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## Ecological and geological determination of trees and shrubs' dispersal on the devastated lands at Kryvorizhya

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**Abstract.** Ecological and geological conditionality for trees and shrubs' dispersal species in devastated lands at Kryvyi Rih Basin (Central Ukraine) was studied. All kinds of devastated lands (the band's side of ore quarries, heap of rocks, dumps, abandoned industrial sites, cavalier, slag heaps, tailings, collapse zones) were investigated. The taxonomic structure of species, their distribution by geographic characteristics, biomorphic and ecomorphic spectra were analyzed. The probability of distribution of trees and shrubs was determined by the values Spearman rank correlations. In the devastated lands at Kryvyi Rih Basin, 55 species of trees and shrubs from 33 genera, 18 families and 1 angiosperm are naturally growing. Mediating to the level of moisture and soil fertility, light-loving, introduced species are the most common. The distribution of trees and shrubs on the devastated lands is affected by: the diversity of the ecological conditions of such lands, the duration of vegetation formation and the amount of precipitation. It has been established that the territories of the devastated lands at Kryvyi Rih Basin, containing both loose and rocky rocks, are the most promising for the creation of woody and shrub plantings without preliminary application of a layer of fertile soil. The diversity of ecological conditions of the devastated lands, the duration of the formation of vegetation in these areas increase the number of taxa of shrubs and of the proportion of aboriginal

species reduce. Mesodepression and microdepression, the lower part of the slope, as well as the part of the banquettes, directly adjacent to the slope, are the most promising places where it is advisable to begin the creation the trees and shrubs plantations. Perspective species of trees and shrubs for phytoreclamation of the devastated lands at Kryvyi Rih Basin and other industrial regions were recommended. Species of shrubs are appropriate to be used for phytoreclamation of land located in the central steppe zone. Species of trees and shrubs to create plantations on devastated lands, one must also take into account of their uncontrolled use as a sours of food and medical raw materials.

*Keywords: devastated land, wood & shrub species, phytoreclamation, Kryvyi Rih Basin*

(Mazur et al., 2015; Sherstyuk, 2017; Smetana, ihajlenko &. Jaroschuk, 2009; Yarkov & Paranko 2013) (Malaxov, 2003; Malahov, 2009).

(Dobrovolskiy, 1980; Davyidov, Dobrovolskiy & Mihaylov, 1971; Mazur & Smetana, 1999; Uberman & Ostr ga, 2012; Sheoran, Sheoran & Poonia, 2010; Yarkov & Paranko, 2013)

(Lykholat et al., 2016<sup>c</sup>; Yermishev et al., 2017). 70–80- (Tereschenko, 1992),

1,2–1,5 250 30 (Kolopats, 2016; Uzbek, 2015; Malahov, 2009).

2005 (Korshikov et al., 2008; Korshikov & Krasnoshtan, 2009; Korshikov, Krasnoshtan & Pasternak, 2012).

60- (Savosko & Alekseeva, 2007).

(Pluhina, Chaika & Chupryna, 1981; Mazur & Smetana, 1999; Smetana, ihajlenko & Jaroschuk, 2009).

2006–2017

1) 2

«

7, 10, » ( ); 2) 1, 4, 5, « » (Matveev, 2003; Tarasov, 2005).

» ( ); 3) (Lakin, 1990). P 0,05

» ( ), 4) / 55

33 18 (Magnoliophyta).

» ( ); 5) (Rosaceae Juss.) – 16

1, 2, 3, / 8 (Salicaceae Mirb.) – 9 2

» ( « »); (Aceraceae Juss.) – 7

6) – 4 4 (Oleaceae Hoffmanns. & Link.)

» ( (Acer L.) – 6

(Populus L.) – 5 (Ulmus L.) – 3

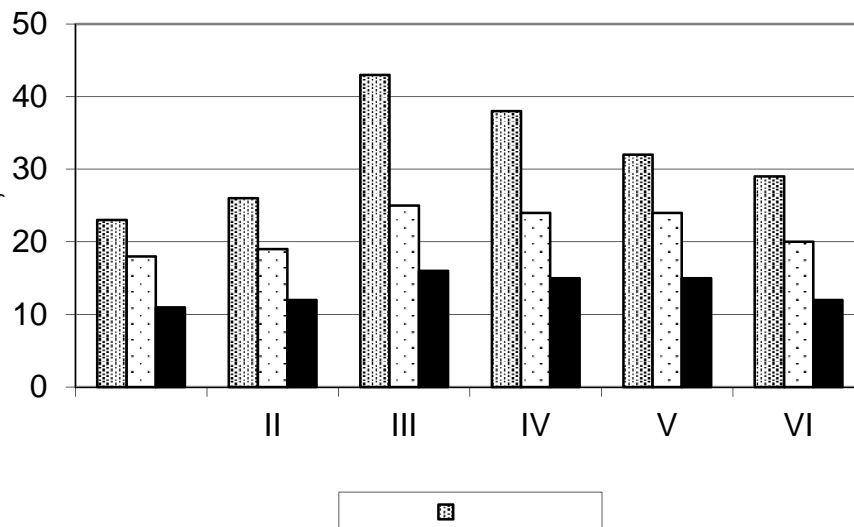
(Dobrochaeva, Kotov & Prokudin, 1987). , 43 38

