

## Ecological Studies on the Rhizospheric Fungi of Some Halophytic Plants in Taif Governorate, Saudi Arabia

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**Abstract:** Efforts are made to record biodiversity of micro-flora associated with the plant cover of the major agricultural development areas in the world. Taif climate is considered dry because the rainfall is less than 10 inch and in desert or semi-desert side. Also the temperature in Taif decreases the dryness in the angle of rain and evaporation, so it effects on vegetation. The total soluble salts showed the highest value in the soil of *Argemone ochroleuce* community at surface layer, while the lowest value at soil of *Peganum harmala* community type. The data show that the total soluble salts decrease with depth, attributed to continuous evaporation of water from surface layer. The vegetation of the studied area is characterized by the dominance of four communities namely *Argemone ochroleuce*, *Asphodelus aestivus*, *Peganum harmala* and *Pulicaria crispa*. The results also indicated that twenty one fungal species which belong to nine genera were isolated from the rhizosphere of the dominant plants. The most prevalent genera were *Aspergillus* and *Fusarium*. The highest number of fungal colonies per gram of soil rhizosphere were recorded on the rhizosphere of *Asphodelus aestivus* (131 colony/gm soil) and the lowest number on the rhizosphere of *Argemone ochroleuce* (74 colony/gm soil). The data cleared also that the highest number of fungal colonies were recorded on the surface layers of the soils.

**Key words:** Rhizospheric fungi • halophytic plants • Taif area

### INTRODUCTION

Salt marshes are transitional areas between land and water, occurring along the intertidal shore of estuaries and sounds where salinity (salt content) ranges from near ocean strength to near fresh in upriver marshes. Salt marsh plants are adapted to a harsh, semi-aquatic environment and saline soils. Species diversity is low. Stout stems, small leaves and physiological adaptations for salt excretion and gas exchange characterize the inhabitants of the salt marsh, which are mostly grasses and low perennial herbs. The tangle of marsh plant roots and stems helps to stabilize the muddy bottom, as well as to trap debris and dissolved nutrients with each tidal cycle. Fungi and bacteria convert this oasis of detritus into food resources for microscopic algae, invertebrate larvae and larger animals. Salt marshes are about twice as photo-synthetically productive as corn fields and provide critical nursery grounds for numerous organisms [1]. The soil moisture-

salinity interaction has been widely recognized as the most important factor in the distribution of the stress tolerant plants [2]. Also the chemical and hydrophysical characteristics of soil affect the diversity and structure of the vegetation [3].

The rhizosphere is generally defined as the soil region under the influence of the root. Many microorganisms lives in soil, but even more (up to 100 times more) live close to the roots of plants [4]. The plant gives the microorganisms food, such as sugars and amino acids and the microorganisms give the plants minerals, some vitamins, nitrogen and some amino acids. Information's on the rhizospheric fungi of various cultivated and desert plants in different localities in the world have been provided by several investigators [5-11]. Saudian soil is infested with many soil-borne fungi. Twenty-five genera and sixty-eight species, were isolated from 40 soil samples collected from desert in Saudi Arabia on 5% sodium chloride-Czapek agar [12]. 100 osmophilic species in addition to two varieties which belong to 38

genera were isolated from desert soils of Saudi Arabia. The most prevalent genera were *Aspergillus*, *Alternaria*, *Penicillium*, *Cephalosporium*, *Acremonium* and *Botryotrichum* which occurred in 55-97.5% of the samples contributing 1.8-45.2% of total fungi [13]. *Aspergillus niger*, *A. flavus*, *A. nidulans*, *Phoma glomerata*, *Phoma humicola*, *Fusarium oxysporum*, *penicillium chrysogenum*, *Mucor racemosus*, *Drechslera spicifera* and *Stachybotrys chartarum* were isolated from 20 dust samples of Taif, Saudi Arabia [14]. Also Altalhi [15] recorded fifteen fungal species belonging to ten genera from the rhizosphere of some Taif plants. *Aspergillus* genus reported highest frequency.

The aim of this study is to enrich our knowledge about the ecology of salt marshes vegetation as well as associates fungi of the dominant species. It assesses the plant communities and the environmental factors that govern species abundance and distribution in Taif area of western Saudi Arabia.

## MATERIALS AND METHODS

**Selected area:** This study were carried out in the period from February to May 2006, on the salt marsh habitats in the Taif area at the sand plains as well as in the wades where the ground water is accumulates in the depression. The plants were selected as the most dominant and distributed species in the salt marshes.

