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INFLUENCE OF SOIL TILLAGE AND HYBRID MATURITY GROUP UPON THE MAIZE GRAIN YIELD FROM MOARA DOMNEASCĂ, ILFOV COUNTY

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Abstract

Sustainable agriculture is an increasingly used concept, as it also includes the minimum or zero tillage technologies. This implies the complete absence of ploughing, disking and other crop maintenance works. This paper presents the mean of the research carried out between 2014-2016 at the Moara Domnească Teaching Farm located in the Ilfov County and belonging to the University of Agronomic Sciences and Veterinary Medicine of Bucharest. The biological material consisted in several early maize hybrids belonging to the following groups: FAO- 270, 280 (Sunergy, PR39B76), FAO- 340, 380 (Bonito, PR37N01) and FAO- 400, 500, 510 (Olt, Sumbra, P0216). The experimental variants for the soil tillage system were: ploughing 20 cm (control), chiselling 20 cm, chiselling 40 cm, disking 10 cm, disking/ploughing 20 cm, disking/chiselling 40 cm. Production ranged between 4886.0 kg/ha (in the FAO 270, 280) and 6626.2 kg/ha (FAO 340, 380), and recorded the highest values of 7034.8 kg/ha in hybrid P0216.

Key words*: soil tillage, Zea mays* L.*, hybrids, yield.*

INTRODUCTION

Plant cultivation technologies include an array of interdependent elements, and make up an organized whole which ensures that farming practices work and meet the intended purpose.

The interactions between the various technological elements, the diversity of environmental conditions and the large number of cultivated plants motivate the wide range of technologies and the differences between them. These technologies are differentiated according to the climatic specificity and the relief of the agricultural areas; within them, the differences depend on the soil particularities, the cultivated plant, the agricultural machinery system and the impact of the technological elements on the environment (Guș, 2003).

Minimum soil tillage involves the replacement of ploughing in crop technology and of soil tillage partly, which leads to soil better preservation. That system was first implemented in the US, then in England and it gradually expanded throughout Europe.

The results obtained in Virginia (1972) showed that the no-tillage system ensured the same effect on the yield treated with lower doses of phosphorus and potassium fertilizers and the loss of water was lower owing to the protective layer (Budoi, 1996). Reduced soil tillage in maize increased after the use of broad spectrum herbicides (Șarpe et al.,1996; Ulinici et al., 1967).

Research on minimum soil tillage has been carried out in Romania, too. Promising results have been obtained so far in the technology of maize, sunflower, soybean and other plants, by carrying out autumn tillage. In spring a single pass of the aggregate on the field prepares the germinating bed concurrently with the application of fertilizers, herbicides and sowing (C. Pintilie et al., 1985).

Unconventional soil tillage, together with other basic elements of sustainable agriculture, have direct influence on crop plants (Guș, 2001; Marin, 2008; Rusu, 2009; Pop, 2011).

Maize is the most commonly studied plant in terms of crop requirements in the minimum tillage or no-tillage system (Hallauer and Colvin, 1985; Wright,1990; Uri, 2000). The selection of the hybrid type for this agricultural system has been a constant concern for the breeders (Hallauer and Colvin, 1985; Newhouse and Crosbie, 1986; Hesterman et al.,1988; De Felice et al., 2006).

The research carried out by A. Canarache and Elisabeta Dumitru at ICPA in 1991 was based on the centralization of the pedoclimatic data collected from OSPA throughout Romania, and showed that about 42% of the arable land met moderate and favorable conditions for the unconventional soil cultivation system (15% under favorable conditions and 27% under moderately favorable conditions) (Guş, 2003).
Research carried out by Marin D.I. on the red preluvosol soil of Moara Domnească, Ilfov County, between 2008 and 2010, showed that the average yield of grain maize ranged from 7,450 kg/ha in the conventional system and 7,248 kg /ha in the nonconventional system (in the 40 cm chisel version).
Soil tillage based only on disc harrows resulted in lower yields compared to other soil tillage variants, i.e. 6,355 kg/ha. The results obtained by soil tillage based on chiselling at 40 cm in depth recommend this variant as a technological alternative of soil tillage for the application of the sustainable agriculture system.

