THE EFFECT OF ORGANIC AND INORGANIC MULCHES ON THE WEED OF SEA BUCKTHORN

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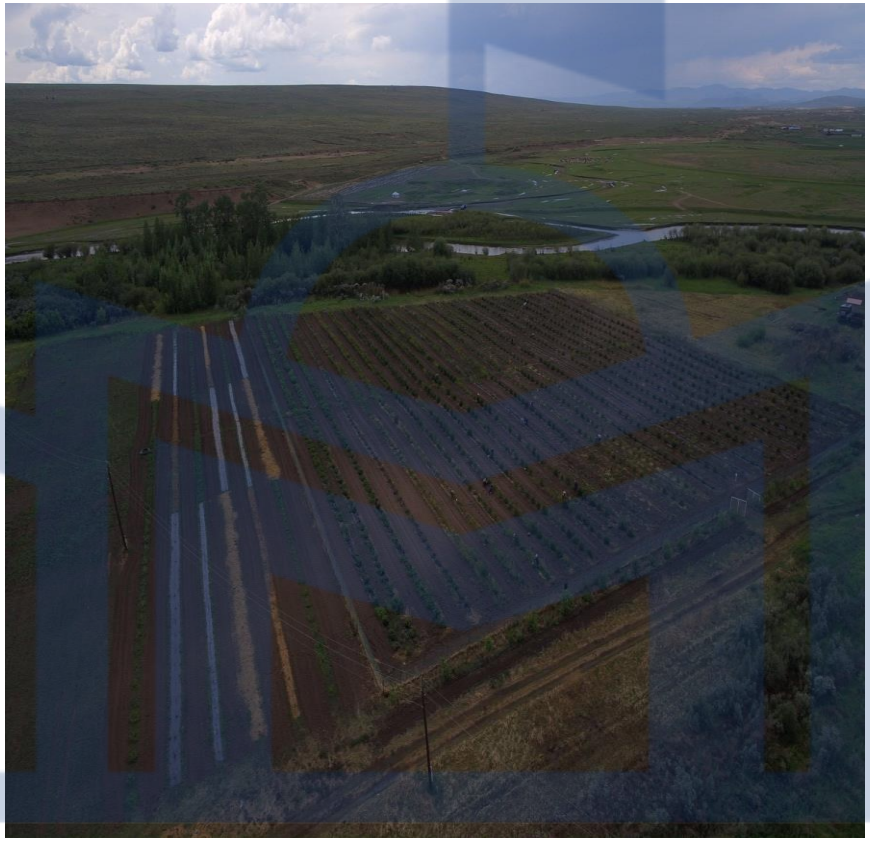
The following objectives are being set in order to study how organic and inorganic mulches affect the quantity and species composition of weeds in sea buckthorn fields. It includes:

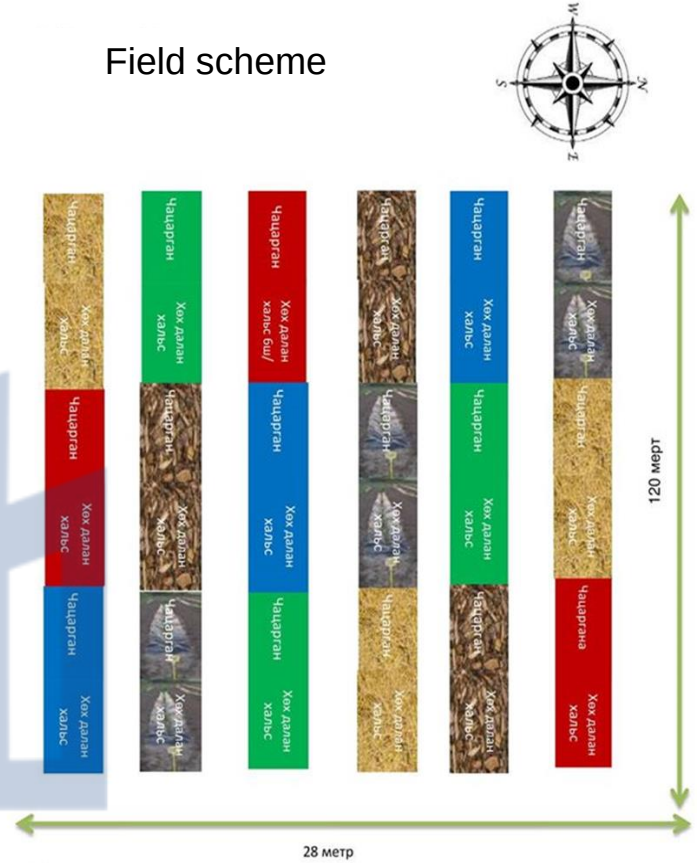
01 To determine in detail the distribution, density and species composition of weeds in sea buckthorn planted field.

