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Full Length Research Paper

Natural vegetation cover of some locations in Duhok Governorate as affected by elevations and aspects

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This research involved general covering percentages in four locations (Bikher Mountain, Benarink Mountain, Derke Mountain and Gara Mountain) of Duhok governorate during the spring of 2009. Three central points were allocated in each elevation at south and north aspects. The elevations comprised from 600 masl up to 1300 masl. The highest mean of covering percentage for the studied area was recorded for herbs (27.13%), followed by trees (21.93%), rocks (13.72%), grasses (13.47%), litter (10.38%), soil (8.91%), and finally the lowest covering percentage recorded was for shrubs (4.47%). The south aspect recorded the highest mean values (14.69, 27.19 and 4.63) for grasses, herbs and shrubs percentages respectively as compared to the north aspect (12.25, 27.06 and 4.131), but was only significant in grasses percentage. On the other hand, the north aspect recorded the highest mean values for trees, litter, bare soil, and rocks percentages as compared to the south aspect, but the differences were not significant except for trees percentage. The highest grasses percentage was recorded in higher altitude of 1100 and 1200 masl (15.25 and 15.0%) and significantly differed with other elevations except 700 masl, and the lowest value was recorded in mid elevation of 800 masl which was 12.0%. In contrast, the highest herbs percentage was recorded in the lowest altitude at 600 masl which was 34.50% and significantly differed with other altitudes especially 1300 masl which recorded the lowest value of 22.75%. The highest mean value of trees (29.25%) was recorded at elevation of 1200 masl, and significantly differed with other elevations especially at 600 masl (11.5%), but the highest percentage of shrubs was recorded at mid altitude (9.5% at 900 masl) compared to lowest value of 2.5% at 600 masl. Bare soil and rocks percentages were the highest in lower altitude of 12.25% and 17.75% in 600 masl respectively and significantly differed with other altitudes (except the 700 masl).

Key words: Duhok governorate, mountain, south, north, elevation.

INTRODUCTION

It was written by Holechek et al. (2004) that the productivity of the rangeland is determined by the characteristics of the soil, topography, and climate. Furthermore, the vegetation cover in mountainous areas is of great importance in many aspects including local and regional climate and erosion reduction (Brang et al., 2001). At the scale hill slopes, the principal limiting factor in vegetation growth is topography; but the soil types and the amount of rainfalls play secondary (Dawes and Short, 1994). The main topographic factors that influence the distribution and patterns of vegetation in mountain areas are elevation, aspect and slope (Titshall et al., 2000). Among these factors, elevation is the most important one (Busing et al., 1992). In many respects, elevation along with aspect and slope determine the microclimate and thus large-scale spatial distribution and patterns of vegetation (Allen and Peet, 1990; Busing et al., 1992).

The effect of abiotic factors on distribution and patterns of vegetation growth have been studied by many researchers (Endress and Chinea, 2001; Bai et al., 2004). Biodiversity preservation is essential for the maintenance of stable productivity in ecosystems (Tilman and Downing, 1994). The rangelands in Iraqi Kurdistan region which lies between 34°31˙30″ and 37°22˙50″

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latitude, and 41°17¯00″ and 46°20¯00″ longitude is one of the most important source of pastureland in Iraq as it possesses a huge biodiversity (Qassim, 1981; Besifky, 1999), which is very important for ecosystem and human wellbeing. Such great role that biodiversity plays in the ecosystems functioning ways and in the services they provide in several aspects include provisioning services, regulating services, cultural services, and supporting services (Cunningham et al., 2005).

Few researches have been conducted for estimating and evaluating the rangelands of this area (Al-kittany et al., 1978; Qassim, 1981; Toma, 1983; Besifky, 1999). Accordingly, the present study planned to achieve further benefits through identifying grasses and herbs species existing in the study area, thereby finding out their distributions and covering percentages in relation to the elevations and aspects; and thus compare between the different elevations, aspects and locations in order to evaluate the rangeland conditions for getting better realistic conceptions of establishing livestock projects and national parks (Exclosures) for wildlife re-habitation and protection.

MATERIALS AND METHODS

Study area

This study was carried out in the spring of 2009 at Duhok governorate which lies on Kurdistan Region, Iraq. The area is bounded by latitudes 36°50¯.00 and 37°02¯.00 N, and longitudes 42°50¯.00 and 43°22¯.00 E.

The range of elevation in this study was from 550-1350 masl. The study area is mountainous and contains forest rangelands which are very rich of variety species including grasses and forbs such as species of Poaceae, Fabaceae, Asteraceae, Brassicaceae, Apiaceae and many other families, in addition to trees and shrubs such as *Quercus aegilops*, *Quercus infectoria*, *Quercus libani*, *Wendlandia ligustroides*, *Anagyris foetida*, *Prunus microcarpa, Pistacia mutica, Pistacia khinjuk*, *Crateagos azarolus* and other species.