MATERIALS AND METHODS

Research was carried out on the experimental field of the Moara Domnească Teaching Farm, Ilfov County, belonging to U.S.A.M.V. Bucharest.
The experiment included the following factors:
Factor A - soil tillage based on the following variants: a_1-ploughing at 20 cm in depth (control - A20 cm), a_2-chisseling 20 cm (C20 cm), a_3-chiselling 40 cm (C40 cm), a_4-disking 10 cm (Disc), a_5-disking/ploughing 20 cm (D/A20 cm), a_6-disking/chiselling 40 cm (D/C40 cm), disking in succesion disking/chiselling 40 cm and disking/ploughing 20 cm was performed in the pre-emergent plant, winter wheat.
Factor B - early maize hybrids: Sunergy, PR39B76 (FAO- 270, 280);
- semi early hybrids: Bonito, PR37N01 (FAO-340, 380);
- semi late hybrids: Olt, Sumbra, P0216 (FAO-400, 500, 510).
Soil tillage was carried out in the last decade of September.
Maize hybridw were sown in the second decade of April by SPC 6 seed drill.
Weeds are a risk factor for agricultural crops as they prevent normal growth of the latter. Thus, for control purposes, the treatments applied were based on such herbicides as Dual Gold in a dose of 1.4 l/ha (*s-metolaclor* 960 g/l) - pre-emergent and Dicopur Top 1.0 l/ha (344 g/l acid 2.4 D + 120 g/l *dicamba*) + Titus 25DF, 50g/ha (25% *rimsulfuron metil*) - post-emergent). Two mechanical hoeing works were also performed during the growing season.
Fertilization provided annual doses of $N_{120}P_{60}K_{60}$ kg d.m./ha of the complex fertilizer NPK 15:15:15 and urea.
Harvesting was carried out in the second decade of September, depending on the climatic conditions which are an important factor influencing plant production. The data recorded by the Găneasa Weather Station were used for the characterization of the climatic conditions. The climatic condition between 2014 and 2016 had direct influence on the growth of the crop plants. The evolution of the thermal regime and rainfalls during the research period oscillated in comparison with the multiannual mean values. From a meteorological viewpoint, 2014 and 2016 were characterized by variations in temperature and particularly rainfalls (Table 1). For the maize growing period (April-August), the average temperature medie was 19.9ºC, i.e. 1.7ºC higher than the normal value in the area, while the sum of rainfalls was 381.2 mm and 343.4 mm, respectively, which was close to the normal value in the area. It is important to note that rainfalls in July and August (2014) were much lower than the normal values in the area.
Less favourable to maize crop were the climatic conditions in 2015, when the rainfalls during the maize growing season (April-August) recorded 146.0 mm, lower than the normal value of 203.3 mm in the area, while the average temperature of 20.1ºC was higher by 1.9ºC than the normal value in the area.

RESULTS AND DISCUSSIONS

The influence of soil tillage on the grain yield in the maize crop

The results concerning the influence of basic soil tillage on the maize grain yield are presented in Table 2.

Table 1. Climatic conditions of Moara Domnească, Ilfov County (2014-2016)

Month	Average temperature (ºC)						Rainfalls (mm)					
	2013-2014	2014-2015	2015-2016	Average 2013-2016	Normal	Diff. from normal value	2013-2014	2014-2015	2015-2016	Average 2013-2016	Normal	Diff. from normal value
October	14.0	11.7	10.7	12.1	**11.0**	1.1	81.7	64.2	70.0	71.9	**35.8**	36.1
November	8.3	5.3	7.7	7.1	**5.3**	1.8	17.6	49.1	110.6	59.1	**40.6**	18.5
December	-0.2	0.8	3.1	1.2	**0.4**	0.8	1.2	84.6	1.8	29.2	**36.7**	-7.5
January	-0.5	-1.1	-3.4	-1.6	**-3.0**	1.4	33.2	33.4	62.6	43.0	**30.0**	13.0
February	1.2	2.0	1.7	1.6	**-0.9**	0.7	7.6	21.4	35.6	21.5	**32.1**	-10.6
March	8.9	6.3	7.5	7.5	**4.4**	3.1	37.3	65.6	67.8	56.9	**31.6**	25.3
April	13.4	11.7	14.3	13.1	**11.2**	1.9	116.0	2.0	64.6	60.8	**48.1**	12.7
May	19.3	18.6	15.8	17.9	**16.5**	1.4	88.0	33.6	71.0	64.2	**67.7**	-3.5
June	19.9	20.9	22.4	21.0	**20.2**	0.8	113.0	56.8	114.8	94.8	**86.3**	8.5
July	22.8	25.2	24.1	24.0	**22.1**	1.9	38.0	5.2	4.2	15.8	**63.1**	-47.3
August	24.1	24.4	23.0	23.8	**21.1**	2.7	26.2	48.4	88.8	54.4	**50.5**	3.9
September	18.4	18.8	18.9	18.7	**17.5**	1,2	60.6	86.0	83.2	76.6	**33.6**	43.0
Average/Sum April-August	19.9	20.1	19.9	19.7	**18.2**	1.5	381.2	146.0	343.4	290.2	**349.3**	-59.1
Average/Sum October-September	12.4	12.0	12.1	12.1	**10.5**	1.6	620.4	550.3	775.0	648.5	**556.1**	92.4

