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RESEARCH CONDUCTED IN THE EXPERIMENTAL FIELD, ON FERTILITY OF THE PSAMOSOIL IN THE DANUBE LOWLAND (AREA POIANA MARE-DOLJ)

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ABSTRACT

In order to test the productive ccapacity of sandy soils from Poiana Mare as well as the way they respond to fertilization there were carried out two monofactorial experiments: one experiment was located on an eutric sandy soil (typical) placed on the tip of the dune and the second one was set up between dunes on a wide place. The treatments were as follows:

***V_1**= not fertilized (control);*
***V_2**= fertilized by N_{100};*
***V_3**= fertilized by N_{100} P_{60};*
***V_4**= fertilized by N_{100} P_{60} K_{40};*
***V_5**= fertilized by manure, 30 t/ha, applied every three years.*

The experiment lasted three years in a wheat – maize crop rotation.These crops are most frecquently cropped in this area in in the above mentioned crop rotation. The trials have been carried out with irrigation.

MATERIAL AND METHOD

The determination of physical, hydrophysical and chemical properties of soil have been made according with „ Metodology of elaborating pedological studies", I.C.P.A. – 1987.

INDTRODUCTION

In order to set up the experiment there were identified two zones that are most representative for the entire surface of sandy soil from Danube lowland.

RESULTS AND DISCUSSIONS

Psamosoil characterization of experimental field

In order to set up the experiment there were identified two zones that are most representative for the entire surface of sandy soil from Danube lowland.

This way, for the typical sandy soil (eutric) there was identified a dune of middle height and wider platform. The soil is characterized by a high sand percentage (over 90%) and a low clay content (under 10%).

Table no.1.
The main physico-chemical properties of psamosoil where the trials were located

SOIL	Depth Cm	Sand 2- 0.2mm	Loam 0.02- 0.002mm	Clay < 0.002mm	HUMUS %	Nt %	P (ppm)	K (ppm)	pH (H_2O)	SB me/mg sol
MOLIC PSAMOSOIL	0- 20	91.6	3.2	5.2	0.41	0.026	9.6	55	7.7	6.3
	20- 40	92.1	3.4	4.5	0.24	0.014	8.5	49	8.2	7.6
EUTRIC PSAMOSOIL	0- 20	83.7	6.1	10.2	1.58	0.079	30.0	101	7.9	9.8
	20- 40	86.1	5.2	8.7	0.91	0.046	14.6	96	8.1	11.5

The humus content is low and the soil is low supplied by nutrients (table 1).

For the molic sandy soil there was identified a place between dunes with middle depth yet well developed. The soil has a lower sand content (under 85% and higher content in fine fractions (1.58%) and the nutrient content is good in cocmparison with the typical sand.

The analytical data show that the first soil has a low productive potential and the molic sandy soil has a higher productive potential.

All sandy soils from Danube lowlandd have an alkaline reaction, the pH values ranging between 7.6 and 8.4. The presence of calcium carbonates is evident for most of the zones.

Results obtained for wheat production on eutric psamosoil on the Danube lowland, the area Poiana Mare

Analyzing the wheat yields during three years of experimentation there can be said that they are low yet taking account of not irrigated conditions, they express the low producctive potential of sandy soils (table 2, figure 1).

Table no.2 .

The influence of mineral and organic fertilization on the production of weat on eutric psamosoil in the area Poiana Mare

Treatment	Average yield Kg/ha	Percentage yield %	±Ctrl.	Significance
V_1= not fertilized (Ctrl)	**770**	**100**	**-**	**-**
V_2= N_{100}	**1040**	**135**	**270**	**Xx**
V_3= N_{100} P_{60}	**1266**	**164**	**496**	**Xxx**
V_4= N_{100} P_{60} K_{40}	**1340**	**174**	**570**	**Xxx**
V_5= manure 30 t/ha	**1496**	**194**	**726**	**Xxx**
	DL 5%		130 Kg/ha	
	DL 1%		189 Kg/ha	
	DL 0.1%		284 Kg/ha	

The average wheat yield obtained in three years of experimentation (2006, 2007 and 2008) has been of 770 kg/ha with not fertilized treatment taken as control.

By applying ammonium nitrate 300 kg/ha (V_2) the yield increased to 1,040 kg/ha, the nitrogen fertilizer applied alone has brought a percentage output of 35% and a yield output of 270 kg/ha which is distinct significant.