The four locations that have been selected in the preceded area for recording observations were: 1) Bikher Mountains, 2) Benarink Mountains, 3) Derke Mountains and 4) Gara Mountains. In each location, two different elevations in the contrasted slope aspects (South and North aspects) were used for taking samples. About 100 m differences in elevation was used to separate each of the two elevations of the contrasted slope aspect in every location. Three plots were allocated in each elevation of the contrasted slope aspects.

The elevations that have been selected for each location were:

1. 600 and 700 masl of north and south aspects at the first location.
2. 800 and 900 masl of north and south aspects at the second location.
3. 1000 and 1100 masl of north and south aspects at the third location.
4. 1200 and 1300 masl of north and south aspects at the fourth location.

Field work

Tapes were driven from the centre of each plot (55 m) to three different directions with an angle of 120°. This process was used for studying the covering percentages in general (grass, herb, tree, shrub, rock, litter or bare soil percentages) according to the Line-point intercepts method (Elzinga et al., 2001) (Figure 1).

The spatial location (latitude, longitude and altitude) of each plot was measured by using a Global Positioning System device GPS (eTrex Vista™) GARMIN Ltd. 2001-2002.

Sampling

It was recorded (for grasses, herbs, trees, shrubs, rocks, litter, or bare soil) at every 0.5 m intercept interval along the transect line by dropping a pin flag freely (the pin flag is simply a piece of one meter long rod supplied with a pair of light), for all transect lines, to fulfill one hundred records for every transect line. The starting point of each transect line is 5 m far from the plot's centre.

Soil samples

The mechanical and chemical properties of soil samples were tested according to Jackson (1958), and are shown in Table 1.

Statistical analysis

Factorial experiment in randomized complete block design was applied for every location separately to estimate the effect of aspect, elevation, and their interactions on general covering percentage.

The effect of locations, aspects and their interactions on general covering percentages were also analyzed, in addition to the effect of elevations on general covering percentages, utilizing Statistical Analyses System (SAS) version 6.2 (2001). The treatment means were verified using Duncan's (1955) multiple ranges test (DMRT) at $p = 0.05$ significant level.

RESULTS AND DISCUSSION

The data of the general covering percentages are represented in Table 3. The mean values of the covering percentage for the studied area in descending order from the highest mean value to the lowest are as follows: herbs (27.13%), trees (21.93%), rocks (13.72%), grasses (13.47%), litter (10.38%), bare soil (8.91%), and finally