Table 2. Influence of soil tillage on maize grain yield, Moara Domnească, Ilfov County, average 2014-2016

Soil tillage variant/ Hybrids	Yield	A20	C20	C40	Disking	D/A20	D/C40
PR39B76	kg/ha	6313.4	5703.7	5772.7	5224.4	6406.9	5969.2
	%	100	90	92	83	101	94
	Diff. kg/ha	Mt	-609.7 ^{ooo}	-540.7 ^{ooo}	-1089.0 ^{ooo}	93.5	-344.2 ^{o}
	$LSD_{5\%}$= 252.3 kg/ha	$LSD_{1\%}$= 358.7 kg/ha	$LSD_{0.1\%}$= 519.4 kg./ha				
SUNERGY	kg/ha	5477.2	4903.2	5068.1	4547.6	5505.7	5168.4
	%	100	89	92	83	101	94
	Diff. kg/ha	Mt	-574.0 ^{ooo}	-409.1^{oo}	-929.6 ^{ooo}	285	-308.8 ^{o}
	$LSD_{5\%}$= 239.6 kg/ha	$LSD_{1\%}$= 331.8 kg/ha	$LSD_{0.1\%}$= 457.9 kg./ha				
PR37N01	kg/ha	6754.7	5968.4	6192.7	5407.7	6865.8	6283.1
	%	100	88	91	80	101	93
	Diff. kg/ha	Mt	-786.3 ^{oo}	-562.0 ^{o}	-1347.0 ^{ooo}	111.1	-471.6 ^{oo}
	$LSD_{5\%}$= 405.7 kg/ha	$LSD_{1\%}$= 576.8 kg/ha	$LSD_{0.1\%}$ = 835.2 kg./ha				
BONITO	kg/ha	6147.1	5344.6	5676.6	5019.2	6386.7	5578.2
	%	100	87	92	82	104	91
	Diff. kg/ha	Mt	-802.5 ^{ooo}	-470.5 ^{oo}	-1127.9 ^{ooo}	239.6	-568.9 ^{oo}
	$LSD_{5\%}$= 274.8 kg/ha	$LSD_{1\%}$ = 390.7 kg/ha	$LSD_{0.1\%}$= 565.7 kg./ha				
OLT	kg/ha	6386.5	5715.2	6125.1	5079.3	6378.1	6213.0
	%	100	89	96	80	100	97
	Diff. kg/ha	Mt	-671.3 ^{ooo}	-261.4	-1307.2 ^{ooo}	-8.4	-173.5
	$LSD_{5\%}$= 264.8 kg/ha	$LSD_{1\%}$ = 376.5 kg/ha	$LSD_{0.1\%}$= 545.1 kg./ha				
SUMBRA	kg/ha	6157.7	5617.7	5850.3	4975.1	6341.3	5971.9
	%	100	91	95	81	103	97
	Diff. kg/ha	Mt	-540.0 ^{ooo}	-307.4 ^{o}	-1182.6 ^{ooo}	183.6	-185.8
	$LSD_{5\%}$= 225.8 kg/ha	$LSD_{1\%}$ = 321.0 kg/ha	$LSD_{0.1\%}$ = 464.9 kg./ha				
P0216	kg/ha	6930.1	5902.3	6328.1	5508.3	7034.8	6442.1
	%	100	85	91	80	101	93
	Diff. kg/ha	Mt	-1027.8 ^{ooo}	-602.0 ^{oo}	-1421.8 ^{ooo}	104.7	-488.0 ^{oo}
	$LSD_{5\%}$= 335.2kg/ha	$LSD_{1\%}$= 476.6 kg/ha	$LSD_{0.1\%}$ = 690.1kg./ha				

The application of minimum tillage resulted in various yields, depending on hybrid.