**Vegetation analysis:** Quadrates were sampled representing the habitat and community variations in the salt habitats area. In each quadrat, a list of species and their abundance were estimated. The plants were identified according to Tackholm [16]; Vesey-Fitzgerald [17] and Zaharn and Girgis, [18].

**Soil analysis:** Soil samples were collected at three depths, surface (0-15 cm), subsurface (15-30 cm) and bottom (30-45 cm) from each habitat. The soil moisture and  $\text{CaCO}_3$  contents were estimated according to Jackson [19], while organic carbon by Walkley and Black rapid titration method [20]. Soil water extracts (1:50) were prepared for the determination of pH using pH meter; total soluble salts by drying methods; chlorides by titration with standard silver nitrate solution, sulphates gravimetrically as  $\text{BaSO}_4$  and soluble bicarbonates by acid titration [20].

Tested plants were selected as the most dominant and distribution in Taif area, especially of shallow roots. These plants were *Argemone ochroleuca* and

*Aphodelus aestivus* collected from Khamis wadi (Shafa region), *Peganum harmala* collected from Hamas wadi (Shafa region) and *Pulicaria crispa*, collected from South route of Taif.

## Isolation and identification of rhizospheric fungi:

Rhizospheric fungi were isolated from soil by dilution plate method [21]. Several dilutions (0.1, 0.01 and 0.001) were prepared and used for isolating rhizospheric fungi on potato dextrose medium. Fungi were purified and identified on the basis of morphological and physiological characteristics [22, 23]. The total fungal counts were determined as colonies forming units per g soil ( $\text{CFU g}^{-1}$ ).

## RESULTS AND DISCUSSION

**Climate:** The climate of the study area falls in a transitional zone between the Monsoon and Mediterranean climatic types, which are modified by the Red Sea and the elevated Harrat Rahat. The data obtained in Table 1 show the range of climatic conditions of Taif area for last ten years from 1992 to 2001. It is clear that January is the coolest month (mean temperature  $15.3^\circ\text{C}$ ) and air temperature rises in February and such rise continued till August. There after, it decreases gradually and attained the lowest value in winter. Relative humidity exhibits considerable seasonal variations. June and July have the lowest humidity value (25 and 27 %, respectively); the most humid months are December (64%) and January (63%). The wind direction mainly in west side and the maximum wind speed recorded in April and July (32 Km/h). October has the lowest wind speed (5 Km/h). The total amount of precipitation ranged from 2 mm/month in February to 243.6 mm/m in November. From Table 1 it is clear also that the number of precipitation days was 47.4/year, while the number of moist days was 33.1/year and Haze days about 41.6/year.

In general Taif climate is warm desert for most climatic classifications. Ahmed [24] recorded that, the primary classification of Taif climate according to the basis of Blair [25] is considered dry climate because the rainfall is less than 10 inch, also Trewartha and Horn [26] show the same result because the humid is less than 40 % for most months. It may be concluded that Taif climate is dry and in desert or semi-desert side. Also the temperature in Taif decreases the dryness in the angle of rain and evaporation, so it effects on vegetation.

Table 1: Mean values of meteorological data of Taif area of the last 10 years from: 1994 to 2004. Station No. 41036, Station Name: TaifLAT: 21 28 44N LOG: 40 32 56E Elevation: 1452.75