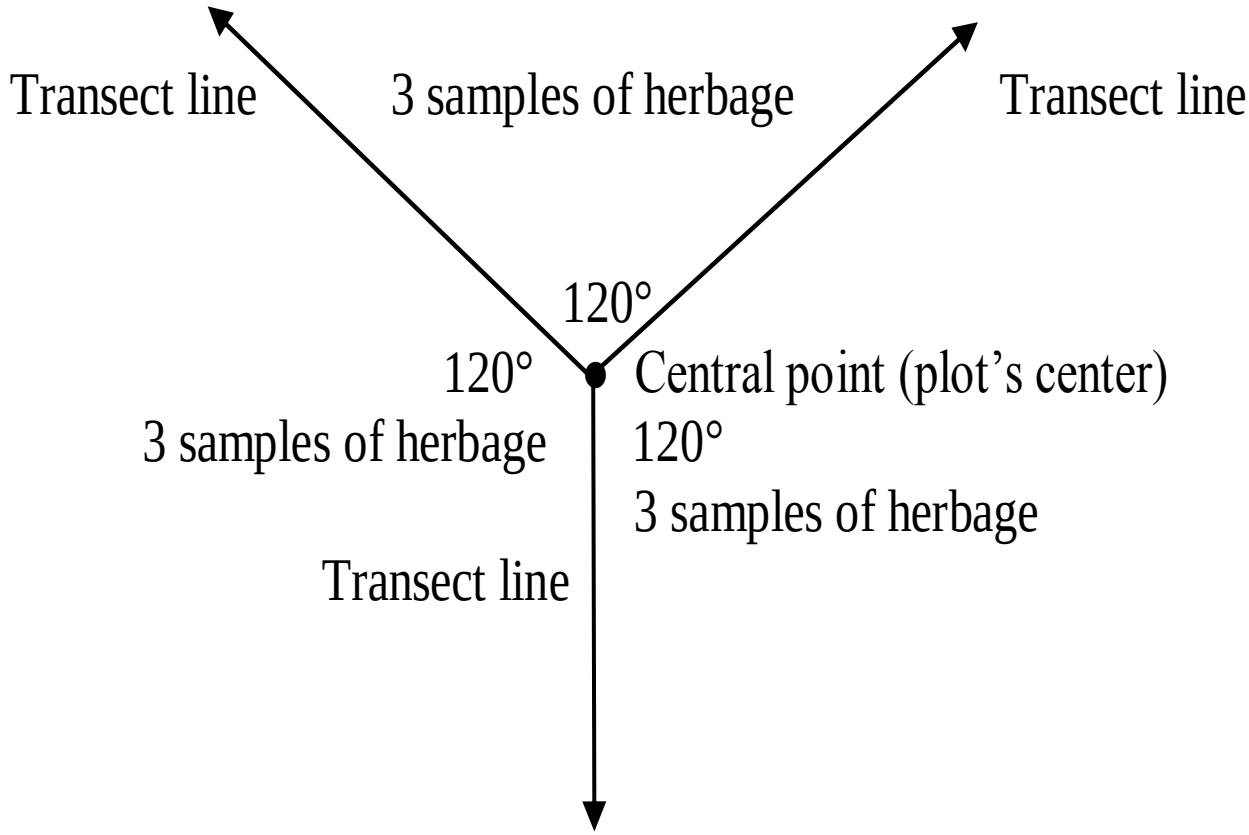

Figure 1. Diagram showing line-point intercepts method (Elzinga et al., 2001).

Table 1. Soil mechanical and chemical analysis of the studied area.

Locations	Aspects	Elevations masl.	Clay %	Silt %	Sand %	pH	EC ds\m	N%	Total P ppm	Ca mE q/L	K mE q/L	Organic matter %
1	South	600	52.1	35.7	12.2	7.81	1.01	0.420	3.86	6.00	0.217	4.13
		700	47.0	33.2	19.8	7.90	0.93	0.425	3.45	5.80	0.245	4.32
	North	600	49.1	30.5	20.4	7.89	1.02	0.568	3.55	3.60	0.282	4.20
		700	43.4	28.4	28.2	7.70	0.98	0.532	3.28	5.40	0.264	4.54
2	South	800	59.6	26.5	13.9	7.95	0.53	0.672	3.45	2.20	0.128	4.66
		900	52.3	23.5	24.2	7.80	0.46	0.463	3.23	4.20	0.146	4.79
	North	800	39.6	34.5	25.9	7.99	0.88	0.412	3.16	2.60	0.153	4.85
		900	36.2	31.7	32.1	7.90	0.79	0.543	3.33	4.00	0.132	4.35
3	South	1000	60.6	24.0	15.4	7.99	0.43	0.561	2.88	3.60	0.076	2.55
		1100	47.8	21.8	30.4	7.80	0.56	0.422	3.24	3.30	0.112	3.78
	North	1000	58.1	28.0	13.9	7.91	0.66	0.504	3.16	3.70	0.217	2.80
		1100	46.5	26.4	27.1	7.90	0.74	0.562	4.55	4.00	0.243	4.11
4	South	1200	50.6	38.5	10.9	7.93	0.60	0.672	5.74	3.40	0.179	5.75
		1300	44.3	34.4	21.3	7.90	0.57	0.531	5.23	4.00	0.202	5.64
	North	1200	25.6	54.0	20.4	7.93	0.77	0.672	3.29	3.50	0.184	5.59
		1300	24.7	43.1	32.2	7.80	0.61	0.624	3.74	3.60	0.218	5.78

the lowest covering percentages recorded was for shrubs (4.47%).

Table 4 revealed that the highest percentage was recorded for grasses at altitudes 1100 and 1200 masl (15.25 and 15% respectively) and they significantly differed with other elevations, with the exception of 700 masl, and the lowest value was recorded in mid elevation (800 masl) which was 12%. In contrast, the highest herbs percentage was recorded at the lowest altitude (600 masl) which was 34.50% and it significantly differed from other altitudes especially 1300 masl which recorded the lowest value of 22.75%. These results were due to the fact that there is more grazing pressure in lowest elevations causing reduction of grasses as more palatable and lifting herbs compared to slight grazing in mid and higher altitudes.

The highest mean value of trees (29.25%) was recorded at elevation 1200 masl and it significantly differed from other elevations especially at 600 masl (11.5%). However the highest percentage of shrubs was recorded at mid altitude (9.5% at 900 masl) as compared to the lowest value of 2.5% at 600 masl. This is due to availability of more moisture at higher altitude which led to greater growth of trees in size and overriding shrubs' species, thus reducing their numbers, as well as the high human and grazing pressures in lower altitudes.

Bare soil and rocks percentages were highest in the lowest altitude (12.25 and 17.75% respectively), and they differed significantly from other altitudes (except the 700 masl). These were intuitive results according to over cutting of trees and shrubs and the continuous over grazing in the lowest elevation, which led to bare soil and consequently exposing it to more erosion. With respect to locations affecting cover traits at the same extent of elevations (Table 5), every two successive elevations represented a location; the first two elevations represented the first location, and the second two elevations represented the second location.

