

## OBSERVATIONS ON THE AGRONOMIC VALUE AND THE USE VALUE OF SOME MAIZE HYBRIDS IN THE PEDOCLIMATIC CONDITIONS OF DÂMBOVIȚA COUNTY

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### Abstract

Maize productivity, same as any other crop, is the result of the interaction between all factors involved one way or another in vegetal production. From 11 maize hybrids considered in the experiments, the highest productions, of over 9000 kg/ha, were given, in the pedoclimatic conditions of Dâmbovița county, by PR38R92, Clarica and MGM 158714 hybrids. The maize grain yield had average values between 81,5% and 85%. EGZ 7403 and X6R223 hybrids had the highest yield. The most drought-resistant hybrids were Turda 201, Turda Moldova 188 and Clarica and the most heat-resistant one was SUM 1093 (SUANITO). The degree of shrivelling was close to 1 for all hybrids, the lowest one being noticed for MONALISA, PR38R92 and EGZ 7403. Most of hybrids had a 0% degree of sterility. EGZ 7403 and X6R223 hybrids were exceptions, having a 2% and 3% degree of sterility. The hybrids with the highest root strength were CLARICA, EGZ 7211 and MGM 158714, and those with the highest stalk strength were Clarica, EGZ 7211 and X6R223.

Keywords: maize, production, environmental factors

## 1. INTRODUCTION

The maize is situated on the third place as importance from the world's crop [2] as the grains of this plant are used in human diet, industry and animal feeding. [1]. Maize productivity, same as any other crop, is the result of the interaction between all factors involved one way or another in vegetal production. For a better use of farm lands and of natural resources for maize, in order to reach a profitable production, a sensible setting of areas for cultivated hybrids, depending on climate resources and biological needs of hybrids, is required [3].

## 2. MATERIAL AND METHODS

Studies were accomplished inside The Variety Testing Center of Târgoviște, during the 2008 - 2009 years and were designed to establish the average production for 11 grain maize hybrids and to observe their behavior, their development in comparison with environmental factors. Maize experiment was organized and accomplished for an early hybrids subgroup. Plot area was 15.4 square meters with 100 plants per plot (repetition).

The experiments were settled in randomized blocks with five repetitions (four repetitions were used to estimate production and the fifth one for biometric measurements and observations during vegetation). Observations were made in non-irrigated crop and the pre-plant was wheat. The soil is brown luvic weak pseudoguided, the altitude of the experimental field is 262 m.

Production was determined by weighing harvested cobs for every plot.

The maize grain yield was determined for whole quantity of cobs resulted from a repetition. The determination was accomplished at harvest, immediately after cobs weighing.

Drought tolerance has been established by observations and successive notes, giving the final score at harvest. The estimation was done by grades on 1 to 9 scale, where grade 1 represents the best resistance.

To estimate the intense heat tolerance it is written down when stigmata is drying. The estimation is done by grades on 1 to 9 scale depending on quantity of dried leaves, like that:

- grade 1 - leaves that are under the panicle without distress;

- grade 3 - first two leaves that are under the panicle with scalded aspect;
- grade 5 - three-four leaves that are under the panicle with scalded aspect;
- grade 7 - four-five leaves that are under the panicle with scalded aspect;
- grade 9 - more than five leaves that are under the panicle with scalded aspect.

Shriveling tolerance is expressed by shriveling degree which represents the product between phenomena frequency and intensity of it. It is estimated when we make an average sample of one hundred cobs at harvest.

Sterility is percentage of sterile plants from all plants that are on the plot and it is given at harvest when counting plants. Estimations were

made making the average between the first and the third repetition.

To estimate the plants fall, we must note before harvest, after eliminations removal. Fallen plants are considered those that are tilted from the base at an angle greater than 45 degrees from vertical. For first noting, plants fallen naturally, under the action of environmental factors, are written down, and for the second noting there are registered fallen plants from the first noting and also plants fallen by bending until the panicle reaches the panicles of plants from the neighbor row. Percentage estimation for fallen plants was made in all four repetitions.