Tempetrature (Deg. C)												Surface wind (Kts)				Pressure (hPa)			Precipitation (mm)								
-----												-----				-----			-----								
Mean												Relative humidity %				Maximum speed			Vap	Station	Sea	Monthly					
-----												Prev				-----			-or	level	level	-----					
MO	MX	MN	H	MX	YY	DD	MN	YY	DD	MX	MN	M	Dir	M	MX	DDD	M	M	M	M	Ext.	YY	Ext.	YY	DD		
01	22.6	7.9	15.3	29.2	1999	31	1.5	1997	20	100	9	63	W	6	45	22	10.7	856.7	4607.8	14.4	38.4	1992	27.9	1992	10		
02	24.5	9.2	16.8	31.5	1999	24	6	1992	12	100	11	56	W	7	38	25	10.6	856.2	4606.9	0.2	2.0	1994	2.0	1994	27		
03	26.8	11.8	19.4	33.0	2000	21	2.8	1992	03	98	4	51	W	8	36	23	11.2	855.2	4605.4	17.6	74.4	1998	72.9	1998	06		
04	30.6	15.2	23.0	35.0	1999	26	9.0	1992	04	98	4	46	W	7	42	32	12.4	855.2	4604.4	32.9	198.5	1994	*****	1994	18		
05	33.7	18.6	26.1	39.0	1996	31	12.0	2000	02	97	2	39	W	6	45	27	12.8	855.3	4603.4	34.6	102.3	1995	46.5	1995	04		
06	36.3	22.1	29.3	39.5	1998	14	15.6	1997	29	86		25	W	8	28	9	10.0	853.4	4601.0	4.8	46.7	1996	32.5	1996	07		
07	35.2	22.5	28.7	40.0	1998	19	17.0	1992	22	81	2	27	W	**	50	32	10.6	852.7	4600.6	2.4	12.5	2000	8.8	2000	23		
08	36.0	23.1	29.2	39.6	1996	03	15.8	1992	15	100	3	32	W	**	50	17	12.8	853.4	4600.4	33.8	143.2	1992	49.0	1992	12		
09	35.1	20.2	27.8	38.2	2001	05	14.9	1996	27	91	2	35	W	6	50	28	12.6	854.9	3703.0	14.8	58.6	1997	51.6	1997	17		
10	31.0	15.3	23.4	36.0	1998	03	8.3	1998	29	97	3	44	E	5	35	5	12.0	857.2	3706.4	25.9	127.4	1997	39.8	1992	11		
11	26.5	11.7	19.2	32.0	1999	09	6.0	1996	15	100	6	59	W	5	40	22	12.5	857.4	3708.5	40.3	243.6	1996	*****	1996	15		
12	24.3	9.5	16.9	29.5	1998	14	1.0	2000	11	100	7	64	W	6	40	27	11.8	857.7	3709.6	6.0	17.6	1995	8.5	1993	16		
Mx	36.3			40.0						100					50						293.6		*****				
MN		7.9					1.5																				
M			22.9									45	7				11.7	855.4	9304.8	19.0							

From Meteorology and Environmental Production Administration in Saudi Arabia

Table 2: Physical analysis of soil samples supporting dominant species in salt habitat at Taif area

Soil description										Mois.	
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Dominant species	Depth in cm	Gravel %	Sand %	Clay %	Cont. %	T.S.S. %	pH	W.H.C %			
<i>Argemone ochroleuce</i>	00-15	22.6	72.6	4.8	8.8	5.34	8.4	35.6			
	15-30	23.9	68.3	7.8	13.4	3.87	8.9	38.4			
	30-45	24.7	61.5	13.8	18.2	2.94	8.2	43.1			
<i>Asphodelus aestivus</i>	00-15	21.9	63.7	14.4	16.9	2.54	7.6	43.1			
	15-30	33.5	63.8	15.8	23.2	2.44	7.9	45.7			
	30-45	36.8	44.9	18.3	28.6	1.26	7.9	51.2			
<i>Peganum harmala</i>	00-15	33.5	48.9	17.9	5.3	2.33	7.3	34.4			
	15-30	35.7	53.1	11.2	8.4	2.25	7.4	32.1			
	30-45	32.3	52.5	15.2	9.4	1.21	7.5	37.2			
<i>Pulicaria crispa</i>	00-15	26.6	71.3	2.1	22.3	1.56	8.9	18.4			
	15-30	34.7	62.4	2.9	29.8	1.85	8.5	21.1			
	30-45	31.2	65.7	3.1	31.6	2.12	8.4	22.4			

**Soil:** The results in Table 2 and 3 show the mean range values of soil analysis associated with different salt march habitats in Taif area. The collected soils associated with the dominant species tend to be more saline and have the highest value of total soluble salts (5.34%) at the soil of *Argemone ochroleuce* community type. The results indicated that:

Table 3: Chemical analysis of soil samples supporting dominant species in salt habitat at Taif area

Dominant species	Depth in Cm	Cl <sup>-</sup> %	SO <sub>4</sub> %	CO <sub>3</sub> %	HCO <sub>3</sub> %	O.C %	CaCO <sub>3</sub> %	T.N %
<i>Argemone ochroleuce</i>	00-15	0.03	.06	0	0.01	0.56	14.9	0.23
	15-30	0.02	0.04	0	0.01	0.67	22.1	0.15
	30-45	0.02	0.03	0	0.02	0.67	23.5	0.21
<i>Asphodelus aestivus</i>	00-15	0.02	0.01	0	0.02	0.93	12.3	0.23
	15-30	0.01	0.01	0	0.02	1.84	14.4	0.24
	30-45	0.01	0.01	0	0.02	3.89	15.6	0.32
<i>Peganum harmala</i>	00-15	0.02	0	0.01	0.01	2.27	26.9	0.18
	15-30	0.02	0.01	0.01	0.01	2.63	31.1	0.19
	30-45	0.02	0.01	0	0	4.09	33.5	0.2
<i>Pulicaria crispa</i>	00-15	0.04	0.06	0.01	0.03	1.4	10.6	0.28
	15-30	0.05	0.05	0.01	0.03	1.6	11.4	0.33
	30-45	0.05	0.05	0.01	0.02	1	11.8	0.32

