INFLUENCE OF TECHNOLOGICAL LINKS ON SOIL MOISTURE DYNAMICS IN CONDITIONS OF PROLONGED DROUGHT OF 2012 IN DEALU BUJORULUI VINEYARD

INFLUENȚA UNOR VERIGI TEHNOLOGICE ASUPRA DINAMICII UMIDITĂȚII SOLULUI, ÎN CONDIȚIILE DE SECETĂ PRELUNGITĂ A ANULUI 2012 ÎN PODGORIA DEALU BUJORULUI

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Abstract. *The research was conducted in the R.D.S.V.V. Bujoru, Galati County imposed by the climatic conditions of the year 2012. Studied objectives relate to monitoring the influence ecopedological factors and mulching total /partial soil on the hydric soil vineyards. To establish dynamics of soil moisture, sampling was done in the lunar soil, the profile of 0-100 cm. Were analyzed climatic elements (temperature, precipitation, humidity, heatstroke) which clearly reveal that during the growing season of 2012 the vine underwent temperature and water stress accented and did not benefit from conditions optimal vegetation. High temperatures, combined with poor rainfall during the growing season and diurnal average consumption of grapes, led of soil system maintenance, moisture differentiated. If total mulching with crop residues (straw) and partial mulching interval with grape marc composted, soil moisture is higher compared with the control and especially 0-60cm profile. The further future research are required to capture different climatic conditions and lead to more accurate determination of technological links to maintain optimum soil moisture for vine culture.*
Key words: *vine, moisture, drought, grape marc, mulching total*

Rezumat. *Cercetările s-au efectuat în cadrul SCDVV Bujoru, jud. Galați impuse de condițiile climatice ale anului 2012. Obiectivele luate în studiu se referă la monitorizarea factorilor ecopedologici şi la influența mulcirii totale/parțiale a solului asupra regimului hidric al solului în plantațiile viticole. Pentru stabilirea dinamicii umidității solului s-a procedat la prelevarea de probe de sol lunar, pe profilul 0-100 cm. S-au analizat elementele climatice (temperatura aerului, precipitații, umiditatea relativă a aerului, insolația) care scot în evidență clar că, în perioada de vegetație a anului 2012 vița de vie a suportat un stres termic şi hidric accentuat şi nu a beneficiat de condiții optime de vegetație. Temperaturile ridicate, cumulat cu precipitațiile deficitare din perioada de vegetație şi consumul mediu diurn al viței de vie au condus la umidități ale solului diferențiate în funcție de sistemul de intreținere al solului. În cazul mulcirii totale cu resturi vegetale (paie) şi mulcire parțială pe interval cu tescovină compostată, umiditatea solului este mai ridicată comparativ cu martorul şi în special pe profilul 0-60cm. Pe viitor se impune continuarea cercetărilor, pentru a surprinde condiții climatice diferite şi să conducă la stabilirea celor mai corecte verigi tehnologice care să mențină o umiditate în sol optimă culturii de viță de vie.*
Cuvinte cheie: *viță de vie, umiditate, secetă, tescovină compostată, mulcire totală*

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INTRODUCTION

Vineyards in Moldavia and especially those in the south are increasingly affected by climate change occurred in the last decade. Drought is mainly a problem of meteorology, which determines the level of precipitation, but its intensity depends to a considerable extent and soil characteristics of the territory affected.

Thus, drought may be enhanced by a loss of water from rainfall soils of low water retention capacity (sandy soils with relatively thin frame profile or the ground), the low permeability or compacted or placed on slopes. Most vine crops located in areas with water deficit, achieves its biological potential rate of 35-45%. Drought is harmful for livestock, directly affects the vegetation status and thus vineyard grape production and is characterized by the lack of rainfall, low relative humidity and high potential evapotranspiration.

Temperature factor has a dual role on water consumption: direct transformation of water vapor increases and enhances the ability to keep water vapor saturation state (Popescu, 1978; Popescu and Bucur, 1999). Drought and desertification as a result of increasing temperatures and other anthropogenic reasons have become major causes affecting far (and future) level and quality of crops, and the health of agriculture and the environment generally.

MATERIAL AND METHOD

The research was conducted during 2012 in an experimental device within SCDVV Bujoru which took into account soil maintenance system, developed by experimental scheme:

V1 – black field (autumn plowing, spring plowing, hoeing mechanical interval 5, 5 manual hoeing a row, fertilization with N, P, K optimal dose) (photo 1).

V2 – total mulching with crop residues/straw (straw spread over a time interval and layer thickness of 10 cm, fertilization with N, P, K optimal dose) (photo 2).

V3 –partial mulching interval with grape marc composted (composted pomace spread within the thickness of 10 cm on all post-emergent herbicide - 2 herbicides, fertilization with N, P, K at a dose reduced by 50%) (photo 3).

They made observations on the thermal regime represented by average temperature, maximum and minimum air thermal balance, sun and fluid regime represented by rainfall, relative humidity.

Measurements of soil moisture dynamics and water shortage have been made to determine how the soil affects the maintenance supply of water from the soil. We took samples of lunar soil, the variations and 0-100 cm profile from 20 to 20 cm.

