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Distribution of Range Plant Communities as Influenced by Edaphic Factors in Raudhat Khuraim

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Abstract

Raudhat Khuraim is a depression of extensive pans against a sand dune belt to the east of Irq Faydat Khuraim, located about 100 km north-east of Riyadh, Saudi Arabia. The Area collects water rain-flow from three watercourses draining eastwards. The area is liable for flooding. Therefore, soil water retention of the Raudhat is higher for a long time than the surrounding areas. High soil moisture is reflected on both vegetation distribution and soil properties. This study was aimed to define the distribution of range plant communities in the northern part of Raudhat Khuraim and to relate soil properties to vegetation cover and distribution. Fifteen plant communities, a semi-bare soil-and a bare soil were recognized. Perennial plant composition, total vegetation cover and species relative cover were defined. Soil samples by layers were collected for physical and chemical analyses. Texture, calcium carbonate, pH, cations, anions and organic matter were determined. Results revealed that soil properties had an influence on vegetation cover and the distribution of different plant communities with different degrees. Properties that had pronounced effect on the distribution of communities were texture, EC, cations of calcium, magnesium and sodium, chloride and bicarbonate anions and surface layer organic matter. Communities with very low vegetation cover had a soil with high magnesium cation in one or more of their profile layers.

Keywords: rangelands, plant communities, Raudhat Khuraim, edaphic factors

Introduction

Rangeland plant community distribution and species composition are known to be related to specific soil properties such as soil climate (moisture and temperature), texture, depth, structure, fertility, pH, salinity and toxic influences. These properties relate to spatial variability of vegetation responses ranging from broad geographic distributions to landscape influences to specific site characteristics. (Leonard *et al.*, 1988).

Tiedeman and Terwilliger (1979) assumed that plant communities can be consistently correlated with soil classification units, because of their shared relationship in the soil forming factors. Soil and vegetation classification seldom exhibit a 1:1 relationship (Leonard *et al*., 1988). The susceptibility of vegetation to changes in short periods of time as compared to soils presents a problem for an establishment of vegetation soil relationships. Succession and retrogression due to both management and natural factors and species interactions within communities result in very different plant communities occurring on the same or similar soils. On the other hand, many serial species occur over a wide range of soil properties and other environmental factors resulting in apparently similar plant communities on contrasting soils capable of producing different plant communities.

Echert (1957) described soil characteristics associated with several sagebrush dominated habitat types in southern Oregon. He found several soil series associated with an individual habitat type, but also found several habitat types associated with one soil series. He suggested that although similar in gross morphological characteristics, the soil differed in minor but important compensating characteristics which allowed distinctly different vegetation units to exist and suggested moisture-holding capacity as one factor. In many studies, a distinct vegetation relationship with soil morphological characteristics is obvious while in others, there appears to be no relationship. The relationship are most often distinct when the involved landscapes contribute to a pattern of soils with distinctly different moisture infiltration and retention characteristics.

West and Ibrahim (1967) found that soil morphological characteristics such as profile depth, surface horizon depth and texture as well as chemical properties of base exchange capacity, exchangeable potassium and sodium were very significantly different between *Atriplex* habitat types in southeastern Utah. Kleiner and Harper (1977), working in the same area, concluded that sites dominated by *Hilaria jamesii* were characterized by finer texture, slightly warmer average temperature, and higher surface potassium and organic matter compared to sites dominated by *Stipa comata*. Fairchild and Brotherson (1980) found that micro-habitat characteristics beneath six major shrubs in northern Arizona were more indicative of site classification than characteristics of the shrub intersperses. Soil depth was determined to be the most important factor, but other factors of importance included slope, clay content, topographic position, aspect and soil pH.

The ratio between nutrients in the soil is another factor influencing the distribution of gangland vegetation. The potassium-magnesium ratio within the soil has been suggested by Jensen (1984) as a possible indicator between shrub dominated sites and grass dominated sites. The root action exchange capacity for the shrubs was over twice that of the grasses and would apparently favor Mg absorption by shrubs rather than K and *vice-versa* for grasses.