The results displayed in Table 5 showed that the south aspect recorded the highest mean values for grasses, herbs, and shrubs percentage (14.69, 27.19 and 4.63 respectively) as compared to the north aspect (12.25, 27.06 and 4.131 respectively) but they were only significant in grasses percentage. On the other hand, the north aspect recorded the highest mean values for trees, litter, bare soil, and rocks percentages as compared to the south aspect. However, the differences were not significant except for the trees percentage. These results were due to the availability of more moisture in the north aspect causing more trees growth in account of shrubs. The interactions of aspect-elevation are shown in Table 6:

- First location: The highest percentage of grasses (16%) was recorded in south at 700 masl but it significantly differed from that of the north at 600 masl combination only. The highest percentages of herbs, soil, and rocks were recorded in the south at 600 masl combination and the lowest percentages were recorded in the north aspect at highest elevations in general. In contrast, trees and shrubs percentages were higher in the north aspect at 700 masl combination, due to high human pressure and livestock grazing in the south aspect of the first location, which led to more soil erosion in the south aspect.
- Second location: There were no differences for grasses, herbs, and bare soil percentages between interactions, but trees percentage was highest in lower elevation. Rocks percentage was higher at the north aspect at 900 masl because it was less protected by trees and more exposed to water erosion.
- Third and fourth locations: There were no significant differences between all combinations for grasses, shrubs, and rocks percentages in the third location, but there were significant differences in the fourth location for herbs, trees, bare soil, and rocks percentages. The differences were little but significant for other traits and seemed to be inconsistent because of favorable environmental factors, as it was in the second location, and the slight differences found could be due to specific features and microclimate that characterize the positions of collecting data.

The aspect interaction effects of locations were displayed in Table 7. The highest percentages of grasses, herbs, bare soil and rocks were recorded in the first location at south aspect; meanwhile, the lowest percentage of trees and shrubs significantly differed from most of the interactions. These results clearly reflect the effect of moisture (precipitations) as shown in Table 2. The higher altitude observed in the over cutting of trees for fuel and grazing pressure in low elevations is as a result of more canopy cover in the third and fourth locations than in the first and second locations. The grasses and herbs' percentages declined in the third and fourth locations due to more competition on sunlight which made it obscure for it to reach the ground. These results were in harmony with those of Joseph et al. (2008) and Sharma et al. (2009).

It can be concluded that the south aspect had positive influence on grasses percentage in contrast to the north aspect for trees. Contrary to herbs percentage, the trees percentage increased with altitudinal increment. Grasses and litter percentages were inconsistently affected by elevations. The shrubs percentage was enhanced by the elevation up to 900 masl, thereafter it declined with elevation increment.

This study recommends the utilization of new technology, such as GIS, remote sensing to study the trend of the vegetation cover in the rangeland, in relation to such factors involved in this study, regarding elevations, aspects and slope degree. Further studies are required to determine the influence of microclimate on plant communities' characters. Moreover, there is need to study the seed mass distributions.

Table 2. Atmosphere relative humidity, temperature, and monthly precipitations of five locations in the studied area from 1996 to 2010.

