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(2001) Loreau

Ma et al., 2008; )  
(Xueqin et al., 2003; Yibing et al., 2007

*Eremurus anisopterus*

Ma et al., 2008; Xueqin et al., )

(2003

(Pimentel et al., 1997)

Shi et )

(al., 2006

(Pimentel et al., 1997; Pimentel et al., 2007)

(Pimentel et al., 2007)

(1997) Duelli

CO<sub>2</sub>

(Pimentel et al., 1997 )

Gabriel & )

(Tschardtke, 2007; Kevan, 1999; Potts et al., 2006

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<sup>1</sup> ephemeretum  
<sup>2</sup> ephemeroid

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Potts *et al.*, 2006; )

(Kevan, 1999

Haddad *et al.*, 2001; Koricheva )  
*et al.*, 2000; Siemann *et al.*, 1998; Unsicker *et al.*,  
(2006

(Siemann *et al.*, 1998; Haddad *et al.*, 2001)

Hernandez-Ruiz & )  
(Castano-Meneses, 2006

( )  
(Siemann *et al.*, 1998)

Haddad *et al.*, 2001; Perner *et al.*, 2005; Tilman, )  
(2000; Unsicker *et al.*, 2006  
(Borror *et al.*, 1989)

Zarrin *et al.*, 1999; Unsicker *et* )

(*al.*, 2006; Tilman, 2000

Haddad *et al.*, 2001; Koricheva *et al.*, )  
Sheridan *et al.*, 2008; Tilman, 2000; 2000  
(Unsicker *et al.*, 2006

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SAS (8.2)

*Boissiera squarrosa*

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*Gundelia tournefortii*

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*Roemeria hybrida*

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.(Knops *et al.*, 2001)

.(Bengtsson, 1998)