02 Identify and compare weed seed bank in organic, inorganic mulched and non-mulched fields, and select mulch types to reduce weed seeds.

03 To determine the distribution, density, and species composition of weeds in mulched field and compare them with without mulch field. To choose a type of mulch that will limit weed growth.



Field scheme



We conducted this research at a sea bucktorn orchard (49°50[1] N, 105°881 [E]) at the field of experience Institute of Plant and Agricultural science, Darkhan-Uul province, between 2020-2023.

Experience version

Polyethylene	Woven fabric	Sawdust	Straw	Control-1	Control-2
(black)	(black)	(1 m wide and 10 cm thick)	(1 m wide and 10 cm thick)	Fight weed by hand	A field without weed control
					

MATERIALS AND METHODS

01 The distribution and density of weed population in plots were evaluated by using I.I.Liberstein and A.I.Tulikov's method for defining weed distribution.

02 Before processing between the rows, place a 0.25m2 frame on the field. Weeds in the frame were classified by biological species and technical results were calculated.

03 Weed density m2 was sampled randomly at four places with the help of one square meter and wet weed biomass m2 at harvest was recorded. The weed control efficiency (WCE) was calculated by using the formula (Kondap and Upadhyay, 1985).

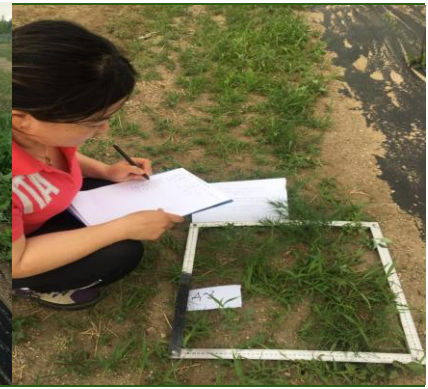
04 Weed seed bank in the soil were determined in the laboratory by taking mixed samples from the depths of 0-10 cm and 10-20 cm in spring and autumn for each version, and the total number of weed seeds was transferred to ha and expressed as millions (M.Z. Stankov, B. .A. Dospekhov, 1987).

