis ciliaris*, *Calotropis procera*, *Verbesina encelioides* and *Heliotropium arbainense*. Other ephemerals are recorded, where accumulated sediments are found, such as: *Datura innoxia*, *Malva parviflora*, *Zygophyllum simplex*, *Sisymbrium irio*, *Aizoon canariense*, *Reichardia tingitana*, *Echinops* sp., *Osteospermum vailantii*.

#### 13. *Fagonia acerosa* community

This community is usually found in plains with high water resources during rainy seasons. The soil is shallow, hence no chance for the establishment of trees. Plant cover is low and not exceeding 5%. *Fagonia acerosa*, the dominant species of this community, has a wide sociological and ecological range of distribution along surveyed area. Main recorded associates are: *Aerva javanica*, *Salsola kali*, *Argemone mexicana*, *Eragrostis minor*, *Chenopodium album*, *Pulicaria crispa*, *Picris longirostris*, *Cynodon dactylon*, *Convolvulus arvensis*, *Lamarckia aurea* and *Fagonia bruguieri*.

#### 14. *Indigofera spinosa* community

This assemblage is usually found in the sandy plains at the foot hills, immature runnels and rocky slopes. The plant cover is reduced (about 5%) obviously due to grazing. Associates are represented mainly by *Lycium shawii*. Species of lesser rank includes: *Arnebia hispidissima*, *Blepharis ciliaris*, *Erodium neuradifolium*, *Acacia gerrardii*, *Filago desertorum*, *Cascuta pedicellata* (= *C. arabica*), as a parasite on *Indigofera spinosa*.

#### 15. *Aerva javanica* community

This community is widely distributed in areas with different habitat features. However the vegetation is thin with plant cover never exceeding 5%. Among the associates are: *Fagonia indica*, *Arnebia hispidissima*, *Cassia senna*, *Ochradenus baccatus*, *Stipagrostis plumosa*, *Verbesina encelioides* and *Blepharis ciliaris*. In addition, a few individuals of *Lycium shawii* occur in the shade of *Acacia hamulosa*.

#### 16. *Lycium shawii* community

The community, dominated by *Lycium shawii*, has a wide ecological and sociological range of distribution along the study area. On ecological basis as well as floristic composition, this community could be divided into two sub-types:

a) The first sub-type is common on rocky slopes and mature runnels where the ground surface is covered by angular stones and pebbles. Plant cover is 15% with a few associates: *Ochradenus baccatus*, *Morettia canescens*, *Lavandula pubescens*, *Otostegia fruticosa*, *Solanum carense* and *Commicarpus grandiflorus*. *Acacia ehrenbergiana* occurs occasionally on the slopes.

b) The second sub-type occurs on the sandy terraces and low land along the road sides with coarse-textured deposits and adequate water supply. Plant cover is higher than the preceding, reaching about 40%. Associates include: *Forsskalea tenacissima*, *Heliotropium arbainense*, *Fagonia acerosa*, *Argemone mexicana*, *Spergula fallax* and *Tribulus terrestris*. *Acacia gerrardii* and *Panicum turgidum* are recorded on the broad terraces where deep deposits are found.

#### 17. *Dipterygium glaucum* community

This community has a limited range of distribution along the study area. It is confined to the sandy plains near Makkah. The soil is coarse-textured with low retaining capacity. Plant cover is thin without recognizable stratification of vegetation. Recorded associates include: *Cassia senna*, *Aerva javanica*, *Flaveria trinerva*, *Panicum turgidum*, *Morettia canescens*, *Stipagrostis plumosa*, *Citrus colocythis*, *Amaranthus graecizans*, *Euphorbia granulata* and *Fagonia acerosa*.

#### 18. *Cassia senna* community

This community inhabits the foot ridges and areas with fine textured soil. Plant cover ranges between 35 and 50%. *Cassia senna* may form almost pure stands. Among associates which are recorded: *Ziziphus spina-christi*, *Dipterygium glaucum*, *Indigofera spinosa*, *Euphorbia granulata*, *Stipagrostis plumosa*, *Panicum turgidum* and *Phalaris minor*.