*Lallemantia iberica*

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<p><i>Acantholimon sp.</i>  <i>Acanthophyllum sp.</i>  <i>Achillea sp.</i>  <i>Aethionema carneum</i>  <i>Alyssum marginatum</i>  <i>Androsace maxima</i>  <i>Artemisia sp.</i>  <i>Astragalus sp.</i>  <i>Boissiera squarrosa</i>  <i>Bromus danthoniae</i>  <i>Bromus sp.</i>  <i>Centaurea sp.</i>  <i>Ceratocarpus arenarius</i>  <i>Consolida sp.</i>  <i>Cousinia afghanica</i>  <i>Cousinia sp.</i>  <i>Echinops sp.</i>  <i>Eremopyrum sp.</i>  <i>Euphorbia sp.</i>  <i>Gagea sp.</i>  <i>Koelpinia linearis</i></p>	<p><i>Laenatrum sp.</i>  <i>Lallemantia iberica</i>  <i>Lappula sp.</i>  <i>Lasiopogon muscoides</i>  <i>Malcolmia sp.</i>  <i>Maresia sp.</i>  <i>Minuartia sp.</i>  <i>Nardurus subulatus</i>  <i>Nonea sp.</i>  <i>Parapholis incurva</i>  <i>Poa bulbosa</i>  <i>Poa sp.</i>  <i>Polygonum sp.</i>  <i>Roemeria hybrida</i>  <i>Rosa persica</i>  <i>Salvia sp.</i>  <i>Saponaria sp.</i>  <i>Scabiosa olivieri</i>  <i>Scariola orientalis</i>  <i>Stipa sp.</i>  <i>Taeniatherum sp.</i></p>	<p><i>Acanthophyllum sp.</i>  <i>Achillea sp.</i>  <i>Acroptilon repens</i>  <i>Aegilops sp.</i>  <i>Alyssum linifolium</i>  <i>Alyssum marginatum</i>  <i>Androsace maxima</i>  <i>Arnebia sp.</i>  <i>Artemisia sp.</i>  <i>Astragalus sp.</i>  <i>Astragalus sp.</i>  <i>Bellevilla sp.</i>  <i>Boissiera squarrosa</i>  <i>Bromus danthoniae</i>  <i>Bromus sp.</i>  <i>Carthamus oxyacantha</i>  <i>Centaurea sp.</i>  <i>Centaurea virgata</i>  <i>Ceratocarpus arenarius</i>  <i>Ceratocephalus falcata</i>  <i>Cirsium arvense</i>  <i>Cleome sp.</i>  <i>Cousinia boissieri</i>  <i>Cousinia sp.</i>  <i>Crepis sp.</i>  <i>Cynodon dactylon</i>  <i>Echinops sp.</i>  <i>Eremopyrum sp.</i>  <i>Eryngium sp.</i>  <i>Euphorbia sp.</i>  <i>Euphorbia bungei</i>  <i>Gagea sp.</i>  <i>Galium sp.</i>  <i>Gundelia tournefortii</i>  <i>Haplophyllum sp.</i></p>	<p><i>Hordeum glaucum</i>  <i>Hordeum sp.</i>  <i>Hyoscyamus sp.</i>  <i>Imex sp.</i>  <i>Iris sp.</i>  <i>Ixiolirion sp.</i>  <i>Koelpinia sp.</i>  <i>Lallemantia iberica</i>  <i>Lappula sp.</i>  <i>Lasiopogon muscoides</i>  <i>Malcolmia sp.</i>  <i>Minuartia sp.</i>  <i>Moriera spinosa</i>  <i>Muscari sp.</i>  <i>Noaea mucronata</i>  <i>Orobancha sp.</i>  <i>Phlomis sp.</i>  <i>Poa bulbosa</i>  <i>Polygonum sp.</i>  <i>Primula sp.</i>  <i>Reseda lutea</i>  <i>Roemeria refracta</i>  <i>Rosa persica</i>  <i>Rumex sp.</i>  <i>Saponaria sp.</i>  <i>Scabiosa olivieri</i>  <i>Scariola orientalis</i>  <i>Sisymbrium officinale</i>  <i>Stipa sp.</i>  <i>Tragopogon sp.</i>  <i>Trigonella sp.</i>  <i>Turgenia sp.</i>  <i>Vaccaria oxyodonta</i>  <i>Vaccaria pyramidata</i>  <i>Valerianella sp.</i>  <i>Veronica sp.</i></p>	<p><i>Acantholepis sp.</i>  <i>Acantholimon sp.</i>  <i>Aethionema carneum</i>  <i>Agropyron sp.</i>  <i>Alyssum linifolium</i>  <i>Anthemis rhodocentra</i>  <i>Anthemis sp.</i>  <i>Arnebia sp.</i>  <i>Astragalus sp.</i>  <i>Astragalus campylorrhynchus</i>  <i>Astragalus sp.</i>  <i>Astragalus tribuloides</i>  <i>Astragalus sp.</i>  <i>Bromus danthoniae</i>  <i>Carex physodes</i>  <i>Centaurea solstitialis</i>  <i>Ceratocephalus falcata</i>  <i>Colchicum sp.</i>  <i>Dipterocome pusilla</i>  <i>Epilasia sp.</i>  <i>Eremopyrum sp.</i>  <i>Eremurus sp.</i>  <i>Euclidium syriacum</i>  <i>Gagea sp.</i>  <i>Galium sp.</i>  <i>Garhadiolus angulosus</i>  <i>Glaucium flavum</i>  <i>Goldbachia laevigata</i>  <i>Gymnarrhena sp.</i>  <i>Heterasia sp.</i>  <i>Heterocaryum szovitsianum</i></p>	<p><i>Heterodera sp.</i>  <i>Hordeum sp.</i>  <i>Hyoscyamus pusilus</i>  <i>Hypecoum pendulum</i>  <i>Koelpinia Linearis</i>  <i>Lallemantia canescens</i>  <i>Lappula ceratophora</i>  <i>Lasiopogon muscoides</i>  <i>Astragalus sp.</i>  <i>Malcolmia turkestanica</i>  <i>Medicago radiata</i>  <i>Minuartia sp.</i>  <i>Nonea caspica</i>  <i>Octoceras lehmannianum</i>  <i>Onosma sp.</i>  <i>Papaver hybridum</i>  <i>Parapholis incurva</i>  <i>Plantago sp.</i>  <i>Poa bulbosa</i>  <i>Rhagadiolus stellatus</i>  <i>Roemeria hybrida</i>  <i>Salsola kali</i>  <i>Saponaria sp.</i>  <i>Schismus arabicus</i>  <i>Scorzonera sp.</i>  <i>Senecio glaucus</i>  <i>Spergularia sp.</i>  <i>Trigonella sp.</i>  <i>Valerianella dufresnia</i>  <i>Valerianella sp.</i>  <i>Veronica sp.</i></p>
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(2003) Xueqin

*Alyssum linifolium* *Erodium oxyrhynchum*

*Carex physodes*

*A. linifolium* *C. physodes*

*Alyssum* *A. linifolium*

*marginatum*

(Xueqin et al., 2003)