By fertilizing with 300 kg/ha ammonium nitrate and 125 kg/ha concentrated superphosphate (V_3), the average yield on three years of experimentation has increased to 1,266 kg/ha, a percentage output of 64% over control (V_1) and a yield output of 496 kg/ha. The commparison between V_2 and V_3 shows that the phosphorus fertilizer has brought a yield output of 126 kg/ha which means 29%, a little lower than the nitrogen fertilizer applied alone (V_2).

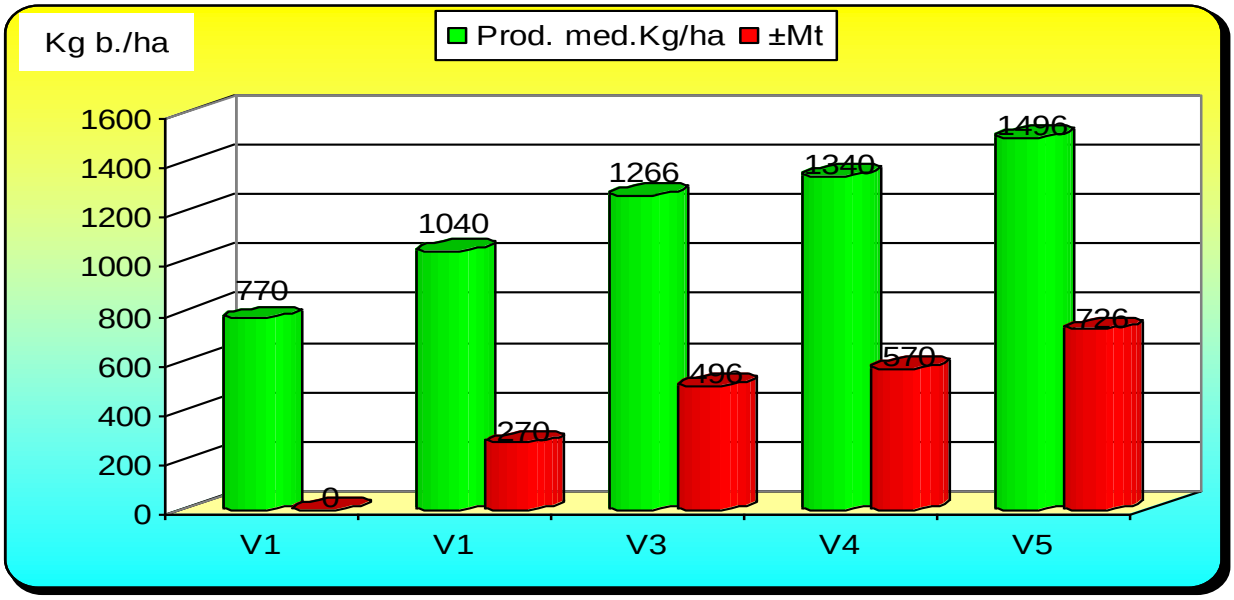

Figure no. 1 . Evolution of production of wheat after mineral and organic fertilization on eutric psamosoil (typical) of the area Poiana Mare (the average grain production(Kg/ha)/2006, 2007, 2008)

With the fourth treatment where there was applied 300 kg/ha ammonium nitrate, 125 kg/ha concentrated superphosphate and 100 kg/ha potassium chlorine the yield reached 1,340 kg/ha.

The percentage output has been of 74% and the yield output was of 570 kg/ha. Making a commparison between V_3 and V_4 we can say that the potassium based fertilizer has brought a percentage output of only 10% and a yield output of only 74 kg/ha therefore much reduced in comparison with outputs brought by nitrogen and phosphorus.

Manure applied in 30 t/ha rate, once every three years (V_5) is the fertilizer that has given the best results on the three years period of experimentation. The average yield of wheat with this treatment has been of 1,496 kg/ha, with a percentage output of 94% and a yield output of 726 kg/ha. Therefore, even in not irrrigatedd conditions the organic fertilization can double the yield on sandy soils from Danube lowland.

Calculating the yield output expressed in kg/kg of active ingredient (a.i.) fertilizer (table 3) there can be noticed that the $N_{100}P_{60}$ (V_3) treatment has brought an output of yield of 3.1 kg/kg a.i., with N_{100} P_{60} K_{40} (***V_4***) treatment the yield output has been of 2.85 kg/kg a.i. and with N_{100} (***V_4***) treatment it was of 2.70 kg/kg a.i.

Table no. 3.