#### 19. *Pulicaria crispa* community

This community is confined to the areas bordering Taif city, in depressions along roadsides and foothills where the soil texture is fine. The plant cover is relatively thin, ranges from 5 to 10%. Tree layer is represented by widely spaced individuals of *Acacia gerrardii*. Associated species recorded are: *Verbesina encelioides*, *Erodium neuradifolium*, *Salsola kali*, *Blepharis ciliaris*, *Picris longirostris*, *Calotropis procera*, *Argemone mexicana*, *Solanum hirtulum* and *Erodium laciniatum*.

#### 20. *Salsola kali* community

This assemblage is not widely represented along the surveyed area. It is restricted to the elevated wadi terraces where the soil is fine-textured, compact, black coloured and slightly saline. Plant cover ranges from 5 to 20%, mainly contributed by the dominant species. Associate species include: *Tamarix aphylla*, *Chenopodium murale*, *Peganum harmala*, *Cynodon dactylon*, *Eragrostis minor*, *Pupalia lappacea*, *Heliotropium longiflorum* and *Convolvulus glomeratus*.

#### 21. *Malva parviflora* community

This is a community dominated by an ephemeral. It is well represented in depressions receiving fine sediments with high water retaining capacity. Plant cover ranges from 40 to 60%, which may almost of pure stands of the (edible) dominant species namely *Malva parviflora*. The vegetation in this community lacks tree or shrub layer. Among the associates are: *Farsetia longisiliqua*, *Peganum harmala*, *Chenopodium murale*, *Pulicaria crispa*, *Rumex vesicarius*, *Filago desertorum*, *Plantago ciliata* and *Asteriscus hierochunticus* (= *A. pygmaeus*).

#### 22. *Filago desertorum* - *Asteriscus hierochunticus* community

This community is another example of a community dominated by ephemerals, it occurs on terraces of shallow wadis crossing desert plains and also on the man-made terraces on slopes. The soil is relatively shallow and formed of fine sand with gravels and pebbles at the surface. Associated species recorded are: *Asphodelus tenuifolius*, *Malva parviflora*, *Lactuca* sp., *Rumex vesicarius*, *Lavandula dentata*, *Datura stramonium*, *Gagea reticulata*, *Spergula fallax*, *Oxalis corniculata* and *Peganum harmala*.

### Discussion

The distribution of the various plant communities and their composition show a clear dependence on geological substrate, elevation above sea level, land form, soil conditions, water supply as well as anthropozoogenic influences (El-Sharkawi, Fayed & Salama 1982; Baierle, El-Sheikh & Frey 1985, Batanouny & Ismail 1985). The majority of the surveyed area shows the restricted type (mode contracté) of vegetation (Monod 1954), with the exception of the mountainous region of Taif Plateau.

Slight variation in the local topography which affects soil characters, particularly soil texture, may lead to the appearance or disappearance of various communities. Hence low-laying sites namely wadi beds and depressions, with fine-textured soil and high water retaining power, support the growth of some communities such as *Acacia gerrardii*, *A. raddiana*, *Cassia senna*, *Commicarpus grandiflorus*, *Dipterygium glaucum* and *Stipagrostis plumosa*. On the other hand crevices of the rocky slopes are characterized by communities dominated by *Acacia hamulosa* and *Acacia asak*. *Acacia tortilis* and *A. ehrenbergiana* communities are usually found on the gravelly slopes and terraces.

The study indicates that there is an obvious correlation between plant communities and prevailing climatic conditions. Distance between Makkah and Zeyamah is the most drier area, since it is subjected to the action of scanty rainfall with a high temperature which lead to severe evapo-transpiration. So, the vegetation is mainly represented by communities dominated by grasses e.g. *Stipagrostis plumosa* or undershrubs such as *Cassia senna*. These species seems to be adopted to resist the above mentioned conditions. On the other hand distance extending from Zeyamah to Taif plateau is characterized by much reduced aridity where the vegetation is mainly dominated by shrubs and trees: *Lycium shawii*, *Calotropis procera*, *Acacia raddiana* and *Acacia tortilis*. The rest of the study area (Taif plateau) is the least arid region, in the study area, and inhabited by communities dominated by *Acacia gerrardii* and *Acacia asak*.

