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Altitudinal impact on the weeds species distribution in the semi-arid mountainous region of Abha, Saudi Arabia

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ABSTRACT

Spatial pattern of weeds diversity are often related to local site conditions and to competitive interaction, but topographical landscape complexity may also be important for local weeds species richness. This research is aimed at investigating the effect of elevation change on species' composition, population size and spatial distribution of weeds flora in Abha Governorate, Aseer region, Kingdom of Saudi Arabia. In the present study, a phytosociological study of weeds flora from five localities of abandoned area located at different elevations ranging between 100 and 300 m in Abha city, Aseer region, Saudi Arabia have been investigated by using seven square quadrat at each site. Each site has an area of 196 square meters. Studied sites were visited regularly during 2012-2013. The weeds were assessed quantitatively and obtained data were used to determine the following ecological parameters including prevalence, absolute frequency, relative frequency; absolute density and relative density of weeds flora in each site. Obtained data indicated that at a lower elevation, site A situated 2250 m above sea level, 63 weed species belonging to 24 different families were recorded with three dominant weeds species, Salsola kali, Ricinus communis and Opuntia ficus-indica. In site B, about 2293 m above sea level, 54 weed species belonging to 21 different families were recorded and the most dominant species found were Salsola kali and Rumex nervosus. In site C, about 2550 m above sea level, 50 weed species belonging to 22 different families were recorded and the most dominant species found were Acacia etbaica, and Setaria viridis. In site D, about 2862 m above sea level, 40 weed species belonging to 19 different families were recorded and the most dominant species found were Acacia etbaica and Euphorbia helioscopia. In site E, 2935 m above sea level, 30 weed species belonging to 15 different families were recorded and Juniperus phoenicea was found to be the most frequently occurring and densely populated weeds. The current study screened the weeds flora at different elevations and found that there is a direct correlation between species distribution and change in the height of surveyed area. The altitude seems to be the most critical ecological factor in determining the richness of vegetation as well as its types.

***Keywords*:** Elevation, phytosociological study, semi-arid region, weeds flora

Saudi Arabia is a large country, and in most regions, has an arid climate. However, due to the topographic differences and variations in soil compositions, a rich flora and various plant communities can be seen in many places that drew the attention of numerous scholars; Abulfatih (1991, 1992), Alfarhan (1999), Alfarhan (2000), Alfarhan *et al.*, (1997), Al-Hemaid (1996), Al-Turki, *et al.*, (2000, 2001), Baierle *et al*., (1985), Boulos (1985, 1994), Collenette (1985), Ghafoor and Al-Turki (1999), Fayed *et al*., (1987), Fayed and Zayed (1989), Moustafa and Alwadi (2011) and many others. Saudi Arabia has the floras of East Africa, North Africa, the Mediterranean countries and the Irano-Turanian countries. The variation in climate and topography in the Asir region has led to the formation of diverse plant community (Abulfatih, 1984).

The Foggy cold places are dominated by *Juniperus procera*. *Acacia* trees are widely distributed to the east and west of Asir highland region. *Ficus salicifolium* communities and *Ziziphus spina-christi* are common in the lowlands and many other are found on the steep slopes to the west and south of the highlands (Abulfatih, 1984).

Abha governorate Aseer region embrace one of the richest and the most variable floristic regions of Aseer Mountains, southwest Saudi Arabia. Jabal Al Sooda, located in Abha, is standing at about 3000 meters high, has also a rich flora. According to Collenelte (1998, 1999), there are about 242 endemic plant species specific to kingdom of Saudi Arabia and 600 rare and endangered species available in the wild; thus an action plan should be taken for their conservation and sustainable development.

Since species and diversity remain one of the mains topics in contemporary ecology and the object of many studies, from community to landscape level and in all

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types of ecosystems. The present investigation is meant to be a documentary study for weeds in ABHA area, KSA, in some abandoned sites at different elevations that is not subjected to human interference.

The study area consists of 5 abandoned lands designated as A, B, C, D and E, and they were chosen from within Abha governorate, Saudi Arabia. The boundary of the study area lies between the latitude of 18° 10' 12.39" N and 18° 23' 33.05" N and longitude of 42° 21' 41.58"E and 42° 39' 36.09"E. These study sites are: site A, situated at an elevation of about 2250 m above sea level, site B at an elevation of about 2293 m, site C at an elevation of about 2550 m, site D at an elevation of about 2862 m, and Site E at about 2935 m, (Fig. 1). The study sites are located on the highland, around 90 km east of the Red Sea and about 220 km north of Yemen and situated in a hilly area, which descends gradually to the east having soils which sandy mixed with small sized rocks.