05 Crop yield was calculated in c/ha.









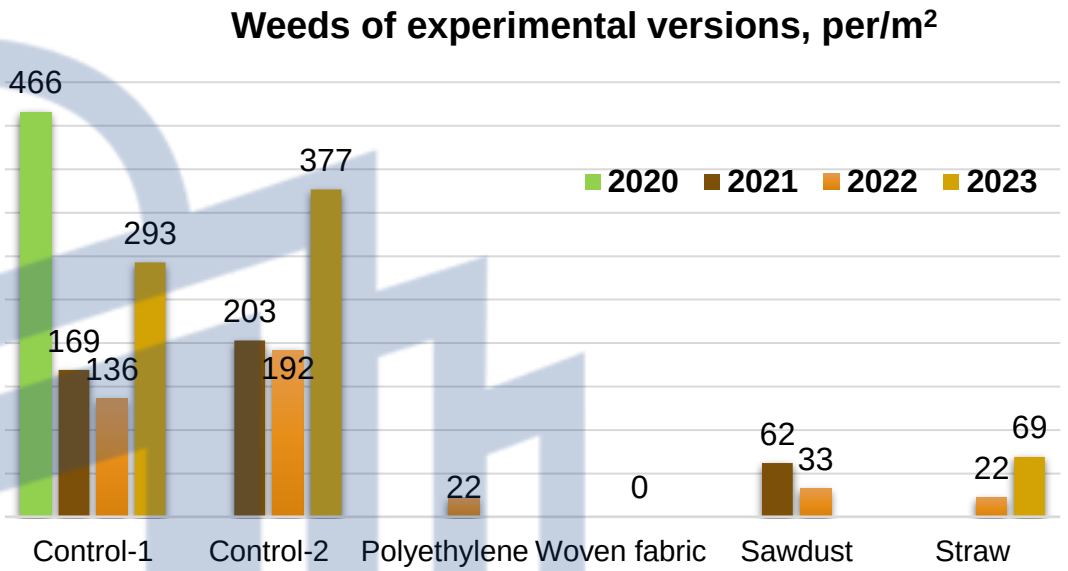
Research result

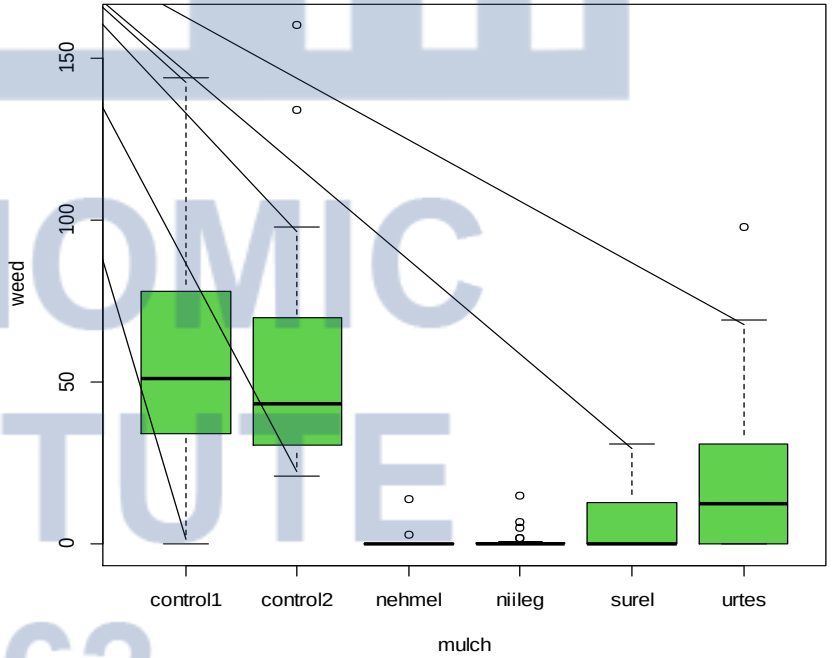
When determining the distribution and species composition of weeds spread during tillage before planting in the study area, 9 species of weeds from 6 families were noted, when considering weeds by biological group classification, annuals accounted for 42.9 %, biennials 5.0 %, and perennials 52.1 %. The number of weeds in the years studied varied greatly depending on the mulching types.

- ✓ In the woven fabric version, it was seen that the growth of weeds was completely limited by the absence of weeds at this time of the research years.
- ✓ The sawdust version had the highest weed growth than the other mulch versions.
- ✓ Compared to control-2, which did not fight weeds at all, the mulching versions had less litter by

141-203 per/m^2 in 2021,
159-192 per/m^2 in 2022,
308-377 per/m^2 in 2023 respectively.