Year	Site	R. H.	Temp. (°C)		Precipitations (mm)									
			H	L	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Total
	Sumel	49.5	33.2	16.4	3.0	5.1	10.4	192.7	39.4	62.4	22.1	64.7	1.2	401.0
	Duhok	49.0	25.5	14.5	--	5.50	17.70	207.5	53.00	133.7	82.00	74.50	7.5	581.4
1996-1997	Zawita	NR	NR	NR	--	8.0	7.0	268	64	172	102	81	5.5	707.5
	Mangesh	NR	NR	NR	--	10.5	8.5	172.5	39.5	124.5	97	71.5	0.5	524.5
	Sarsank	NR	NR	NR	--	--	--	185.5	37.3	104	80.9	55	--	462.7
	Sumel	51.6	25.3	10.7	4.0	33.5	31.6	103.0	71.2	61.9	75.4	36.2	14.7	431.5
	Duhok	54.0	24.9	12.7	--	39.10	33.0	108.8	86.60	83.50	140.2	36.00	20.90	548.1
1997-1998	Zawita	NR	NR	NR	--	42	32	85	98	70.5	150.5	59.5	38	575.5
	Mangesh	NR	NR	NR	--	38	18	93	76.5	75.5	105	44	32.5	482.5
	Sarsank	NR	NR	NR	--	37.5	--	52	114.5	75.5	96.7	28.2	28	432.4
	Sumel	48.6	25.7	12.1	--	--	--	--	32.7	41.4	34.8	--	--	108.9
	Duhok	48.0	26.8	15.2	--	4.00	3.00	9.20	38.00	71.80	77.30	12.60		215.9
1998-1999	Zawita	NR	NR	NR	--	--	3.5	12	42	118	81	19	2.5	278.0
	Mangesh	NR	NR	NR	--	--	3.5	13.5	40	77.5	68.5	27.5		230.5
	Sarsank	NR	NR	NR	--	--	--	--	20	66.6	58	11.2	2	157.8
	Sumel	45.5	27.2	12.6	--	7.3	19.5	36.2	36.2	32.8	84.2	40.9	1.3	258.4
	Duhok	43.0	26.5	14.5	1.5	14.80	11.20	58.60	202.2	59.90	78.50	33.30		460.0
1999-2000	Zawita	NR	NR	NR	--	21	7.5	75.5	349.5	52.5	100.5	--	--	606.5
	Mangesh	NR	NR	NR	--	17	5.5	24.5	226.5	65	60.5	--	--	399.0
	Sarsank	NR	NR	NR	1.0	8.5	3.3	29.1	201	30.8	104.9	--	--	378.6
	Sumel	43.5	24.5	12.2	--	11.9	76	140.2	90.1	90.6	92.5	35.3	29.7	566.3
	Duhok	43.0	25.4	13.5	--	12.80	66.80	174.1	36.60	101.1	84.30	47.30	18.00	541.0
2000-2001	Zawita	NR	NR	NR	--	21	84	262	55	161.5	129	40.5	--	753.0
	Mangesh	NR	NR	NR	--	6.5	56.5	156	41	167	98	47.5	--	572.5
	Sarsank	NR	NR	NR	--	16.5	90.7	269.5	62	322.2	157.5	94	--	1012.4
	Sumel	43.4	26.1	10.9	--	8.7	16	44	163.3	34.3	155.5	55.5	3	480.3
	Duhok	48.0	26.6	14.4	--	8.00	25.00	91.90	103.8	48.00	186.8	72.10	4.30	539.9
2001-2002	Zawita	NR	NR	NR	--	12	42.4	147.4	154.8	76.8	225.4	136.0	10.5	805.0
	Mangesh	NR	NR	NR	--	9.5	31.5	142	95.5	60.5	177	150	27	693.0
	Sarsank	NR	NR	NR	--	15.2	57.6	230.8	225.5	142	228	187.5	18	1105
	Sumel	47.7	26.2	11.1	--	19.3	11	69	68.8	169.1	99.7	8.4	4.6	449.9
	Duhok	44.0	26.0	14.4	--	19.10	23.70	204.9	96.8	211.3	139.6	30.5	3.7	729.6
2002-2003	Zawita	54.2	26.2	11.2	--	34.3	41.9	216.9	124.5	237.5	189.2	46.1	17	907.6
	Mangesh	46.8	21.8	11.7	--	33	25	184.5	118	247	194	26.5	4	832.0
	Sarsank	51.4	19.4	13.4	--	34.5	45	122	122	236.5	322	58	11	951.0
	Sumel	45.3	26.0	11.2	--	10.7	110.9	99.3	122.8	76.5	27.3	45.9	37.4	530.8
	Duhok	54.0	25.7	15.0	--	21.9	71.2	112	126.8	89.5	30.3	89.9	16.9	558.5
2003-2004	Zawita	54.6	23.6	9.80	--	30	115.5	166.7	193	172.7	33.1	117.3	26.7	855.0
	Mangesh	48.7	21.4	11.9	--	32	86	135	147	154	44.5	76	57	731.5
	Sarsank	47.5	21.3	11.2	--	41	143	164.5	180.5	122	49.5	101	49	850.5
2004-2005	Sumel	50.4	26.2	10.5	--	0.8	103.6	8.1	143	89	50.7	17	40	452.2

Table 2. Cont'd.