Wide altitudinal variation (277-1540 m), is a main factor affecting the distribution of plant communities in the study area. Stands of higher altitudes (over 1400 m), are characterized by certain communities such as *Acacia asak*. Stands between 1000 and 1400 m are occupied by communities such as *Acacia tortilis*. Lower and drier sites comprises desert communities dominated by *Maerua crassifolia*, *Acacia tortilis*, *Cassia senna*, *Dipterygium glaucum*, *Rhazya stricta* and *Stipagrostis plumosa*. But some communities have wide altitudinal range of distribution: *Aerva javanica*, *Pulicaria crispa* and *Indigofera spinosa*.

However, some of the associated species have wide ecological and sociological range of distribution: *Fagonia acerosa*, *Euphorbia granulata*, *Blepharis ciliaris*, *Panicum turgidum* and *Eragrostis minor*. Where *Solanum carense*, *Ochradenus baccatus*, *Morettia canences* and *Verbesina encelioides* are moderately distributed. In contrast, other species are confined to certain plant communities: *Euphorbia arabica*, and *Dolenix elata* associating *Acacia ehrenbergiana* - *Acacia hamulosa* community and *Caralluma quadrangula* and *Ecbolium viridi* associating *Acacia tortilis* community.

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**Table 1.** Average monthly and annual rainfall

Station	Alt. (m)	Rainfall (mm)												Mean annual (m)
		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Taif	1454	12.2	10.5	21.4	44.0	44.9	6.7	11.0	9.5	12.1	15.9	19.5	5.9	208.4
Ai Sail Al Kabir	1230	19.9	6.5	17.2	28.8	16.9	3.9	5.1	5.0	5.8	11.7	14.0	8.3	127.9
Makkah	300	30.3	4.5	1.2	12.3	1.5	2.6	0.1	0.8	9.0	7.0	15.6	14.8	86.6

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**Table 2.** List of the species recorded in the different plant communities

Species	Community number
<b>ACANTHACEAE</b>	
<i>Barleria prionitis</i> L. subsp. <i>appressa</i> (Forssk.) Brummitt & J.R. Wood	6
<i>Blepharis ciliaris</i> (L.) B.L. Burt	1, 2, 6, 9, 12, 14, 15, 19.
<i>Ecobolium viridi</i> (Forssk.) Alston	2.
<b>AIZOACEAE</b>	
<i>Aizoon canariense</i> L.	1, 5, 9, 12.
<i>Zeleya pentandra</i> (L.) C. Jeffrey	6.
<b>AMARANTHACEAE</b>	
<i>Aerva javanica</i> (Burm. f.) Juss. ex Schultes	8, 10, 13, 15, 17.
<i>Amaranthus graecizans</i> L.	17.
<i>Pupalia lappacea</i> (L.) A. Juss.	20.
<b>APOCYNACEAE</b>	
<i>Rhazya stricta</i> Decne.	1, 7, 8, 9, 11.
<b>ASCLEPIADACEAE</b>	
<i>Calotropis procera</i> (Ait.) Ait. f.	7, 8, 9, 11, 12, 19.
<i>Caralluma quadrangula</i> (Forssk.) N.E.Br.	1, 2.
<i>Caralluma retorspiciens</i> (Ehrenb.) N.E. Br.	5, 9.
<b>BORAGINACEAE</b>	
<i>Arnebia hispidissima</i> (Lehm.) DC.	2, 14, 15.
<i>Heliotropium arbainense</i> Fresen.	12, 16.
<i>Heliotropium bacciferum</i> Forssk.	9.
<i>Heliotropium longiflorum</i> (A.DC.) Hochst. & Steud	20.
<i>Trichodesma africanum</i> (L.) R. Br.	20.
<b>CAPPARACEAE</b>	
<i>Cadaba glandulosa</i> Forssk.	8.
<i>Capparis decidua</i> (Forssk.) Edgew	5, 8.
<i>Maerua crassifolia</i> Forssk.	1, 7.

Table 2. Contd.

