

EVALUATION OF THE ABUNDANCE OF THE SPECIES *ADONIS VERNALIS* IN THE TÂRNAV PLATEAU USING MODERN TECHNOLOGIES

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Abstract

The great diversity of orographic, climatic and pedological conditions encountered in the area of permanent grasslands in Romania gives them great heterogeneity in terms of floristic composition, production and forage quality.

The presence of the Carpathian Mountains causes a profound change in the climatic conditions and, therefore, in those of the soil and vegetation.

*The purpose of the research is: assessment of habitats and abundance of the species *Adonis vernalis* from 2 different resorts.*

*The objectives pursued were the following: characterization of the floristic composition and biodiversity of the 2 habitats; assessment of the abundance of the *Adonis vernalis* species by quantifying all individuals.*

Keywords: *Adonis vernalis*, Blaj, biodiversity, abundance, grasslands management

INTRODUCTION

The flora and vegetation of the Târnavă Plateau (Transylvanian Plateau) has not been the subject of a complex and in-depth study to date. This territory, dominated by low-altitude hills and mountains, does not seem to be an area where spectacular floristic results can be recorded. Until now, it has not attracted the attention of specialists. However, contrary to expectations, the presented territory shelters an extremely rich flora, namely a varied grassland canopy, due to the geomorphological factor, which constitutes a contact region that extends in the vicinity of the plain

region and to the fact that it is an interference zone into which floristic elements from very different geographical regions have penetrated. The most studied region is the Natura 2000 site Sighișoara - Târnavă Mare, which has an exceptional scientific value at an international level. This is reflected both in terms of landscape and species diversity. The spring buttercup (*Adonis vernalis*) is a perennial herbaceous plant, from the Ranunculaceae family, known under several popular names: horse-weed, talan weed, black weed, etc. It is a melliferous, decorative, medicinal,

but also toxic plant. Its toxic principles are adonitoxin, which contains coumarin and a coumarin derivative, vernadine. By drying the toxicity of the plant is preserved, and by boiling the toxicity disappears. Animals that consume the plant manifest toxic sensitivity, consisting of gastroenteritis with rebellious diarrhea, polyuria, cardiovascular disorders externalized by accelerated pulse, then slowed down, heart failure, pale mucous membranes, collapse, convulsions, depression and their death. In humans, excess treatment with this plant leads to intoxication manifested by nausea, vomiting, diarrhea, cardiac arrest and even death. Treatment is with emetics, purgatives, activated charcoal and cardiac analeptics (Habel *et al.*, 2013). Only the aerial parts are harvested, during flowering, which are used in both human and veterinary medicine, to treat dropsy and migraines. They have cardiotonic and diuretic, calming, slightly hypertensive action. It gives good results in the treatment of tachycardia, extrasystoles of nervous nature, arterial hypotension and neurovegetative disorders (Pârvu, 2010). *Adonis vernalis* grows on steep slopes, in dry, sunny pastures and meadows, from the plains to the mountains. Its distribution is limited by hydrological factors. Thus, it is distributed where less than 500 mm of precipitation falls per year. In Romania it is widespread in the

plateau and hill areas, in the Romanian Subcarpathians. It is widespread in Central and Southern Europe, but also in Western Asia.

Adonis vernalis is a protected species, declared a Natural Monument, considered a Vulnerable Species (VU) on the National Red Lists (IUCN, since 2011); thus, the populations of this species require conservation measures. As a rare species of European flora, *Adonis vernalis* is listed in the Red Books or in the lists of protected plant species in Bulgaria, Hungary, Romania and Moldova. The anthropogenic impact on the *Adonis vernalis* species is materialized by: the expansion of arable land areas to the limit of the species' distribution, grazing, exploitation of the substrate of xerophilic meadows, where it is found (Niculescu *et al.*, 2023). One of the species with national and international conservation priorities is *Adonis vernalis*, a species characteristic of continental-Mediterranean xerothermal grasslands, belonging to the order *Festucetalia valesiaceae*. Most populations of *Adonis vernalis* have decreased considerably in size in many European countries in recent decades and, therefore, as a threatened species, it is maintained under the CITES agreement. The causes for which the species is threatened are complex. These include overexploitation of populations (intensive agricultural practices) or overenclosure of

patches due to secondary succession of grasslands.