(Czerepanov, 1995). « » , 32 29

(The International Plant Names Index, 2017).

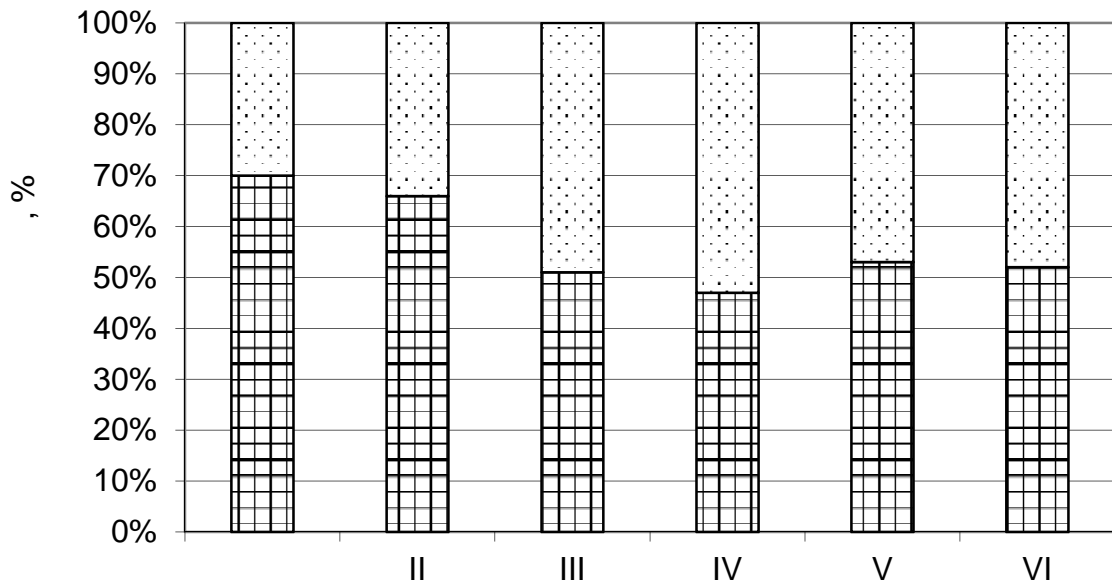
– 23 , 26

(Taktadzan, 1978), (Serebrjakov, 1962), (Bellegard, 1950),



1. I – , II – « », VI – , III – , IV – , V –

23 ( 45,5 % ) -  
 , 15 (27,3 %) -  
 , 6 (10,9 %) - 9  
 (16,4 %) - (Tarasov, 2005)  
 (Kucherevsky, 2004).  
 (Acer g do L.), (Cotinus coggygia Scop.),  
 (Juglans regia L.), (Lonicera tatarica L.),  
 (Prunus mahaleb L.), - 47-51 %  
 (Robinia pseudoacacia L.), «  
 (Rosa canina L.), »  
 (Swida sanguinea L.), (Ulmus minor Mill.). - 52-53 %  
 - 65-70 %.