Between 2014 and 2016 the average yield of maize grain in the seven hybrids under study ranged between 4,975.1 kg/ha (hybrid Sumbra, disking 10 cm) and 7,034.8 kg/ha (hybrid P0216, disking/ploughing 20 cm). In the control (ploughing 20 cm) the highest average yield was recorded in the hybrid P0216, i.e. 6,930.1 kg/ha, followed by PR37N01 (6754.7 kg/ha) and Olt (6386.5 kg/ha). The average yields recorded in the control variant ranged between 5,477.2 kg/ha (hybrid Sunergy) and 6,930.1 kg/ha (hybrid P0216).

The hybrid P0216 recorded the highest average yield both in the traditional worked variant and in unconventional system (6,442.1 kg/ha - disking/chiselling 40). The closest to the control were the yields obtained from minimum tillage and were recorded in the variants chiselled at 40 cm in depth, i.e. 91% (hybrids PR37N01, Bonito and P0216) and 97% (hybrids Olt and Sumbra). The chiselled variants at 20 cm in depth resulted in yields of 85% (hybrid P0216 - 5,903.2 kg/ha) and 91%, respectively (hybrid Sumbra - 5,617.7 kg/ha) compared with the control ploughed at 20 cm in depth. The yields obtained from the seven hybrids in the disked variant recorded highly significant negative values, compared with the control ploughed at 20 cm in depth. They ranged between 4,975.1 kg/ha (hybrid Sumbra) and 5508.3 kg/ha (hybrid P0216), i.e. between 80 and 83% of the values recorded by the control.

Influence of the hybrid maturity group on the grain yield in the various variants of soil tillage.

The hybrids grown in Romania are classified into five groups of early ripeness according to the growing period, as follows: very early hybirds (FAO classification 100-199); early hybrids (FAO 200-299); semi early hybrids (FAO 300-399); semi late hybrids (FAO 400-499 and 500-599) and late hybrids (>600). Hybrid zoning is based on the thermal constant, which represents the sum of temperatures over 10°C throughout the entire growing season.

The comparative analysis of the maize hybrid maturity groups (Table 3) shows that, compared with the early hybrids (the control group), higher yields were recorded in both semi early and semi late hybrids. Compared with the control group, semi late hybrids recorded yields ranging between 5,187.5 kg/ha (disked variant) and 6,584.7 kg/ha (variant disking/ploughing 20), i.e. 106 and 110%, respectively, of the control value. In the conventional system, the yields ranged between 6,450.9 kg/ha (semi early hybrid group - variant ploughing 20 cm) and 6,626.2 kg/ha (semi early hybrid group - variant disking/ploughing 20 cm). In the nonconventional system, the semi late hybrid group was conspicuous, compared with the control group, by its increased yield, i.e. 680.7 kg/ha. This showed that the semi late hybrids were better suitable for southeastern Romania.

Table 3. Influence of hybrid maturity group on maize grain yield in various soil tillage systems, Moara Domnească, Ilfov County, average 2014-2016

FAO group/ Soil tillage	FAO 270-280 (Early)			FAO 340-380 (Semi early)			FAO 400- 510 (Semi late)		
	kg/ha	%	Diff. kg/ha	kg/ha	%	Diff. kg/ha	kg/ha	%	Diff. kg/ha
A20	5895.3	100	Mt	6450.9	109	555.6**	6491.4	110	596.1***
C20	5303.4	100	Mt	5656.5	106	353.1*	5745.0	108	441.6**
C40	5420.4	100	Mt	5934.6	109	514.2 *	6101.1	112	680.7***
Disc	4886.0	100	Mt	5213.4	106	327.4	5187.5	106	301.5*
D/A20	5956.3	100	Mt	6626.2	111	669.9**	6584.7	110	628.4***
D/C40	5568.8	100	Mt	5930.6	106	361.8*	6209.0	111	640.2***
				$LSD_{5\%}$= 340.2 kg/ha $LSD_{1\%}$ = 483.7kg/ha $LSD_{0.1\%}$= 700.4 kg./ha			$LSD_{5\%}$= 275.2 kg/ha $LSD_{1\%}$= 391.9 kg/ha $LSD_{0.1\%}$ = 566.7 kg./ha		

The average results regarding the influence of soil tillage system on the Thousand Grain Weight (TGW) and Standard Mass per Storage Volume (SMPSV) in the seven maize hybrids grown in both traditional and minimum tillage systems are shown in Tables 4 and 5.