General relationships between plant communities and saline soils have been documented world-wide, (Shantz and Premeisal, 1940, Billings, 1949, Tag El-Din and Ibrahim, 1978). Roundy (1983, 1985a, 1985b), suggested that high salinity levels are limiting for plant re-establishment and growth. Hodgkinson (1987) made a direct correlation for six salt brush species in Arizona and New Mexico with SAR, EC. and pH. Species ranked from highest to lowest in their adaptability to SAR, EC and pH as follows: *Atriplex corrugata, A. obovata, A. cuneata, A. flacata, A. confertifolia* and *A. canescens*. Bowman *et al*. (1985) analyzed a saltgrass meadow and found that vegetation cover and species composition were related to salinity, sodicity, fertility and physical characteristics.

Similar and repeatable soil-vegetation units form a basis for making more consistent interpretations. During the process of data collection and evaluation, ranges of characteristics can be identified to help range managers determine reasonable expectations. Where probabilities have been determined such as with seeding trials, risks can be also evaluated. Past management practices can be evaluated based on associated soil- vegetation relationships.

The major rangeland habitat types in Saudi Arabia are sand ridges, Wadi beds and Riyadh. Sand ridges support deep rooted shrubs and tussock grasses with fibrous roots. Wadi beds vegetation is usually dominated by tall shrubs or trees with an under story of dwarf shrubs. Riyadh, a plural of Raudhat is a vernacular term employed for extensive alluvium pans against sand dunes receiving excessive precipitation run-off through water-courses. During the cool season, Riyadh are favorable sites for grazing as a lush meadow of diverse mesophytic annual Herbs and grasses come up. High soil moisture retention for long periods of time favors growth of diverse perennial species. Raudhat Khuraim is a good example of the Riyadh type of habitat. The area is a major grazing resource for the surrounding inhabitants.

A part from a brief description by Vesey-Fitzgerald (1957), no detailed information was found on vegetation of Raudhat Khuraim. Such information is vital for proper management of the area. The objectives of this study were (1) to define the wide distribution of range plant communities in the northern part of Raudhat Khuraim and (2) to assess the influence of Edaphic factors on the distribution of these plant communities.

Materials and Methods

The study was conducted in Raudhat Khuraim, located about 90 km northeast of Riyadh (25º 20' N, 47º 15' E) and about 15 km south of Rumah town. The area is a depression running south-east ward, about 18 km long and 1 to 2.5 km wide. The area is fed with rainfall water by three wadis running eastward. Wadi Ghaylanah feeds the northern part, wadi Khuwaish feeds the middle part and wadi Wathailan feeds the southern part. The north eastern edge of Rawdhat Khuraim is bordered by a longitudinal sand dune belt called Irq Faydhat Khuraim. This Irq is one of parallel longitudinal sand dunes at the western edge of AL-Dahnaa desert. This Irq serves as a dike intercepting water run off and hence the Rawdhat was formed. Evaluation of Rawdhat Khuraim area ranges between 532 m at the south and 557 m at the northern edge.

Currently, Raudhat Khuraim is managed through the municipality of Rumah. Grazing is deferred until seed setting of annuals. However, no control over stocking rate is imposed. Common grazing by camels, sheep and goats is the usual practice. Beside grazing, it is a favorable site for picnic but no camping is allowed.

Annual plants contribute substantially to forage production during rainy seasons. The important annual species include: *Astragalus* sp.. *Cotula anthemoides*, *Emex spinosa*, *Horwoodia dicksoniae*, *Lepidium aucheri*, *Malva neglecta*, *Medicago laciniata*, *Neurodia procumbeus*, *Plantago* sp., *Trigonella anguina* and *T. hamosa*.