( )

*Gagea sp.*

( )

(Yibing et al., 2007; Xueqin et al., 2003)

<i>Alyssum marginatum</i>	<i>Alyssum linifolium</i>	<i>Alyssum linifolium</i>
<i>Astragalus sp.</i>	<i>Alyssum marginatum</i>	<i>Arnebia sp.</i>
<i>Echinops sp.</i>	<i>Arnebia sp.</i>	<i>Astragalus campylorrhynchus</i>
<i>Eremopyrum sp.</i>	<i>Astragalus sp1.</i>	<i>Astragalus sp1.</i>
* <i>Gagea sp.</i>	<i>Astragalus sp2.</i>	<i>Astragalus sp2.</i>
<i>Koelpinia linearis</i>	<i>Crepis sp.</i>	<i>Astragalus tribuloides</i>
<i>Lappula sp.</i>	<i>Echinops sp.</i>	<i>Astragalus sp3.</i>
<i>Nonea sp.</i>	<i>Eremopyrum sp.</i>	* <i>Carex physodes</i>
	* <i>Gagea sp.</i>	<i>Eremopyrum sp.</i>
	* <i>Ixilirion sp.</i>	* <i>Eremurus sp.</i>
	<i>Koelpinia sp.</i>	* <i>Gagea sp.</i>
	<i>Lappula sp.</i>	<i>Garhadiolus angulosus</i>
	<i>Nonea mucronata</i>	<i>Goldbachia laevigata</i>
	* <i>Tragopogon sp.</i>	<i>Hypicum pendulum</i>
	<i>Trigonella sp.</i>	<i>Koelpinia linearis</i>
	<i>Veronica sp.</i>	<i>Lappula ceratophora</i>
		<i>Nonea caspica</i>
		<i>Onosma sp.</i>
		<i>Plantago sp.</i>
		<i>Salsola kali</i>
		<i>Schismus arabicus</i>
		* <i>Scorzonera sp.</i>
		<i>Senecio glaucus</i>
		<i>Spergularia sp.</i>
		<i>Trigonella sp.</i>
		<i>Veronica sp</i>

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Diptera

Tscharntke Kruess

Diptera

(2002)

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Diptera

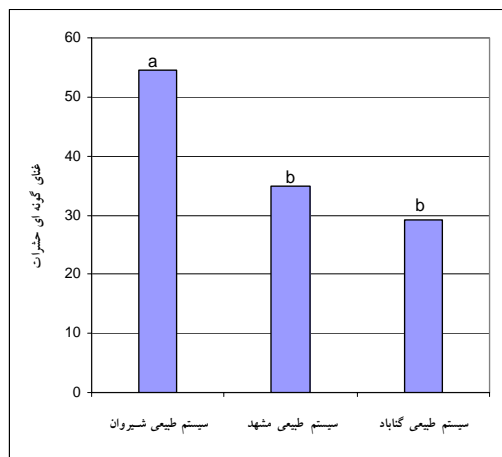
Homoptera

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Homoptera

(Rowe et al., 2006)

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Acari
Coleoptera
Collembola
Diptera
Heteroptera
Homoptera
Hymenoptera
Isopoda
Isoptera
Lepidoptera
Mantodea
Mesostigmata
Neuroptera
Orthoptera
Phasmoptera
Thysanoptera
unknown

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Coleoptera	Alleculidae(1), Anthicidae(1), Bruchidae(2) Buprestidae(1) Chrysomelidae(5), Cleridae(1), Coccinellidae(6) Curculionidae(5), Mordellidae(1), Nitidulidae(1), Staphylinidae(2)
Collembola	Sminthuridae(1)
Diptera	Anthomyiidae(4), Asilidae(2), Bombyliidae(1), Calliphoridae(1) Cecidomyiidae(1), Chloropidae(3), Coelopidae(1) Culicidae(2) Dolichopodidae(1), Empididae(2), Muscidae(2), Mycetophilidae (1) Oestridae(1), Pipunculidae(1), Rhinophoridae(1), Sepsidae(1) Scathophagidae(2), Scatopsidae(1), Sciaridae(2) Syrphidae(2), Tachinidae(2), Therevidae(1), Tephritidae(6)
Heteroptera	Pentatomidae(3), Miridae(5), Alydidae(1), Anthocoridae(1) Rhopalidae(2), Coreidae(1), Berytidae(1), Lygaeidae(2)
Homoptera	Aphididae(4), Cicadellidae(5), Psyllidae(2)
Hymenoptera	Braconidae(4), Sphecidae(1), Ichneumonidae(2) Vespidae(1), Formicidae(7), Halictidae(1)
Lepidoptera	Lycaenidae(1), Styridae(1)
Mantodea	Mantidae(1)
Orthoptera	Acrididae(9), Tanaoceridae(1), Tettigonidae(3)
Phasmoptera	Heteronemiidae(1)
Thysanoptera	Phaeothripidae(1)



