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(*Buxus hyrcana* Pojark.)

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Hypericum Pteris cretica L.

Atropa belladonna L. *Athyrium flix-femina* (L.) Roth *Carex sylvatica* L. *Rubus hyrcanus* Woron. *androsaemum*

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Diospyrus lotus L.

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(Esmailzadeh et al., 2011 b)
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(Esmailzadeh et al., 2011 a)
Grime and Thompson (1979)
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(Levin, 1990)
(Thompson, 2000)
(Thompson et al., 1997)
(Esmailzadeh et al., 2010 a)
(Stark et al., 2008)
(Buxus hyrcana Pojark)
(Jalili & Jamzad, 1999)
(Bakker et al., 1996)
(Bakker, 1989; Baskin & Baskin, 1998)
(Thompson & Grime, 1979)
(Baskin & Baskin, 1998)
al., 2008)

² Transient
³ Persistent

¹ Soil seed bank

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(Bossuyt & Honnay,
et al., Yan et al. (2009) .2008)
(2009) Chaideftou (2009)

(Anonymous,
.1998)

Jalili et al.,
Esmailzadeh et al., (2010 b) (2003)

.(Barbour et al., 1987)

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(Barnes, 1998) (

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(Baskin

.& Baskin, 1998)

(Leckie et al., 2000)

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(Godefroid et al., 2006)

(Augusto et al., 2001)

(Leckie et al., 2000)

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(Esmailzadeh et al., 2010 b)

(Fourie, 2008)

(Esmailzadeh et al., 2011

(Baskin &

b.)

.Baskin, 1998)

(Baskin & Baskin, 1998)

¹ Seedling emergence method

(Diaz-Villa et al., 2003)

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(Raunkaier, 1934)

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(Greig-Smith, 1983)

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Carex sylvatica (*Rubus hyrcanus* Woron.)

(*Athyrium flix-femina* (L.) Roth) L.

Atropa belladonna L.

(*Diospyrus lotus* L.)

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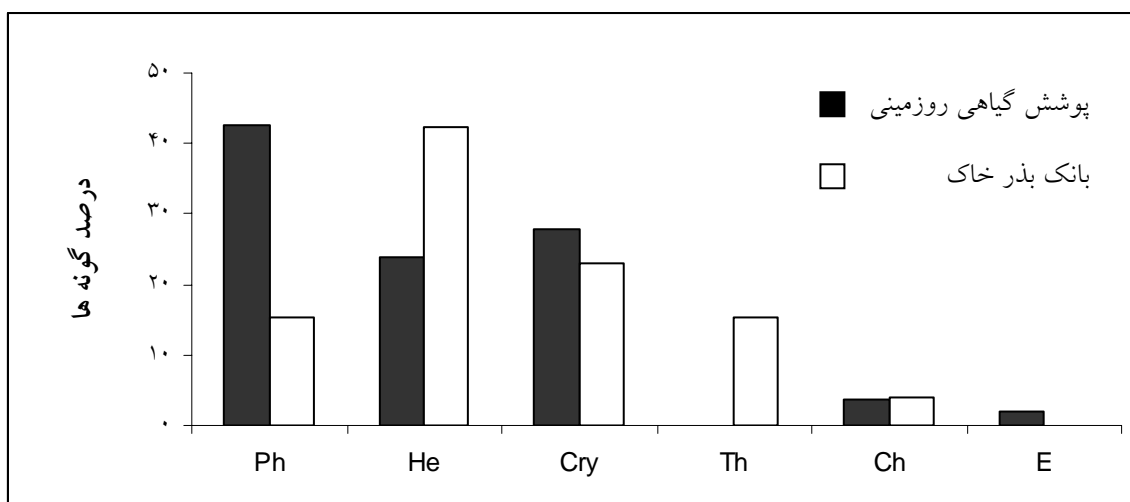
:

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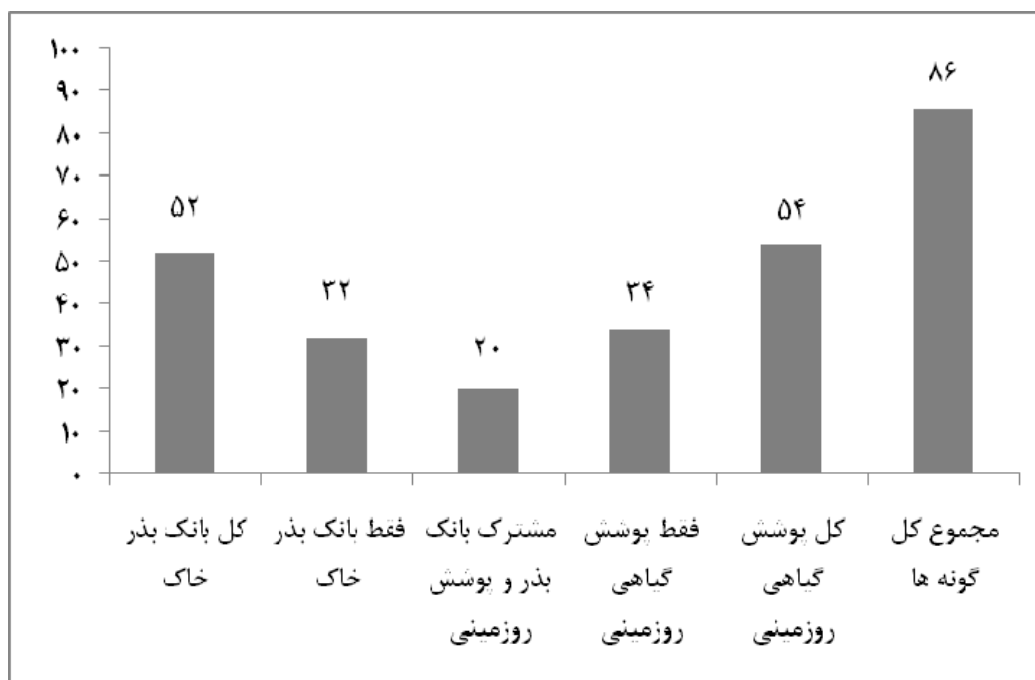
¹ Jaccard Similarity Index

		()
Adiantaceae			
<i>Adiantum capillus-veneris</i> L.	He	/	
Asteraceae			
<i>Conyza canadensis</i> (L.) Cronq.	Th	/	/
<i>Circaea lutetiana</i> L.	He	/	/
<i>Artemisia annua</i> L.	Th	/	/
<i>Sigesbeckia orientalis</i> L.	Th	/	/
<i>Willemetia tuberosa</i>		/	/
Athyriaceae			
<i>Athyrium flix-femina</i> (L.) Roth.	Cry	/	/
Betulaceae			
<i>Alnus subcordata</i> C. A. Mey.	Ph	/	/
Boraginaceae			
<i>Lithospermum officinale</i> L.	He	/	/
Caprifoliaceae			
<i>Sambucus ebulus</i> L.	Cry	/	/
Cruciferae			
<i>Capsella bursa-pastoris</i> (L.) Medicus	Th	/	/
<i>Cardamine impatiens</i> L.	He		/
<i>Cardamine hirsuta</i> L.	Th	/	/
Cyperaceae			
<i>Carex riparia</i> Curtis	Cry	/	/
<i>Carex sylvatica</i> L.	Cry	/	/
<i>Carex</i> sp.	Cry	/	/
Ebenaceae			
<i>Diospyrus lotus</i> L.	Ph		/
Ephorbiaceae			
<i>Euphorbia amygdaloides</i> L.	He		/
Equisetaceae			
<i>Equisetum maximum</i> Lam.	Cry	/	/
Mimosaceae			
<i>Albizia julibrissin</i> Durraz.	Ph	/	/
Moraceae			
<i>Ficus carica</i> L.	Ph	/	/
<i>Morus alba</i> L.	Ph	/	/
Poaceae			
<i>Poa bulbosa</i> L.	Cry	/	/
<i>Brachypodium pinnatum</i> (L.) P. Beauv.	He	/	/
<i>Oplismenus undulatifolius</i> (Ard.) P. Beauv.	He	/	/
Hypericaceae			
<i>Hypericum androsaemum</i> L.	Ch		/
<i>Hypericum perforatum</i> L.	He		/
Juncaceae			
<i>Juncus</i> sp.	Cry	/	/

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Lamiaceae				
<i>Clinopodium umbrosum</i> C. Koch	He	/	/	
<i>Lamium album</i> L.	He	/	/	
<i>Lycopus europaeus</i> L.	He	/	/	
<i>Mentha aquatica</i> L.	He		/	
Phytolaccaceae				
<i>Phytolacca americana</i> L.	He	/	/	
Polygonaceae				
<i>Rumex acetosella</i> L.	He	/	/	
Portulacaceae				
<i>Portulaca oleracea</i> L.	Th	/	/	
Primulaceae				
<i>Cyclamen coum</i> Miller	Cry	/	/	
<i>Primula heterochroma</i> Stapf	He	/	/	
Pteridaceae				
<i>Pteris cretica</i> L.	Cry			
<i>Pteridium aquilinum</i> (L.) Kuhn.	Cry		/	
Rosaceae				
<i>Rubus hyrcanus</i> Woron.	Ph		/	
Scrophulariaceae				
<i>Digitalis nervosa</i> Steud. & Hochst. ex	Th	/	/	
<i>Scrophularia vernalis</i> L.	He	/	/	
Solanaceae				
<i>Atropa belladonna</i> L.	He	/	/	
<i>Solanum kieseritzkii</i> C. A. Mey.	Ch	/	/	
<i>Solanum nigrum</i> L.	Th		/	
Typhaceae				
<i>Typha latifolia</i> L.	Cry	/	/	
Ulmaceae				
<i>Ulmus glabra</i> Hudson	Ph	/	/	
Urticaceae				
<i>Urtica dioica</i> L.	He	/	/	
Verbenaceae				
<i>Verbena officinalis</i> L.	He	/	/	
Violaceae				
<i>Viola alba</i> L.	He	/	/	
Vitaceae				
<i>Vitis sylvestris</i> Gmelin	Ph	/	/	
(=Th =He =Cry =Ch =Ph)				