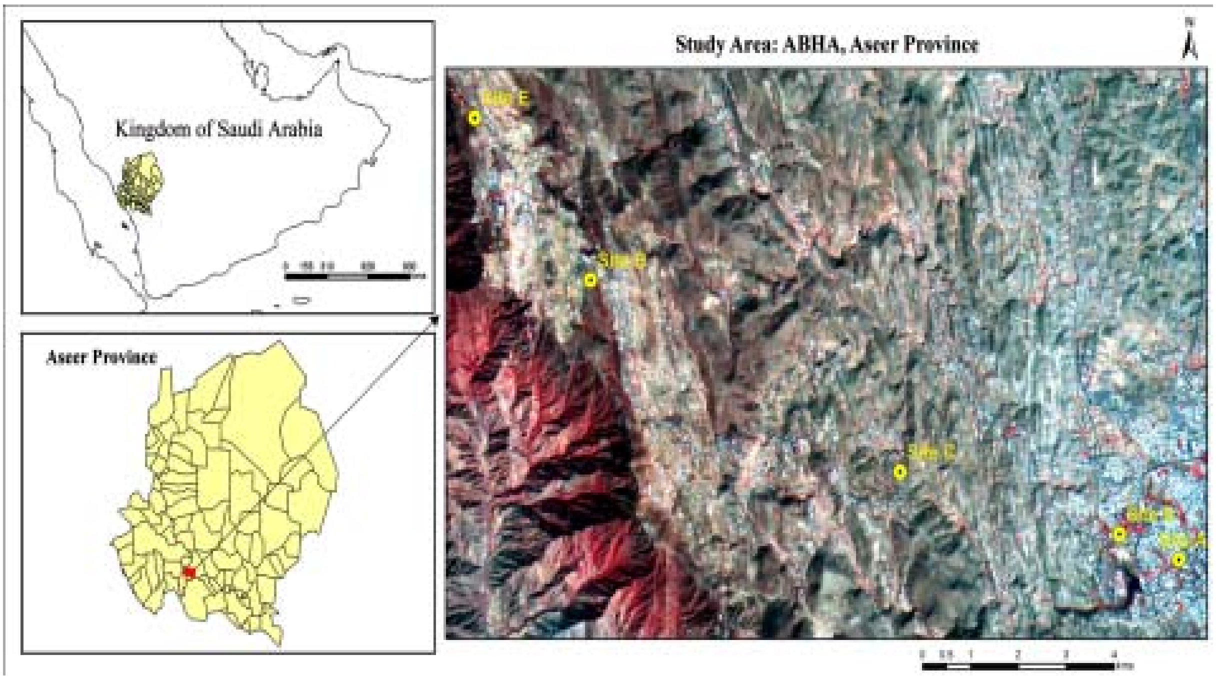
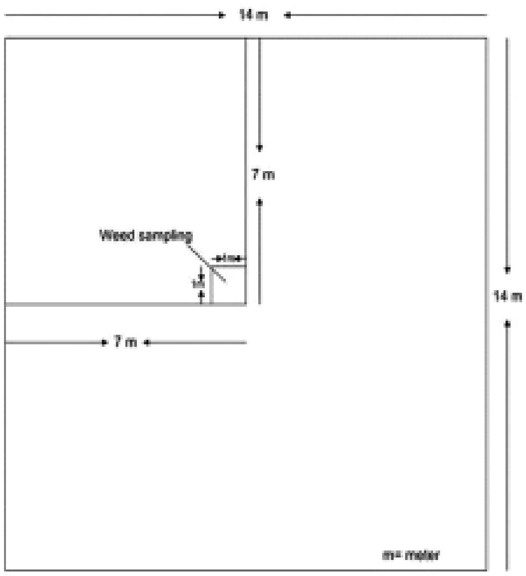


Fig. 1: Study area with site location



Quadrant Dimension	Use of quadrat in measurements and sampling
1 X 1 meter	1) Sampling of weed species and grasses, above ground and roots, litter fall and debris for drying and weighing to determine live and dead weeds 2) Counting of weeds species and number of individuals within species