- ✓ Statistic result were $P_{0.05}$ =1.99e-10***-3.93e-11***





R version 4.3.2, ANOVA

Судалгааны ажлын үр дүн

Зураг 1. Нэхмэл даавуун хучлага

Зураг 2. Нийлэг хальсан хучлага

Зураг 3. Сүрлэн хучлага

Зураг 4. Үртсэн хучлага

Weed species composition

Version	2020		2021		2022		2023	
	Family	Species	Family	Species	Family	Species	Family	Species
Control-1	6	9	4	6	6	8	2	3
Control-2			6	9	5	8	8	9
Sawdust			6	8	1	1	2	3
Straw			-	-	3	3	3	4
Polyethylene			-	-	1	1	-	-
Woven fabric			-	-	-	-	-	-

Classification of weeds in mulch versions by biological group

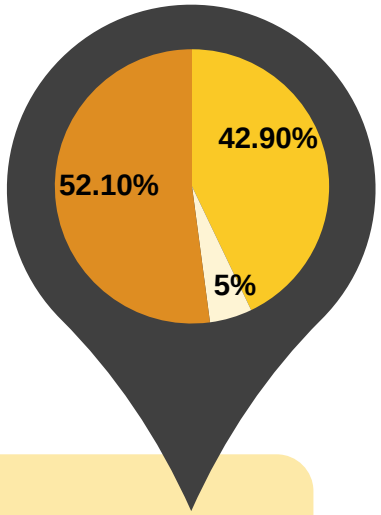
Annual
Biennial
Perennial

Annual
37.1 %

Biennial
100 %

Perennial
42.1 %

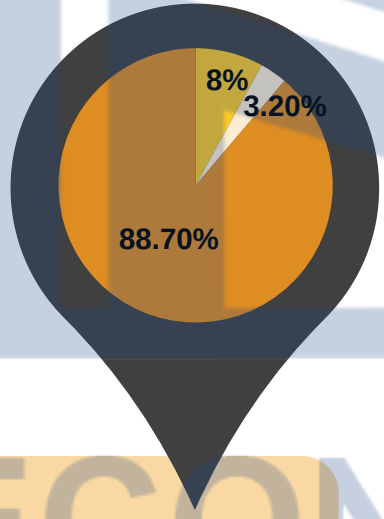
2020 он



- Annual-200 per/m²
- Biennial-24 per/m²
- Perennial-243 per/m²

Total-466 per/m²

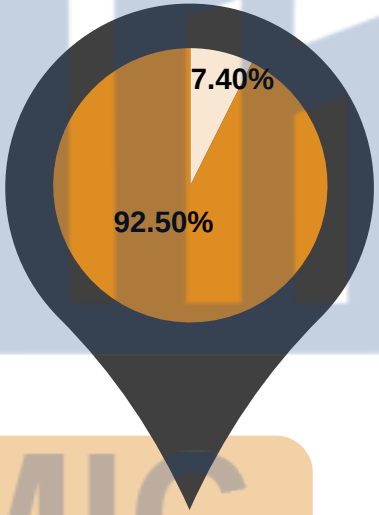
2021 он



- Annual -5 per/m²
- Biennial -2 per/m²
- Perennial -55 per/m²

Total-62 per/m²

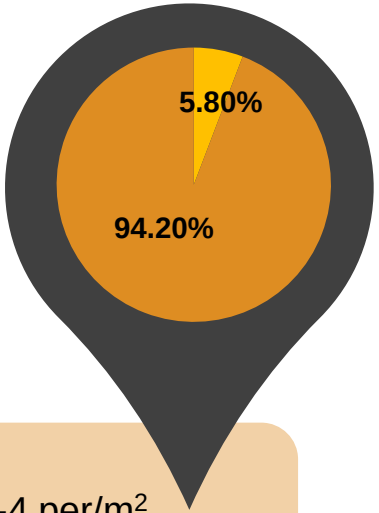
2022



- Annual -0 per/m²
- Biennial -2 per/m²
- Perennial -25 per/m²

Total-27 per/m²

2023



- Annual -4 per/m²
- Biennial -0
- Perennial -65 per/m²

Total- 69 per/m²

№	Version	Weed species composition		Biological group
		Mongolia	Latin	
2021				
1	Polyethylene	-	-	-
2	Woven fabric	-	-	-
3	Sawdust	Бага хургалж	Eragrostis minor	Annual
4		Царвант шарилж	Artemisia sieversiana Willd	Biennial
5		Степаны заан таваг	Erodium stephanianum	Biennial
6		Хөдөөгийн бираг	Thlaspi arvensis L	Perennial
7		Хиаг	Agropyrum repens	Perennial
8		Галуун гичгэнэ /мөлхөө/	Potentilla anserina L.	Perennial
9		Хөдөөгийн шаралзгана	Sonchus arvensis L	Perennial
10		Азаргана	Cirsium Arvense	Perennial
11	Straw	-	-	-
2022				
12	Polyethylene	Хиаг	Agropyrum repens	Perennial
15	Woven fabric	-	-	-
16	Sawdust	Хиаг	Agropyrum repens	Perennial
18	Straw	Царвант шарилж	Artemisia sieversiana Willd	Biennial
19		Хиаг	Agropyrum repens	Perennial