(=E =Th =He =Cry =Ch =Ph)



<i>Adiantum capillus-veneris</i> L.	<i>Alnus subcordata</i> C. A. May.	<i>Acer cappadocicum</i> Gled.
<i>Albizzia julibrissin</i> Durraz.	<i>Athyrium flix-femina</i> (L.) Roth.	<i>Acer velutinum</i> Boiss.
<i>Anonymous</i>	<i>Brachypodium pinnatum</i> (L.) P.	<i>Asplenium adiantum-nigrum</i>
<i>Artemisia annua</i> L.	<i>Cardamine impatiens</i> L.	<i>Buxus hyrcana</i> Pojark.
<i>Atropa belladonna</i> L.	<i>Carex riparia</i> Curtis	<i>Carex remota</i> L.
<i>Capsella bursa-pastoris</i> (L.) Medicus	<i>Carex sylvatica</i> L.	<i>Carex pendula</i> Huds.
<i>Cardamine</i> sp.	<i>Circaea lutetiana</i> L.	<i>Carpinus betulus</i> L.
<i>Carex</i> sp.	<i>Diospyrus lotus</i> L.	<i>Cephalanthera caucasica</i>
<i>Clinopodium umbrosum</i> C. Koch	<i>Equisetum maximum</i> Lam.	<i>Cerasus avium</i> (L.) Moench
<i>Conyza Canadensis</i> (L.) Cronq.	<i>Euphorbia amygdaloides</i> L.	<i>Crataegus microphylla</i> C.
<i>Cyclamen coum</i> Miller	<i>Ficus carica</i> L.	<i>Danae racemosa</i> (L.) Moench
<i>Digitalis nervosa</i> Steud. & Hochst. ex	<i>Hypericum androsaemum</i> L.	<i>Dryopetris borrieri</i> Newm.
<i>Hypericum perforatum</i> L.	<i>Lamium album</i> L.	<i>Dryopetris dilatata</i> (Hoffm.) A. Grav
<i>Juncus</i> sp.	<i>Oplismenus undolatifolius</i> (Ard.) P. Beauv.	<i>Epipactis helleborine</i> (L.) Crantz
<i>Lithospermum officinale</i> L.	<i>Primula heterochroma</i> Stapf.	<i>Evonymus latifolia</i> (L.) Mill.
<i>Lycopus europaeus</i> L.	<i>Pteris cretica</i> L.	<i>Fagus orientalis</i> Lipsky
<i>Mentha aquatica</i> L.	<i>Rubus hyrcanus</i> Woron.	<i>Frangula alnus</i> Miller
<i>Morus alba</i> L.	<i>Solanum kieseritzkii</i> C. A. May.	<i>Fragaria vesca</i> L.
<i>Poa bulbosa</i> L.	<i>Ulmus glabra</i> Hudson	<i>Galium oduratum</i> (L.). Scop.
<i>Phytolacca Americana</i> L.	<i>Viola alba</i> L.	<i>Hedera pastuchovii</i> Woron. Ex Grossh.
<i>Portulaca oleracea</i> L.		<i>Ilex spinigera</i> (Loes) Loes
<i>Pteridium aquilinum</i> (L.) Kuhn.		<i>Laurocerasus officinalis</i>
<i>Rumex acetosella</i> L.		<i>Mespilus germanica</i> L.
<i>Sambucus ebulus</i> L.		<i>Parotia persica</i> (DC.) C. A.
<i>Scrophularia vernalis</i> L.		<i>Petasites hybridus</i> (L.) P.
<i>Sigesbeckia orientalis</i> L.		<i>Polypodium vulgare</i> L.
<i>Solanum nigrum</i> L.		<i>Polystichum aculeatum</i> (L.)
<i>Typha latifolia</i> L.		<i>Polystichum woronowii</i>
<i>Urtica dioica</i> L.		<i>Quercus qastaneaefolia</i> C. A.
<i>Verbena officinalis</i> L.		<i>Ruscus hyrcanus</i> Woron.
<i>Vitis sylvestris</i> Gmelin		<i>Sanicula europaea</i>
<i>Wilmetica tuberosa</i>		<i>Solidago virga-aurea</i> L.
		<i>Tamus communis</i> L.
		<i>Tilia platyphyllos</i> Scop.