Fig. 2: Use of nested quadrats sites for sampling and measurement

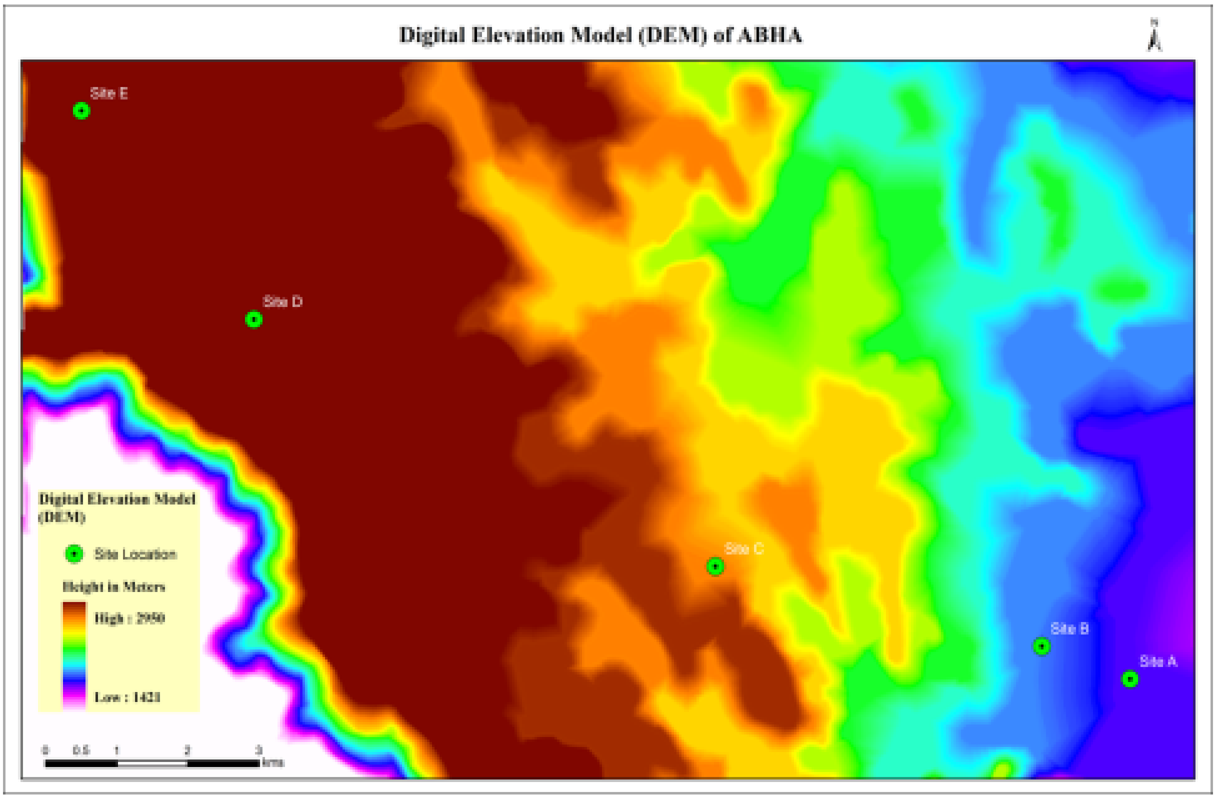


Fig. 3: Digital elevation model and its relationship with sampling sites

The area surveyed is characterized by its mild climatic conditions with the influence of the prevailing south westerly winds during most of the year. The topography of the area is undulating and the elevation ranges from 1951 meters to 2991 meters mean sea level. The proposed site having sedimentary soft, hard silt and clay rocks surround the watershed. The rainfall recorded at Abha is 355 mm, and the mean maximum temperature is about 22.4 °C and the minimum about 10 °C according the meteorological data from Abha governorate station.

MATERIALS AND METHODS

Topographical data: Digital Elevation Model (DEM)

The process of Digital Elevation Model (DEM) creation begins with the scanned (Topographical map scale: 1:25000), geo-referenced Topographic Map (raster image). Contour Lines and spot elevations, from the raster image (topographical map), are extracted, converted to digital vectors and given elevation values. Once a digital image has been fully vectorized, a raster representation of the map i.e. DEM is created based on those vector features using TIN (Triangulate Irregular Network) method (Fig. 3).

Sampling procedure

A square quadrat was used for the weed sampling, and at each site, a quadrate size of 1 m^2 was used forty nine times and the weeds flora inside each quadrate was observed, identified and classified (Fig. 2) according to Migahid (1987), Collenette (1985), Boulos (1985) and Mandaville (1990). Figure 3 and 4 shows the digital elevation model and height of sampling location and its relationship.