1. The soil moisture content is low in all habitats of Taif area. It ranges from 5.3% in surface layer (soil of *Peganum harmala*) and 31.6% in bottom (soil of *Pulicaria crispa*).
2. The organic carbon content varied between 0.56% (0-15 cm layer) in soil of *Argemone ochroleuce* and 4.09% (30-45 cm layer) in soil of *Peganum harmala* and brought about dense vegetation cover.

- Calcium carbonate content recorded higher values in all habitats. The highest value of  $\text{CaCO}_3$  was (33.5%) in bottom layer (30-45 cm) at *Peganum harmala* habitat.
- The soil reaction changed between slightly alkaline to alkaline. The highest pH value was 8.9 in soil of *Argemone ochroleuca* and *Pulicaria crispa*, while the lowest value was 7.3 in soil of *Peganum harmala* community type.
- The total soluble salts showed the highest value in the soil of *Argemone ochroleuca* (5.34%) at surface layer, while the lowest value (1.21%) at bottom layer in soil of *Peganum harmala* community type. The data show that the total soluble salts decrease with depth, this may be attributed to continuous evaporation of water from surface layer [1]. Chlorides and sulphates were the most common anions, while carbonate was almost absent.
- The water holding capacity ranging between 18.4% in the soil of *Pulicaria crispa* and 51.2% in the soil of *Asphodelus aestivus* at bottom layer.

**Sociological range of salt marshes habitat:** The sociologically structured of the community types dominated in the salt marshes habitat at Taif area were recorded in Table 4-7. It cleared that in *Argemone ochroleuca* community five associated species were recorded namely *Verbesiana encoleioides*, *Areva javanica*, *Solanum incanum*, *Datura inucannoxia* and *Peganum harmala*. The presence of species in this community range from 10% for *Peganum harmala* and 100% for the dominant species *Argemone ochroleuca*, while the frequency ranging from 10% for the most associated species and 100% for the dominant species *Argemone ochroleuca*. The abundance recorded the highest value 86.5% for the dominant *Argemone ochroleuca* meanwhile the lowest value 2% for *Datura inucannoxia* and *Peganum harmala*.

In *Asphodelus aestivus* community type seven associated species were recorded namely *Capparis deciduas*, *Argemone ochroleuca*, *Verbesiana encoleioides*, *Areva javanica*, *Solanum incanum*, *Datura inucannoxia* and *Peganum harmala*. The presence of species in this community range from 10% for most of species and 100% for the dominant species *Asphodelus aestivus*, while the frequency ranging from 10% for the most associated species and 100% for the dominant species *Asphodelus aestivus*. The abundance recorded the highest value 65.5% for the dominant *Asphodelus aestivus* and the lowest value 2% for *Datura inucannoxia* and *Peganum harmala*.

**Table 4:** Analysis of community type dominated by *Argemone ochroleuca* sweet in salt marshes at Taif area (Shafa)

Species	Presence (%)	Frequency (%)	Abundance (%)
<i>Argemone ochroleuca</i>	100	100	86.5
<i>Verbesiana encoleioides</i>	45	15	5.0
<i>Areva javanica</i>	26	10	4.3
<i>Solanum incanum</i>	10	10	3.7
<i>Datura inucannoxia</i>	10	10	2.0
<i>Peganum harmala</i>	10	10	2.0

**Table 5:** Analysis of community type dominated by *Asphodelus aestivus* Brot in salt marshes at Taif area (Shafa):

Species	Presence (%)	Frequency (%)	Abundance (%)
<i>Asphodelus aestivus</i>	100	100	65.5
<i>Capparis decidua</i>	30	20	9.0
<i>Argemone ochroleuca</i>	30	20	8.9
<i>Verbesiana encoleioides</i>	30	20	6.0
<i>Areva lanata</i>	26	10	4.3
<i>Solanum incanum</i>	10	10	3.7
<i>Datura inucannoxia</i>	10	10	2.0
<i>Peganum harmala</i>	10	10	2.0