**Table 1. Meteorological data - 2008**

| Month   | Temperature (°C) |      |      |                 | Rainfall (mm) |      |      |                |            |
|---------|------------------|------|------|-----------------|---------------|------|------|----------------|------------|
|         | I                | II   | III  | Monthly average | I             | II   | III  | Total (liters) | Rainy days |
| 10.2007 | 13.9             | 9.1  | 8.7  | 11              | 3.4           | 14.4 | 95   | 112.8          | 13         |
| 11.2007 | 4.4              | 2.3  | 1.4  | 2.7             | 24.1          | 47.1 | 0.3  | 71.5           | 11         |
| 12.2007 | 3.9              | -2.3 | -4.9 | -1.0            | 26.8          | 10.1 | 0.7  | 37.6           | 13         |
| 01.2008 | -6.0             | -3.5 | 3.8  | -3.0            | 12.1          | 0.1  | 12.9 | 25.1           | 9          |
| 02.2008 | 1.0              | -3.4 | 6.8  | 1.3             | 4.1           | 2.4  | -    | 6.5            | 9          |
| 03.2008 | 6.6              | 6.8  | 6.7  | 6.7             | 16.0          | 3.1  | 7.7  | 26.8           | 12         |
| 04.2008 | 9.7              | 12.4 | 12   | 11              | 32.4          | 45.7 | 32.9 | 110.0          | 14         |
| 05.2008 | 11.7             | 15.7 | 19.5 | 15              | 39.4          | 28.8 | 37.4 | 105.6          | 20         |
| 06.2008 | 17.3             | 19.4 | 23.9 | 20              | 10.2          | 40.6 | 3.8  | 54.6           | 11         |
| 07.2008 | 22.2             | 22   | 20.1 | 21.4            | 9.4           | 6.6  | 54.2 | 70.2           | 14         |
| 08.2008 | 22.9             | 23.7 | 21.9 | 22.8            | -             | 0.2  | -    | 0.2            | 1          |
| 09.2008 | 19.0             | 13.5 | 11.5 | 15.2            | 1.2           | 68.8 | 11.2 | 81.2           | 9          |

**Table 2. Meteorological data - 2009**

| Month   | Temperature (°C) |      |      |                 | Rainfall (mm) |      |      |                |            |
|---------|------------------|------|------|-----------------|---------------|------|------|----------------|------------|
|         | I                | II   | III  | Monthly average | I             | II   | III  | Total (liters) | Rainy days |
| 10.2007 | 13.3             | 11.9 | 9    | 11.2            | 62.8          | 3.4  | 7.2  | 73.4           | 7          |
| 11.2007 | 10               | 1.9  | 1.7  | 5.0             | 0.8           | 3.6  | 37.5 | 41.9           | 9          |
| 12.2007 | 5.2              | 4.2  | -2.4 | 2.2             | 1.5           | 45.5 | 5.8  | 52.8           | 16         |
| 01.2008 | -4.9             | -0.8 | 5.6  | 0               | 1.5           | 6.7  | 30.1 | 38.3           | 17         |
| 02.2008 | 4.2              | -0.3 | -0.9 | 1.3             | 2.2           | 25.6 | 3.6  | 31.4           | 12         |
| 03.2008 | 4.1              | 2.9  | 6.3  | 4.5             | 44.5          | 9.8  | 7.1  | 61.4           | 9          |
| 04.2008 | 11.8             | 11.2 | 11   | 11.3            | 5.8           | 10.4 | 5.6  | 21.8           | 7          |
| 05.2008 | 13.5             | 17.6 | 17.7 | 16.2            | 17.6          | 11.6 | 47.0 | 76.2           | 16         |
| 06.2008 | 19.5             | 20.2 | 20.2 | 20              | 44.0          | 7.4  | 48.6 | 100.0          | 14         |
| 07.2008 | 21.9             | 21.7 | 22.8 | 22.1            | 16.8          | 68.4 | 0.6  | 85.8           | 12         |
| 08.2008 | 20.6             | 21.2 | 22.9 | 20.8            | 77.4          | 0    | 50.2 | 127.6          | 7          |
| 09.2008 | 17.8             | 16.8 | 15.6 | 16.7            | 42.4          | 3.2  | 0.6  | 46.2           | 5          |