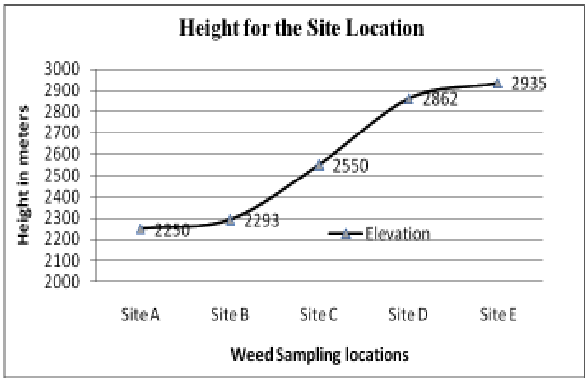


Fig. 4: Height for the sapmling location

The weeds were assessed quantitatively and the information obtained was used to determine the following ecological parameters such as abundance, density, cover, frequency, relative cover, and relative density.

In this paper, the data related to prevalence, absolute, relative frequency, absolute and relative density of weeds were calculated by applying the following formulas: % Prevalence P% (number of sites in which a specie occurs/Total number of sites) × 100; % Absolute Frequency P% (number of quadrates in which a specie occurs/Total number of quadrates) × 100; % Relative Frequency P% (Absolute frequency value of a species/ Total absolute frequency for all species) × 100; % Absolute density P% Total number of individual of a species in all quadrates/Total number of quadrates and % Relative density P% (Absolute density value of a species / Total absolute density for all species) × 100), as described previously Riaz *et al.*, (2007).

RESULTS AND DISCUSSION

In Site A (2250 m above sea level), 63 weed species belonging to 24 different families were recorded. Table 1 shows three dominant weeds in site A; *Salsola kali*, *Ricinus communis* and *Opuntia ficus-indica* were found to be the most frequently occurring and densely populated weeds with absolute frequency (AF) of 100% and absolute density (AD) of 6.12, 4.08 and 1.42 respectively. The other frequently occurring and densely populated weeds were *Convolvulus arvensis*, *Sonchus oleraceus*, *Lycium shawi*i, *Ochradenus baccatus*, *Reseda lutea* and *Rumex nervosus* with absolute frequency (AF) ranging from 55.1–73.4% and absolute density (AD) from 0.61–2.89. In Site B (2293 m above sea level), 54 weed species belonging to 21 different families were recorded (Table 2). It shows 2 dominant weeds, *Salsola kali* and *Rumex nervosus*, which were found to be the most frequently occurring and densely populated weeds with absolute frequency (AF) of 100% and absolute density (AD) of 6.12 and 4.08 respectively. The other frequently occurring and densely populated weeds were *Schinus molle*, *Chenopodium murale*, *Acacia etbaica*, *Ficus palmata*, *Sonchus oleraceus* and *Ochradenus baccatus* with absolute frequency (AF) ranging from 57.1–75.5% and absolute density (AD) from 0.30–6.12. In Site C (2550 m above sea level), 50 weed species belonging to 22 different families were recorded (Table 3). It shows 2 dominant weeds, *Acacia etbaica*, and *Setaria viridis* were which were found to be the most frequently occurring and densely populated weeds with absolute frequency (AF) of 100% and absolute density (AD) of 0.71 and 2.08 respectively. The other frequently occurring and densely populated weeds were *Rumex nervosus*, *Avena fatua*, *Opuntia ficus-indica*, *Ochradenus baccatus* and *Reseda lutea* with absolute frequency (AF) ranging from 55.1–79.5 % and Absolute Density (AD) from 0.61–2.02. In Site D (2862 m above sea level), 40 weed species belonging to 19 different families were recorded (Table 4). It shows 2 dominant weeds, *Acacia etbaica and Euphorbia helioscopia* which were found to be the most frequently occurring and densely populated weeds with absolute frequency (AF) of 100 and 91.8% and absolute density (AD) of 0.71 and 1.02 respectively. The other frequently occurring and densely populated weeds were *Arnebia decumbens*, *Rumex nervosus*, *Convolvulus arvensis*, *Marrubium vulgare*, *Nepeta deflersiana*, *Ageratum conyzoides* and *Reseda lutea* with absolute frequency (AF) ranging from 55.1–81.6% and absolute density (AD) from 0.34–2.08. In Site E (2935 m above sea level), 30 weed species belonging to 15 different families were recorded (Table 5). It shows one dominant weed *Juniperus phoenicea* which was found to be the most frequently occurring and densely populated weeds with absolute frequency (AF) of 100% and absolute density (AD) of 1.63. The other frequently occurring and densely populated weeds were *Ageratum conyzoides*, *Arnebia decumbens*, *Rumex nervosus* and *Acacia etbaica* with absolute frequency (AF) ranging from 59.1–81.6% and absolute density (AD) from 0.63–1.63. Our results indicate that low lands are more species-rich than a high altitude areas whereas in low lands numbers of species decreased progressively from 63 weeds species belonging to 24 family to 30 weeds belonging to 15 family (Fig. 5).

