Influence of Climate Factors and Plant Varieties on the Hay Technology (Fibrous Feed)

Victor Adrian BĂRBIERU¹, Mihai OLAR^{1*}, Ovidiu RANTA¹, Mircea MUNTEAN¹, Ovidiu MARIAN¹, Laurenț OGNEAN², Georgiana CĂTUNESCU¹

¹ Faculty of Agriculture, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Calea Mănăştur 3-5, 400372, Cluj-Napoca, Romania

¹ Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Calea Mănăştur 3-5, 400372, Cluj-Napoca, Romania

* corresponding author: mihai.olar@gmail.com

Bulletin UASVM series Agriculture 73(2)/2016

Print ISSN 1843-5246; Electronic ISSN 1843-5386

DOI 10.15835/buasvmcn-agr: 12404

ABSTRACT

The present study was carried on the Research and Didactical Station Jucu located close to Someș River. The aim of the study is to determine the fuel consumption and productivity of aggregates (machineries) used in the conditions of the two levels of hay production technology. The experimental plot uses *Festuca Arundinacea*, while control, spontaneous vegetation (*Dactylis glomerata* 70%, *Alopecurus pratensis* 10% *Festuca sp.*6%, *Trifolium repens* 5%, other plants 9%). Grassland soil taken in study type is molded with a high coefficient of withering (16-19%) and a small capacity water output (8%). Chemical characteristics of soil samples shows us a good content in humus and good to very good in mobile potassium, being deficient in phosphorus mobile. The differences noted between the fuel consumptions for the two parcels is due to higher vegetable production of control plot which has also a running speed of different aggregates also influencing effective productivity.

Keywords: gathering, meadows plots, mowing; scattering.

INTRODUCTION

Research has taken place on the grounds of the Research and Didactical Station Jucu located close to Someș River with GPS coordinates: 46°50' N and 23°45' E. Physical conditions of this place are in climatic frame named Trans-Carpathian area, with an altitude between 280 and 360 meters. The study tracked the average temperatures, rain sum and soil type, with physical and chemical features, samples being taken from the meadow located on Someș River floodplain (Bărbieru, 2006; Molnar-Irimie, 2016). The aim of this study is to determine the fuel consumption and productivity of aggregates (machineries) used in the conditions of the two levels of hay production technology (Dobre *et al.*, 2014). In this purpose, we used to plots: experimental and control, respectively (Bungescu and Popa, 2007).

MATERIALS AND METHODS

The two plots on which we have conducted the experiments are:

- Experimental Plot (Fig. 1) sown *Festuca Arundinacea* (2nd year of vegetation) being sown in the spring of 2013 with {*Vio Jucu*} seed, sowing with 35 kg/ha seed, land preparation were an autumn ploughing at 25-27 cm deep and in the spring it was harrowing before sowing. Sowing depth of 1.5 cm and after sowing we use a roller machine for the contact of seeds with the ground, resulted in a rapid and uniform of the raising of meadow, in the second year we have an average production of 28.5 to/ha.
- Control plot (Fig. 2) with spontaneous vegetation (*Dactylis glomerata* 70%, *Alopecurus*

Fig. 1. Experimental plot (*Festuca arundinacea*)

Fig. 2. Control plot (spontaneous vegetation)

pratensis 10% *Festuca sp.* 6%, *Trifolium repens* 5%, other plants 9%), with a vegetal production of 50.6 to/ha, favored by the rains of spring 2014 as well as the existence in the past (8-10 years) of the summer cattle camp of the farm's cows on that land.

Agricultural machinery used for the production of hay were:

- Tractor U-445 in aggregate with a rotary mower GMD-44 (fig. 3) to the work of mowing;
- Tractor U-445 in aggregate with double rake GRS-24 (fig. 4) for scattering and gathering the furrow.

Fig. 3. Rotary mower GMD

Fig. 4. Rotary rake GRS 24

Were determined by fuel consumption, the effective productivity of aggregates, as well as the qualitative work indices such as: working width of the aggregate, uniformity of plant pruning, the uniformity of the land, the loss of feeding stuffs to furrows gathering, depending on the speeds of displacement.