20		Степаны заан таваг	Erodium stephanianum	Biennial
2023				
24	Polyethylene	-	-	-
25	Woven fabric	-	-	-
26	Sawdust	Бага хургалж	Eragrostis minor	Annual
27		Хиаг	Agropyrum repens	Perennial
28		Азаргана	Cirsium Arvense	Perennial
29	Straw	Бага хургалж	Eragrostis minor	Annual
30		Софийн борбут	Descurainia sophia	Annual
31		Азаргана	Cirsium Arvense	Perennial
32		Хиаг	Agropyrum repens	Perennial

Weed species composition of mulched versions. (2020-2023)

In the vertions with polyethylene and woven fabric mulch, the weed species composition of the first year of the experiment was completely eliminated in 2023, the last year of the study. It restricts sunlight by using mulch and reduces weed growth by reducing aeration.

Weeds in the experimental field

Софийн борбут	*Descurainia sophia*

Хөдөөгийн бираг	*Thlaspi arvensis L*

Бага хургалж	*Eragrostis minor*

Цагаан лууль	*Chenopodium album*

Чөдөр тарна	*Polygonum convolvulus*

Урвуу гагадай	*Amaranthus refroflexus*

Бог будаа	*Panicum miliaceum*

Жамба цэцэг	*Malva mohileviensis*

Царвант шарилж	*Artemisia sieversiana*

Степаны заан таваг	*Erodium stephanianum*

Их таван салаа	*Plantago major*

Будан барбад	*leptopyrum fumariodes*

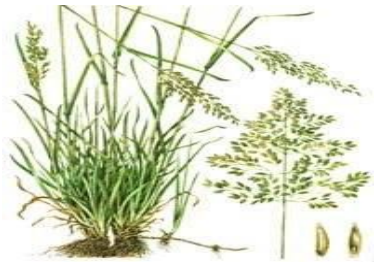
Хөдөөгийн шаралзгана	*Sonchus arvensis L*

Азаргана	*Cirsium Arvense*

Татаар зираа	*Lactuca tatarica*

Галуун гичгэнэ	*Potentilla anserina L.*

Мөлхөө хиаг	*Agropyrum repens*



Нугын биелэг	*Poa pratensis L.*

Weed growth in versions during the first tillage between rows of sea buckthorn trees, per/m²

Crop	version	Weed, per/m2				
		2020	2021	2022	2023	X
Between row		508	176	210	221	278
Sea buckthorn	Control-1	313	137	261	-	237
	Control-2	314	425	310	390	**359**
	Polyethylene	1	-	-	-	1
	Woven fabric	2	-	-	-	2
	Sawdust	32	85	156	240	128
	Straw	26	8	98	257	97

After identifying weeds, weeds were destroyed and leveled with a Kubota-50 tractor with a GQN-125 rotor. All inter-row weeds are 100% killed.