Photo 1 - Black field

Photo 2 - Total mulching with straw

Photo 3 - Partial mulcing with grape marc composted

RESULTS AND DISCUSSIONS

Climatic factors in 2012 correspond to excessively dry year (Table 1). Dealu Bujorului Vineyard is located in the South of Moldova, nature dry area with annual average temperature of 11,5 ° C and rainfall of 453,8 mm multi-annual average.

Evolution of climatic factors

In terms of thermal evolution of the minimum and maximum interest, duration, frequency and comparison with the multi-annual average temperatures. The average temperature compared to the annual average for 2012 shows a surplus of 0,4 ° C. Compared to the vegetation, the excess heat is recorded in June, July, August and September. During the period of vegetative rest absolute minimum temperatures exceeded the strength of the vine. Absolute minimum were recorded on 11 February (-23,6 ° C). The average temperature and maximum temperatures are above previous years and since April have been reported air temperatures above 30 ° C. There is an increasing trend in the number of days with maximum air temperature above 30 ° C (Fig. 1).

Active thermal balance of the vegetation is 3797,8 ° C and shows that are provided Dealu Bujorului Vineyard grape ripening conditions by age V and VI, VII era caution.

2012 was a particularly dry year, with a decrease in rainfall regime and an uneven distribution of rainfall. Maximum rainfall was in May (115,8 mm) and led to a build script, in reality not all the amount was recovered, much of it is lost through leakage to the ground. Since June precipitation decreased considerably.

Deficit rainfall and maximum temperatures above 30 ° C have influenced the relative humidity, during periods that recorded values below 50%, leading to stressful conditions for growing vines.

In terms of hours of sunshine they have a surplus, located mainly in July, August and September.

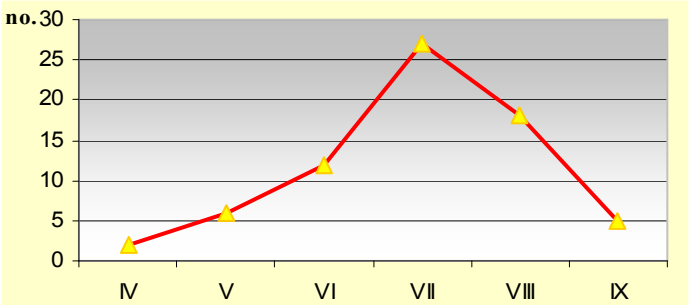

FIG. 1 Number of days with maximum air temperatures above 30 ° C

A soil water reserves at the beginning of the growing season was at the lower level as the field capacity and minimum level of soil moisture (Table 2). This is explained by excessive fluid deficit accumulated during the growing season and the previous year due to insufficient rainfall in winter. In general, water shortage at the beginning of the growing season is accentuated profile 80-100cm, in some versions even at a depth of 60 cm.

The low level of rainfall in April maintains moisture in the soil in early May to values comparable to that of April 1. High temperatures in May combined with vines consumption for the same period in early June led to differences between the versions. If total mulching with plant debris and mulch mulching partial interval marc compost, soil moisture is higher compared with the control and especially 0-60 cm profile. During April-June, soil moisture was below minimum level of soil moisture in all experimental variants was maintained in July due to accentuated water deficit recorded since June.

Deficient rainfall in July, August and September, the cumulative consumption of vines in the same period resulted in increased soil water shortage, soil moisture reaching the wilting coefficient values close to the end of the growing season. Soil moisture was preserved better if total mulching with crop residues (straw), followed by partial mulching mulch marc blank row. At the end of the growing season soil moisture was at values below the minimum level of moisture; although rainfall in September covered the 0-40 cm profile some of the accumulated deficit.