Species	Community number
CARYOPHYLLACEAE	
<i>Spergula fallax</i> (Lowe) Krause	1, 16, 22.
CHENOPODIACEAE	
<i>Chenopodium album</i> L.	13.
<i>Chenopodium murale</i> L.	2, 13, 20, 21.
<i>Salsola kali</i> L.	13, 19, 20.
CLEOMACEAE	
<i>Cleome brachycarpa</i> Vahl.	8.
<i>Cleome droserifloia</i> (Forssk.) Del.	3, 4.
COMPOSITAE	
<i>Asteriscus hierochunticus</i> (Michon) Winkl. (= <i>A. pygmaeus</i> (DC.) Coss. & DR.)	21, 22.
<i>Echinops</i> sp.	6, 12.
<i>Filago desertorum</i> Pomel	6, 14, 21, 22.
<i>Flaveria trinerva</i> (Spreng.) Mohr.	17.
<i>Lactuca</i> sp.	5, 22.
<i>Osteospermum vailantii</i> (Decne.) Y. Nori.	12.
<i>Picris longirostris</i> Schultz Bip.	8, 13, 19.
<i>Pulicaria crispa</i> (Forssk.) Benth. ex Oliver.	6, 13, 19, 21.
<i>Pulicaria schimperii</i> DC.	8.
<i>Reichardia tingitana</i> (L.) Roth	12.
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.f.	6, 12, 15, 19.
CONVOLVULACEAE	
<i>Cascuta pedicellata</i> Ledeb.	14.
<i>Convolvulus arvensis</i> L.	2, 13.
<i>Convolvulus glomeratus</i> Choisy.	20.
CRUCIFERAE	
<i>Dipterygium glaucum</i> Decne.	7, 10, 17, 18.
<i>Farsetia longisiliqua</i> Decne.	9, 21.
<i>Morettia canescens</i> Boiss.	5, 8, 16, 17.
<i>Sisymbrium irio</i> L.	6, 12.

Table 2. Contd.

Species	Community number
<b>CUCURBITACEAE</b>	
<i>Citrullus colocynthis</i> (L.) Schrad.	1, 7, 8, 17.
<i>Cucumis prophetarum</i> L.	6, 8.
<b>EUPHORBIACEAE</b>	
<i>Andrachne aspera</i> Spreng.	1, 7, 11.
<i>Euphorbia arabica</i> Hochst. & Steud.	3.
<i>Euphorbia cuneata</i> Vahl.	3, 4.
<i>Euphorbia granulata</i> Forssk.	1, 7, 9, 10, 11, 17, 18.
<b>GERANIACEAE</b>	
<i>Erodium cicutarium</i> (L.) L'Hérit.	5, 6.
<i>Erodium laciniatum</i> (Cav.) Willd.	19.
<i>Erodium neuradifolium</i> Del. ex Godr.	14, 19.
<b>GRAMINEAE</b>	
<i>Cenchrus ciliaris</i> L.	8, 9.
<i>Cynodon dactylon</i> (L.) Pers.	13, 20.
<i>Eragrostis aspera</i> (Jacq.) Nees.	2, 7, 9.
<i>Eragrostis minor</i> Hochst.	1, 8, 10, 11, 13, 20.
<i>Lamarckia aurea</i> (L.) Moench.	2, 11, 13.
<i>Panicum turgidum</i> Forssk.	4, 7, 9, 11, 16, 17, 18.
<i>Phalaris minor</i> Retz.	18.
<i>Stipagrostis plumosa</i> Munro ex T. Anders.	9, 10, 15, 17, 18.
<i>Themeda triandra</i> Forssk.	6, 7, 9.
<b>LABIATAE</b>	
<i>Lavandula dentata</i> L.	22.
<i>Lavandula pubescens</i> Decne.	16.
<i>Otostegia fruticosa</i> (Forssk.) Schweinf. ex Penzig.	5, 6, 16.
<i>Teucrium polium</i> L.	5.
<b>LEGUMINOSAE</b>	
<i>Acacia asak</i> (Forssk.) Wild.	5.
<i>Acacia ehrenbergiana</i> Hayne.	2, 3, 5, 8, 9, 11, 16.
<i>Acacia gerrardii</i> Benth.	6, 12, 14, 16, 19.