Эгэл ноцоргоно	***Xanthium strumarium L***

Дээврийн банга	***Crepis tectorum***

Ямаан шарилж	***Artemisia scoparia***

Үхэр тарна	***Poligonum divaricatum***

Бударгана	***Salsola collina Pall***

Тогторгоно	**Kochia scoparia**

Weed growth in versions during the first tillage between rows of sea buckthorn trees, per/m²

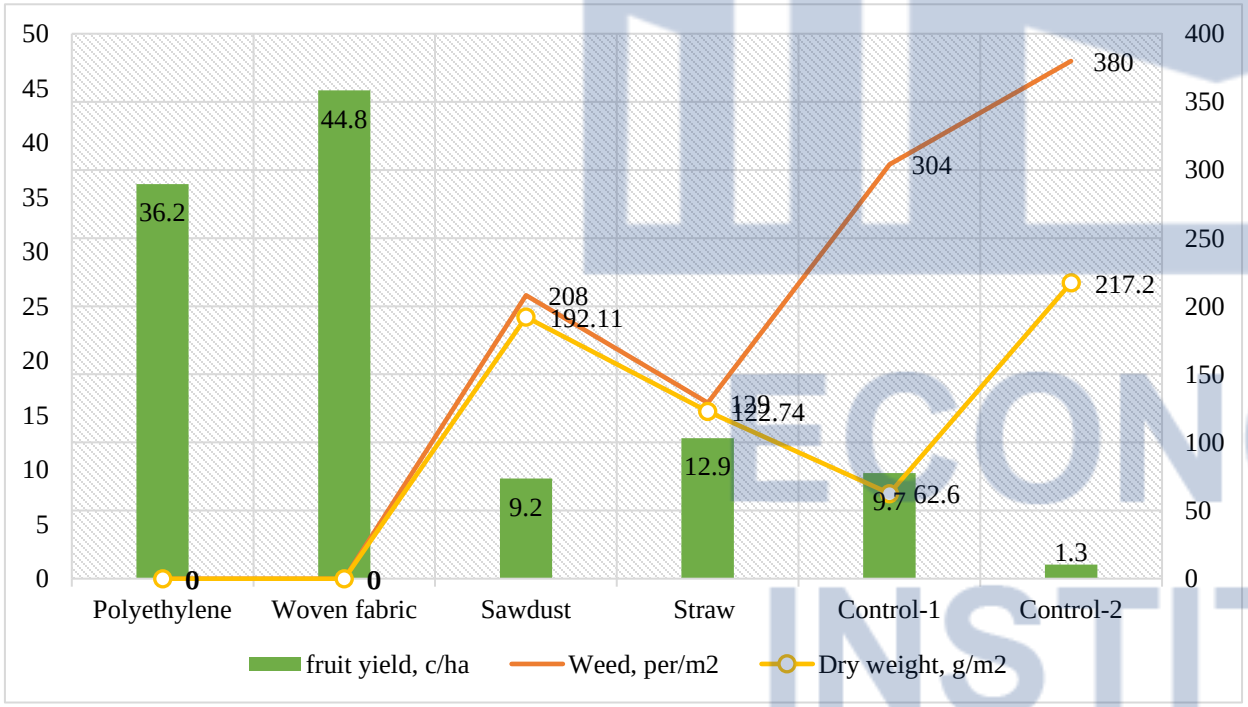
Between the rows, one tillage was done, so it was mostly annual weeds growth.