Yield output of wheat crop on eutric psamosoil (typical) in Poiana Mare-Dolj (kg wheat / Kg active ingredient of fertilizer)

Specification	Treatment			
	V_1	V_2	V_3	V_4
Kg wheat/Kg a.i.	**-**	**2.70**	**3.10**	**2.85**

In order to compare all average wheat yields obtained during three years of experimentation after the system each of each there was drawn a table with the following colons (table 4):

- Current number vor the five treatments;
- Wheat yield in increasingly order;
- Variants correspondint to respective yields;

- Yield differences and their significations taking as control each variant in comparison with the others.

Table no. 4.

Calculation of multiple comparisons on culture of wheat in eutric psamosoil (typical) in the area Poiana Mare-Dolj

Nr. Crt	Yield (Kg/ha)	Variant	1040	1266	1340	1496
1	1496	V_5	726***	456***	230 **	156 *
2	1340	V_4	570***	300***	74	-
3	1266	V_3	496***	226**	-	-
4	1040	V_2	270**	-	-	-
5	770	V_1	-	-	-	-

DL 5% 130 Kg/ha
DL 1% 189 Kg/ha
DL 0,1% 284 Kg/ha

From these results there can be noticed that when V_1 was taken as control the difference of yield with V_2 (270 kg/ha) has been distinct significant and all other differences have been very significant. When V_2 variant was taken as control, the yield difference to V_3 (226 kg/ha) has been distinct significant and the yield differences over V_4 and V_5 have been very significant.

Taking as control the V_3 treatment, the yield differences over V_4 has been of 74 kg/ha which means significant and the yield difference over V_5 has been distinct significant.

When V_4 has been taken as ccontrol the yield difference over V_5 was of 156 kg/ha and it was significant.

Results obtained for wheat production on molic psamosoil of the Danube lowland, the area Poiana Mare

The average wheat yields obtained during experimentation years on molic sandy soil are double over the ones obtained on eutric sandy soil and that proves the yielding potential of these soils is higher. With the control treatment the average yield has been of 1,306 kg/ha, 600 kg/ha higherr than the one obtained on eutric sandy soil (table 5, figure 2).

Table no.5.

The influence of mineral and organic fertilization on the production of weat on molic psamosoil in the area Poiana Mare

Treatment	Average yield Kg/ha	Percentage yield %	±Ctrl.	Significance
V_1= not fertilized (Ctrl)	1306	100	-	-
V_2= N_{100}	1533	117	227	Xx
V_3= N_{100} P_{60}	1720	132	414	Xxx
V_4= N_{100} P_{60} K_{40}	1773	136	467	Xxx
V_5= maanure 30 t/ha	1920	147	614	Xxx

DL 5% 105 Kg/ha
DL 1% 152 Kg/ha
DL 0.1% 229 Kg/ha

The mineral and organic fertilization have brought yield outputs with all treatments yet, a little lower than on dunes.

With the variant fertilized by 300 kg/ha ammonium nitrate the wheat yield has been of 1,533 kg/ha grains, with a percentage increase over the control of 17% and a yield output of 227 kg/ha which was distinct significant.

When along with ammonium nitrate there was applied concentrated superphosphate in quantity of 125 kg/ha the wheat yield has been of 1,720 kg/ha with an increase over the control of 414 kg/ha.

The percentage increase was of 32% and the yield output was very significant. Comparing the yields of V_2 and V_3 we can say that phosphorrus based fertilizer has brought a percentage output of 1187 kg/ha, both a little lower than nitrogen based fertilizer (ammonium nitrate) applied alone (V_2).