The climate is hyper arid characterized by relatively mild winter and hot summer. The mean maximum temperature is 33°C and the mean minimum temperature is 17°c, with average temperature of 25°C. Average annual precipitation is about 100 mm per year, with a great variation from year to year. Approximately, 70% of the precipitation falls in the period from January to April. (Zoghet and Akabawi, 1986).

Field work was conducted during Autumn season of 1993 and covered about 14 km of the northern part of the Rawdhat. A transect extending about 2.5 km from western edge of Irq Faydhat Khuraim to the western edge of the Rawdhat was defined in such a way to intersect most of the plant communities extending parallel to. the longitudinal sand dune. Plant communities in the transect were described. Plant communities located outside the transect but distributed elsewhere in the studied area were also defined. Perennial species composition for different plant communities were identified. Canopy cover by species and total cover were estimated by ocular methods (Cook and Stubbendick, 1986). Cover is defined as the vertical projection of the crown or shoot area of a species to the ground surface expressed a fraction or percent of a reference area (Muller and Ellenberg, 1974). For each plant community, soil profiles were observed between plants within plant communities, and soil samples were taken by layer through its ocular physical properties. Soil samples were air dried for soil properties analyses.

Particle size distribution was estimated by using the hydrometer method (Bouyocos, 1962). Organic matter percentage was determined by the Walkly-Black method (Allison, 1965). Other soil parameters were determined following Richards (1954). These parameters included percentage of calcium carbonate (CaC03%), saturation paste percentage (S.P.%), pH, electrical conductivity (EC), calcium, magnesium, sodium, and potassium cations and carbonate, bicarbonate and chloride anions.

Results and Discussion

Plant communities widely distributed in the chosen transect and in the other parts of the study area are presented in Table 1. Nine plant communities and a semi-bare soil across the transect were observed in the transect. They are arranged from east to west as follows: (1) *Stipagrostis drarri-Cyprus conglomeratus* community, (2) *Stipa plumose-Heliotropium ramosissimum* community, (3) *Heliotropium ramosissimum* community, "Semi bare ground", (4) *Rhazya stricta-Lasiurus hirsutus. (5) Acacia gerrardii-Calotropis procera* community, (6) *Zilla spinosa-Lasiurus hirsutus* community, (7) *Lycium shawii-Rhazya stricta* community, (8) *Acacia gerrardii-Pulicaria crispa* community, and (9) *Pulicaria crispa-Zilla spinosa* community.

In addition to the plant communities defined across the transect, eight plant communities and bare ground soil were also distributed in wide areas of the northern part of Rawdhat Khuraim. Bare ground within the studied area was surrounded by different plant communities characterized by high vegetation coverage. Therefore, bare grounds were treated as a "plant community" in this study. The eight plant communities not found across the transect are arranged from the northern terminal of the Rawdhat towards the south as follows: (1) *Capparis decidua-Ziziphus mummularia* community, (2) *Ziziphus mummularia-Acacia garradii* community, (3) *Capparis spinosa-Calotropis procera* community, (4) *Rhazya stricta* community, (5) *Capparis spinosa-Rhazia stricta- Calotropis procera* community, (6) Bare soil material surrounded with dense vegetation. (7) *Lasiurus hirsutus-Rhazya stricta* communitv and (8) *Calytropis procera-Zilla spinosa* community. An obvious correlation between texture and $CaC0_3$ could be noticed. It was found that fine particles increased with high content of calcium carbonate.

Saturation paste percentage (S.P. %): In different plant communities profiles, S.P. ranged from 15.3% to 51.7%. A good correlation could be observed between S.P. and both texture and calcium carbonate content. So, the same trend could be achieved with S.P.%.

pH values: Soil pH for all communities was alkaline and ranged between 7.32 and 8.61. It seems that pH had no influence on the distribution of plant communities and vegetation cover.