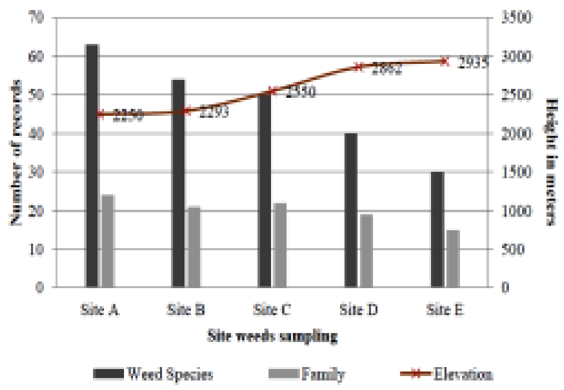


Fig. 5. Relationship of weed species, its family with elevation

It is reported that, at the regional level, diversity has been related to various factors such as area, altitude, productivity, landscape heterogeneity, successional status and disturbance (Huston, 1994; Swift and Anderson, 1994; Rosenzweig, 1995). These factors, to

Table1: Prevalence, absolute frequency, relative frequency, absolute density, relative density of weeds in abandoned lands (Site A)

No.	Species	Family	P (%)	AF (%)	RF (%)	AD	RD (%)
1.	*Aizoon canariense* L.	Aizoaceae	20	2.04	0.12	0.10	0.27
2.	*Amaranthus viridis* L.	Amaranthaceae	60	18.3	1.14	2.61	6.56
3.	*Schinus molle* L.	Anacardiaceae	80	18.3	1.15	0.42	1.08
4.	*Calotropis procera* L.	Asclepiadaceae	20	14.2	0.89	0.59	1.45
5.	*Ageratum conyzoides* L.	Asteraceae	80	38.7	2.43	0.91	2.31
6.	*Crepis kotschyana* Boiss.	"	20	6.12	0.38	0.26	0.67
7.	*Echinops spinosus* L.	"	60	30.6	1.91	0.24	0.62
8.	*Francoeuria crispa* (Forssk.) Cass	"	20	4.08	0.23	0.04	0.10
9.	*Launaea arborescens* (Batt.) Murb	"	60	24.4	1.53	0.38	0.97
10.	*Reichardia picroides* (L.) Roth	"	40	18.3	1.15	0.22	0.56
11.	*Reichardia tingitana* (L.) Roth	"	40	14.2	0.89	0.30	0.77
12.	*Sonchus oleraceus* L.	"	100	61.2	3.83	2.89	7.29
13.	*Xanthium pungens* L.	"	20	2.04	0.12	0.02	0.05
14.	*Phoenix dactylifera* L.	"	40	6.12	0.38	0.06	0.15
15.	*Echium plantagineurn* L.	Boraginaceae	60	36.7	2.29	0.40	1.02
16.	*Brassica tournefortii* Gouan	Brassicaceae	60	24.4	1.53	0.30	0.76
17.	*Eruca sativa* L.	"	40	6.12	0.38	0.38	0.97
18.	*Lepidium draba* L.	"	20	2.04	0.12	0.08	0.20
19.	*Sisymbrium irio* L.	"	40	28.5	1.78	0.46	1.18
20.	*Aerva javanica* (Burm. f.) Juss.	Chenopodiaceae	60	14.2	0.89	0.48	1.23
21.	*Beta vulgaris* ssp. *maritima* L.	"	40	10.2	0.64	0.18	0.46
22.	*Chenopodium album* L.	"	40	14.2	0.89	0.55	1.38
23.	*Chenopodium murale* L.	"	80	55.1	3.44	0.61	1.54
24.	*Rumex nervosus* Vahl	"	100	3.74	3.83	6.61	6.67
25.	*Salsola kali* L.	"	100	100	6.25	6.12	15.38
26.	*Convolvulus arvensis* L.	Convolvulaceae	100	63.2	3.95	0.69	1.74
27.	*Euphorbia prostrata* L.	Euphorbiaceae	40	16.3	1.02	0.22	0.56
28.	*Ricinus communis* L.	"	80	100	2.55	4.08	1.54