Some causes are also due to the biology and ecology of the plant. (Denisow *et al.*, 2014).

The main purpose of this work is to evaluate the current state of habitats and abundance of the plant species *Adonis vernalis* in the Blaj area, a region of botanical interest from the point of view of biodiversity conservation. Through this research, it is aimed to obtain relevant data that will contribute to understanding the local ecology of the species, to substantiate some protection and conservation measures, as well as to highlight the role that the species *Adonis vernalis* plays within the studied ecosystems.

MATERIAL AND METHOD

The Transylvanian Plateau, also called the Transylvanian Basin (45°40'-47°50' N and 23°00'-25 °40' E) is a hilly area in central Romania. The research activity was carried out on a representative grassland area, called Obârșia Tiurului, in the Blaj locality. Blaj municipality is located at 23°55' east longitude and 46°10' north latitude, which gives it a relatively central position within the country. This brings it multiple advantages, such as: advantageous economic connections with the centers of the Târnaveilor Plateau, the Apuseni Mountains, the Southern Carpathians and the Mureș Corridor. Blaj municipality is

The specific objectives of this research are: characterizing the floristic composition and biodiversity of the two habitats studied - this characterization will allow the assessment of the degree of floristic diversity, the identification of any characteristic or invasive species, as well as the analysis of the ecological relationships existing between the component species of the habitat; evaluating the abundance of the *Adonis vernalis* species - where a rigorous quantification of individuals (bushes) from the two habitats will be carried out, using standard methods of inventory and ecological sampling.

located in the eastern part of Alba county (www.primariablaj.ro).

To determine the floristic composition of the grassland in the Târnaveilor Plateau, a study was needed for which 2 floristic surveys were carried out, using the Braun-Blanquet method modified by Păcurar and Rotar, in 2014, with three sub-notes and three sub-intervals, applied on 2 surfaces, each of 320 m². To evaluate the abundance of the plant species *Adonis vernalis*, 32 variants of 10 m² were delimited in each of the 2 plots/experiments, where each individual was counted (Figure 1).



Fig. 1 Original photo plot 1 and 2

Additionally, at the time of each floristic survey, using the GPS (Global Positioning System) device, data were recorded regarding the altitude (in meters, above sea level) and the exposure (in degrees, 0 – 360°) of the survey research point (Kent 2012).

Vegetation research using this method is carried out in 3 stages:

1. determining the extent of the phytocenosis and establishing the survey area.

2. compiling the survey: noting on the ground in a geobotanical sheet the following information:

- current survey number, name of the grassland body and the locality (county, commune), within whose radius it is located.
- survey area.
- altitude, exposure, slope (degrees or percentages), relief, characterization of the resort (erosion, salinization, etc.).
- general vegetation coverage, in percentages.
- height and vegetation layering.
- observations on vegetation dynamics, etc.

The floristic list alone is not sufficient to characterize a phytocenosis, therefore the main geobotanical indices are assessed and recorded. The requirements of plants for ecological factors (light, temperature, soil moisture, soil reaction and nitrogen) were specified by species indicator values (from 1 to 9), according to (Ellenberg, 1998) updated by the Federal Agency for Nature Conservation, Germany (Bundesamt für Naturschutz – www.floraweb.de) and adapted to the conditions of our country by Kovács (1979). As specific names of species depending on the ecological categories of a factor, those developed by Păcurar and Rotar were used. Using descriptive statistics, analyses were carried out that are divided into two categories: central tendency parameters and data dispersion indicators. The central tendency parameters include those procedures that provide a representative (central) value for the measured data series. There are three estimators that can be used in

this regard: mean, median and mode. Monitoring the *Adonis vernalis* species with the help of a drone - the flights were carried out using the DJI Matrice300 RTK drone. With its help, photographs were taken from 25 m height, 30 m, 40 m, and from 120 m, to determine the number of individuals of the

RESULTS AND DISCUSSIONS

Within the perimeter of Obârșia Tiurului commune, 2 plots were studied, different in type of grassland, as follows (figure 2):

Obârșia Tiurului _1 -
grassland type *Stipa pennata* –
Festuca rupicola

Adonis vernalis species from the photographs as well. Thus, the data and photographs obtained can be processed in the office at any time and do not require accelerated field research due to the very short vegetation period of the plant.