Breaking stalks is also estimated by writing down. Broken plants are considered only those for which breaking occurs under the cobs. Same as for the fall, for breaking there are necessary two notations. First noting represents natural breaking and the second notation, resulted from plants bending, cumulate also the first one.

### 3. RESULTS AND DISCUSSIONS

In 2008, sowing was performed on 22.05 and in 2009 on 08.05. For both years sowing depth was of six centimeters, distance between rows was 70 centimeters and distance between plants on a row was 22 centimeters.

In order to maintain clean weed culture there were performed the following maintenances:

- in 2008:

- thinning out - 09.06.2008;
- mechanical weeding I - 09.06.2008;
- manual weeding I - 09.06.2008;
- mechanical weeding II - 02.07.2008;
- manual weeding II - 02.07.2008.
- in 2009:
- thinning out - 04.06.2008;
- mechanical weeding I - 04.06.2008;
- manual weeding I - 04.06.2008;
- mechanical weeding II - 27.06.2008;
- manual weeding II - 03.07.2008.

Land preparation consisted of:

- autumn plowing, performed at a 28 – 30 cm depth on 03.09.2007 and 06.10.2008;
- disc I – II, at 6 cm depth on 08.05.2008 and 07.05.2009;

**Table 3. Production data for maize crop - 2008**

| Crt. no. | Hybrid name        | Production/parcel (kg) |      |      |      | Grains yield (%) |
|----------|--------------------|------------------------|------|------|------|------------------|
|          |                    | R 1                    | R 2  | R 3  | R 4  |                  |
| 1        | TURDA 201          | 11.9                   | 12.4 | 11.8 | 12.6 | 80               |
| 2        | TURDA MOLDOVA 188  | 11.6                   | 12.6 | 13.8 | 12.5 | 79               |
| 3        | CLARICA            | 11.2                   | 11.9 | 13.2 | 13.3 | 80               |
| 4        | MONALISA           | 14.5                   | 15.6 | 14.7 | 14.8 | 80               |
| 5        | PR38R92            | 12.2                   | 12.6 | 13.2 | 11.9 | 78               |
| 6        | SUM 1093 (SUANITO) | 12.2                   | 11.9 | 12.4 | 12.9 | 80               |
| 7        | EGZ 7211           | 13.8                   | 13.6 | 13.7 | 13.9 | 81               |
| 8        | EGZ 7403           | 12.1                   | 12.4 | 12.4 | 14.1 | 83               |
| 9        | HT 127 TURDA       | 14.3                   | 12.2 | 12.1 | 11.9 | 80               |
| 10       | MGM 158714         | 14.8                   | 14.1 | 12.2 | 13.1 | 81               |
| 11       | X6R223             | 12.7                   | 10.8 | 13.1 | 12.6 | 82               |