RESULTS AND DISCUSSION

The ground on which we have set our experiences is typical of the area, namely molded (*argilic*) with groundwater to over 2 m in depth. In terms of physical characteristics (Tab. 1) of soil it is characterized by a loamy texture on all the clay content profile, being in the horizon A_m 42-48% and B_t horizon 49-51%, index of structural

Tab. 1. Physical and hidrophysical features of soil in the experimental field, S.D.E. Jucu

Profile	Level	Depth (cm)	Granulometrical structure (%)				Coeff. Hy (%)	Withering coeff. % from weight	Field capacity % of weight
			Sand (mm)		Dust 0.02 – 0.002 (mm)	Clay <0.002 (mm)			
			Coarse 2-0,2	Fine 0,2-0,02					
1	A _p	0-15	0.57	29.7	24.0	45.7	10.0	16.0	24.06
	A _m	25-40	0.97	33.6	23.4	42.0	11.0	14.7	23.83
	AB	65-80	0.58	19.8	14.9	55.7	13.0	19.5	24.69
	B _{t1}	120-135	0.66	35.5	13.9	49.9	13.2	17.5	24.32
	B _{t2}	170-185	0.27	35.8	12.3	51.6	12.2	18.1	24.43
	C	210-225	0.72	34.0	15.3	50.0	10.2	17.5	24.33
2	A _p	0-15	0.90	34.2	17.6	47.3	9.6	16.6	24.16
	A _m	30-45	1.09	21.8	29.1	48.0	10.3	16.8	24.20
	AB	75-90	1.06	20.5	21.7	56.7	14.1	19.9	24.81
	B _{t1}	120-135	1.06	26.3	16.1	56.5	13.8	19.8	24.78
	B _{t2}	185-200	0.79	27.1	20.1	51.0	12.2	17.8	24.39
	C	210-225	0.81	23.1	15.0	49.1	10.0	17.0	24.10

Tab. 2. Chemical features of the soil in experimental field, S.D.E. Jucu

Pro-file	Level	Depth (cm)	pH	CaCO ₃ (%)	Humus (%)	N total (%)	P ₂ O ₅ (mg/100 g sol)	K ₂ O (mg/100 g sol)	T (mg/100 g sol)	V%
1	A _p	0 - 15	5.80		8.81	0.416	4.4	39.5	43.4	67
	A _m	25 - 40	6.02		7.33	0.329	0.6	22.0	43.0	75
	AB	65 - 80	6.42		3.27	0.154	0.2	27.0	37.3	81
	B _{t1}	120 - 135	7.18				0.2	22.0		
	B _{t2}	170 - 185	7.88	0.9			1.0	18.7		
	C	210 - 225	8.44	8.0			1.1	22.8		
2	A _p	0 - 15	6.05			0.259	2.4	22.8	37.1	72
	A _m	25 - 40	6.36			0.220	0.3	21.0	34.9	79
	AB	65 - 80	6.38			0.136	0.2	26.5	35.3	80
	B _{t1}	120 - 135	6.60				0.1	25.0	32.8	87
	B _{t2}	170 - 185	7.20	0.2			0.4	23.3		
	C	210 - 225	8.02	7.9			1.1	21.0		

differentiation between horizon A_m and B_t over 1.20.

Coefficient of withering is very high by about 16% in horizon A_m and 19% in the horizon B_t and the capacity of field for water is 24% by weight, resulting in rapid transition from layer saturated in water the withering (24-16 = 8%).

Chemical characteristics of soil show a weak acid reaction in horizon A_m, neutral to B_t horizon and into the horizon C alkaline (Tab. 2). Content in

humus is good to very good, and the content of total nitrogen also. Mobile phosphorus is ensured poorly towards the middle in the top 50 cm, and very weak in depth, and potassium is well stocked to very well.

