

The test of the Sainfoin (*Onobrychis sativa* L) Varieties In The Great Lake Region Of Mongolia

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ABSTRACT

soum of Uvs province's soil and weather condition. We are conducted to study of five varieties of sainfoin, which is Peschany 1251, Tashyl 3, Novosibirsky 1284, Shortandisky 83, Mikhailovsky-5 were compared on the without irrigation trial. Sainfoin has a high resistance to winter conditions, of high temperature and of drought conditions. Those varieties are high palatable perennial leguminous plants. According to the result of research work, sainfoin has acclimatized Uvs province's soil and weather condition. The highest performance variety is Taskhyl 3 which is generated in the Plant research center of Hakassia.

KEYWORDS: Sainfoin, Taskhyl 3, plant growth and development, regrowth, biology resistance;

1. INTRODUCTION

Sainfoin (*Onobrychis sativa* L.) is an important perennial leguminous which is well adapted to the soil and weather condition of Mongolia. It is suitable to grow good quality hay, fodder and seed in the forage steppe zone and irrigated condition. In the steppe zone, wild sainfoin grow downhill, woodside and water meadow. Sainfoin appears usually in the forest steppe zone, where Orkhon, Selenge, Yruu, Zuunkharaa, Batsumber [2].

The roots penetrate through deeper layers of the soil and supply a great amount of organic matter from the deep soil and improve soil structure [11]. Organic matter is very important in the harsh and dryland conditions, which have low green mass. The tuber bacteria located deep in the root system releases nutrients rich in nitrates, which is very important in regions with a dry, cool climate and a low green mass of plants [12].

It is a valuable rotation for improving soil erosion and fallow land. Very good honey plant [13]. Last 20 years, increase head of livestock 67.1 million (2020), at the same time decrease quality and quantity of pasture. The nomadic livestock face big risk and pasture degradation.

Therefore, high palatable, high nutritive and drought, winter tolerant plants play a very important role in nomadic livestock of Mongolia. In other words, testing suitable varieties and expedient time to plant sainfoin. Our study's purpose is to test well adapted, high yield varieties of sainfoin and observe the impact for soil improvement in the Great Lake region.

1. Observe development stages of varieties, 2. Compare biotic potential, resistance and biometer indicators of varieties. 3. Observe regrowth after harvest.

2. MATERIALS AND METHODS

The research work was carried out during the 2018-2021 growing seasons in Ulaangom soum. The experiments established block design with 4 replications. The soil texture is clay-loam, light brown colored and the layer of nutritive soil is 18-30cm.

The experiment has 5 variants and 4 repetitions. Per plot is 3m² total plot is 60m². The gross experimental field is 123.8m², side protective belt is 40m, and marginal protective belt is 1m. The seeding rate was 9.6kg/ha, 0.96g seed per square meter. 1000 seed weight is 20g.

Peschany 1251(St), Tashyl-3, Novosibirsky 1284, Shortandisky 83, Mikhailovsky-5 were used as experimental material. Those varieties were compared with Peschany 1251 which is well adapted in Mongolia. Peschany 1251 was selected as a control variety based on the report of Peschany 1251 varieties studied at the Animal Husbandry Institute in 1970-1980. 5 varieties were planted on the 20th of May.

The development stages were compared by N.B Beidman method, calculated begin was 25% of each plot, becoming even was 75% of each plot.

We used the main methods which is used in the field experiment of varieties test. In this:

- Method of Matskov for testing heat resistance of varieties
- Method of Nekrasov for testing drought resistance of varieties.

3. RESULTS AND DISCUSSION

The Uvs province is one of the coldest places of Mongolia. The winter is long with low temperatures while the summer is hot and much shorter. Winter lasts from November to late April - spring May and summer from the beginning of June through to September. There are 257 sunny days a year, often with clear cloudless skies

Table 1. shows the humidity and temperature of the 3 years we conducted the study Hydrothermal parameters (2018-2020)

Year	The sum of precipitation for an average temperature above 10 ° c (r)	The average daily temperature (°t) above 10°C decreased by 10 times	Hydrothermal coefficient (htc) by g.t. Selyaninov
2018	69.3	2445	0.28
2019	177.6	2406	0.73
2020	149.2	2427	0.61

Meteorological processing based on data from Ulaangom station. The study years were relatively cool with abundant precipitation (Table 1).