Electrical conductivity (EC): Electrical conductivity varied from 0.19 mmoh/cm (sub-surface layer of *Stipagrostis plumosa - Heliotropium ramoissimum* community profile) to 3.6 mmoh/cm (surface layer of *Heliotropium ramosissimum* community profile). The surface layer for all soil profiles had higher EC than other layers, except for profiles of semi bare soil and bare soil which had vegetation cover less than 1 %. The increase in conductivity in the surface layer for most communities is probably due to evaporation of water collected in the Rawdhat from the catchments area through Ghailanah valley and its tributaries. Profiles of communities having less than 2% vegetation cover had layers with EC more than 3 mmohs/cm. Electrical conductivity (especially at the surface layer) could be taken as a characteristics parameter for vegetation cover and distribution of most plant communities.

Cations content: cations content of soil paste extract varied with plant communities and within soil profiles. Calcium cation had similar trend to EC It ranged between 0.48 meq/l in the third layer of *Capparis spinosa-Calotropis procera* community soil profile and 20.4 meq/l. in the second layer of bare soil. Soil surface layer had markedly higher calcium content than the other layers for most plant communities.

Nearly similar trend was observed with magnesium cation. It ranged between 0.18 meq/l in *Stipagrostis plumosa-Heliotropium ramosissimum* and 17.5 meq/l in the semi bare soil. Both values were observed in the second layer. The coverage of the first community was 35%, while it was 1% for the second community. Therefore, relatively high content of magnesium cation could be considered as a factor inhibiting growth of vegetation.

Sodium cation concentrations ranged between 0.26 meq/l in the third layer of *Acacia gerrardii-Pulicaria crispa* community soil profile to 5.3 meq/l in the surface layer of *Heliotropium ramosissimum* community profile. The first community had about 60% vegetative cover while the second had only 2% Cover. Although most of soil profile layers had low concentration (less than 1 meq/l), sodium could be taken as an indicator for distribution of vegetation communities in addition to vegetation percentage cover.

Potassium cation concentration for different profile layers varied from 0.15 meq/l to 2.0 meq/l. High potassium cation content could be observed in surface layers, except those layers which have high salt content. Potassium cation could be taken to some extent as an indicator for distribution of plant communities, especially those occupying the northern part of the studied area, (*Capparis decidua-Ziziphus mummularia* community, *Ziziphus mummularia-Acacia garradii* community, *Capparis spinosa-Calotropis procera* community).

Anions: Anions concentrations seem to have the same relation as that of EC. The concentration of anions was higher in the surface layer than in other layers of profiles for most vegetation communities. Compared to other anions, bicarbonate varied greatly at the surface layer among plant communities. It ranged between 1.63 meq/l in *Helotropium ramosissimum* community and 11.3 meq/l in *Acacia gerrardii-Calotropis procera* community. Communities occupying the central area along the transect had relatively more bicarbonates in the surface layer.

Organic matter: Organic matter (O.M. %) varied greatly from one plant community to another. It was higher in the surface layer than in other layers nearly for all plant communities. For surface layers, O.M. % ranged from 0.134% to 2.44%. The northern plant communities (*Lycium shawii-Rhazya stricta*, *Acacia gerardii-Pulicaria crispa*, *Pulicaria crispa-Zilla spinosa*, *Lasiurus hirsutus*) had the highest O.M.%. Communities with sand surface layer and those with sparse vegetation had low organic matter content. Generally, O.M % was higher in the western communities than in eastern communities.

From the previous discussion, it could be concluded that different soil characteristics have different degrees of influence on the vegetation cover and vegetation distribution. For vegetation percentage cover, specific salt cations in the high salt content soil layers seems to have a great influence. All vegetation types having low vegetation cover % and the bare soil, had high content of magnesium cation which might restrict the growth of most plant species. Soil texture, $CaC0_3$%, total salts, calcium cation, bicarbonate anion and the surface layer organic matter content tended to have the greatest influence on plant communities distribution than the other studied characteristics.