Obârșia Tiurului _2 -
grassland type *Stipa pennata* –
Koeleria macrantha (figure 3).

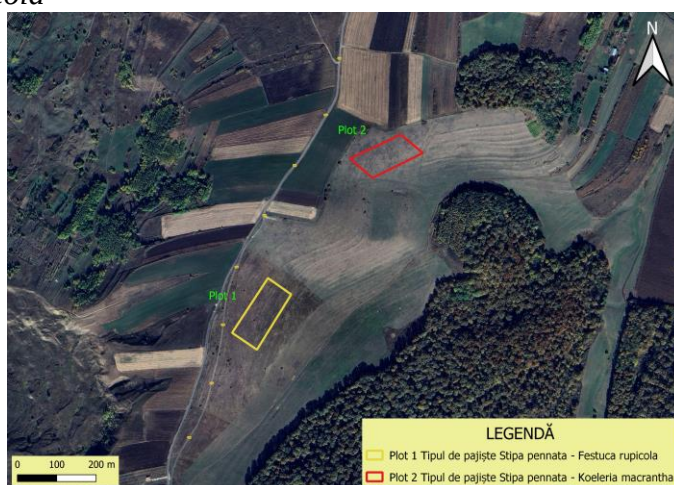


Fig. 2 Delimitation of plots on the Obârșia Tiurului grassland

Fig. 3 Photo of the pasture of Obârșia Tiurului _1

In the first plot, from this grassland, the *Stipa pennata* – *Festuca rupicola* type was identified, present on a land with a

slope of 20-25% and South-West exposure. The general vegetation coverage of the phytocenosis is 70%, the coverage with woody

vegetation is 5-6%, and that with is fresh molehills 3-4%. The degree of

vegetation consumption is 30-35% (table 1, figure 4).

Table 1

Condiții staționale ale pășunii Obârșia Tiurului 1

Survey code	Obârșia Tiurului _1
Locality	OBÂRȘIA TIURULUI
Grassland plot	Obârșia Tiurului
Altitude (m)	357
Slope (°)	20-25
Exposition	S-V
Land use	Pășune
Grassland type	<i>Stipa pennata</i> – <i>Festuca rupicola</i>
General cover (%)	70
Wooden vegetation cover (%)	5-6
Fresh molehills (%)	3-4
Erosion (%)	2-3
Consumption rate (%)	30-35

In the floristic composition of the *Stipa pennata* – *Festuca rupicola* grassland type, Poaceae have the largest share in the canopy, with an average participation of 43%. Plants from other botanical families (AFB) are present in a proportion of 27%, species from the Fabaceae family have a coverage of 3.5%, and species from the Cyperaceae – Juncaceae family are absent from the grassland.

The phytocenosis of the *Stipa pennata* – *Festuca rupicola*

grassland type has 20 species in its floristic composition. Among the Poaceae, in addition to the dominant species, *Stipa bromoides* also appears, with 12.5% coverage. Among the plants from other botanical families, the following species stand out: *Adonis vernalis* (12.5%), *Stachys germanica* and *Thymus glabrescens*, each with a share of 5% in the grassland canopy (table 2).