	Duhok	48.0	26.1	14.4	--	40.5	16	57.2	100.9	183.2	11.9	136.2	8.3	554.2
	Zawita	51.7	22.8	8.90	--	9.0	140	13.8	219	164.7	57.2	37.4	54.4	695.5
	Mangesh	50.3	22.7	12.4	--	49	23	74	128	181.5	--	161	8.5	625.0
	Sarsank	NR	NR	NR	--	31.5	225	11.5	224.5	198.5	69.5	50	61.5	872.0
	Sumel	42.8	27.2	10.6	--	--	26.8	50.7	151.2	166.9	18.6	105.3	4.7	524.2
	Duhok	43.0	26.4	14.8	--	1.7	29.7	72.9	209.3	188.6	35.9	142.6	8.2	688.9
2005-2006	Zawita	48.7	23.6	9.00	--	5.5	39	133.2	343.2	280.1	45.4	174	11.6	1032
	Mangesh	49.0	23.1	13.4	--	--	45	134	298	225	50	157.5	6	915.5
	Sarsank	46.8	21.1	10.9	--	1.5	51	194	327.5	233.5	63.5	234	7.5	1113
	Sumel	44.1	26.9	11.6	--	21.3	73.4	57.6	59.6	56	55.9	70.8	16.8	411.4
	Duhok	43.0	25.7	15.4	--	100.4	48.9	71.4	82.8	130.1	58.4	84.9	29.7	606.6
2006-2007	Zawita	49.6	22.7	9.10	--	73	36.5	104	150	172	96.5	119.5	25.5	777.0
	Mangesh	NR	NR	NR	--	114	82	60	110	138	107	115	19	745.5
	Sarsank	47.9	18.2	10.5	--	113.5	107	86	93	164	143	169	29	904.5
	Sumel	42.0	26.6	11.6	--	--	3.5	2.1	59.4	48.1	22.2	1.3	--	136.6
	Duhok	NR	NR	NR	--	0.2	17.8	8.3	96.3	51	40.2	2.2	0.2	216.2
2007-2008	Zawita	NR	NR	NR	--	3.5	27	16	223	96	52.5	1	--	419.0
	Mangesh	NR	NR	NR	--	1.5	44.5	17	101	90.5	51	0.5	16	430.5
	Sarsank	45.2	18.8	10.3	--	--	41	48	116	137	66	6.5	16	430.5
	Sumel	36.6	24.4	11.8	1.3	16.5	66.3	26.6	30.3	59.3	63.3	35.7	--	299.3
	Duhok	NR	NR	NR	3.3	18.6	76.6	81.7	4.0	67.9	63.9	29.9	0.5	346.4
2008-2009	Zawita	NR	NR	NR	6.5	25	73	109.5	7.0	86.5	97	36	1.5	442.0
	Mangesh	NR	NR	NR	8.5	28.5	40	86	7.0	87.5	100.5	66	--	424.0
	Sarsank	NR	NR	NR	14	53	59	108	18	126	158	57	1.0	594.0
	Sumel	41.8	26.3	11.4	6.0	34.7	86.8	109.9	80.1	67.7	12.8	16.5	48.4*	462.9
	Duhok	NR	25.6	14.6	6.8	55.4	64.2	194.6	110.1	68.1	28.7	26.9	42.4	597.2
2009-2010	Zawita	42.2	21.9	9.50	20	59	83.8	294.3	163.4	112.8	68.6	38.6	59.3	899.8
	Mangesh	NR	NR	NR	15	53	85	201	161	83	85	75	117	875.0
	Sarsank	51.7	16.1	11.4	19	96.5	116	302	191.5	82.5	82.5	53	78	1021

Source: (General Directorate of Agriculture-Duhok Governorate).

Table 3. Overall means of general covering recorded in every elevation of north and south aspects.

Locations	Aspects	Elevations	Grasses %	Herbs %	Trees %	Shrubs %	Litter %	Bare Soil %	Rocks %	Total
First	South	600	15.0	36.5	4.50	1.5	7.50	14.5	20.5	100
First	South	700	16.0	31.0	8.00	2.0	10.5	13.5	19.0	100
First	North	600	11.0	32.5	18.5	3.5	9.50	10	15.0	100
First	North	700	13.0	28.5	18.0	7.0	9.50	10.5	13.5	100
Second	South	800	12.5	28.5	28.5	7.5	8.00	7.5	7.50	100
Second	South	900	13.5	29.5	21.5	11.5	7.50	7.0	9.50	100
Second	North	800	11.5	28.5	21.5	2.0	13.5	8.5	14.5	100
Second	North	900	11.0	27.0	19.5	7.5	9.50	9.0	16.5	100
Third	South	1000	15.0	23.5	23.5	4.0	14.0	7.5	12.5	100
Third	South	1100	15.5	21.5	29.0	5.0	11.5	5.5	12.0	100

Table 3. Cont'd.

Third	North	1000	12.0	26.5	23.5	5.0	12.0	8.5	12.5	100
Third	North	1100	15.0	27.0	23.0	3.0	10.5	7.5	14.0	100
Fourth	South	1200	16.5	24.5	29.0	2.0	10.0	6.5	11.5	100
Fourth	South	1300	13.5	22.5	27.5	3.5	12.0	8.0	13.0	100
Fourth	North	1200	13.5	23.5	29.5	3.5	9.50	8.5	12.0	100
Fourth	North	1300	11.0	23.0	26.0	3.0	11.0	10	16.0	100
Average	----	----	13.469	27.125	21.938	4.4688	10.375	8.906	13.72	100

Table 4. Effect of elevations on general covering occurrence.