Plant composition, total coverage percentage and the relative coverage of species for different communities are also presented in Table 1. Total coverage percentage varied from nil to 60%. Three plant communities had total cover percentage less than 2% (bare soil surrounded with dense vegetation, *Heliotropium ramosissimum* community, and semi bare ground). Three plant communities had total cover between 10% and 20%, (*Lycium shawii-Rhazya stricta-Stipagrostis drarii-Cyprus conglomeratus* and *Acacia gerrardii-Calotropis procera* community). The other eleven plant communities had more than 30% coverage.

The physical and chemical analyses for soil profile samples for different plant communities are presented in Table 2. The soil characteristics varied widely between different plant communities as follows:

Soil Depth: Most plant communities in Rawdhat Khuraim exist in areas with deep soils. The depth of the surface layer ranged from 10-25 cm except for *Stipagrostis drarii-Cyprus conglomeratus* community which had a deep profile of drifted sand, located directly beside the Faydat Khuraim Irq sand dune.

Texture: The soil texture of different layers in different plant communities varied from sand to clay. For the transect communities, the texture tended to be light in the east and heavy towards the west. Layers of clay texture were found in profiles of two communities namely *Capparis decidua-Ziziphus mummularia* community and *Ziziphus mummularia-Acacia gerrardii* community, which occupied the northern part of the studied area. North to these two communities, elevation increases gradually and hence flow energy of water coming from Wadi Ghailanah decreases and fine particles precipitate. In western plant communities, sand particles were fine and calcareous while those particles found in eastern communities were coarse and siliceous. The last communities lie near the sand dune dyke.

Calcium carbonate content: $CaCO_3$ ranged from 3.8% in *Stipagrostis drarii-Cyprus conglomeratus* community profile to 30.8% in the third layer of *Acacia gerrardii-Pulicaria crispa* community profile. Calcium carbonate content of the two eastern communities (*Stipagrostis drarii-Cyprus conglomeratus* and *Stipagrostis plimosa-Heliotropium ramosissimum*) profiles and the subsurface layer of *Heliotropium ramosissimum* community profile were low (less than 4.5%). These layers were characterized as coarse sandy texture. On the other hand, the third layer of *Rhazya stricta* community profile, which occupies the western part of the Rawdhat was fine sandy texture, but $CaCO_3$ % was high (10.6%). This indicates that siliceous sand particles in the eastern part of the Rawdhat may have migrated from the Dhanaa desert while sand particles of the western part were calcareous from the local parent material.

Table 1. Total cover percentage of plant communities and relative species cover in Raudhat Khuraim.

Plant Species	Plant Community																
	S. drarii - C. conglomeratus	*S. plomosa-H. ramosississmum*	*H. ramosississmum*	Semi-bear soil	*A. gerardii- C. procera*	*Z. spinosa-L. hirsutus*	*L. shawii-R. stricta*	*A. gerardii-P. crispa*	*P. crispa-Z. spinosa*	*C. decidua-Z. nummularia*	*Z. nummularia-A. gerardii*	*C. spinosa-C. procera*	*R. stricta*	*C. spinosa-R. stricta-C. procera*	Bare soil	*L. hirsutus-R. stricta*	*C. procera-Z. spinosa*
Acacia gerardii		+			35		+	28	2		20						
Achillea fragrantissima										+							
Astragalus spinosus																	2
Calatropis procera		+		+	35	5	2	3			+	20		24		10	33
Capparis decidua										40							
Capparis spinosa							+	+				40	6	57			
Cassia senna							+										
Chrozophora oblingifolia						+											8
Citrullus colocynthia		+										5	4	+			
Cleome arabica												5					
Convolvulus oxyphyllus						+	8	1									2
Cynodon dactylon								10	4			10					
Cyperus conglomeratus	30																
Ephedra foliata										7	+						
Fagonia glutinosa				+		+											
Fagonia indica							8									+	
Haplophyllus tuberculata							5										
Heliotropium ramosississmum	10	25	100													+	
Lasiurus hirsutus				+		30	11									60	
Lyceum shawii					30		28	3	2								
Panicum turgidum		15															
Pennisetum divisum		5															
Pullicaria crispa								41	72			10					
Rhazya stricta				+		25	28	+	1			5	90	19		25	17
Stipagrostis drarii	60	25														3	
Stipagrostis plumosa		34					+										
Zilla spinosa						40	8	14	18			5					36
Ziziphus nummularia								+		53	80						
Total vegetation cover %	12	35	2	1	20	35	10	45	55	45	30	45	50	40	0	45	60