**Table 6:** Analysis of community type dominated by *Peganum harmala* L. in salt marshes at Taif area (South Road area)

Species	Presence (%)	Frequency (%)	Abundance (%)
<i>Peganum harmala</i>	100	100	73.8
<i>Verbesiana encoleioides</i>	45	38	10.6
<i>Salsola spinoceas</i>	23	27	7.8
<i>Argemone ochroleuca</i>	17	15	5.6
<i>Capparis decidua</i>	16	10	4.3
<i>Areva lanata</i>	10	10	3.7
<i>Solanum incanum</i>	10	10	2
<i>Datura inucannoxia</i>	10	10	2
<i>Asphodelus aestivus</i>	5	5	1.6

**Table 7:** Analysis of community type dominated by *Pulicaria crispa* Forssk in salt marshes at Taif area (South road)

Species	Presence (%)	Frequency (%)	Abundance (%)
<i>Pulicaria crispa</i>	100	100	59.8
<i>Peganum harmala</i>	40	28	9.6
<i>Salsola spinoceas</i>	23	27	7.8
<i>Argemone ochroleuca</i>	17	13	5.6
<i>Cavancloda pubescens</i>	14	10	4.3
<i>Areva javanica</i>	10	10	3.7
<i>Solanum incanum</i>	10	10	2.1
<i>Datura inucannoxia</i>	9.2	8.6	2.2
<i>Asphodelus aestivus</i>	5	5	1.0

*Peganum harmala* community type have eight associated species were recorded namely *Salsola spinoceas*, *Capparis deciduas*, *Argemone ochroleuca*, *Verbesiana encoleioides*, *Areva javanica*, *Solanum incanum*, *Datura inucannoxia* and *Asphodelus aestivus*.

The presence of species in this community range from 5% for *Asphodelus aestivus* and 100% for the dominant species *Peganum harmala*. The frequency ranging from 5% for the *Asphodelus aestivus* and 100% for the dominant species *Peganum harmala*. The abundance recorded the highest value 73.8% for the dominant *Peganum harmala* and the lowest value 1.6% for *Asphodelus aestivus*.

*Pulicaria crispa* community type have eight associated species were recorded namely *Peganum harmala*, *Salsola spineceas*, *Argemone ochroleuce*, *Cavancloda pubescens*, *Areva javanica*, *Solanum incanum*, *Datura inucannoxia* and *Asphodelus aestivus*.

Table 8: Mean number of fungi/g (CFU g<sup>-1</sup>) of rhizosphere of some plants at different regions

Dominant plant	Mean number of fungi(CUF g <sup>-1</sup> ) At different regions		
	Surface	Subsurface	Bottom
	(0-15cm)	(15-30cm)	(30-45cm)
<i>Argemone ochroleuce</i>	3.8x10	2.4x10	1.2x10
<i>Aphodelus aestivus</i>	5.2x10	4.3x10	3.6x10
<i>Peganum harmala</i>	2.9x10	2.6x10	2.1x10
<i>Pulicaria crispa</i>	3.5x10	3.3x10	1.5x10

The presence of species in this community range from 5% for *Asphodelus aestivus* and 100% for the dominant species *Pulicaria crispa*. The frequency ranging from 5% for the *Asphodelus aestivus* and 100% for the dominant species *Pulicaria crispa*. The abundance recorded the highest value 59.8% for the dominant *Pulicaria crispa* and the lowest value 1% for *Asphodelus aestivus*.

**Fungal population:** From Table 8 we concluded that the number of fungal population (CFU) differ with different plants and the highest number of fungal population were found in the rhizosphere of *Asphodelus aestivus* (131 colony/gm), followed by *Pulicaria crispa* (83 colony/gm) and the lowest number was reported on the rhizosphere of *Argemone ochroleuce* (74 colony/gm). This result is in accordance with that of Altalhi [15]. He reported that the highest number of fungal colonies per gram of Taif soil rhizosphere were recorded on *Artemisia judaica* (320.4 colony/gm) and the lowest number on *Desmostachya bipinnata* (1.6 colony/gm). This difference in total fungal counts (CFU) may be due to the difference in rhizo-deposition, the place and type of plant soil [27-29].