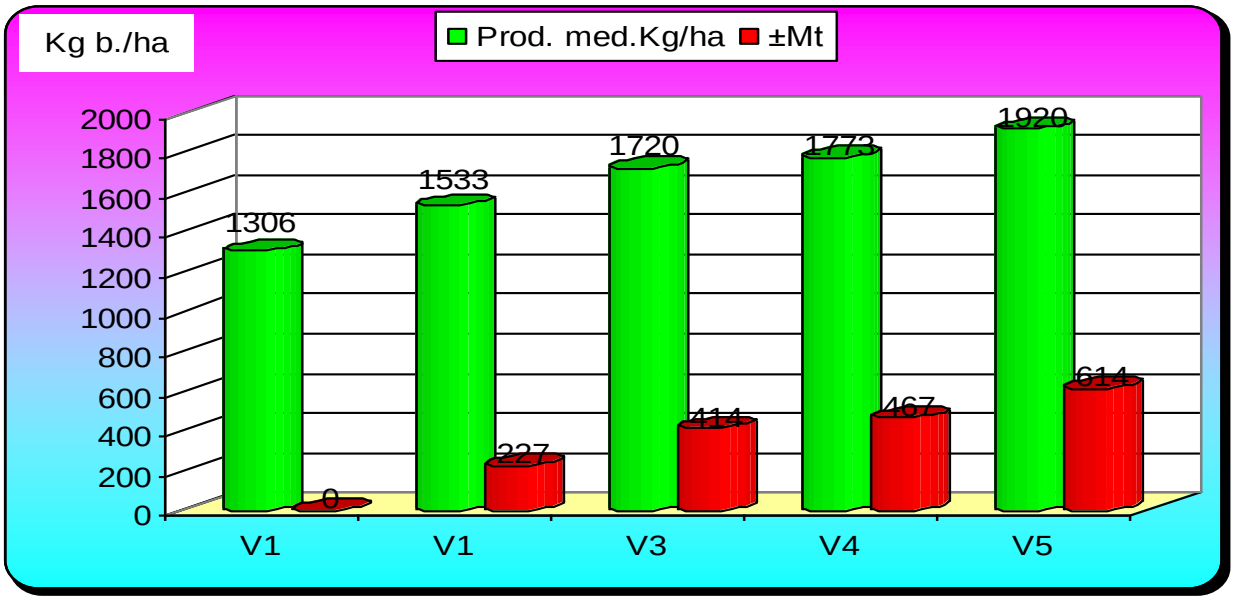

Figure no. 2. Evolution of production of wheat after mineral and organic fertilization on molic psamosoil of the area Poiana Mare (the average grain production(Kg/ha)/2006, 2007, 2008)

With the forth variant, where the mineral fertilization has been made with 300 kg/ha ammonium nitrate, 125 kg/ha concentrated superphosphate and 125 kg potassium chlorine, the wheat yield has been of 1,773 kg/ha.

The percentage output over V_4 has been of 36% and the yield output was of 467 kg/ha. Comparing the yields of V_3 and V_4 there can be noticed that the potassium based fertilizer has brought a percentage output of only 4% and a yield output of 53 kg/ha, so much lower in comparison with outputs brought by nitrogen and phosphorus. This aspect can be explained by low potassium rate (100 kg/ha) and the natural reserve in potassium of this type of soil.

Manure applied in 30 t/ha rate (V_5) has given the best results on three years period of experimemntation on molic sandy soil. The average wheat yield with this variant has been of 1,930 kg/ha, recording a percentage output of 47% and a yield increase of 614 kg/ha.

Calculating the yield output obtained on one kg of active ingredient of fertilizer (table 6) there can be noticed that only with ammonium nitrate the yield output per kg of active ingredient has been the lowes this fact showing that the nitrogen determines a high vegetative growth yet a lower grain yield per kg of active ingredient. The best yield output was recorded with the variant fertilized by ammonium nitrate and concentrated superphosphate (V_3).

Table no. 6.

Increase the harvest of wheat crop on molic psamosoil in Poiana Mare-Dolj (kg wheat / Kg active substance)

Specification	VARIANT			
	V_1	V_2	V_3	V_4
Kg wheat/Kg a.i.	**-**	**2.27**	**2.58**	**2.34**

The interpretation of yield results over the system each to each variant (table 6) shows that, when V_1 variant has been taken as control, the yield difference over V_2 (227 kg/ha) has been distinct significant and the yield differences over V_3 (414 kg/ha), V_4 (467 kg/ha) and V_5 (614 kg/ha)0 have been very significant.

Taking as control the V_2, the yield difference over V_3 (187 kg/ha) has been distinct significant and the yield difference over V_4 (240 kg/ha) and V_5 (387 kg/ha) have been very significant.

When V_3 has been taken as control, the yield difference over V_4 (50 kg/ha) was significant and over V_5 (200 kg/ha) has been distinct significant.

With V_4 as control, the yield difference over V_5 (147 kg/ha) was significant.

Table no.7.

Calculation of multiple comparisons on culture of wheat on molic psamosoil in the area Poiana Mare-Dolj

Nr. Crt	Yield (Kg/ha)	Variant	1533	1720	1773	1920
1	**1920**	**V_5**	**614*****	**387*****	**200 ****	**147 ***
2	**1773**	**V_4**	**467*****	**240*****	**50**	-
3	**1720**	**V_3**	**414*****	**187****	-	-
4	**1533**	**V_2**	**227****	-	-	-
5	**1306**	**V_1**	-	-	-	-

DL 5% 105 Kg/ha
DL 1% 152 Kg/ha
DL 0.1% 229 Kg/ha

CONCLUSIONS

Overall, there can be said that the experimental results obtained on molic sandy soil with wheat crop have had the same tendency, with the specification that the yield differences over the control have been lower, which can be explained by the higher natural reserve of nutrients on this soil.

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