Table 2

Floristic composition of the type of grassland *Stipa pennata* – *Festuca rupicola* and specific requirement on ecological, agronomic and anthropogenic (B - BioForm, T - temperature, U - humidity, R - soil reaction, N – nutrition, C - tolerance of mowing, P - tolerance of grazing, S - tolerance of crushed, OBF-other botanical family)

Ecological indexes					Agronomical indexes			Species	Coverage	Is	Is*%
L	T	U	R	N	C	P	S				
								Poacee	43		
8	7	3	8	2	-	-	-	<i>Festuca rupicola</i>	12.5	1	12.5
6	X	5	x	X	9	8	8	<i>Poa pratensis</i>	0.5	4	2
-	-	-	-	-	-	-	-	<i>Stipa bromoides</i>	12.5	-	0
8	7	2	8	2	-	-	-	<i>Stipa pennata</i>	17.5	X	0
								Fabacee	3.5		
8	7	2	7	2	-	-	-	<i>Astragalus monspensulanus</i>	0.5	1	0.5
6	6	4	3	2	-	-	-	<i>Cytisus negricans</i>	0.5	X	0
8	5	3	9	3	7	2	2	<i>Medicago sativa</i>	2.5	4	10
7	x	X	x	X	7	4	4	<i>Trifolium pratense</i>	0	4	0
								OBF	27		
7	6	3	7	1	-	-	-	<i>Adonis vernalis</i>	12.5	X	0
7	6	X	7	x	4	4	4	<i>Convolvulus arvensis</i>	0.5	3	1.5
8	6	5	7	3	-	-	-	<i>Eryngium planum</i>	0.5	X	0
6	x	5	7	7	-	-	-	<i>Euphorbia helioscopia</i>	0.5	X	0
-	-	-	-	-	-	-	-	<i>Filipendula hexapetala</i>	0.5	-	0
7	x	5	x	6	-	-	-	<i>Fragaria vesca</i>	0.5	1	0.5
-	-	-	-	-	-	-	-	<i>Gallium octonarum</i>	0.5	-	0
9	7	1	9	1	-	-	-	<i>Salvia nutans</i>	0.5	X	0
7	6	3	8	X	-	-	-	<i>Stachys germanica</i>	5	X	0
8	7	2	8	2	-	-	-	<i>Teucrium polium</i>	0.5	X	0
8	6	3	6	3	-	-	-	<i>Thymus glabrescens</i>	5	X	0
-	-	-	-	-	-	-	-	<i>Veronica praecox</i>	0.5	-	0
								Σ	72	-	27
								Number of species	20		

From the point of view of fodder value, the *Stipa pennata* - *Festuca rupicola* type belongs to the

category of grassland unsuitable for grazing and supports a load of 0.20 livestock unit (LU) per ha (table 3).

Table 3

Classification of the *Stipa pennata*-*Festuca rupicola* grassland type

Improvement coefficient for			Note of improving	The grassland class	The category of grassland	Grazing capacity (LU/ha)
Pastoral value	Cover with molehills	Woody vegetation cover				
0.27	1	1	10	X	Improper	0.20

Regarding *Stipa pennata*-*Festuca rupicola* type, it is noted,

according to the species' requirements for ecological factors:

9 heliophile species, one heliophilous species and one extremely heliophilous species. If we also take into account the cover, the phytocenosis has a heliophilous character. According to temperature preferences, we have 6 mesothermal species, 4 thermophilic species and 3 indifferent species, and the

hierarchy remains the same when taking into account the cover. The plants' requirements for humidity determine the presence of 5 mesoxerophilous species, 4 mesophilic species, 3 xerophilous species and one indifferent species. The character of the phytocenosis is a mesoxerophilous one (table 4).

Table 4

Plant requirements for ecological factors

Interval	Light		Temperature		Humidity	
	No. sp.	A%	No. sp..	A%	No. sp.	A%
1-2	-	-	-	-	3	1,5
3-4	-	-	-	-	5	2
5-6	1	1,5	6	4	4	2
7-8	9	27,5	4	14	-	-
9	1	0,5	-	-	-	-
X	-	-	3	1,5	1	0,5
Total	11	29,5	13	19,5	13	6

Legend: No. sp-number of species, A-cover%

Regarding the species' nitrogen requirements, we have: 6 nitrogen-fugitive species, 3 moderately nitrophilic species and 3 indifferent species, one medium-

nitrophilic species and one nitrophilic species. Taking into account the cover, the character of the phytocenosis is nitrogen-fugitive (table 5).