Table 2. Contd.

Species	Community number
<i>Acacia hamulosa</i> Benth.	2, 3, 4, 5, 7, 15.
<i>Acacia raddiana</i> Savi.	1, 7.
<i>Acacia tortilis</i> (Forssk.) Hayne.	2, 4, 5, 9.
<i>Cassia senna</i> L.	3, 7, 8, 9, 10, 15, 17, 18.
<i>Crotalaria</i> sp.	6.
<i>Dolenix elata</i> (L.) Gamble.	3.
<i>Indigofera spinosa</i> Forssk.	1, 2, 3, 7, 9, 10, 11, 14, 18.
<i>Lotononis platycarpa</i> (Viv.) Pichi-Serm.	9.
LILIACEAE	
<i>Asphodelus tenuifolius</i> Cav. (= <i>A. fistulosus</i> L. var. <i>tenuifolius</i> (Cav.) Baker)	3, 22.
<i>Gagea reticulata</i> (Pall.) A.H. Schultz.	22.
MALVACEAE	
<i>Abutilon pannosum</i> (Forst.f.) Schlecht.	3.
<i>Malva parviflora</i> L.	6, 12, 21, 22.
MENISPERMACEAE	
<i>Cocculus pendulus</i> (J.R. & G. Foster) Diels.	5.
NYCTAGINACEAE	
<i>Boerhavia coccinea</i> Mill.	2, 6, 7.
<i>Commicarpus grandiflorus</i> (A. Rich) Standl.	1, 2, 6, 7, 12, 16.
OXALIDACEAE	
<i>Oxalis corniculata</i> L.	1, 22.
PAPAVERACEAE	
<i>Argemone mexicana</i> L.	2, 6, 8, 13, 16, 19.
PLANTAGINACEAE	
<i>Plantago ciliata</i> Desf.	21.
POLYGONACEAE	
<i>Rumex vesicarius</i> L.	6, 21, 22.

Table 2. Contd.

Species	Community number
<b>RESEDACEAE</b>	
<i>Ochradenus baccatus</i> Del.	2, 6, 12, 15, 16.
<b>RHAMNACEAE</b>	
<i>Ziziphus spina-christi</i> (L.) Wild.	18.
<b>SCHROPHULARIACEAE</b>	
<i>Lindenbergia sinaica</i> (Decne.) Benth.	10.
<b>SOLANACEAE</b>	
<i>Datura innoxia</i> Mill.	9, 12.
<i>Datura stramonium</i> L.	22.
<i>Lycium shawii</i> Roem. & Schult.	4, 5, 6, 12, 14, 15, 16.
<i>Solanum carense</i> Dunal.	5, 6, 9, 11, 16.
<i>Solanum hirtulum</i> Steud. ex A. Rich.	19.
<i>Withania somnifera</i> (L.) Dunal.	2.
<b>TAMARICACEAE</b>	
<i>Tamarix aphylla</i> (L.) Karst.	20.
<b>TILIACEAE</b>	
<i>Grewia erythraea</i> Schweinf.	5.
<b>URTICACEAE</b>	
<i>Forsskalea tenacissima</i> L.	8, 10, 16.
<b>VITIDACEAE</b>	
<i>Cissus quadrangularis</i> L.	1, 7.
<b>ZYGOPHYLLACEAE</b>	
<i>Fagonia acerosa</i> Boiss.	1, 8, 10, 11, 13, 16, 17.
<i>Fagonia bruguieri</i> DC.	6, 9, 10, 13.
<i>Fagonia indica</i> Nurm. f.	6, 7, 15.
<i>Peganum harmala</i> L.	6, 20, 21, 22.
<i>Tribulus terrestris</i> L.	1, 2, 5, 7, 9, 16.
<i>Zygophyllum simplex</i> L.	10, 12.