29.	*Acacia etbaica* Schweinf.	Fabaceae	80	26.5	1.66	0.30	0.77
30.	*Acacia gerrardii* var. *najdensis* Chaudhary	"	40	18.3	1.15	0.22	0.567
31.	*Loranthus regularis* Steud. ex Sprague	Loranthaceae	40	12.2	0.77	0.24	0.61
32.	*Eucalyptus globulus* L.	Myrtaceae	40	4.08	0.26	0.08	0.21
33.	*Argemone ochroleuca* Sweet	Papaveraceae	100	40.8	2.55	0.53	1.33
34.	*Arundo donax* L.	Poaceae	60	12.2	0.77	0.32	0.82
35.	*Aristida adscensionis* L.	"	80	48.9	3.07	0.61	1.54
36.	*Avena fatua* L.	"	40	20.4	1.28	0.28	0.72
37.	*Cynodon dactylon* Pers	"	60	26.5	1.66	0.38	0.97
38.	*Dicanthium annulatum* Stapf.	"	80	32.6	2.03	1.02	2.56
39.	*Diplachne fusca* (L.) Beauv.	"	40	14.2	0.89	0.14	0.36
40.	*Eragrostis minor* Host	"	20	4.08	0.25	0.04	0.10
41.	*Pennisetum setaceum* (Forsk.) Chiov.	"	80	30.6	1.92	0.46	1.18
42.	*Pennisetum villosum* (R. Br.) Fresen	"	40	20.4	1.28	0.34	0.87
43.	*Phalaris minor Retz.*	"	20	8.16	0.51	0.34	0.87
44.	*Poa annua* L.	"	80	20.4	1.28	0.67	1.69
45.	*Polypogon monspeliensis (L.) Desf.*	"	80	16.3	1.02	0.28	0.71
46.	*Setaria glauca* (L.) Beauv.	"	80	12.2	0.77	0.26	0.67
47.	*Setaria viridis* (L.) Beauv.	"	60	18.3	1.15	0.22	0.56
48.	*Tetrapogon villosum* Desf	"	60	12.2	0.77	0.26	0.67
49.	*Malva parviflora* L.	Malvaceae	40	8.16	0.76	0.18	0.46
50.	*Ficus palmata* Forssk	Moraceae	80	14.2	0.89	0.18	0.46
51.	*Opuntia ficus-indica* (L.) Mill.	"	140	100	6.26	1.42	3.59
52.	*Oxalis corniculata* L.	Oxalidaceae	60	42.8	2.68	0.26	0.67
53.	*Commicarpus grandiflorus* Standl.	Nyctaginaceae	60	20.4	1.27	0.24	0.61
54.	*Ziziphus spina-christi* (L.) Desf.	Rhamnaceae	40	14.2	0.89	0.18	0.46
55.	*Ochradenus baccatus* Delile	Resedaceae	80	55.1	3.44	1.83	4.61
56.	*Reseda lutea* L.	"	100	55.1	3.44	0.61	1.54
57.	*Dodonaea angustifolia* L.f.	Sapindaceae	40	6.12	0.38	0.18	0.46
58.	*Datura stramonium* L.	Solanaceae	80	8.16	0.51	0.18	0.46
59.	*Solanum incanum* L.	"	100	18.3	1.14	0.40	1.03
60.	*Solanum nigrum* L	"	40	4.08	0.25	0.10	0.26
61.	*Lycium shawii* Roem. & Schult	"	120	73.4	4.59	2.04	5.13
62.	*Withania somnifera* (L.) Dunal.	"	60	18.3	1.14	0.18	0.46
63.	*Forsskalea tenacissima* L.	Urticales	80	14.2	0.89	0.63	1.59

Note:P=Prevalence; AF=Absolute frequency; RF=Relative frequency; AD=Absolute density; RD=Relative density.