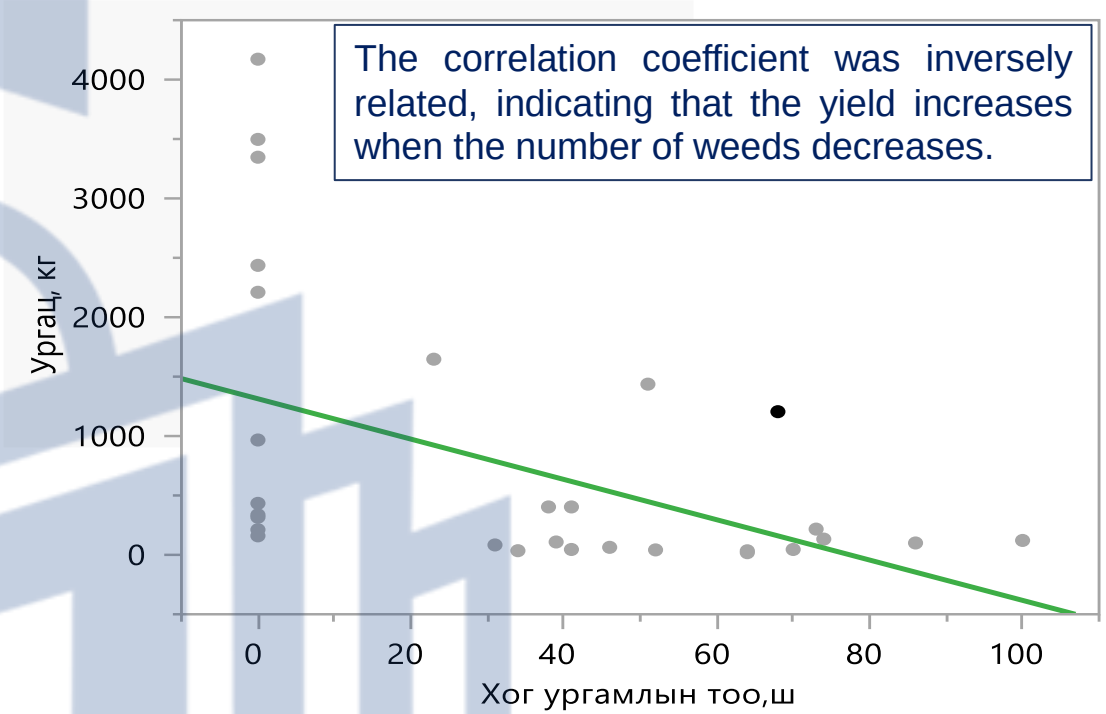
- lamb's quarters /***Chenopodium album***/,
- Black bindweed /***Polygonum convolvulus/,***
- little lovegrass /***Eragrostis minor***/,
- Virgate wormwood /***Artemisia scoparia***/

Crop	Version	Weed, per/m²			
		2020	2021	2022	X
Between row		136	228	76	146
Sea buckthorn	Control-1	142	277	221	213
	Control-2	230	279	261	256
	Polyethylene	-	-	-	-
	Woven fabric	-	-	-	-
	Sawdust	276	133	111	**173**
	Straw	351	51	94	165

The yield in the version with woven fabric was 44.8 c/ha 8.6-43.5 c/ha more than in other versions. Number of weeds decreases as the sea buckthorn yield increases. There was a strong negative correlation between yield and weed number r=-0.81, and a weak negative correlation with weed biomass yield r=-0.62. No differences in weed species composition were observed among the mulch versions.

Effects of weeds on sea buckthorn yield, 2021-2023



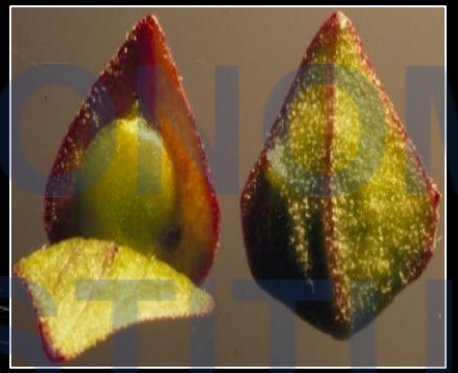


Sea buckthorn	*Yield per bush,g*	*Weed, per/m²*	*Dry weight,g*
Yield per bush,/g/	1		
Weed, per/m²	**-0.81**	1	
Dry weight,g	**-0.62**	0.624829	1


