# RESEARCH REGARDING THE INFLUENCE OF SOME CULTIVATION TECHNOLOGY ELEMENTS ON MAIZE YIELD UNDER DIFFERENT CLIMATE CONDITIONS

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**Abstract**

In the years 2013, 2014, and 2015, at the Didactic Station of the BUASVM from Timișoara, Romania, a tri-factorial trial was carried on to monitor the influence of basic soil work, of sowing time and of maize hybrid on maize yield. The three trial years were, as far as climate favourability is concerned, different: 2013 was medium favourable, 2014 was very favourable, and 2015 was little favourable. Results pointed out that hybrid and sowing time influence yield significantly. Basic soil work had a lesser contribution to yield variability. In 2015, a dry year, yield increased with 520 kg/ha with no statistic ensurance in the „scarification" variant.

**Key words**: hybrid, sowing time, scarification, yield

In the context of climate change, we need to adapt cultivation technologies to climate variations, important from one year to another. The most frequently, unfavourable climate conditions are the result of long dry periods or of periods with little precipitations associated with extreme heat.

Maize hybrids can diminish the negative effects of bad weather due to their morpho-physiological features and to the length of the vegetation period. Scarification increases soil water storage capacity and sowing time can alter the vegetation period, avoiding the risk of overlapping water critical phenol-phases and dry periods.

## MATERIAL AND METHOD

The trial was carried out at the Didactic Station of the BUASVM from Timisoara, Romania, after the subdivided plot method with three replicates.

The trial factors were as follows:

FACTOR A = basic soil work: a1 = ploughing; a2 = scarification

FACTOR B = hybrid: b1 = Gavot; b2 = Kitty; b3 = Mikado

FACTOR C = sowing time: c1 = sowing time I (second decade of April); c2 = sowing time II (third decade of April); c3 = sowing time III (first decade of May).

Climate conditions are presented in Tables 1 and 2 below.

The year 2013 had medium favourability, 2014 was very favourable and 2015 was less favourable for maize cultivation. The trial soil was a typical chernozem.

## RESULTS AND DISCUSSION

In 2013 (*Table 3*), the maize hybrid had a significant influence on maize yield variability (56.38%). Sowing time also had an important influence (26.41%), while basic soil work had an influence of only 0.61%. Simple or even double interactions with statistically ensured influences were soil works x sowing time (2.38%) and sowing time x hybrid (2.08%).

In 2014, according to the data in *Table 4*, sowing time and hybrid had a strong, statistically ensured influence on yield level. Sowing time contributed 79.78% to the total variability of this feature, and hybrid shared 15.3%. Basic soil work did not influence yield level (0.4%).

The interactions sowing time x hybrids and hybrids x soil works x sowing times had the most consistent influences on maize yield.

In 2015 2015, a very dry year (*Table 5*), the maize hybrid had the most important effect on yield (48.58%), close to that of the sowing time (43.58%), while that of the soil works was reduced (0.93%). The effect of the interactions influenced yield level. The most important ones were soil work x sowing time and sowing time x hybrid.

Analysing the impact of basic soil works on maize yield (*Tables 6, 7 and 8*), we see that in 2013 and 2014 there was no influence whatsoever.

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In 2015, a very dry year, in the variants scarified, yield increased with 520 kg/ha, but it was not statistically ensured.

*Table 3.* Main phenological data in the three maize hybrids at the Didactic Station of the BUASVM from Timisoara (2013)

Table 1.

**Mean monthly temperatures (°C) at the Meteorological Station in Timişoara during the trial cycle**

| Agricultural year/Month | X | XI | XII | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | 12.2 | 8.0 | -0.2 | 1.4 | 3.9 | 5.2 | 13.1 | 17.9 | 20.4 | 23.0 | 23.9 | 15.4 |
| 2014 | 12.7 | 9.0 | 1.1 | 3.1 | 5.7 | 9.2 | 12.7 | 16.2 | 20.7 | 22.1 | 22.1 | 17.2 |
| 2015 | 12.3 | 10.8 | 7.5 | 2.1 | 2.9 | 7.1 | 11.6 | 17.7 | 21.2 | 24.9 | 24.5 | 19.0 |
| Multiannual mean | 11.3 | 5.7 | 1.4 | -1.2 | 0.4 | 6.0 | 11.3 | 16.5 | 19.6 | 21.6 | 20.8 | 16.9 |

Table 2.