Traits / Elevation	Grasses %	Herbs %	Trees %	Shrubs %	Litter %	Bare Soil %	Rocks %
600 m	13.00 C	34.50 A	11.50 E	2.50 D	8.500 B	12.25 A	17.75 A
700 m	14.50 AB	29.75 B	13.00 E	4.50 B	10.00 B	12.0 A	16.25 AB
800 m	12.00 C	28.50 BC	25.00 BC	4.75 B	10.75 AB	8.00 B	11.00 D
900 m	12.25 C	28.25 BC	20.50 D	9.50 A	8.500 B	8.00 B	13.00 CD
1000 m	13.50 BC	25.00 CD	23.50 C	4.50 B	13.00 A	8.00 B	12.50 CD
1100 m	15.25 A	24.25 D	26.00 B	4.00 BC	11.00 AB	6.50 B	13.00 CD
1200 m	15.00 A	24.00 D	29.25 A	2.75 D	9.750 B	7.50 B	11.75 CD
1300 m	12.25 C	22.75 D	26.75 B	3.25 CD	11.50 AB	9.00 B	14.50 BC

Different letters at the same column refer to signification at p=0.05 according to DMRT (1955).

Table 5. Effect of locations and aspects on general covering occurrence.

Factors / Traits		Grasses %	Herbs %	Trees %	Shrubs %	Litter %	Bare Soil %	Rocks %
Locations	1	13. 75 A	32.13 A	12.25 D	3.500 BC	9.250 B	12.13 A	17.00 A
	2	12.13 B	28.36 B	22.75 C	7.125 A	9.625 B	8.000 B	12.00 B
	3	14.38 A	24.63 C	24.75 B	4.250 B	12.00 A	7.250 B	12.75 B
	4	13.63 A	23.38 C	28.00 A	3.000 C	10.63 AB	8.250 B	13.13 B
Aspects	South	14.69 A	27.19 A	21.44 B	4.630 A	10.13 A	8.750 A	13.19 A
	North	12.25 B	27.06 A	22.44 A	4.131 A	10.63 A	9.063 A	14.25 A

Different letters at the same column of each factor refer to signification at p=0.05 according to DMRT (1955).

Table 6. Effect of aspects-elevations interaction on general covering occurrence in four locations.

Locations	Asp. x Ele. / Traits		Grasses %	Herbs %	Trees %	Shrubs %	Litter %	Bare Soil %	Rocks %
1	South	600 m	15.00 AB	36.50 A	4.500 C	1.500 B	7.500 A	14.50 A	20.50 A
		700 m	16.00 A	31.00 AB	8.000 B	2.000 B	10.50 A	13.50 AB	19.00 A
	North	600 m	11.00 B	32.50 AB	18.50 A	3.500 B	9.500 A	10.00 C	15.00 B
		700 m	13.00 AB	28.50 B	18.00 A	7.000 A	9.500 A	10.50 BC	13.00 B
2	South	800 m	12.50 A	28.50 A	28.50 A	7.500 B	8.000 B	7.500 A	7.500 B
		900 m	13.50 A	29.50 A	21.50 B	11.50 A	7.500 B	7.000 A	9.500 B

Table 6. Cont'd.

3	North	800 m	11.50 A	28.50 A	21.50 B	2.000 C	13.50 A	8.500 A	14.50 A
		900 m	11.00 A	27.00 A	19.50 C	7.500 B	9.500 B	9.000 A	16.50 A
	South	1000 m	15.00 A	23.50 BC	23.50 B	4.000 A	14.00 A	7.500 AB	12.50 A
		1100 m	12.50 A	21.50 C	29.00 A	5.000 A	11.50 AB	5.500 B	12.50 A
	North	1000 m	12.00 A	26.50 AB	23.50 B	5.000 A	12.00 AB	8.500 A	12.50 A
		1100 m	15.00 A	27.00 A	23.00 B	3.000 A	10.50 B	7.500 AB	12.50 A
4	South	1200 m	16.50 A	24.50 A	29.00 A	2.000 B	10.00 B	6.500 A	11.50 A
		1300 m	13.50 AB	22.50 A	27.50 A	3.500 A	12.00 A	8.000 A	13.00 A
	North	1200 m	13.50 AB	23.50 A	29.50 A	3.500 A	9.500 B	8.500 A	12.00 A
		1300 m	11.00 B	23.00 A	26.00 A	3.000 A	11.00 AB	10.00 A	16.00 A

Different letters at the same column for each location, refer to signification at p= 0.05 according to DMRT (1955).

Table 7. Effect of location-aspect interactions on general covering occurrence.

Traits / Locations		Grasses %	Herbs %	Trees %	Shrubs %	Litter %	Bare Soil %	Rocks %
Location 1	South	15.50 A	33.75 A	6.250 G	1.750 E	9.000 BC	14.00 A	19.75 A
	North	12.00 C	30.50 B	18.25 F	5.250 B	9.500 BC	10.25 B	14.25 BC
Location 2	South	13.00 BC	29.00 CB	25.00 C	9.500 A	7.750 C	9.250 BC	8.500 D
	North	11.25 C	27.75 CB	20.50 E	4.750 B	11.50 BA	8.750 BCD	15.50 B
Location 3	South	15.25 AB	22.50 D	26.25 BC	4.500 CB	12.75 A	8.000 CDE	12.25 C
	North	13.50 ABC	26.75 C	23.25 D	4.000 BCD	11.25 BA	7.250 DE	13.25 BC
Location 4	South	15.00 AB	23.50 D	28.25 A	2.750 ED	11.00 BA	7.250 DE	12.25 C
	North	12.25 C	23.25 D	27.75 AB	3.250 CD	10.25 ABC	6.500 E	14.00 BC

Different letters at the same column refer to signification at p=0.05 according to DMRT (1955).