**Table 4. Production data for maize crop - 2009**

| Crt. no. | Hybrid name        | Production/parcel (kg) |      |      |      | Grains yield (%) |
|----------|--------------------|------------------------|------|------|------|------------------|
|          |                    | R 1                    | R 2  | R 3  | R 4  |                  |
| 1        | TURDA 201          | 11.8                   | 12.4 | 13.3 | 14.1 | 84               |
| 2        | TURDA MOLDOVA 188  | 10.4                   | 12.2 | 11.8 | 12.7 | 84               |
| 3        | CLARICA            | 15.2                   | 14.6 | 13.5 | 12.8 | 86               |
| 4        | MONALISA           | 13.6                   | 14.8 | 13.9 | 14.6 | 85               |
| 5        | PR38R92            | 15.8                   | 16.6 | 17.1 | 18.0 | 86               |
| 6        | SUM 1093 (SUANITO) | 13.2                   | 14.6 | 14.3 | 15.4 | 86               |
| 7        | EGZ 7211           | 10.8                   | 11.4 | 11.8 | 12.2 | 85               |
| 8        | EGZ 7403           | 13.8                   | 14.2 | 12.6 | 13.4 | 87               |
| 9        | HT 127 TURDA       | 12.3                   | 13.8 | 12.7 | 13.9 | 84               |
| 10       | MGM 158714         | 15.8                   | 14.3 | 15.2 | 15.4 | 85               |
| 11       | X6R223             | 15.5                   | 15.1 | 15.9 | 15.0 | 87               |

**Table 5. Average production data for maize crop, 2008 - 2009**

| Crt. no. | Hybrid name        | Average production -2008 (kg) 4 repetitions | Average production -2009 (kg) 4 repetitions | Average production 2008 – 2009 (kg) | Grains average yield (%) |
|----------|--------------------|---|---|-------------------------------------|--------------------------|
| 1        | TURDA 201          | 12.10                                       | 12.9  | 12.5                                | 82.0                     |
| 2        | TURDA MOLDOVA 188  | 12.60                                       | 11.7  | 12.1                                | 81.5                     |
| 3        | CLARICA            | 12.40                                       | 14.0  | 13.2                                | 83.0                     |
| 4        | MONALISA           | 14.90                                       | 14.2  | 14.5                                | 82.5                     |
| 5        | PR38R92            | 12.40                                       | 16.8  | 14.6                                | 82.0                     |
| 6        | SUM 1093 (SUANITO) | 12.35                                       | 14.3  | 13.3                                | 83.0                     |
| 7        | EGZ 7211           | 13.70                                       | 11.5  | 12.6                                | 83.0                     |
| 8        | EGZ 7403           | 13.10                                       | 13.5  | 13.3                                | 85.0                     |
| 9        | HT 127 TURDA       | 12.60                                       | 13.1  | 12.8                                | 82.0                     |
| 10       | MGM 158714         | 13.50                                       | 15.1  | 14.3                                | 83.0                     |
| 11       | X6R223             | 12.30                                       | 15.3  | 13.8                                | 84.5                     |

**Table 6. Behavior of some maize hybrids on environmental factors**

| Crt. no. | Hybrid name        | Drought Average value 2008-2009 | Heat Average value 2008-2009 | Shrivelling Average value 2008-2009 | Sterility Average value 2008-2009 | Root strength Average value 2008-2009 | Stalk strength Average value 2008-2009 |
|----------|--------------------|---------------------------------|------------------------------|-------------------------------------|-----------------------------------|---------------------------------------|--|
| 1        | TURDA 201          | 1.5                             | 2.0                          | 1.3                                 | 0                                 | 0.5                                   | 2.5                                    |
| 2        | TURDA MOLDOVA 188  | 1.5                             | 2.0                          | 1.2                                 | 0                                 | 1                                     | 1                                      |
| 3        | CLARICA            | 1.5                             | 2.0                          | 1.2                                 | 0                                 | 0                                     | 0                                      |
| 4        | MONALISA           | 2.0                             | 2.5                          | 1.1                                 | 0                                 | 0.5                                   | 0.5                                    |
| 5        | PR38R92            | 2.5                             | 2.0                          | 1.1                                 | 0                                 | 1.5                                   | 1                                      |
| 6        | SUM 1093 (SUANITO) | 2.5                             | 1.5                          | 1.2                                 | 0                                 | 0.5                                   | 1.5                                    |
| 7        | EGZ 7211           | 2.5                             | 2.0                          | 1.2                                 | 0                                 | 0                                     | 0                                      |
| 8        | EGZ 7403           | 2.0                             | 2.0                          | 1.1                                 | 2                                 | 2                                     | 0.5                                    |
| 9        | HT 127 TURDA       | 2.5                             | 2.0                          | 1.4                                 | 0                                 | 1                                     | 3                                      |
| 10       | MGM 158714         | 2.0                             | 2.0                          | 1.2                                 | 0                                 | 0                                     | 2.5                                    |
| 11       | X6R223             | 2.0                             | 2.5                          | 1.3                                 | 3                                 | 1                                     | 0                                      |