**Mean monthly precipitations (l/m²) at the Meteorological Station in Timişoara during the trial cycle**

| Agricultural year/Month | X | XI | XII | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | 69.4 | 19.2 | 57.0 | 54.3 | 37.1 | 98.3 | 32.7 | 97.0 | 47.5 | 24.9 | 50.9 | 62.8 |
| 2014 | 55.0 | 52.0 | 1.2 | 41.7 | 16.7 | 13.4 | 41.3 | 146.8 | 57.7 | 120.9 | 64.2 | 63.7 |
| 2015 | 83.7 | 85.2 | 87.0 | 51.4 | 37.4 | 33.3 | 28.1 | 46.9 | 61.8 | 25.0 | 111.2 | 60.5 |
| Multiannual mean | 54.8 | 40.6 | 47.8 | 40.9 | 40.2 | 41.6 | 50.0 | 66.7 | 81.1 | 59.9 | 52.2 | 46.1 |

Table 3.

**Variance analysis of the effect of soil works, sowing time and maize hybrid on maize yield in 2013**

| Source of variation | SP | GL | S2 | Test F |
|---|---|---|---|---|
| Total | 72414043 | 53 | | |
| Replicates | 385712 | 2 | 192856 | 4.03 |
| Soil works | 57624 | 1 | 57624 | 1.20 |
| Work errors | 95756 | 2 | 47878 | |
| Sowing time | 15296691 | 2 | 7648346 | 51.89** |
| Soil work x Sowing time | 1379447 | 2 | 689723.5 | 4.68* |
| Sowing time errors | 1179078 | 8 | 147384.8 | |
| Hybrid | 42465817 | 2 | 21232909 | 110.78** |
| Soil work x Hybrid | 1428913 | 2 | 714456.5 | 3.73* |
| Sowing time x Hybrid | 3137002 | 4 | 784250.5 | 4.09* |
| Soil work x Sowing time x Hybrid | 2387824 | 4 | 596956 | 3.11* |
| Hybrid error | 4600179 | 24 | 191674.1 | |

Table 4.

**Variance analysis of the effect of soil works, sowing time and maize hybrid on maize yield in 2014**

| Source of variation | SP | GL | S2 | Test F |
|---|---|---|---|---|
| Total | 165648655 | 53 | | |
| Replicates | 103169 | 2 | 51585 | 1.25 |
| Soil works | 12627 | 1 | 12627 | 0.31 |
| Work errors | 82575 | 2 | 41288 | |
| Sowing time | 114558359 | 2 | 57279180 | 654.27** |
| Soil work x Sowing time | 785975 | 2 | 392988 | 4.49* |
| Sowing time errors | 700376 | 8 | 87547 | |
| Hybrid | 39163410 | 2 | 19581705 | 125.47** |
| Soil work x Hybrid | 1379574 | 2 | 689787 | 4.42* |
| Sowing time x Hybrid | 3314539 | 4 | 828635 | 5.31* |
| Soil work x Sowing time x Hybrid | 1812323 | 4 | 453081 | 2.90* |
| Hybrid error | 3745728 | 24 | 156072 | |