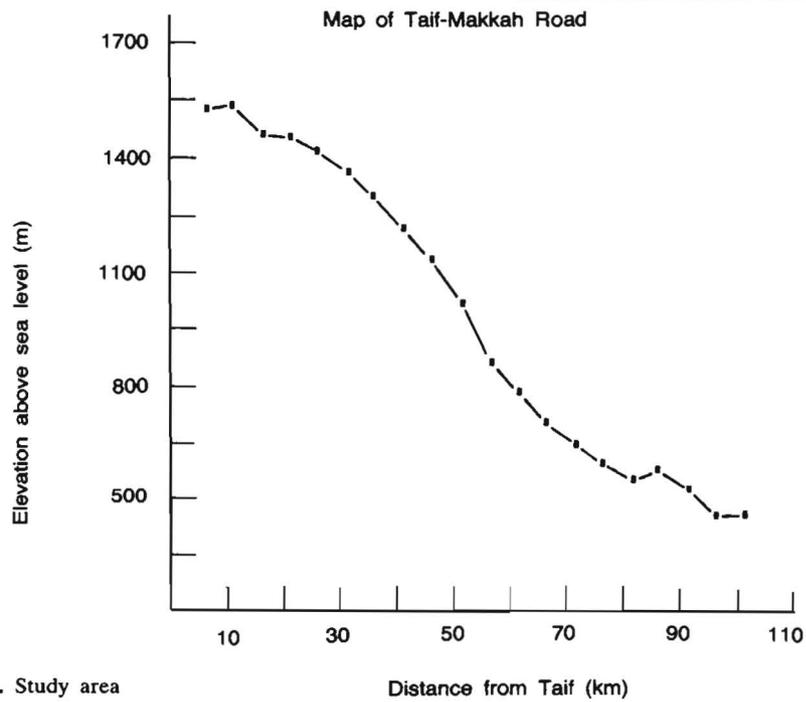
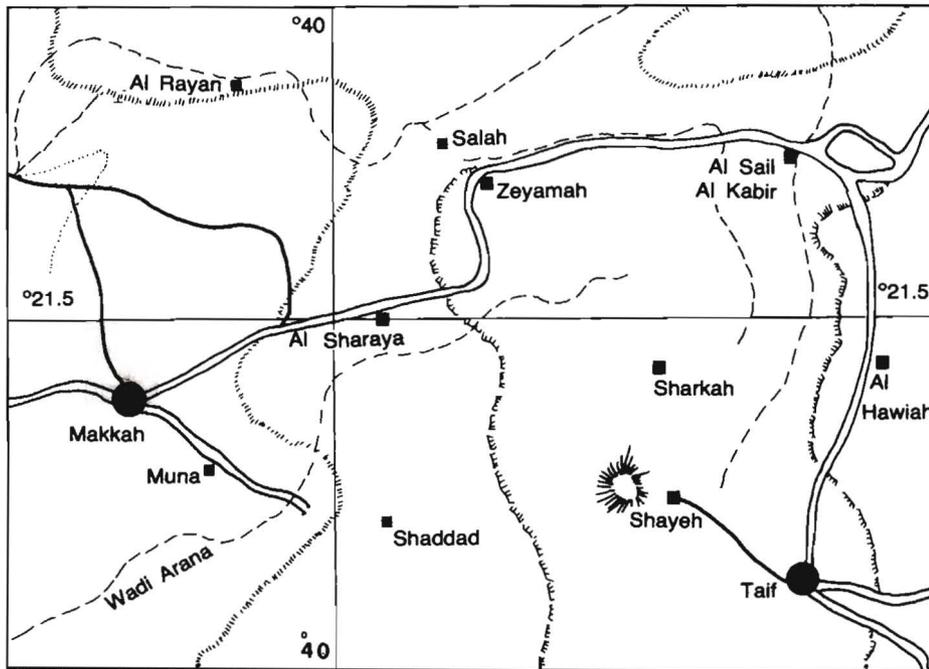