Table 1

The climate data 2012, Dealu Bujorului vineyard

Specification	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Ave-rage
The average air temperature °C	-2,3	-8,0	4,4	12,9	18,0	22,5	28,1	26,1	20,7	14,6	8,2	-1.7	11,9
Multi-annual average	*-1,1*	*0,5*	*5,2*	*11,5*	*18,2*	*22,0*	*23,9*	*23,1*	*17,5*	*11,2*	*5,3*	*1,0*	*11,5*
Difference	**-1,2**	**-8,5**	**-0,8**	**1,4**	**-0,2**	**0,5**	**4,2**	**3**	**3,2**	**3,4**	**2,9**	**-2,7**	**0,4**
Maximum temperature (°C)	10,6	10,7	21,5	30,5	35,7	36,8	38,0	41,5	27,5	30,0	20,0	13,0	26,3
Minimum temperature(°C)	-15,1	-23,6	-11,2	-2,0	8,6	10,1	14,0	10,5	7,5	1,4	-2,0	-17,9	-1,6
Rainffal (mm)	39,3	25,4	9,2	18,6	115,8	13,8	27,1	23,1	24,6	42,0	4,3	102,3	445,5
Multi-annual average	*19,8*	*20,3*	*25,5*	*36,6*	*46,5*	*71,0*	*57,4*	*48,0*	*38,0*	*31,4*	*30,7*	*28,6*	*453,8*
Difference	**19,5**	**5,1**	**-16,3**	**-18,0**	**69,3**	**-57,2**	**-30,3**	**-24,9**	**-13,4**	**10,6**	**-26,4**	**73,7**	**-8,3**
Relative humidity (%)	78,7	76,6	65,9	62,9	64,8	59,3	42,0	43,0	50,0	59,0	68,0	69,0	61,6
Multi-annual average	84,0	80,0	74,0	68,0	63,0	64,0	62,0	64,0	70,0	76,0	82,0	85,0	73.0
∑° ta	x	x	x	331,3	556,4	603,8	867,8	818,4	620,1	x	x	x	3797,8
Multi-annual average	x	x	x	318,3	590,3	683,3	786,1	755,3	552,6	x	x	x	3685,9
∑° tu	x	x	x	11,3	236,4	303,8	557,8	508,4	320,1	x	x	x	2037,8
Multi-annual average	x	x	x	8ţ9,2	273,3	380,3	466,1	435,3	226,1	x	x	x	1870,3
Insolaţion (ore)	68,9	72,2	176,6	209,1	181,6	312,6	337,5	286,0	226,0	134,0	79,4	29,5	2113,4
Multi-annual average	*47,8*	*72,2*	*138,2*	*176,5*	*239,6*	*235,7*	*257,6*	*250,2*	*165,5*	*122,9*	*58,5*	*31,0*	*1795,7*
Difference	**21,1**	**0**	**38,4**	**2,6**	**-58**	**76,9**	**79,9**	**35,8**	**60,5**	**11,1**	**20,9**	**-1,5**	**317,7**

Table 2

Soil moisture dynamics, the profile of 0-100 cm, Dealu Bujorului vineyard

Depth cm	V1							V2							V3						
	IV	V	VI	VII	VIII	IX	X	IV	V	VI	VII	VIII	IX	X	IV	V	VI	VII	VIII	IX	X
0-20	381	306	383	188	149	160	225	333	393	427	195	227	223	306	400	299	433	190	189	189	316
20-40	393	388	408	231	184	180	206	402	315	397	266	233	187	202	402	367	441	278	205	195	205
40-60	361	363	288	199	166	159	177	366	375	327	281	231	159	188	351	348	380	285	189	179	176
60-80	314	343	219	151	152	159	158	343	291	285	225	163	158	190	192	288	231	263	175	168	177
80-100	203	291	295	136	152	159	156	291	224	182	190	112	158	186	192	256	177	148	132	168	176
average	**1652**	**1691**	**1593**	**905**	**803**	**817**	**922**	**1735**	**1598**	**1618**	**1157**	**966**	**885**	**1072**	**1537**	**1558**	**1662**	**1164**	**890**	**899**	**1050**

In conclusion, soil moisture throughout the period under review remained lower minimum level of humidity throughout the 0-100 cm soil profile.

Soil water shortage was reported in the water field capacity (2990 m^3/ha) minimum threshold of soil moisture (1853 m^3/ha) and wilting coefficient (715 m^3/ha) and is emphasized in July for all variants experimental peak occurred in the control, followed by full version with straw mulching and mulching partial composted marc.

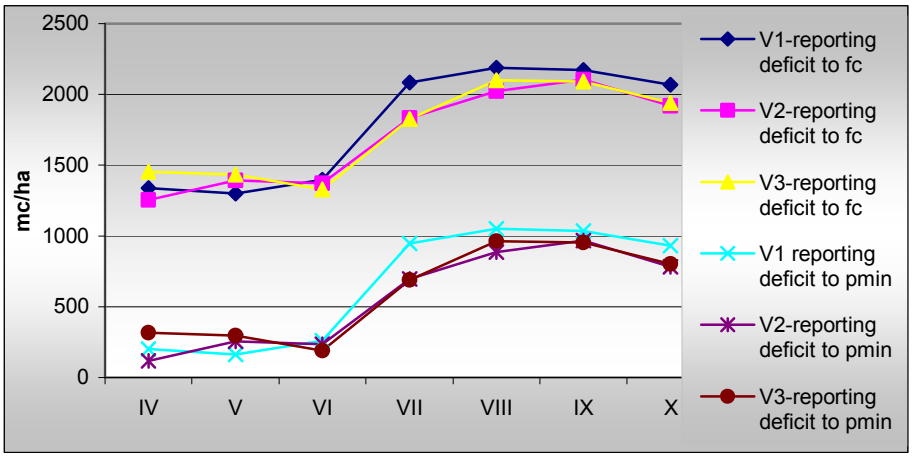

Fig. 2 - Water shortage in the soil (m^3/ha)

CONCLUSIONS

1. Year 2012 in terms of climate was atypical, with a water deficit widened to a surplus thermal regime. Since the end of April there were air temperatures above 30 ° C.

2. Under conditions of prolonged drought, soil moisture is preserved best when total mulching with straw, mulching followed by partial composted marc and then control.

3. At the end of the growing season soil moisture reaches the wilting coefficient values comparable, especially on the profile of 60-80 cm.

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