The values analysed were influenced by the climatic conditions, grown hybrids and soil tillage system. The TGW of the seven hybrids under study ranged between 253.1 g (hybrid Sunergy - disking) and 279.0 g (hybrid P0216 - disking/ploughing 20 cm).

In the traditional system, hybrid P0216 ranged between 277.7 g in variant A20 cm (control) and 279.0 g in variant disking/ploughing 20 cm, followed by hybrids PR37N01 (278.5 g, variant disking/ploughing 20 cm) and hybrid Olt, respectively, that recorded 273.8 g in variant ploughing 20 cm.

The lowest valued of TGW were recorded in the variants disked at 10 cm in depth and chiselled at 20 cm in depth of the hybrids Sunergy and Bonito. The closest to the control ploughed at 20 cm in depth were the values

recorded in the following hybrids: PR39B76 (269.2 g - variant disking/chiselling 40 cm), Olt (272.4 g - variant disking/chiselling 40 cm) and Sumbra (269.1 g - variant disking/chiselling 40 cm), i.e. 99% of their values.

Table 4. Influence of basic soil tillage on thousand grain weight (TGW) in maize crop, Moara Domnească, Ilfov County, average 2014-2016

Soil tillage variant/ Hybrids	TGW (g)	A20	C20	C40	Disc	D/A20	D/C40
PR39B76	TGW (g)	271.9	266.9	267.8	262.8	273.4	269.8
	%	100	98	98	96	101	99
	Diff. (g)	Mt	-5.0	-4.1	-9.1 ^{o}	1.5	-2.1
	$LSD_{5\%}$= 9.1 g	$LSD_{1\%}$= 14.1 g	$LSD_{0.1\%}$= 20.4 g				
SUNERGY	TGW (g)	263.3	257.0	261.1	253.1	263.4	260.8
	%	100	97	99	96	100	99
	Diff. (g)	Mt	-6.3	-2.2	-10.2	0.1	-2.5
	$LSD_{5\%}$= 10.4 g	$LSD_{1\%}$= 14.8 g	$LSD_{0.1\%}$= 21.4 g				
PR37N01	TGW (g)	277.0	270.1	272.0	262.9	278.5	272.8
	%	100	97	98	95	101	98
	Diff. (g)	Mt	-6.9	-5.0	-14.1 ^{o}	1.5	-4.2
	$LSD_{5\%}$= 10.1 g	$LSD_{1\%}$= 14.4 g	$LSD_{0.1\%}$ = 20.9 g				
BONITO	TGW (g)	270.9	261.2	264.6	255.0	271.6	265.8
	%	100	96	97	94	100	98
	Diff. (g)	Mt	-9.7	-6.3	-15.9 ^{o}	0.7	-5.1
	$LSD_{5\%}$= 11.3 g	$LSD_{1\%}$ = 16.1 g	$LSD_{0.1\%}$= 23.4 g				
OLT	TGW (g)	273.8	267.3	270.3	260.4	273.6	272.4
	%	100	97	98	95	100	99
	Diff. (g)	Mt	-6.5	-3.5	-13.4 ^{o}	-0.2	-1.4
	$LSD_{5\%}$= 9.7 g	$LSD_{1\%}$ = 13.8 g	$LSD_{0.1\%}$= 20.0 g				
SUMBRA	TGW (g)	270.1	264.6	268.2	260.1	272.5	269.1
	%	100	98	99	96	101	99
	Diff. (g)	Mt	-5.5	-1.9	-10.0 ^{o}	2.4	-1.0
	$LSD_{5\%}$= 8.9 g	$LSD_{1\%}$ = 12.6 g	$LSD_{0.1\%}$ = 18.3 g				
P0216	TGW (g)	277.7	270.8	272.3	264.3	279.0	273.2
	%	100	97	98	95	100	98
	Diff. (g)	Mt	-6.9	-5.4	-13.7 ^{o}	1.3	-4.5
	$LSD_{5\%}$= 10.0 g	$LSD_{1\%}$= 14.3 g	$LSD_{0.1\%}$ = 20.7 g				

On average for 2014-2016, the Standard Mass per Storage Volume (SMPSV) recorded high values in the traditional variants where the highest values were recorded in the hybrids P0216 (73.5 kg/hl, variant disking/ploughing 20 cm) and PR37N01 (73.1 kg/hl, variant disking/ploughing 20 cm). This exceeded the control by 0.6 and 0.8 kg/hl, respectively.