New laws and legislation have to be issued properly for land utilization taking into consideration the number and distribution of the livestock adequately on the rangelands. The proper carrying capacity for few years for every pasture used for grazing livestock should be determined, although it will vary from season to season due to inconsistent average rainfall. Determination of grazing intensity at different elevations and aspects at each location is also necessary. More so, there should be reseeding of uncovered areas with nutritive and palatable species for collection of seeds from species around these areas. Nonetheless, some national parks (Exclosures) should be established for wildlife re-habitation and protection, because of the great support, provisioning, regulation and cultural benefits they provide.

REFERENCES

Al-Kittany MM, Hassan SM, Al-Ma'roff IN, Al-Raho HA (1978). Effect of fire on pine forest and natural vegetation in Zawita. Al-Raffidain Agriculture J., 15 (2), 1980, College of Agriculture and Forestry/ Univ. of Mosul.

Allen RB, Peet RK (1990). Gradient analysis of forests of the Sangre de Cristo Range, Colorado. Canadian J. of Botany, 68: 193-201.

Bai YK, Broersma DT, Ross TJ (2004). Landscape-level dynamics of grassland-forest transitions in British Columbia. J. Range Manage., 57: 66-75.

Besifky KIS (1999). A contrastive confining and evaluation of plant covering under natural forestry conditions in Dosky Quarter/ Duhok. M. Sc. Thesis, College of Agri./ Univ. of Duhok.

Brang P, Schönenberger W, Ott E, Gardner RH (2001). Forests as protection from natural hazards. In: Evans, J. (Ed.). The Forests Handbook. Blackwell Science Ltd., Oxford, 53-81.

Busing RT, White PS, MacKende MD (1992). Gradient

analysis of old spruce-fir forest of the Great Smokey Mountains Circa 1935. Can. J. Bot., 71: 951-958.
Cunningham WP, Cunningham MA, Saigo BW (2005). Environmental Science: A global concern, Eighth edition. The McGraw-Hill Companies, Inc., 1221Avenue of the Americas, New York, NY, 10020.
Dawes WR, Short D (1994). The significance of topology for modeling the surface hydrology of fluvial landscapes. Water Resour. Res., 30, 1045-1055.
Duncan DB (1955). Multiple Ranges and Multiple “F” Tests. Biometrics II, 1-2.
Elton CS (1958). The ecology of invasions by animals and plants.-Methuen. Progress in Phys. Geo. 31(6): 659-666.
Elzinga C, Salzer D, Willoughby J, Gibbs J (2001). Monitoring plant and animal populations, Blackweel publishing. 368.
Endress BA, Chinea JD (2001). Landscape patterns of tropical forest recovery in the Republic of Palau. Biotropica, 33, 555-565.
Holechek JL, Oieper RD, Herbel CH (2004). Range Management, Principles and Practices, Fifth Edition.
Jackson ML (1958). Soil chemical analysis. Englewood cliffs. Prentice, Hall Inc. New Jersey. U. K.
Joseph S, Reddy CS, Pattanaik C, Sudhakari S (2008). Distribution of plant communities along climatic and topographic gradients in Mudumalai Wildlife Sanctuary (southern India). Biol. let. 45, 29-41.
Qassim YM (1981). Selection of wild ungulate according to the pasture plants in Atrosh, Zaweta and Sinjar enclosures. M. Sc. thesis. College of Agriculture and Forestry. Mosul University.
Statistical Analyses System (SAS for Windows), version 6.12, TS020, 1989-1996. SAS institute Inc., Cary, NC, USA.
Sharma CM, Ghildiyal SK, Gairola S, Suyal S (2009). Vegetation structure, composition and diversity in relation to the soil characteristics of temperate mixed broad-leaved forest along an altitudinal gradient in Garhwal Himalaya. Indian J. Sci. Technol. 2, (7): 39-45.
Tilman D, Downing J (1994). Biodiversity and Stability in Grasslands. Nature 367, 363-365.
Titshall LW, O’Connor TG, Morris CD (2000). Effect of long-term exclusion of fire and herbivory on the soils and vegetation of sour grassland. Afr. J. Range Forage Sci., 17, 70-80.
Toma SM (1983). Surveying and evaluating of pasture plants in some locations in the north of Iraq as base of rangeland for wild ungulate. M. Sc. Thesis, College of Agriculture and forestry/ Univ. of Mosul.