Fig. 1. Study area



(A) *Lycium shawii*



(B) *Acacia tortilis*



(C) *Rhazya stricta*



(D) *Cassia senna*

**Fig. 2.** Selected communities showing changes in vegetation.



(A) *Commicarpus grandiflorus* on *Acacia*



(B) *Otostegia fruticosa*

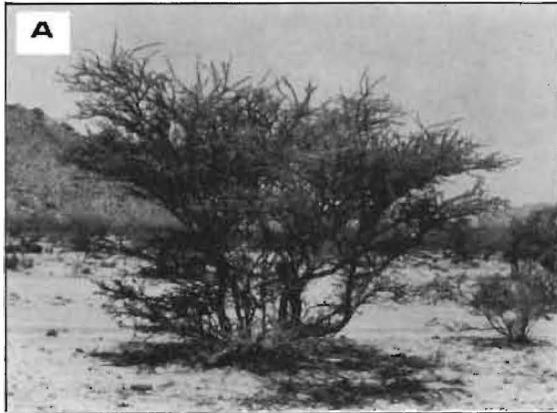


(C) *Barleria prionitis* subsp. *appressa*

**Fig. 3.** Some plants were found in bloom.



(D) *Indigofera spinosa*



(A) *Acacia tortilis*



(B) *Farsetia longisiliqua*



(C) *Osteospermum vaillantii*  
Fig. 4. Selected individuals.



(D) *Acacia asak*

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## الكساء الخضري بين مكة المكرمة والطائف (السعودية)

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تتميز منطقة جنوب غرب المملكة العربية السعودية بوفرة وتنوع نباتاتها كما أن الدراسات السابقة التي أجريت بالمنطقة غير وافية . ولقد قام الباحثان بدراسة الكساء الخضري في المنطقة الواقعة على الطريق بين مكة المكرمة والطائف والتي تبلغ حوالي مائة ١٠٠ كم وبارتفاع حاد يتراوح بين ٢٢٧ - ١٤٥٠ متراً فوق مستوى سطح البحر .

ويمكن تقسيم منطقة الدراسة إلى ثلاثة قطاعات متباينة :

القطاع الأول ويمتد من مكة المكرمة وحتى منطقة الزيمه ، أما القطاع الثاني فيمتد من الزيمه وحتى منطقة السيل الكبير، في حين يشمل القطاع الثالث باقي منطقة الدراسة وهذا القطاع جزء من هضبة الطائف . والقطاعات الثلاثة تتباين فيما بينها من حيث طبيعة التربه والمظاهر الطبوغرافية، والارتفاع عن مستوى سطح البحر، والمناخ السائد، إذا إنعكس ذلك على طبيعة الكساء الخضري من حيث الوفرة والسيادة والتنوع وطرز النمو .

تم اختيار ٦٥ موقعاً للدراسة اختيرت على أساس تتبع التغير في حالة الكساء الخضري وتم تجهيز مجموعة نباتية مرجعية أودعت مكررات منها في معشبة جامعة القاهرة ومعشبة الحديقة الملكية بأدنبره بالمملكة المتحدة .

وقد سجل الباحثان ١٠٩ نوعاً من النباتات الوعائية تنتمي إلى ٣٦ عائلة نباتية . من أكثر هذه العائلات تمثيلاً هي العائلة المركبة والعائلة البقلية (١١ نوعاً لكل منها) ثم تأتي العائلة النجيلية (٩ أنواع) وكل من العائله الباذنجانية

والرطريبية (٦ أنواع لكل منها) في حين مُثلت باقي العائلات بعدد محدود من الأنواع.

وهذه الأنواع تشكل فيما بينها ٢٢ عشيرة نباتية : اثنتين من هذه العشائر تسودها نباتات حوله هي الحُبَيْزَة والقُطَيْنَة بينما تسود باقي العشائر نباتات معمرة هي : السَّمْر، السَلَم، الضهيا، المَرُو، الصمعاء، العُشَار، الرازيا، البَلَسَم، الشَّوَيْكَة، الشَّيرِق، الأروى، العوسج، الصفوى، السنامك، الجشجات، الدمران.

وقد زود البحث بجدول رقم (٢) يضم قائمة مراجعة باسماء نباتات مرتبة حسب عائلاتها، مضافاً إلى ذلك أرقام العشائر التي سُجِّل فيها كل نبات. كما جهزت لوحة خطية لموقع الدراسة وصور فوتوغرافية لمختارات من العشائر والأنواع النباتية السائدة. وتمت مناقشة العلاقات بين العشائر النباتية المختلفة والظروف البيئية السائدة.