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Coleoptera	Alleculidae(2), Bruchidae(2), Buprestidae(2), Cerambycidae(1) Chrysomelidae(5), Cleridae(1), Coccinellidae(2) Contharidae(1), Curculionidae(3), Dermestidae(1) Meloidae(1), Mordellidae(1), Nitidulidae(1), Scarabaeidae(1) Staphylinidae(1), Tenebrionidae(2)
Collembola	Sminthuridae(1)
Diptera	Anthomyiidae(1), Scathophagidae(4), Empididae(3), Chironomidae(3) Bibionidae(3), Tachinidae(2), Tipulidae(1), Chloropidae(1) Tephritidae(3), Muscidae(3), Sepsidae(1), Bombyliidae(2)
Hemiptera	Pentatomidae(3), Miridae(4), Alydidae(1), Scutelleridae(1) Rhopalidae(1), Coreidae(1), Lygaeidae(3)
Homoptera	Aphididae(5), Cicadellidae(5), Delphacidae(1), Psyllidae(2)
Hymenoptera	Anthophoridae(1), Braconidae(3), Formicidae(7) Halictidae(2), Ichneumonidae(4), Megachilidae(2)
Isoptera	Hodotermitidae(1)
Orthoptera	Acrididae(1), Tettigonidae(1)
Thysanoptera	Phaeothripidae(1)

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Coleoptera	Coccinellidae(6), Curculionidae(4), Nitidulidae(1), Dermestidae(1), Tenebrionidae(1), Meloidae(2), Alleculidae(1), Staphylinidae(2) Contharidae(2), Bruchidae(1), Chrysomelidae(3)
Collembola	Sminthuridae(1)
Diptera	Phoridae(1), Rhinophoridae(1), Scatopsidae(1), Coelophidae(1) Empididae(2), Therevidae(1) Chironomidae(1), Anthomyiidae(2), Syrphidae(3) Chloropidae(1), Muscidae(1), Tephritidae(3), Simuliidae(1)
Heteroptera	Pentatomidae(2), Scutelleridae(2), Lygaeidae(4) Anthocoridae(2), Rhopalidae(3) Reduviidae(2), Tingidae(1), Miridae(5)
Homoptera	Psyllidae(5), Cicadellidae(2), Aphididae(2)
Hymenoptera	Braconidae(1), Halictidae(1), Formicidae(5)
Mesostigmata	Laelapidae(1)
Neuroptera	Chrysopidae(1)
Orthoptera	Acrididae(3), Tettigonidae(1)
Thysanoptera	Aeolothripidae(1), Phaeothripidae(1)

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/ b	/ b
/ b	/ b

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(2003) Gahanbin Koocheki .

(Giller *et al.*, 1997)

*Eremurus sp.*

Yibing et al., 2007; Xueqin et al., )

(2003

*Eremurus sp.*

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## Evaluation of Structural Biodiversity in Natural Systems of Arid and Semi-arid Regions: Plants and Arthropods

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### Abstract

Plants and arthropods are the main elements of biodiversity in ecosystems. In order to evaluate structural biodiversity of plants and arthropods in natural systems of arid land, a study was carried out in Shirvan, Mashhad and Gonabad, three regions of Razavi and Northern Khorasan provinces, Iran. In each region, 10 areas of natural systems selected and sampling was done in these selected areas. Plant sampling performed by quadrates and arthropod sampling was done by sweep net. Species richness of plants in natural systems of Mashhad and Gonabad was greater than Shirvan. In the same time, species richness and abundance of insects in the natural system of Shirvan were greater than two other systems. Furthermore, species richness and abundance of spiders in the natural system of Shirvan were greater than two other systems. Results showed that biodiversity of plants and arthropods were affected by increasing of mean annual temperature and decreasing of mean annual precipitation.

**Keywords:** Biodiversity, Plants diversity, Insect's diversity, Spider's diversity, Ephemerals, Khorasan