Table 2: Prevalence, absolute frequency, relative frequency, absolute density, relative density of weeds in abandoned lands (Site B)

No.	Species	Family	P (%)	AF (%)	RF (%)	AD	RD (%)
1.	*Amaranthus viridis* L.	Amaranthaceae	60	18.3	1.17	2.61	7.61
2.	*Schinus molle* L.	Anacardiaceae	80	55.1	3.52	0.42	1.25
3.	*Calotropis procera* L.	Asclepiadaceae	80	14.2	0.91	0.59	1.72
4.	*Ageratum conyzoides* L.	Asteraceae	80	32.6	2.09	0.91	2.67
5.	*Crepis kotschyana* Boiss.	“	20	4.08	0.26	0.26	0.77
6.	*Echinops spinosus* L.	“	60	20.4	1.31	0.26	0.77
7.	*Francoeuria crispa* (Forssk.) Cass.	“	20	4.08	0.26	0.06	0.18
8.	*Launaea arborescens* (Batt.) Murb	“	60	24.4	1.56	0.38	1.13
9.	*Reichardia picroides* (L.) Roth	“	40	18.3	1.17	0.22	0.65
10.	*Reichardia tingitana* (L.) Roth	“	40	14.2	0.91	0.30	0.89
11.	*Sonchus oleraceus* L.	“	100	61.2	3.92	2.89	8.44
12.	*Xanthium pungens* L.	“	20	2.04	0.13	0.02	0.06
13.	*Phoenix dactylifera* L.	Arecaceae	40	6.12	0.39	0.06	0.18
14.	*Echium plantagineurn* L.	Boraginaceae	60	36.7	2.35	0.40	1.19
15.	*Brassica tournefortii* Gouan	Brassicaceae	60	24.4	1.57	0.30	0.89
16.	*Eruca sativa* L.	“	40	6.12	0.39	0.38	1.13
17.	*Lepidium draba* L.	“	20	2.04	0.13	0.08	0.24
18.	*Sisymbrium irio* L.	“	40	28.5	1.82	0.46	1.37
19.	*Aerva javanica* (Burm. f.) Juss.	Chenopodiaceae	60	14.2	0.91	0.48	1.43
20.	*Beta vulgaris* ssp. *maritima* L.	“	40	10.2	0.65	0.18	0.53
21.	*Chenopodium album* L.	“	40	14.2	0.91	0.55	1.60
22.	*Chenopodium murale* L.	“	80	55.1	3.52	0.61	1.78
23.	*Rumex nervosus* Vahl	“	100	100	6.39	4.08	11.9
24.	*Salsola kali* L.	“	100	100	6.39	6.12	17.8
25.	*Convolvulus arvensis* L.	Convolvulaceae	100	38.7	2.48	0.22	0.65
26.	*Euphorbia prostrata* L.	Euphorbiaceae	60	18.3	1.17	0.61	1.78
27.	*Ricinus communis* L.	“	40	2.04	0.13	0.08	0.24
28.	*Acacia etbaica Schweinf.*	Fabaceae	100	61.2	3.91	0.30	0.89
29.	*Acacia gerrardii* var. najdensis Chaudhary	“	60	20.4	1.30	0.22	0.65
30.	*Loranthus regularis* Steud. ex Sprague	Loranthaceae	40	12.2	0.78	0.24	0.71
31.	*Argemone ochroleuca* Sweet	Papaveraceae	100	46.9	3.00	0.51	1.45
32.	*Aristida adscensionis* L.	Poaceae	100	46.9	3.00	0.69	2.02
33.	*Cynodon dactylon* Pers	“	100	30.6	1.95	0.51	1.49
34.	*Dicanthium annulatum* Stapf.	“	100	34.6	2.21	0.40	1.19
35.	*Eragrostis cilianensis* (All.) Lutati	“	60	12.2	0.78	0.18	0.53
36.	*Eragrostis minor* Host	“	20	4.08	0.26	0.04	0.12
37.	*Pennisetum setaceum* (Forsk.) Chiov.	“	100	20.4	1.31	0.40	1.19
38.	*Pennisetum villosum* (R. Br.) Fresen	“	60	18.3	1.17	0.22	0.65
39.	*Phalaris minor Retz.*	“	40	12.2	0.78	0.20	0.59
40.	*Poa annua* L.	“	100	22.4	1.44	0.44	1.31
41.	*Polypogon monspeliensis (L.) Desf.*	“	100	14.2	0.91	0.22	0.65
42.	*Setaria glauca* (L.) Beauv.	“	80	12.2	0.78	0.26	0.77
43.	*Setaria viridis* (L.) Beauv.	“	80	12.2	0.78	0.20	0.59
44.	*Malva parviflora* L.	Malvaceae	60	10.2	0.65	0.20	0.59
45.	*Ficus palmata* Forssk	Moraceae	100	61.2	3.92	0.30	0.89
46.	*Commicarpus grandiflorus* Standl.	Nyctaginaceae	80	22.4	4.31	0.26	0.77
47.	*Ziziphus spina-christi* (L.) Desf.	Rhamnaceae	40	18.3	1.17	0.20	0.59
48.	*Ochradenus baccatus* Delile	Resedaceae	80	75.5	4.83	1.80	5.35
49.	*Reseda lutea* L.	”	100	40.8	2.61	0.44	1.30
50.	*Dodonaea angustifolia* L.f.	Sapindaceae	60	10.2	0.65	0.22	0.65
51.	*Solanum incanum* L.	Solanaceae	100	100	1.44	1.37	1.31
52.	*Lycium shawii* Roem. & Schult	“	100	42.8	4.57	1.37	2.38
53.	*Withania somnifera* (L.) Dunal.	“	60	42.8	4.05	1.24	0.59
54.	*Forsskalea tenacissima* L.	Urticales	80	14.2	0.91	0.63	1.84