Table 2. Field germination and regrowth of the sainfoin varieties

Varieties	2018		2019		2020		Average of 3 years	
	plant, num/m ₂	Field germination,%	num/m ₂	regrowth,%	num/m ₂	Regrowth , %	num/m ₂	regrowth,%
Peschany 1251(st)	35	87	30	85	28	93.3	31	88.4
Taskhyl 3	39	97	38	97	36	94.7	37.6	96.2
Mikhailovsky 5	29	72	20	68	12	60	20.3	66.6
Plamingo	32	80	23	71.8	19	82.6	24.6	78.1
Shortandisky 83	30	75	24	80	18	75	24	76.6

In varietal research experiments, it is necessary to pay attention to their field germination and plant regrowth or density per unit area ($P < 0.01$).

In the first year of the experiment, the field germination of 5 varieties was 75-97%, and compared to the control, Taskhyl 3 varieties were 20% more, Mikhailovsky varieties 15%, and the other 2 varieties 12.7% less, but new varieties this is an indicator that the local soil is likely to adapt to future climatic conditions.

The main indicator of the life of the variety is the regrowth of the following years. Except Mikhailovsky variety, the regrowth of the Taskhyl 3 in 2019 and 2020 was 8.8% higher than control, while other varieties were below control but could be considered sufficient at the varietal level An average of 3 years of regrowth is 76.6-96.2%, which indicates that sainfoin varieties are better able to withstand winter.

Table 3. First year observation of development stages of the sainfoin varieties, (date in the 2018)

Varieties	Germination		Branching	
	begin	Becoming even	Begin	Becoming even
Peschany 1251(st)	06.1	06.7	6.21	7.20
Taskhyl 3	06.1	06.9	7.11	7.23
Mikhailovsky 5	06.3	06.8	7.15	8.5
Plamingo	5.28	06.4	7.6	7.29
Shortandisky 83	6.5	06.12	7.22	8.4

According to the development stage indicators of the 2018 growth period of Sainfoin varieties, the germination and branching of the varieties took place between 51 and 63 days. The first year, stages of germination and branching took place 100 % on all varieties and few flowers appeared on the Taskhyl 3 variety.

Table 4. Some pre-winter biometric parameters of Sainfoin varieties

Varieties	2018		2019		2020	
	Plant height, sm	Number of branches, pl/num	Plant height, sm	Number of branches, pl/num	Plant height, sm	Number of branches, pl/num
Peschany 1251(st)	46	4.9	66.6	10	70.2	14
Taskhyl 3	56	5.5	80.7	8.6	87.4	13.8
Shortandisky 83	44	5.2	62	7.2	73.3	8.7
Plamingo	41	4.7	57	5.8	69.9	7.6
Mikhailovsky 5	45	5.4	62.3	6.9	68.6	7.1

The development plant height and number of branch by years are significantly different $P < 0.01$. Measurements of plant height and number of branches in the second 10 days of September, when the plant growth phase is complete, show that the plant height and number of branches are increasing year by year.

The tallest variety, Taskhyl 3, is 87.4 cm, and the shortest variety Mikhailovsky 5, is 68.6 cm. The Taskhyl 3 was 15-26.4 cm higher than the control and other varieties by these parameters, and the higher number of branches were 9-8.

Table 5. Formation of growth stages suitable for harvest (date in the 2019, 2020)

Number of hay	Varieties	Regrowth		Branching		Budding		Flowering		Day of harvest
		Beg	even	Beg	even	Beg	even	Beg	even	
First	Peschany 1251(st)	4.28	5.3	5.23	5.30	6.24	6.29	7.5	7.15	7.20
	Taskhyl 3	4.28	5.5	5.19	5.26	6.27	7.1	7.7	7.15	
	Mikhailovsky 5	4.30	5.2	5.18	5.25	6.26	7.4	7.10	7.18	
	Plamingo	4.30	5.6	5.20	5.27	6.29	6.30	7.8	7.18	
	Shortandisky 83	4.28	5.3	5.17	5.24	6.24	6.29	7.8	7.19	
Second	Peschany 1251(st)	7.22	7.24	7.31	8.5	8.20	9.1	9.8		9.14 9.15
	Taskhyl 3	7.22	7.25	8.1	8.5	8.24	9.3	9.10		
	Mikhailovsky 5	7.21	7.24	8.3	8.5	8.24	9.4	9.12		
	Plamingo	7.23	7.26	8.3	8.6	8.26	9.6	9.11		
	Shortandisky 83	7.23	7.25	8.5	8.6	8.25	9.5	9.10		

It is possible to go through two stages of development or harvest twice during the growing season, as can be seen from the phenological observations of the varieties (Table 5). In 2020, the first harvest was carried out 62-80 days after the regrowth stage, and the second harvest was carried out 45-40 days later.