Table 9: Fungi isolated from different plant rhizosphere in Taif area

Fungi	Plant												P%
	<i>Argemone ochroleuce</i>			<i>Aphodelus aestivus</i>			<i>Peganum harmala</i>			<i>Pulicaria crispa</i>			
	Surface 0-15 cm	Subsurface 15-30 cm	Bottom 30-45 cm	Surface 0-15 cm	Subsurface 15-30	Bottom 30-45 cm	Surface 0-15 cm	Subsurface 15-30	Bottom 30-45 cm	Surface 0-15 cm	Subsurface 15-30	Bottom 30-45 cm	
<i>A. ochraceus</i>	+	+++	+	-	-	-	+++	+++	+++	+++	+++	+++	66.7
<i>A. niger</i>	-	-	++	+++	+++	++	+++	+++	+++	+++	+	+++	83.3
<i>A. japonicus</i>	+++	-	++	+++	-	-	-	-	++	-	++	-	41.7
<i>A. candidus</i>	+++	+++	-	-	-	-	-	-	-	-	-	-	16.7
<i>A. fumigatus</i>	-	+	-	-	+++	-	-	+	-	-	-	-	25.0
<i>A. flavus</i>	-	-	-	-	-	+++	-	-	+	-	+++	+++	33.3
<i>A. oryza</i>	-	-	-	-	-	-	-	-	-	+++	-	+	16.7
<i>Fusarium sp1</i>	+	+	+++	+++	-	-	-	+	+++	+++	++	++	75.0
<i>F. acuminatum</i>	-	-	-	-	-	-	+	-	-	-	-	-	8.3
<i>F. lateritium</i>	-	-	-	-	-	-	+	-	-	-	-	-	8.3
<i>Fusarium sp2</i>	-	-	-	-	-	-	-	-	-	-	++	-	8.3
<i>F. poae</i>	-	-	-	-	-	-	-	-	-	-	-	+++	8.3
<i>Verticillium sp.</i>	-	-	+++	-	+++	+++	-	-	-	-	-	-	25.0
<i>Mycelia sterilia</i>	+	+	+	-	-	-	-	-	+	-	++	-	41.7
<i>Alternaria alternata</i>	+	+	++	+	+	-	-	-	-	-	+++	++	58.3
<i>Cladosporium sp.</i>	-	-	-	+++	-	+	-	-	-	+++	-	-	25.0
<i>Penicillium</i>													
<i>brevicompactum</i>	-	-	-	-	-	-	-	++	-	-	+++	+	25.0
<i>Rhizopus sp.</i>	+++	-	-	+++	-	-	+	++	-	-	-	-	33.3
<i>Phoma pomorum</i>	-	-	++	-	-	-	-	-	-	-	-	-	8.3

P = Total presence, + = Rare, ++ = Common, +++ = Abundance

The most frequent genera were *Aspergillus* (7 species) followed by *Fusarium* (4 species), *Alternaria* and *Rhizopus* (1 species). From these genera the most abundant fungal species in the plant rhizospheres were *A. nigr* (P = 83.3%), *Fusarium* sp<sub>1</sub> (P = 75%), *A. ochraceus* (P = 66.7) and *Alternaria alternate* (P = 58.3%) and the lowest abundant fungal species were *F. acuminatum*, *F. lateritium*, *Fusarium* sp<sub>2</sub>, *F. poae* and *Phoma pomorum* (P = 8.3) (Table 9). These results agreed with Abdel-Hafez [12, 13]. He isolated different fungal genera and species from the desert soils in Saudi Arabia. Abdel-Hafez and Shoreit [14] isolated 70 species and 31 genera from 20 dust samples of Taif, Saudi Arabia and the most common genera were *Aspergillus*, *Fusarium*, *Penicillium* and *Mucor*. Also our results agreed with El-abyad *et al.* [30]. They concluded that the microbial counts in the rhizosphere of the desert halophytic plants were considerably stimulated and the degree of such stimulation varies according to the species and prevailing environmental conditions. Also from our results in Table 9 we concluded that the frequency and type of fungal species varies with different plants. These results agreed well with that of Shindia and Abdel-Fattah [9], Pandey *et al.* [10] and Jain and Gupta [31].

So we can concluded that some species have wide ecological and sociological ranges of distribution. These are *Peganum harmala*, *Verbesiana encoleioide* *Salsola spineceas* *Salsola spineceas* *Areva lanata* *Solanum incanum* *Datura inucannoxia* and *Asphodelus*. The number and types of fungal genera and species differ with different plant, also the number of fungi decrease with increasing the depth of the soil.

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