+ Rare stand

Table 2. Soil physical and chemical properties of different plant communities distributed in Rhaudhat Khuraim.

Plant Community	Soil Depth (cm)	Soil Properties												
		Texture	$CaCO_3$ %	S.P. %	pH	E.C. Mmoh/cm	Ca	Mg	Na	K	CO_3	H CO_3	Cl	O.M. %
							Meq./ l							
S. drarii - C.conglomeratus	0-70	sand	3.8	16.0	8.61	0.30	2.1	0.62	0.4	0.3	0.35	1.85	0.7	0.335
S. plumosa – H. ramossimum	0-20	Sand	3.9	15.3	8.59	0.24	1.35	0.58	0.48	0.39	0.35	1.90	0.42	0.353
	20-70	Sand	4.3	15.6	8.60	0.19	0.93	0.18	0.50	0.35	0.05	1.75	0.63	0.101
H. ramossimum	0-15	Clay loam	19.3	41.0	7.93	3.6	18.30	12.0	5.3	0.30	0.38	1.63	3.50	0.502
	15-70	Sand	4.1	16.7	8.14	1.40	8.40	3.0	2.26	1.80	T	1.63	2.30	0.101
Semi-bare soil	0-25	Clay loam	23.6	42.0	8.11	0.46	3.50	0.25	0.89	0.50	0.30	2.85	0.77	0.329
	25-70	Loam	20.8	27.0	7.70	3.50	16.00	17.5	1.00	0.79	T	2.00	3.15	0.301
A. gerardii – C. procera	0-20	Loam sand	8.6	20.5	7.60	1.50	8.50	2.25	0.87	2.00	0.38	11.25	2.98	1.102
	20-40	Loam sand	7.6	25.6	7.90	0.70	3.50	1.25	0.70	1.45	0.60	3.70	0.84	0.469
	40-60	Clay loam	15.3	36.5	7.87	1.09	9.00	7.25	1.70	1.00	0.50	5.38	2.60	0.507
Z. spinosa – L. hisutus	0-10	Loam sand	16.10	22.0	8.18	1.25	7.00	2.50	0.70	2.00	0.75	6.25	4.20	0.134
	10-50	Sandy loam	15.6	24.0	8.51	0.26	1.80	0.50	0.30	0.43	0.75	2.05	0.63	0.201
L. shawii – R. stricta	0-15	Sandy loam	14.70	23.0	8.31	0.66	2.50	1.50	0.58	0.50	0.75	2.80	1.12	0.368
	15-50	Sandy loam	15.9	21.7	8.34	0.30	1.93	0.73	0.70	0.29	0.15	2.15	0.70	0.134
	50-70	Sandy loam	14.7	24.0	8.22	0.58	3.25	2.25	0.84	0.60	0.10	1.70	1.40	0.168
A. gerardii – P. crispa	0-20	Sandy loam	20.70	37.6	7.85	0.86	5.25	2.25	0.76	0.80	0.40	7.80	2.0	1.000
	20-90	Sandy clay loam	24.9	32.0	8.11	0.26	1.20	1.10	0.37	0.25	0.10	2.55	0.91	0.234
	90-110	Clay loam	30.8	45.8	8.15	0.23	1.05	1.00	0.26	0.20	0.10	2.00	0.80	0.201
P. crispa – Z. spinosa	0-20	Silty clay loam	25.2	46.0	8.15	0.55	3.50	1.35	0.58	0.46	0.50	1.25	0.98	1.570
	20-50	Clay loam	19.7	33.0	8.05	0.35	2.25	0.75	0.43	0.37	0.15	1.95	0.84	0.134
	50-110	Sand loam	17.4	28.0	7.94	0.35	1.08	1.00	0.40	0.17	0.15	2.15	0.70	0.431
C. decidua – Z. nummularia	0-10	Sandy clay loam	10.5	35.8	7.32	1.5	9.5	4.0	1.0	1.35	0.88	10.5	4.03	2.440
	10-20	Sandy loam	6.20	22.8	8.02	0.44	3.53	0.73	0.48	0.45	0.20	2.70	0.84	0.601
	20-50	Clay	18.5	34.0	8.08	0.37	1.98	1.20	0.48	0.48	0.15	2.45	0.98	0.510
	50-80	Clay loam	14.2	29.5	8.11	0.31	1.35	1.20	0.40	0.41	0.15	1.70	0.77	0.502