Table 5

Plant requirements for nitrogen content

Interval	Number of species	Coverage%
1-2	6	32
3-4	3	8
5-6	1	0.5
7-8	1	0.5
9	-	-
X	3	6
I	-	-
Total	14	47

Regarding the species' requirements for soil reaction, it is found that we have 6 alkaliphilic species, 4 neutrophilic species, 2 indifferent

species, one moderately acidophilic species and one weakly acidophilic species. In the case of general cover,

the character of the phytocenosis is alkaliphilic (table 6).

Table 6

Plant requirements for soil reaction

Interval	Number of species	Coverage%
1-2	-	-
3-4	1	0.5
5-6	1	5
7	4	2
8-9	6	38
X	2	1
I	-	-
Total	14	60.5

In the second plot, from this body, the type of grassland *Stipa pennata* – *Koeleria macrantha* was identified, present on a land with a slope of 20-25% and a Southern exposure. The general vegetation

coverage of the phytocenosis is 75%, the woody vegetation coverage is 2-4%, and the one with molehills is 1-2%. The degree of vegetation consumption is 30% (table 7, figure 4).



Fig. 4 Photo of the pasture of the Tiur origin _2

Table 7

Stationary conditions of the Obârșia Tiurului pasture 2

Survey code	Obârșia Tiurului _2
Locality	OBÂRȘIA TIURULUI
Grassland plot	Obârșia Tiurului
Altitude (m)	407
Slope (°)	20-25
Exposition	S
Land use	Pășune
Grassland type	<i>Stipa pennata</i> – <i>Koeleria macrantha</i>

General cover (%)	75
Wooden vegetation cover (%)	2-4
Fresh molehills (%)	1-2
Erosion (%)	2-3
Consumption rate (%)	30

In the floristic composition of the *Stipa pennata* – *Koeleria macrantha* grassland type, Poaceae have the largest share in the canopy, with an average participation of 47.5%. Plants from other botanical families (AFB) are present in a proportion of 24.5%, species from the Fabaceae family have a coverage of 1.5%, and species from the Cyperaceae – Juncaceae family are absent from the vegetal cover. The phytocenosis of the *Stipa pennata* – *Koeleria macrantha*

grassland type has 18 species in its floristic composition. Among the Poaceae, in addition to the dominant species, *Brachypodium pinnatum* also appears, with 5% coverage. Among the plants from other botanical families, the following species stand out: *Adonis vernalis* (17.5%), *Veronica austriaca*, *Achillea millefolium*, *Agrimonia eupatoria*, etc., each with a share of 0.5% presence (table 8).

Table 8

Floristic composition of the type of grassland *Stipa pennata* – *Koeleria macrantha* and specific requirement on ecological, agronomic and anthropogenic (B - BioForm, T - temperature, U - humidity, R - soil reaction, N – nutrition, C - tolerance of mowing, P - tolerance of grazing, S - tolerance of crushed, OBF-other botanical family)

Ecological indexes					Agronomical indexes			Species	Coverage	Is	Is*%
L	T	U	R	N	RC	RP	RCA				
								Poacee	47.5		
6	5	4	7	4	3	6	6	<i>Brachypodium pinatum</i>	5	1	5
7	6	3	7	2	-	-	-	<i>Koeleria macranta</i>	17.5	X	0
6	X	5	x	X	9	8	8	<i>Poa pratensis</i>	0.5	4	2
8	7	2	8	2	-	-	-	<i>Stipa pennata</i>	25	X	0
								Fabacee	1.5		
8	7	2	7	2	-	-	-	<i>Astragalus monspensulanus</i>	0.5	1	0.5
7	6	3	5	2	-	-	-	<i>Cytisus albus</i>	0.5	X	0
7	x	4	7	4	6	4	4	<i>Lotus corniculatus</i>	0.5	4	2
								OBF	24.5		
8	x	4	x	5	7	4	5	<i>Achillea millefolium</i>	0.5	2	1
7	6	3	7	1	-	-	-	<i>Adonis vernalis</i>	17.5	X	0
7	6	4	8	4	3	4	3	<i>Agrimonia eupatoria</i>	0.5	X	0
7	6	X	7	x	4	4	4	<i>Convolvulus arvense</i>	0.5	3	1.5
9	7	3	8	4	-	-	-	<i>Eryngium campestre</i>	0.5	X	0