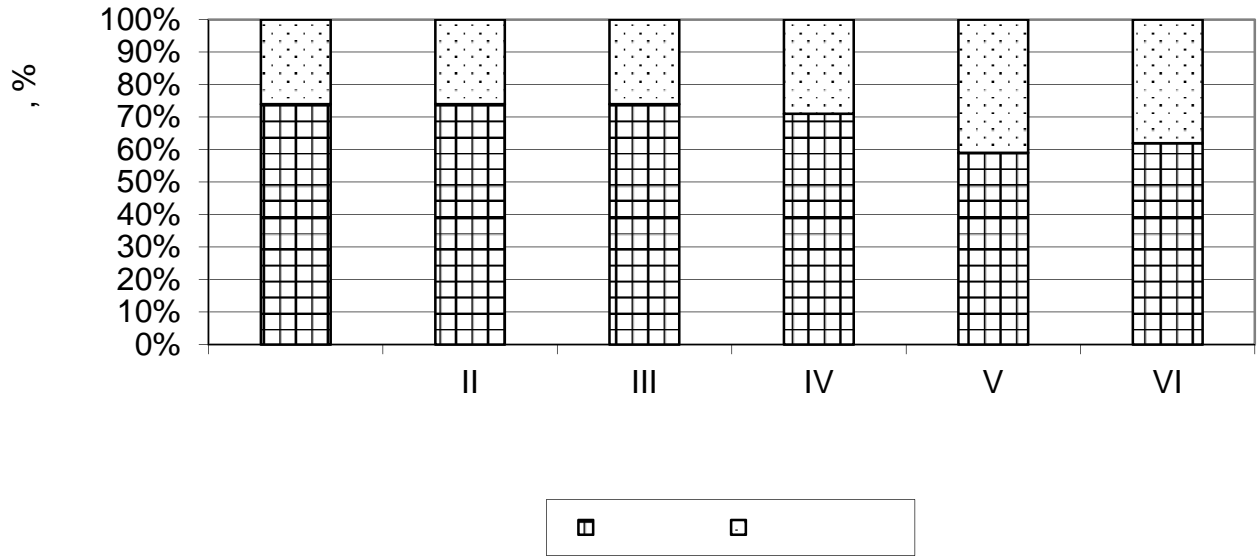
.2.  
 : I - , II -  
 III - , IV -  
 V - « », VI -  
 (Taktadžan, 1978)  
 ( .1). 22

(40,7 % ) - (31,5 %)  
 , - , 12 (22,2 %) - 2  
 , , (3,7 %) - .  
 17 - , , -

1.

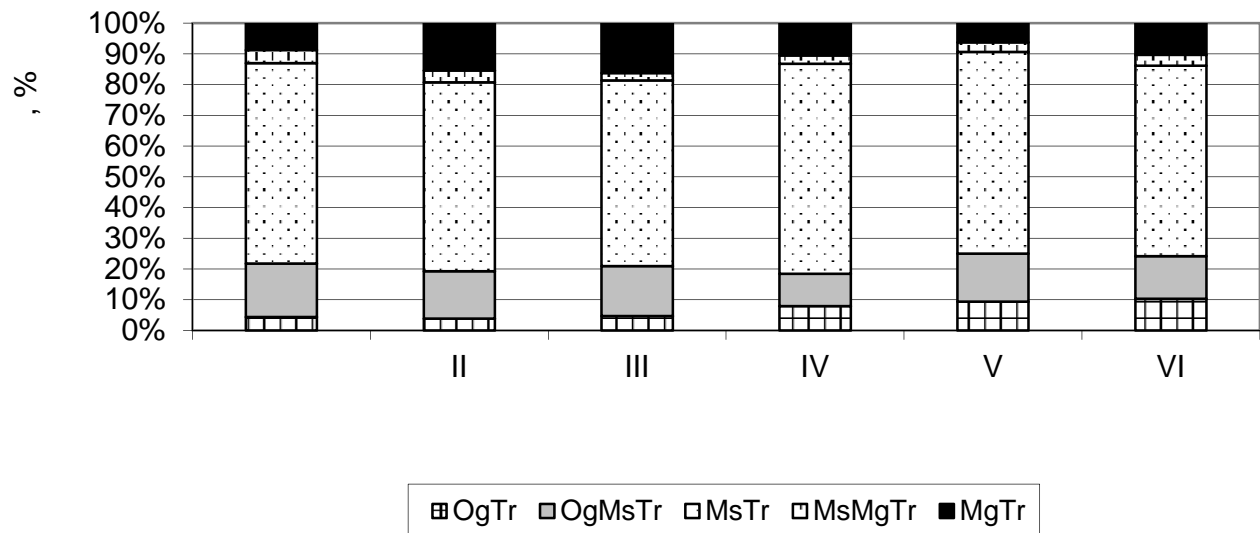
									« »			
	.	%	.	%	.	%	.	%	.	%	.	%
	4	17,4	5	19,2	7	16,7	4	10,5	4	12,5	5	17,2
	2	8,7	2	7,7	5	11,9	4	10,5	4	12,5	4	13,8
-	3	13,0	3	11,5	3	7,1	4	10,5	3	9,4	3	10,3
	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
	0	0,0	0	0,0	1	2,4	0	0,0	0	0,0	0	0,0
	0	0,0	1	3,9	3	7,1	3	7,9	2	6,3	1	3,5
-	4	17,4	5	19,2	7	16,7	4	10,5	4	12,5	5	17,2
	2	8,70	2	7,7	5	11,9	4	10,5	4	12,5	4	13,8
-	1	4,4	3	11,5	6	14,3	5	13,2	7	21,9	5	17,2
-	3	13,0	2	7,7	5	11,9	5	13,2	3	9,4	3	10,3
- -	0	0,0	0,0	0,0	0	0,0	1	2,6	0	0,0	0	0,0
-	1	4,4	1	3,9	0	0,0	1	2,6	0	0,0	0	0,0
-	8	34,8	8	30,2	10	23,3	9	23,7	8	25,0	7	24,1
, -	1	4,4	1	3,9	2	1,3	2	5,3	0	0,0	0	0,0