some extent, are acting mutually making it difficult to assess the role of each factor in determining species richness (Kohn and Walsh, 1994; Pys¡ek *et al.*, 2002). Also, related works reported that the differences in richness of weed floras are largely attributed to broad-scale variation in environmental factors and to the crop-specific agricultural practices (Froud-Williams, 1988). Pys¡ek *et al.*, (2005) found that the cover and number of weeds species are highly affected by altitudinal floristic region whereas both weed species number and cover decrease over time, more in the moderate-to-cold than in the warm altitudinal floristic region. Investigating altitudinal gradient included areas of the Red Sea coastal line, arid areas in the transitional zone of Tihama Hills, and the elevated slopes of Tallan Mountain found that the gradient rich by members of the genus *Acacia*, namely; *A. ehrenbergiana* and *A. tortilis* as well as perennial herbs, grasses, and succulent species (Masrahi *et al.*, 2011). In contrast to our findings, Masrahi *et al.*, (2011) reported that plant diversity increased with increased altitude in a pattern that reflected the observed altitudinal decline of air temperature and at the same time there is an increase in plant abundance with increasing altitude. It was found that there is a greater abundance of seedlings at higher elevations whereas climate-moving up-slope making conditions more suitable at higher elevations than at lower ones for high rates of germination and survival of seedlings (Badano *et al.*, 2007; Grabherr *et al.*, 1994; Hughes, 2000; Gworek, 2007; Jump *et al.*, 2007; Garcia 2006; Jurado *et al.* 2011). Almost similarly, to our findings, Pyankov and Mokronosov, (1993); Sayed and Mohamed, (2000) showed that C4 plants were absent where minimum air temperature was below 8 °C along altitudinal gradients in the tropics. It was probably due to that the low temperatures prevailing at high altitudes make it difficult for C4 plants to survive and arid regions temperature probably more important in controlling the altitudinal distribution of C3 and C4 plants. Vaupel and Matthies, (2012) found that population size and density of *Carduus defloratus* plants along a latitudinal declined with decreasing altitude. It was reported that the *climatic fluctuation* probably cause an increase in the abundance of some species and reduce abundance of others (Kusnierczyk and Ettl, 2002; Van der Meer *et al.*, 2002; Ibanez *et al.*, 2007) in a way that there is no change in the overall abundance of seedlings.

It is concluded that local species richness of weeds was related to landscape context and topographical heterogeneity. The low temperatures prevailing at high altitudes make *Juniperus phoenicea* to be the most frequently occurring and densely populated weed, hence it shifts the ecological balance in favour of certain plant species. It can also be concluded that that there is a direct correlation between species distribution and climatic changes along altitudinal gradients which seems to be the most critical ecological factors in determining types and the richness of vegetation. The results support the hypothesis (i.e. source-sink models by Wagner and Edwards, (2001), the species pool hypothesis by Zobel, (1997), and neighborhood effects by Dunning *et al.*, (1992) that local weeds species in abandoned lands is greatly influenced by processes operating at the landscape context and topographical heterogeneity.

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