7	x	5	x	6	-	-	-	<i>Fragaria vesca</i>	0.5	1	0.5
7	x	4	8	3	4	8	8	<i>Plantago media</i>	0.5	1	0.5
6	6	6	7	5	8	4	5	<i>Potentilla reptans</i>	0.5	X	0
8	6	3	7	3	-	-	-	<i>Salvia nemorosa</i>	0.5	X	0
8	6	3	6	3	-	-	-	<i>Thymus glabrescens</i>	0.5	X	0
8	7	2	8	1	-	-	-	<i>Veronica austriaca</i>	2.5	-	0
								Σ	74	-	13
								Număr specii	18		

From the point of view of fodder value, the type *Stipa pennata* - *Koeleria macrantha*, belongs to class X, a category

unsuitable for grazing and supports a load of 0.20 LU/ha (table 9).

Table 9

Classification of the grassland type *Stipa pennata* - *Koeleria macrantha*

Improvement coefficient for			Note of improving	The grassland class	The category of grassland	Grazing capacity (LU/ha)
Patoral value	Cover with molehills	Woody vegetation cover				
0.13	1	1	10	X	Improper	0.20

The light requirements of the plants determine the following structure: 11 heliophiles species, 3 meso-heliophilous species and one extremely heliophilous species. The heliophilous character of the phytocenosis is evident from the coverage. The temperature requirements determine the following division: 7 mesothermal species, 5 indifferent species and 3

thermophilic species, and according to the degree of coverage it is evident that the phytocenosis has a mesothermal character. Depending on the humidity requirements, the species are structured as follows: 9 mesoxerophilous species, 3 mesophilic species, 2 xerophilous species and one indifferent species (table10).

Table 10

Plant requirements for ecological factors

Interval	Light		Temperature		Humidity	
	No. sp.	A%	No. sp..	A%	No. sp.	A%
1-2	-	-	-	-	2	3
3-4	-	-	-	-	9	9
5-6	3	6	7	8	3	1,5
7-8	11	7,5	3	3,5	-	-
9	1	0,5	-	-	-	-
X	-	-	5	2,5	1	0,5
Total	15	14	15	14	15	14

The species' requirement for nitrogen content determines the

following structure: 6 moderately nitrophilic species, 4 nitrogen-fugitive species, 3 moderately

nitrophilic species and 2 indifferent species. The character of the

phytocenosis is nitrogen-fugitive (table 11).

Table 11

Plant requirements for nitrogen content

Interval	Number of species	Coverage%
1-2	4	28.5
3-4	6	7.5
5-6	3	1.5
7-8	-	-
9	-	-
X	2	1
I	1	17.5
Total	16	56

The plant requirements for soil reaction determined the following structure: 5 alkaliphilic species, 5 neutrophil species, 3

indifferent species and 2 weakly acidophilic species. The character of the phytocenosis is alkaliphilic (table 12).

Table 12

Plant requirements for soil reaction

Interval	Number of species	Coverage%
1-2	-	-
3-4	-	-
5-6	2	1
7	5	7
8-9	5	29
X	3	1.5
I	1	17.5
Total	16	56

Effective monitoring of the species *Adonis vernalis*

In all 32 plots of Plot 1, *Adonis vernalis* individuals were identified. The least number was one plant/25 m², and the most was 165 plants/25 m². The variability within our experience is very high (CV = 0.84), and the coefficient of variability indicates that the median is representative. The median in this

plot was 49 individuals, and the mean was 63. A moderately asymmetric distribution (Skuness = 0.44) is observed, and the skewness (Kurtosis = -1.14) is platokurtic (table 13).