Нэр: Ноцоргоно
Латин нэр: Lappula echinata Gilib
Овог: Ноцоргоны овог /Boraginaceae Juss/


1 mm


1 millimeter




1 mm


1 mm

Weed seed bank of sea buckthorn field, million/piece

(0-10 cm)

Version	2020	2021	2022	2020-2022	ANOVA
Spring					
Control-1	65.6	51,40	33,4	50,1	$P_{0.05}$= 0.0212 *
Control-2		93,9	39,5	66,3	
Sawdust		50,3	37,3	51,0	
Straw		48,9	39,0	51,1	
Polyethylene		37,6	12,3	38,5	
Woven fabric		41,7	13,4	40,2	
Autumn					
Control-1	97,5	33,2	26,4	52,3	2.2-33.2 million/piece (+)
Control-2	240,0	15,7	42,9	99,5	
Sawdust	72,5	15,1	21,4	36,3	1.05-1.4 more than (-)
Straw	90,6	15,9	38,4	48,3	
Polyethylene	48,1	19,8	15,4	27,8	
Woven fabric	52,5	28,1	10,0	30,2	

(0-20 cm)

Version	2020	2021	2022	2020-2022	ANOVA
Spring					
Control-1	94,6	81,5	52,0	76,0	$P_{0.05}$= 0.0141 *
Control-2		169,0	77,8	113,8	
Sawdust		115,0	51,7	87,1	
Straw		95,1	69,5	86,4	
Polyethylene		73,4	35,9	68,0	
Woven fabric		70,4	23,5	62,9	
Autumn					
Control-1	135,0	54,2	58,4	82,5	6.5-16.3 million/piece (+)
Control-2	286,8	27,8	75,6	130,1	
Sawdust	120,6	36,4	84,5	80,5	
Straw	110,6	27,5	80,3	72,8	
Polyethylene	70,0	32,9	20,4	41,1	
Woven fabric	79,3	43,1	24,8	49,1	

Weed seeds were mostly at 0-10 cm soil depth

- 2020- 69.3 %,
- 2021- 41-77 %,
- 2022- 40-67 %.

- ✓ Sawdust 6.6 million/piece,
- ✓ Polyethylene 26.9 million/piece,
- ✓ Woven fabric 13.8 million/piece,
- ✓ Straw 13.6 million/piece, respectively, weed seed bank have been reduced.

Covering the soil with organic and inorganic materials protects weed seeds from sunlight and reduces the conditions for their germination (B. Dorj, D. Ichinkhorloo 2010).

Дүгнэлт

1. In the first year of the study, 9 species of weeds from 6 families were growing in the field. In 2021-2023, depending on the type of mulch, the number of weed families and species is decreasing. The woven fabric version completely suppressed weeds.
2. According to the results of the study, the synthetic film, woven fabric, and straw mulch limit the growth and development of weeds, impairing their ability to breathe and reproduce. On average, the sawdust version had 53-75 per/m^2 more weeds than the mulched version, which was the highest than the mulched version.
3. The yield in the woven fabric version was 44.8 c/ha 8.6-43.5 c/ha more than in other versions. In the years of the study, the version with woven fabric mulch was free of weeds. There was a strong negative correlation between yield and weed number r=-0.81, and a weak negative correlation with weed biomass yield r=-0.62. As the number of weeds decreased, the yield increased.
4. In the experimental mulched versions, weed seed bank decreased from spring to autumn. When determined the weed seed bank in the experimental versions, 69.3% in 2020, 41-77% in 2021, and 40-67% in 2022 were contained in the 0-10 cm depth of the soil.
5. Weed seed bank at a depth of 0-20 cm were reduced by 6.6 million/piece, polyethylene by 26.9 million/piece, woven fabric by 13.8 million/piece, and straw by 13.6 million/piece, while in the control version, it was 6.5-16.3 million/piece increased.

Thank you for your attention

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