The values resulted from nonconventional tillage recorded between 90 and 99% of the control.

The chiselled variant at 20 cm in depth recorded values that ranged from negative to highly significant negative, compared with the control (ploughing 20 cm).

The disking of reddish preluvosoil resulted in lower values of the SMPSV, compared with the other soil tillage variants. They ranged between 63.7 kg/hl (hybrid Bonito) and 67.3 kg/hl (hybrid PR39B76), which were significantly negative, compared with the control.

Table 5. Influence of basic soil tillage on Standard Mass per Storage Volume (SMPSV) in grain maize crop, Moara Domnească, Ilfov County, average 2014-2016

Soil tillage variant/ hybrids	SMPSV (kg/100 l)	A20	C20	C40	Disc	D/A20	D/C40
PR39B76	SMPSV (kg/hl)	71.2	68.4	69.6	67.3	71.7	70.5
	%	100	96	97	94	100	99
	Diff. (kg/hl)	Mt	-2.8 ^{oo}	-1.6	-3.9 ^{oo}	0.5	-0.7
	$LSD_{5\%}$= 1.9 kg/hl	$LSD_{1\%}$= 2.8 kg/hl	$LSD_{0.1\%}$= 4.0 kg/hl				
SUNERGY	SMPSV (kg/hl)	66.3	64.2	65.4	63.8	66.0	65.5
	%	100	97	98	96	100	99
	Diff. (kg/hl)	Mt	-2.1 ^{o}	-0.9	-2.5 ^{o}	-0.3	-0.8
	$LSD_{5\%}$= 2.1 kg/hl	$LSD_{1\%}$= 2.9 kg/hl	$LSD_{0.1\%}$= 4.3 kg/hl				
PR37N01	SMPSV (kg/hl)	72.5	68.9	70.9	66.4	73.1	70.7
	%	100	95	98	91	101	97
	Diff. (kg/hl)	Mt	-3.6 ^{oo}	-1.6	-6.1 ^{ooo}	0.6	-1.8
	$LSD_{5\%}$= 2.4 kg/hl	$LSD_{1\%}$= 3.5 kg/hl	$LSD_{0.1\%}$ = 5.0 kg/hl				
BONITO	SMPSV (kg/hl)	71.0	66.1	68.2	63.7	70.9	69.1
	%	100	93	96	90	100	97
	Diff. (kg/hl)	Mt	-5.0 ^{ooo}	-2.8 ^{o}	-7.3 ^{ooo}	-0.1	-1.9
	$LSD_{5\%}$= 2.3 kg/hl	$LSD_{1\%}$ = 3.2 kg/hl	$LSD_{0.1\%}$= 4.7 kg/hl				
OLT	SMPSV (kg/hl)	71.1	68.2	69.5	66.0	71.4	70.6
	%	100	96	97	93	100	99
	Diff. (kg/hl)	Mt	-2.9 ^{oo}	-1.6	-5.1 ^{ooo}	0.3	-0.5
	$LSD_{5\%}$= 2.0 kg/hl	$LSD_{1\%}$ = 2.9 kg/hl	$LSD_{0.1\%}$= 4.2 kg/hl				
SUMBRA	SMPSV (kg/hl)	71.1	68.4	69.5	65.8	71.5	70.6
	%	100	96	98	92	101	99
	Diff. (kg/hl)	Mt	-2.7 ^{o}	-1.6	-5.3 ^{ooo}	0.4	-0.5
	$LSD_{5\%}$= 2.0 kg/hl	$LSD_{1\%}$ = 2.9 kg/hl	$LSD_{0.1\%}$= 4.2 kg/hl				
P0216	SMPSV (kg/hl)	72.7	68.9	70.9	66.2	73.5	71.0
	%	100	94	97	91	101	97
	Diff. (kg/hl)	Mt	-3.8 ^{oo}	-1.8	-6.5 ^{ooo}	0.8	-1.7
	$LSD_{5\%}$= 2.4 kg/hl	$LSD_{1\%}$= 3.4 kg/hl	$LSD_{0.1\%}$ = 5.0 kg/hl				

CONCLUSIONS

The climatic conditions between 2014 and 2016 manifested direct influence on the development of the crop plants. The evolution of the thermal regime and rainfalls throughout the same period oscillated, compared with the multiannual average values.