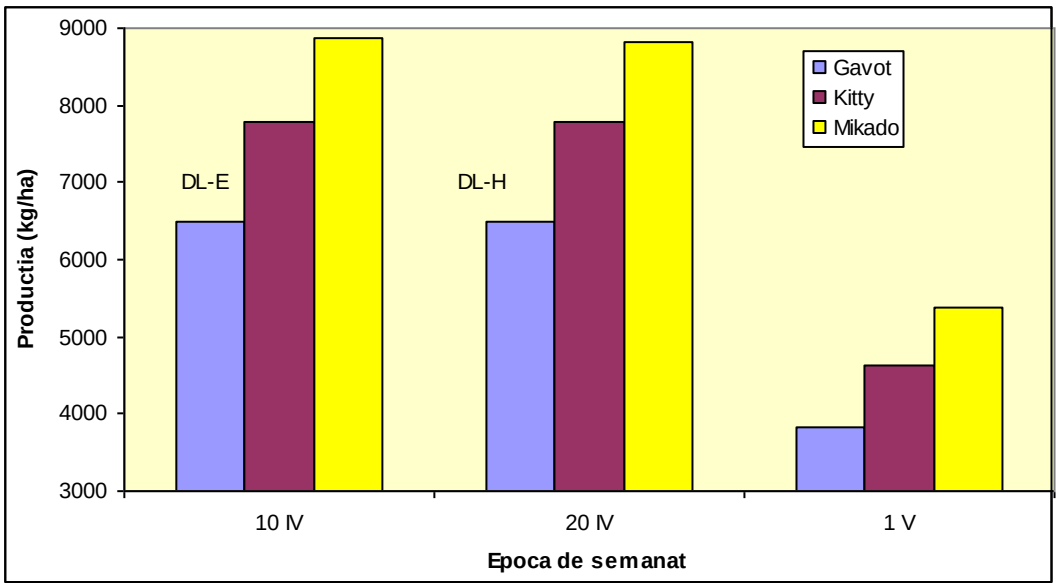


Fig. 1. The **maize yields in 2014 under different sowing periods and hybrids**

Table 5.

**Variance analysis of the effect of soil works, sowing time and maize hybrid on maize yield in 2015**

| Source of variation | SP | GL | S2 | Test F |
|---|---|---|---|---|
| Total | 183104381 | 53 | | |
| Replicates | 1110008 | 2 | 555004 | 1.54 |
| Soil works | 3648840 | 1 | 3648840 | 10.12 |
| Work errors | 720924 | 2 | 360462 | |
| Sowing time | 10303391 | 2 | 5151696 | 474.73** |
| Soil work x Sowing time | 150174 | 2 | 75087 | 6.92* |
| Sowing time errors | 86815 | 8 | 10852 | |
| Hybrid | 145544343 | 2 | 72772172 | 530.25** |
| Soil work x Hybrid | 1644002 | 2 | 822001 | 5.99** |
| Sowing time x Hybrid | 14920552 | 4 | 3730138 | 27.18** |
| Soil work x Sowing time x Hybrid | 1681520 | 4 | 420380 | 3.06* |
| Hybrid error | 3293812 | 24 | 137242 | |

Table 6.

**Effect of soil works on maize yield in 2013**

| Soil work | Mean (kg/ha) | | Relative value (%) | Difference/Significance |
|---|---|---|---|---|
| Scarification - Ploughing | 6682 | 6675 | 100.10 | 7 |

DL5% = 238 kg/ha,
DL1% = 549 kg/ha,
DL0.1% = 1,747 kg/ha

Table 7.

**Effect of soil works on maize yield in 2014**

| Soil work | Mean (kg/ha) | | Relative value (%) | Difference/Significance |
|---|---|---|---|---|
| Scarification - Ploughing | 8526 | 8461 | 100.77 | 65 |

DL5% = 256 kg/ha,
DL1% = 591 kg/ha,
DL0.1% = 1,882 kg/ha

Table 8.

**Effect of soil works on maize yield in 2015**

| Soil work | Mean (kg/ha) | | Relative value (%) | Difference/Significance |
|---|---|---|---|---|
| Scarification - Ploughing | 5338 | 4818 | 110.79 | 520 |

DL5% = 703 kg/ha,
DL1% = 1,622 kg/ha,
DL0.1% = 5,163 kg/ha

## CONCLUSIONS

Hybrid and sowing time influenced strongly and significantly yield in all trial years.

Basic soil work had a minor influence on yield in 2013 and 2014.

In 2015, a dry year, scarification increased yield with 520 kg/ha, but without statistic ensurance.

Interactions of trial factors shared 3% of yield variability.

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