➤ processing with combinatorial at a 6 cm depth on 08.05.2008 and 07.05.2009. Basic fertilization was performed in both years, with nitrogen fertilizers (80 kg/ha) and phosphorus fertilizers (80 kg/ha). In vegetation period, on the I breeding nitrogen fertilizers were applied (50 kg/ha in 2008 and 40 kg/ha in 2009). There were harvested on 20.09.2008 and 12.10.2009. All yields, both annual and medium, besides those where the unit is provided, were reported at 15.4 square meters, respectively 100 plants.

So, in the soil and climate conditions from Dambovită county, average productions on two-year study (tables 3, 4 and 5) in the 11 maize hybrids considered in the experiments ranged from 12.1 kg for the hybrid TURDA MOLDOVA 188 at 15.4 kg for the hybrid PR38R92. Calculating the equivalent to one hectare, the corresponding yields are 7,857.1 kg/ha and 9,480.5 kg/ha. The highest productions, of over 9,000 kg/ha, were given by PR38R92, CLARICA and MGM 158714 hybrids.

In terms of grain output (table 6), that is the ratio between grain weight and total weight of cobs, it had average values between 81.5% and 85%. EGZ7403 and X6R223 hybrids had the highest yield. The lowest value was recorded in TURDA MOLDOVA 188 hybrid.

Regarding the 11 hybrids behavior from environmental factors, in table 6 we can see the most drought-resistant hybrids were TURDA 201, TURDA MOLDOVA 188 and CLARICA, as they were rated at 1.5 grade.

All hybrids considered in experiments are heat-resistant and they were estimated with grades under 3. The most heat-resistant hybrid is SUM 1903 (SUANITO), rated at 1.5 grade.

The degree of shriveling was close to 1 for all hybrids, the lowest one being noticed for MONALISA, PR38R92 and EGZ 7403 hybrids.

Most of hybrids had a 0% degree of sterility. EGZ 7403 and X6R223 hybrids were exceptions, having a 2% and 3% degree of sterility.

Percentage of plants fall ranged from 0% to 2%, the hybrids with the highest root strength proved to be CLARICA, EGZ 7211 and MGM 158714.

Average percentage of plants breaking for the 11 hybrids ranged as value from 0% to 3%, those with the highest stalk strength were CLARICA, EGZ 7211 and X6R223 hybrids. The highest value was registered for HT 127 TURDA hybrid.

#### 4. CONCLUSIONS

From 11 maize hybrids considered in the experiments, the highest productions, of over 9,000 kg/ha, were given, in the pedoclimatic conditions of Dâmbovița county, by PR38R92, Clarica and MGM 158714 hybrids.

The maize grain yield had average values between 81,5% and 85%. EGZ 7403 and X6R223 hybrids had the highest yield. The most drought-resistant hybrids were Turda 201, Turda Moldova 188 and Clarica and the most heat-resistant one was SUM 1093 (SUANITO). The degree of shrivelling was close to 1 for all hybrids, the lowest one being noticed for MONALISA, PR38R92 and EGZ 7403. Most of hybrids had a 0% degree of sterility. EGZ 7403 and X6R223 hybrids were exceptions, having a 2% and 3% degree of sterility. The hybrids with the highest root strength were CLARICA, EGZ 7211 and MGM 158714, and those with the highest stalk strength were Clarica, EGZ 7211 and X6R223.

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