The average maize grain yield of the seven hybrids studied between 2014 and 2016 ranged between 4,975.1 kg/ha (hybrid Sumbra, disking 10 cm) and 7,034.8 kg/ha (hybrid P0216, disking/ploughing 20 cm).

The yields that were the closest to the control were obtained from minimum tillage in the following variants: chiselling 40 cm and disking/chiselling 40 cm, i.e. between 91% (in hybrids PR37N01, Bonito and P0216) and 97% (in hybrids Olt and Sumbra).

Concerning the influence of hybrid maturity group on the maize grain yield, the highest yield was recorded in the semi late hybrids, i.e. 680.7 kg/ha (chiselling 40 cm), compared with the control.

The thousand grain weight of the seven hybrids studied recorded values between 253.1 g (hybrid Sunergy - disking) and 279.0 g (hybrid P0216 - disking/ploughing 20 cm).

The standard mass per storage volume (SMPSV) on average for the period between 2014 and 2016 recorded high values in the conventional variants, compared with the nonconventional ones. In the sonventional system, the values of the standard mass per storage volume ranged between 66.0 kg/hl (hybrid Sunergy - disking/ploughing 20 cm) and 73.5 kg/hl (hybrid P0216 - disking/ploughing 20 cm).

Considering the results obtained during the three years of research, we recommend cisseling at 40 cm in depth as an alternative to traditional soil tillage in the Moara Domnească area, the Ilfov County.

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REFERENCES

De Felice, M., Carter, P., Mitchell, S. (2006). Influence of Tillage on corn yield in the USA and Canada. *Crop Insights., 16*(11). Pioneer Hi-Breed. Johnston. I.A.

Guş, P., Rusu, T., Bogdan, Ileana, Haţegan, M. (2001). *Sisteme neconvenţionale de lucrare a solului*. Ed. Risoprint. Cluj-Napoca.

Guş, P., Rusu, T., Stănilă, S. (2003). *Lucrările neconvenţionale ale solului şi sistema de maşini*. Editura Risoprint. Cluj-Napoca.

Hallauer, A.R., and Colvin, T.S. (1985). Corn hybrids response to four methods of tillage. *Agronomy Journal, 77*, 547–550.

Hesterman, O.B., Pierce, F.J., Rossman, E.C. (1988). Performance of commercial hybrids under convenţional and no-tillage system. *J. Prod. Agric*., *1*, 202–206.

Marin, D.I., Rusu, T., Mihalache, M. (2008). The effect of non-conservation tillage up on the edaphic component of the Agricultural Ecosystem. *Analele Universităţii din Craiova. Lucrări ştiinţifice - Agricultură. Montanologie. Cadastru*, 399–402. ISSN 1841-8317.

Marin, D.I., Mihalache, M., Ciontu, C., Ilie, L., Bolohan, C. (2011). Influenţa sistemului de lucrare a solului asupra culturilor de mazăre. grâu şi porumb. USAMV Cluj. *5th Internaţional Symposium - Soil Minimum Tillage System*, 111–118. Ed. Risoprint Cluj-Napoca.

Newhouse, K.E., and Crosbie, T.M. (1986). Interacţion of maize hybrids with tillage system. *Agronomy Journal*, *78*, 951–954.

Pintilie, C., Timariu, Gh., Romosan, St. (1985). *Agrotehnică.* Editura Didactică şi Pedagogică. Bucureşti.

Pop, A.I., Guş, P., Rusu, T., Bogdan, I., Moraru, P., Cîmpean, P. (2011). Influence of soil tillage system on weeding degree and corn yield. *Scientific Papers. Series A. Agronomy, LIV*, 230–234. ISSN 1222-5339.

Rusu, T., Guş, P., Bogdan, I., Moraru, P.I., Pop, A.I., Clapa, D., Marin, D.I., Oroian, I. and Pop, L.I. (2009). Implications of Minimum Tillage Systems on Sustainability of Agricultural Production and Soil Conservation. *Journal of Food. Agriculture & Environment, 7*(2), 335–338.

Uri, N.D. (2000). Perception on the use of no-till farming in producţion agriculture in United States: an analysis of survey results. *Agricultural Ecosystem and Enviroment, 77*, 263–266.

Wright, D.L. (1990). Starter fertilizer placement in No-Till corn. Florida *Agr. Exp. Station Journal*, *9943*, 27–29.