Cationic exchange capacity (T) has high values and the degree of saturation in the alkaline (V%) is in the oligo-mezoalkaline. In conclusion clay named *chernozem* studied is a soil clayey-sandy, rich in humus and nutrients except phosphorus.

Tab. 3. Thermal regime (°C) and rainfall regime (mm) in condition of Jucu village (Cluj county) in year 2014 (Surce: Meteorological station Jucu belongs to USAMV Cluj-Napoca)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Average/ sum
Multi-annual average thermal regime (°C)	-4.5	-2.3	3.2	9.1	14.3	17.5	19.3	18.3	14.3	9.1	3.3	1.6	8.3
Multi-annual sum, pluvio-metric regime (mm)	27.0	27.2	27	51	74.5	99.0	91.4	77.5	50.0	43.0	28.0	17.1	612.7

Tab. 4. Fuel consume, effective productivity, speed and gear step for mowing and gathering obtained for experimental and control plots.

Plot	Work	Gear step	Speed <km/h>	Fuel consume <l/ha>	Effective Productivity < ha /h >
Experimental plot < 28.5 to/ha>	Mowing	III M	6.54	6.84	0.78
Control plot < 50.6 to/ha >	Mowing	I R	8.18	4.48	0.98
Experimental plot < 28.5 to/ha>	Scattering	II M	3.67	10.31	0.41
Control plot < 50.6 to/ha >	Scattering	I R	7.48	5.48	0.83
Experimental plot < 28.5 to/ha>	Gathering	I R	7.0	1.28	2.09
Control plot < 50.6 to/ha >	Gathering	I R	8.9	1.18	2.15
Experimental plot < 28.5 to/ha>	Gathering	III M	4.74	2.04	1.05
Control plot < 50.6 to/ha >	Gathering	II R	10.3	1.04	2.23
Experimental plot < 28.5 to/ha>	Gathering	I R	6.37	1.53	1.71
Control plot < 50.6 to/ha >	Gathering	I R	6.84	1.57	1.78
Experimental plot < 28.5 to/ha>	Gathering	III M	5.91	3.64	1.13
Control plot < 50.6 to/ha >	Gathering	II R	8.15	1.50	1.79

Temperatures and precipitation throughout the year 2014 as 8.3 °C annual average, and a total annual rain was 612.7 mm (Tab. 3).

Fuel consumptions and effective productivity and highlighted the synthetic Tab. 4 reveals significant differences in fuel economy for the harvest work (mowing) on the control parcel (10.3 L/ha) compared with 6.8 l/ha experimental plot, as well as lower productivity on the parcel.

CONCLUSIONS

1. Grassland soil taken in study type is molded with a high coefficient of withering (16-19%) and a small capacity water output (8%). Chemical characteristics of soil samples shows us a good content in humus and good to very good in mobile potassium, being deficient in phosphorus mobile.

2. The climatic conditions of the area were employed in the D.f.b.x. subtype k "with an average temperature of 8.3°C and annual rainfall of 612.7 mm, the spring of 2014 being richer in

precipitation than the average of previous years what has fostered the growth and development of plants on both plots.

3. The differences noted between the fuel consumptions for the two parcels is due to higher vegetable production of control plot which has also a running speed of different aggregates also influencing effective productivity.

REFERENCES

1. Bărbieru VA (2006). Mașini și instalații zootehnice – Construcție, funcționare și reglaje. Editura Risoprint Cluj-Napoca
2. Bungescu ST, Popa CI (2007). Mașini și instalații zootehnice, Editura Eurobit, Timișoara.
3. Molnar – Irimie A (2016). Finite element method study on stress state in soil induced by agricultural traffic (in press)
4. Dobre P, Farcaș N., Udrioiu NA, Gâdea M, Moraru AC (2014). Research on *Camelina sativa* wintering, by genotype and fertilizer doses used, in the pedo-climatical conditions from the south of Romania, Romanian Biotechnological Letters, 19(6): 9964-9973