Table 6. The height of plants regenerated after harvest, sm (Average of the 2 years)

#	Varieties	Plant height, cm				
		1 week later	2 weeks later	3 weeks later	4 weeks later	32 days later
1	Peschany 1251(st)	13	22	26.6	33	39.2
2	Taskhyl 3	16.5	24.5	29	38.8	47
3	Plamingo	16.5	22	25	36.5	40.5
4	Shortandisky 83	12.5	16	21	26	39
5	Mikhailovsky 5	12.5	16.5	21.5	31.5	39.5
	P<	0.002603	0.002603	0.00014	0.001084	0.003043

Post-harvest regenerated plants were measured at 7-week intervals. According to the result of measurement, the average 2 year plant height of Taskhyl 3 was 46.2sm. Therefore, Taskhyl 3 varieties were 7.5 cm taller than control.

It is possible to harvest at least twice a year because Sainfoin varieties' regrowth activity is very good.

Table 7. The result of third year measurement of varieties' green mass yield, 2020

Varieties	Regrowth, %	Density, num/m ²	Plant height preharvest, cm	Green mass yield, t/ha	Absolute matter content, %	dry	Dry matter yield, t/ha
Peschany 1251(st)	93.3	28	46	18.0	24.78		4.28
Taskhyl 3	94.7	36	44	32.1	24.72		8.02
Mikhailovsky 5	60	12	45	20.4	20.45		4.55
Plamingo	82.6	19	56	26.5	26.3		5.65
Shortandisky 83	75	18	41	19.7	23.5		3.51
P<	2.14497	2.14497	0.005136	0.000904	0.41121		0.00012

There is a significant difference in plant height, green mass yield and dry matter yield of the varieties ($P < 0.001$). Compared to the varieties in terms of biomass and dry matter yield in the growing season of 2020, Taskhyl 3 has a higher biomass yield of 5.6-14.7 t / ha and dry matter yield of 2.32-4.52 t / ha than other varieties.

Table 8. Biological tolerance assessment table, (Average of 2 years)

Varieties	Regrowth %	High temperature resistance					Winter resistance					Disease and pest resistance				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1 Peschany 1251(st)	85					X				X						X
2 Taskhyl 3	97					X				X						X
3 Mikhailovsky 5	68					X				X						X
4 Plamingo	71.8					X				X						X
5 Shortandisky 83	80					X				X						X

Varieties have excellent resistance to high temperature, winter, and disease pest conditions. Pest and disease resistance of varieties were evaluated by scoring during the experimental period. Plant lice were abundant in the experimental area but had no effect on sainfoin varieties. Compared to the third year of experiment, the Taskhyl 3 variety was 1.4-34.7% higher than the others. Other indicators gave a score of 4-5 points.

4. DISCUSSION

The green mass yield of sainfoin varieties reached 18-32.1 t / ha in the third year, and Taskhyl 3 variety (32.1 t / ha) had the highest yield was 14.1 t / ha more than the control variety. Sainfoin produces a rich grass yield in the forest steppe and in the steppe zone.

The green mass of sainfoin is more than 20 percent higher on irrigated land [6]. The peschany1251 variety yielded 37.7 t/ha, mikhailovsky 5 variety yielded 35 t/ha on irrigated fields [8].

Studies by Vladeta Stevovik and Rade Stenisavlevik (2010) have shown that planting 50 cm wide rows of sainfoin produces more powerful plants that are more suitable for seed and green mass crops. The number of plant stems depends on the distance between the rows.

Planting at 80 cm wide rows of sainfoin would increase the number of stems but was less than at 50 cm wide rows of seed and green mass.

We planted the experiment in 50 cm wide rows, 5 cm apart between plants. Depending on the sainfoin variety, yields up to 32.1 t / ha of green mass.

5. CONCLUSION

1. In terms of field germination, Mikhailovsky 5 varieties had the lowest germination rate of 72%, while Taskhyl 3 varieties had the highest germination rate of 97% and were selected from other varieties. The field germination of sainfoin varieties is higher than that of other forage plants.
2. Compared to the regrowth after the first harvest, Taskhyl 3 varieties had higher plant height and growth buds and number of breeding buds than control and other varieties
3. In terms of green mass, the amount per hectare is increasing every year. In the second year, Flamingo and Taskhyl 3 varieties yielded more green mass than other varieties. In the third year, Taskhyl 3 variety yielded 14.1 t / ha more than the control varieties

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