Table 2. Continued.

Plant Community	Soil Depth (cm)	Soil Properties												
		Texture	$CaCO_3$ %	S.P. %	pH	E.C. Mmoh/cm	Ca	Mg	Na	K	CO_3	H CO_3	Cl	O.M. %
							Meq./ l							
Z. nummularia –A. gerardii	0-25	Silty clay	25.1	51.7	7.49	1.30	9.50	2.50	1.00	1.10	0.75	11.3	2.80	2.470
	25-50	Silty clay	24.9	41.0	8.23	0.23	1.28	0.75	0.39	0.17	0.15	1.65	0.63	0.802
	50-100	Clay	24.4	41.5	8.30	0.21	0.63	1.00	0.48	0.13	T	1.65	0.84	0.569
C. spinosa – C. procera	0-20	Silty clay loam	25.0	44.0	8.06	0.68	4.50	1.50	0.67	0.69	0.60	5.40	1.53	2.310
	20-60	Clay loam	25.9	35.8	8.29	0.23	0.60	1.30	0.37	0.23	0.10	0.80	0.84	0.670
	60-80	Loam	23.9	32.0	8.27	0.23	0.48	1.37	0.45	0.13	0.10	1.55	0.84	0.234
R. stricta	0-20	Silty loam	24.9	36.8	7.85	0.74	5.00	1.00	0.74	0.60	0.30	5.35	1.60	0.269
	20-40	Sandy loam	15.4	18.0	8.20	0.31	1.50	1.00	0.65	0.18	0.30	2.25	0.84	0.269
	40-110	Sand	10.6	10.0	8.29	0.23	1.00	0.75	0.60	0.18	0.10	1.90	0.98	0.067
C. spinosa – R. stricta – C. procera	0-10	Sandy clay loam	18.6	33.0	7.51	1.80	11.50	4.00	1.70	1.30	1.00	11.90	4.90	0.201
	10-50	Clay loam	21.8	28.0	8.07	0.31	1.75	0.75	0.76	0.35	0.15	2.30	0.98	0.135
	50-100	Loamy sand	13.1	21.0	8.53	0.27	1.75	0.25	0.83	0.29	0.20	2.35	0.91	0.135
Bare soil	0-15	Silty clay loam	26.6	40.7	8.06	0.55	4.00	0.50	0.58	0.57	0.15	3.15	1.12	0.333
	15-100	Clay loam	25.2	34.0	7.69	3.00	20.4	8.25	1.80	0.83	T	2.0	4.00	0.201
L. hirsutus – R. stricta	0-10	Sandy clay loam	18.3	29.0	7.73	1.00	6.50	2.00	0.80	0.70	0.30	6.40	2.00	1.130
	10-50	Sandy loam	18.3	20.7	8.24	0.29	1.75	0.50	0.48	0.30	0.15	2.55	0.77	0.201
	50-110	Loamy sand	19.3	16.7	8.17	0.53	2.50	1.30	0.65	0.15	0.05	1.90	1.40	0.113
C. procera – Z. spinosa	0-10	Clay loam	19.7	35.0	7.68	1.05	6.50	2.00	0.80	0.70	0.75	7.25	2.63	1.471
	10-20	Loamy sand	13.4	18.8	8.12	0.31	1.50	0.75	0.56	0.25	0.10	2.70	0.91	0.133
	20-40	Loamy sand	14.9	18.8	8.53	0.23	1.25	0.50	0.46	0.19	0.10	2.00	0.84	0.133
	40-60	Loamy sand	12.9	19.0	8.30	0.26	1.25	0.75	0.56	0.23	0.30	2.30	1.00	0.070