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Conyza *Atropa belladonna* *Carex sylvatica*
(2010 Esmailzadeh et al., *canadensis*

b)

(*Carex* sp.) (*Rubus spp*)

(Kostel- Hughes et al., 1998;

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Onaaindia & Amezaga, 2000; Bossuyt & Hermy,
2001; Diaz- Villa et al., 2003; Amrein et al., 2005;
Roovers et al., 2006; Zobel et al., 2007 and
.Chaideftou et al., 2009)

Jalili et al., (2003)

Esmailzadeh et al., (2011 b)

Esmailzadeh et al., (2010 b)

Bossuyt et al., (2002)

Rovers et al., (2006) Diaz-villa et al., (2003)

l) (*Rubus hyrcanus*)

l) (*Hypericum androsaemum*) (

Carex sylvatica (l) *Atropa belladonna* (

(l) *Conyza canadensis* (l)

Portulaca oleracea (l) (*Diospyrus lotus* L.)

(l)

() (*Pteris cretica*)

(l) (*Athyrium flix- femina*)

	(m ²)	(Cm)	(Cm ³)
Ashton <i>et al.</i> , 1998			
Halpern <i>et al.</i> , 1999			
Leckie <i>et al.</i> , 2000			
Bossuyt <i>et al.</i> , 2002			(<i>F. sylvatica</i>) (<i>Q. robur</i>)
Diaz- villa <i>et al.</i> , 2003			(<i>Q. canariensis</i>)
Diaz- villa <i>et al.</i> , 2003			(<i>Q. suber</i>)
Jalili <i>et al.</i> , 2003			
Arriaga and Mercado, 2004			
Amrein <i>et al.</i> , 2005			(<i>F. sylvatica</i>) Basel
Godefroid <i>et al.</i> , 2006			
Roovers <i>et al.</i> , 2006			(<i>Q. robur</i>) (<i>F. sylvatica</i>)
Zobel <i>et al.</i> , 2007			
Allen and Nowak, 2008			(<i>P. monophylla</i>) (<i>J. osteosperma</i>)
Esmailzadeh <i>et al.</i> , 2011			(<i>F. orientalis</i>) ()

(Esmailzadeh et

.al., 2011 b)
Esmailzadeh et al., (2010 b)

(Gaps)

(Sabeti,

.1994)

(Bossuyt

.& Hermy, 2003)
Esmailzadeh et al., (2010 b)
Chaideftou et al., (2009)
Allen & Nowak (2008)
et al., (2007)

et al.,

Pozas

Roovers (2006)

Esmailzadeh et al., (2010 b)

(/)

(Augusto et al., 2001; Bossuyt et al., 2002; Diaz-
. Villa et al., 2003 & Amrein et al., 2005)

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) ((Esmailzadeh et al., 2011 b) (

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Persistent soil seed bank in *Khybus* protected area

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Abstract

The objective of this study was to determine the floristic composition of the persistent soil seed bank and comparison of its seed bank composition with its above- ground vegetations in *Khybus* protected forest that is one of the best and most virgin Habitats of Box trees in *Hyrceanian* forest. The study of ground vegetation was carried out with releve method and the soil seed bank was estimated using the seedling emergence method. For this purpose 64 releves with 400 m² area were made by systematic- selective method and considering indicator stand concept. For sampling of soil seed bank within each releve, two soil samples were randomly collected by hammering a 20 cm × 20 cm square (400 cm²) hollow metal frame into the soil to a depth of 10 cm. 52 species with mean of 3880 seeds per m² emerged from soil seed banks. *Pteris cretica* L., *Hypericum androsaemum*, *Rubus hyrcanus* Woron., *Carex sylvatica* L., *Rubus hyrcanus* Woron, *Athyrium flix- femina* (L.) Roth, *Atropa belladonna* L. and *Diospyrus lotus* L. with the mean density of 3132, 213, 154, 125.4, 98.5, 34.4 and 17 seeds per m² were exhibited as the most abundant taxa respectively. Forbs, with the possession of the 64 percent seed bank flora, were the most numerous growth forms in soil seed bank. The comparison of seed bank and above vegetation revealed that the similarity between soil seed bank and vegetation is low. Finally, we are concluded that persistence soil seed bank of the study area like other areas, is not capable of restoring the ground vegetation of plant communities.

Keyword: Persistent soil seed bank, above ground vegetation, species similarity, Box tree (*Buxus hyrcanus* Pojark), *Khybus* protected area, *Hyrceanian* forests