Table 13
Abundance of the species *Adonis vernalis* (no. of individuals/25m²; Plot 1)

PLOT 1							
1	1	1	14	94	115	110	156
7	16	53	92	165	124	105	154
4	16	40	55	129	121	96	93
9	11	8	24	44	49	49	47
STATISTICS							
Minim	1						
Maxim	165						
CV	0.84						
Median	49						
Average	62.59						
The vaulting	-1.14						
Asymmetry	0.44						
Standard deviation	52.69						

In all variants of Plot 2, *Adonis vernalis* individuals were identified. The least number was 5 plants/25 m², and the most was 197 plants/25 m². The variability within our experience is very high (CV = 0.73), and the coefficient of variability indicates that the median

is representative. The median in this plot was 80 individuals, and the mean was 83. A moderately asymmetric distribution (Skuness = 0.22) is observed, and the kurtosis (Kurtosis = -1.30) is platokurtic (table 14).

Table 14
Abundance of the species *Adonis vernalis* (no. of individuals/25m²; Plot 2)

PLOT 2							
7	5	25	53	92	133	126	166
34	30	33	102	145	142	121	132
9	7	20	45	119	173	183	197
7	9	49	59	75	85	127	138
STATISTICS							
Minim	5						
Maxim	197						
CV	0.73						
Median	80						
Average	82.75						
The vaulting	-1.30						
Asymmetry	0.22						
Standard deviation	60.57						

Results of monitoring flights of the species *Adonis vernalis*

Following the flights carried out in April 2023, it was found that the

plants can be easily identified from the images taken from heights of 25 m and 30 m (figure 5). From the images from 40 – 60 m, the plants can only be identified if the photo is

enlarged (with Zoom) (figure 6). Above 60 m (60 – 120 m), *Adonis vernalis* individuals are difficult to distinguish and with a high degree

of error (figure 7). These things were observed in both plots.



Fig. 5 Original drone photo (25m)



Fig. 6 Original drone photo (50 m)

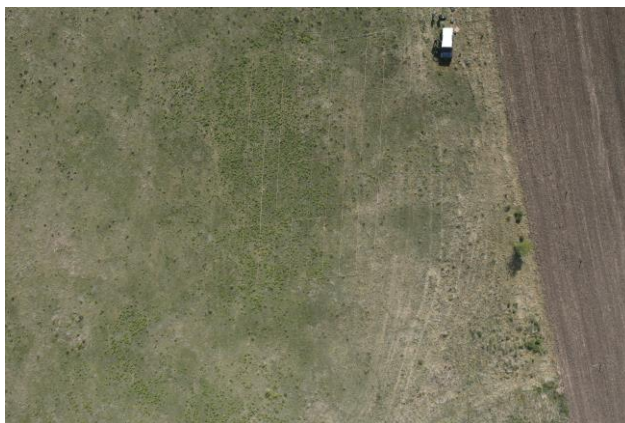


Fig. 7 Original drone photo (100 m)

CONCLUSIONS

Following field studies, 2 types of grassland were identified:

- the *Stipa pennata* type - *Festuca rupicola* has a heliophilic, mesothermal, mesoxerophilic, nitrogen-loving, alkalophilic character;

- the *Stipa pennata* type - *Koeleria macrantha* has a heliophilic, mesothermal, mesoxerophilic, nitrogen-loving and alkalophilic character.

Both types are part of the X-th grassland class, a category unsuitable for grazing and support a load of 0.20 LU/ha.

The abundance of the *Adonis vernalis* species differs from one plot to another, presenting a high variability. Thus, the presence of the species was on average 63 plants/25m² in Plot 1 and 83 plants/25m² in Plot 2.

Photographing the plots and counting *Adonis vernalis* individuals from the office can only be done if the drone flights are made at a height of 25 – 30 m.

The plant can be successfully harvested and used as a medicinal plant because it is present in a fairly large proportion in grassland

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