T = Trace

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تأثير عوامل التربة في توزيع المجتمعات النباتية الرعوية في روضة خريم بالمملكة العربية السعودية

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تقع روضة خريم على بعد نحو ١٠٠كم شمال شرقي مدينة الرياض بالمملكة العربية السعودية، وهي عبارة عن منخفض متسع محاط من الشرق بكثبان رملية حاجزة لمياه الأمطار التي تغذي المنطقة من جهتها الغربية بثلاثة شعاب. ولذلك فإن التربة تبقى رطبة لفترة أطول من السنة مقارنة بالمناطق المحيطة بها. وقد انعكس هذا المخزون المرتفع لرطوبة التربة على كل من الغطاء النباتي وخواص التربة الأخرى. تهدف هذه الدراسة إلى تحديد توزيع المجتمعات النباتية الرعوية في الجزء الشمالي للروضة وربط بعض خواص التربة بدرجة التغطية النباتية وتوزيع المجتمعات النباتية. تبين من حصر الغطاء النباتي في الروضة أن هناك خمسة عشر مجتمعاً نباتياً وأرضاً جرداء وأخرى شبه جرداء. وقد تم التعرف على المكونات النباتية المعمرة لهذه المجتمعات وتقدير التغطية الكلية للغطاء النباتي والتغطية النسبية للمكونات النباتية المعمرة. جمعت عينات من طبقات تربة المجتمعات النباتية والأرض الجرداء وشبه الجرداء لتحليل صفاتها الطبيعية والكيميائية.

أوضحت النتائج أن عدد الأنواع النباتية المعمرة بلغ ٣٠ نوعاً وعدد المجتمعات ١٧مجتمعاًنباتياً، وتفاوتت التغطية النباتية داخل المجتمعات من صفر إلى ٦٠%،

منها ثلاثة مجتمعات تغطيتها النباتية أقل من ٢%، وثلاثة مجتمعات بين ١٠إلـــى ٢٠% والباقي أعلى من ٢٠%. وانتشار الأنواع النباتية كـــان موازيـــا للعـــروق الرملية.

وبينت النتائج أن لخواص التربة تأثيراً في توزيع المجتمعـــات النباتيـــة المختلفـــة وكذلك في التغطية النباتية وبدرجات متفاوتة. وقد كان لقوام التربـــة وتوصـــيلها الكهربائي وكاتيونات الكالـــسيوم والمغنيـــسيوم والـــصوديوم وآنيونـــات الكلـــور والبيكربونات والمادة العضوية في طبقة التربة السطحية تأثير قوي فـــي توزيـــع المجتمعات النباتية الرعوية في الروضة. بينما تبين أن المجتمعـــات النباتيـــة ذات التغطية النباتية المنخفضة تحتوي على تركيزات عالية من عنصر المغنيسيوم فـــي واحدة أو أكثر من طبقاتها.