- 11 . (20,37 %). -  
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 - , 5  
 (17,24 %), 4 (13,79 %) 3 (10,34 %). -  
 , -  
 , ( . 3). , -  
 - 70,9 % ( ), -  
 , 3 - 29,1 %.  
 (13,04 %) 1 (4,35 %).  
 - 1,85-2,63 %.  
 - 74 %.  
 - 71-74 %.  
 - « » , ,  
 - 59-63 %



3.

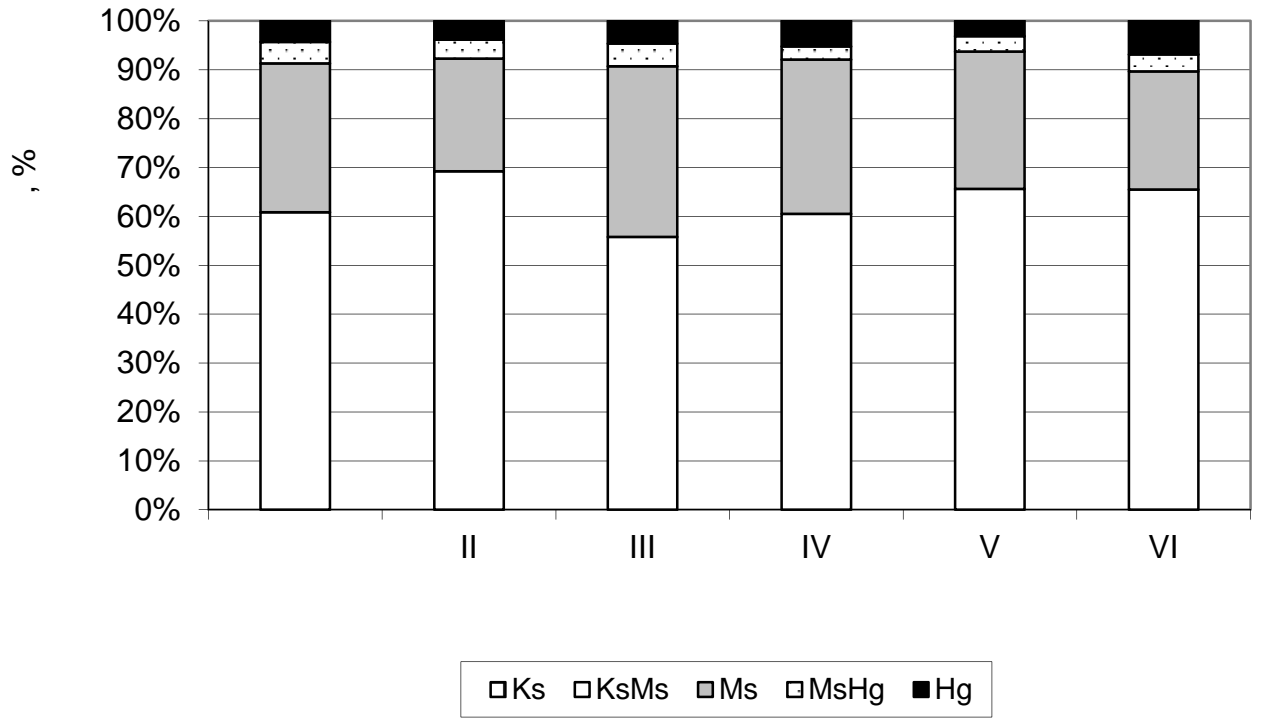
I – , II – , III – , IV – , V – « », VI – , ( . 4): ( 8 – 14,6 %), ( 4 – 7,3 %), ( 8 – 14,6 %).



4.

I – , II – , III – , IV – « », VI – ,

( 3,7 % ) ,  
 - ,  
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 ( .5) ,  
 ( - 3,64 % , 55 ,  
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 ( , 62,9 % 28,7 % ( - ( -  
 ), ) ).



.5.  
 : I - , - , II - ,  
 III - , IV - « » , VI - ,  
 V - ,  
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 - ,  
 - ,  
 ( .5) . ( ) - 33 , 60,0 %  
 ( .6) , 2,2  
 , 55,8 % ( ( (15 - 27,3 %), (7 - 12,7 %).  
 ) 69,2 % ( - ) 4,7  
 - , 55 ,  
 23,1 % ( - ,  
 ) 34,9 % ( - ,  
 , ) .





2.

		0,343*	-0,429*	0,686**	0,971***
		0,257	-0,229	0,600**	0,943***
		0,286	-0,371*	0,457*	0,857***
		-0,343*	0,429*	-0,686**	-0,914***
		0,286	-0,600**	-0,229	0,171
		0,514**	-0,257	0,343*	-0,229
		0,114	0,200	-0,400*	-0,286
		-0,229	0,029	-0,629**	0,286

«\*» – P < 0,01; «\*\*\*» – P < 0,001.

P < 0,05; «\*\*» –

(.2) – 18

(32).

10

(r<sup>2</sup> > 0),

(r<sup>2</sup> < 0).

(0,7 < r<sup>2</sup> < 0,9)

(Dobrovolskiy & Shanda, 1982; Mazur et al., 2015; Savosko, 2010; Savosko, Nevyadomsky &



	( <i>Prunus mahaleb</i> L.),	-
	( <i>Elaeagnus angustifolia</i> L.),	-
	( <i>Robinia pseudoacacia</i> L.),	-
	( <i>Robinia viscosa</i> Vent.),	-
	( <i>Pinus sylvestris</i> L.),	-
	( <i>Pinus pallasiana</i> D.),	( <i>Rhus</i>
	<i>t phina</i> L.),	( <i>Populus alba</i> L.),
	( <i>Populus deltoides</i> Marsch.),	-
	( <i>Populus italica</i> (Du	-
	Roi) Moench),	( <i>Fraxinus excelsior</i>
	L.).	:
	( <i>Ligustrum vulgare</i> L.),	( <i>Syringa</i>
	<i>vulgaris</i> L.),	( <i>Amorpha fruticosa</i>
	L.),	( <i>Crataegus ucrainica</i>
	Pojark.),	( <i>Sambucus nigra</i> L.),
	( <i>Hippophae rhamnoides</i> L.),	-
	( <i>Lonicera tatarica</i> L.),	-
	( <i>Caragana</i>	-
	<i>arborescens</i> Lam.),	( <i>Swida</i>
	<i>sanguinea</i> L.),	( <i>Cotinus</i>
	<i>coggyria</i> Scop.),	( <i>Rosa</i>
	<i>canina</i> L.).	-
	-	-
	(Savosko & Alekseeva, 2007;	-
Savosko, 2011),	-	-
:	-	-
(Davyidov Dobrovolskiy &	-	-
Mihaylov, 1971; Dobrovolskiy, 1980),	-	-
(Mazur &	( <i>Armeniaca vulgar s</i> )	( <i>Juglans</i>
Smetana, 1999; Mazur et al., 2015; Korshikov,	<i>regia</i> ).	-
Krasnoshtan & Pasternak, 2012),	( <i>Crataegus ucrainica</i> ),	( <i>Sambucus</i>
	<i>nigra</i> ),	( <i>Hippophae</i>
(Ale[eyeva et al., 1971; Lykholat et	<i>rhamnoides</i> ),	( <i>Rosa canina</i> ).
al., 2016 <sup>b</sup> ; Lykholat et al., 2016 <sup>a</sup> ; Travleyev, Belova	-	-
& Zverkovsky, 2005; Zverkovsky, 1997),	-	-
	-	-
(Bekarevich et al., 1971; Demidov et al., 2013),	-	-
	-	-
(Shapar, Skripnik & Bobyir,	-	-
2005)	-	-
(Brovko,	-	-
1988; Brovko & Brovko, 2011; Brovko & Brovko,	-	-
2012),	(Sheoran,	-
(Sheoran,	-	-
Sheoran & Poonia, 2010; Kowalska & Sobczyk,	-	-
2012; The Forestry Reclamation Approach, 2016)	-	-
	-	-
	-	-
	-	-
	-	-
	(	-
	-	-
	),	-
:	(	-
( <i>Armeniaca vulgar s</i>	(	-
Lam.),	( <i>Betula pendula</i> Roth),	5
( <i>Ulmus minor</i> Mill.),	),	-
( <i>Juglans regia</i> L.),	( <i>Quercus robur</i>	-
L.),	( <i>Quercus rubra</i> L.),	-
( <i>Acer g do</i> L.),	-	-

1. 55 33 18 ( 5 )

2. ( , )

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