

## TILLAGE AND NITROGEN RATE EFFECTS ON MAIZE IN THE SPECIFIC GROWING CONDITIONS OF DANUBE MEADOW

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### Abstract

*Tillage is an important tool within the crop technology to ensure good growing conditions for maize plants, decrease production costs, and improve soil characteristics. Also, nitrogen has a significant effect on crops, especially when it comes to maize, this being the most important nutrient that affects plant growth and yielding capacity of the plants. Thus, the paper aims to present the effects of different tillage and nitrogen rates on maize grain yield and yielding elements in the specific growing conditions of Danube Meadow from South Romania. In this respect, the research was performed in the years 2023 and 2024, in field experiments under rainfed conditions located in the Danube Meadow from South Romania, respectively near Oltenița city from Călărași County. The experimental factors were tillage methods (Plowing at 25 cm + 2 disc harrows passes; Scarifying at 35 cm + 2 disc harrows passes; Gruber Tiger at 25 cm; Gruber Tiger at 15 cm; Disc harrow at 15 cm x 2 passes) and nitrogen rate (0, 80, 120, and 160 kg/ha). Nitrogen fertilization had a positive effect on maize yielding elements and grain yield, especially at the highest rate regardless of the tillage method or climatic conditions of the year. The highest average grain yields were obtained in the case of variant of tillage with Gruber Tiger at 25 cm depth, especially in the better climatic conditions and associated with high nitrogen rate (160 kg/ha).*

**Key words:** maize, tillage, nitrogen rate, grain yield, yielding elements.

### INTRODUCTION

Due to constantly changing climatic conditions, the individual requirements of crop species and technical progress, soil cultivation methods have constantly evolved. Moreover, the sustainable development of agriculture has stated that there is no universally applicable system for tillage because of the local differences, especially climate and soil type and also the technical level of endowment (Rusu et al., 2009). A single tillage system is not suitable for all soils and climatic conditions, and therefore, the choice of the best suited tillage system must be harmonious to the particular agro-ecological environment (Barut & Akbolat, 2005). Appropriate tillage systems are soil - and crop-specific and their adaptation is governed by both biophysical and socio-economic factors (Lai, 1991). Practically, a specific tillage system is depending on the crop and cultivation conditions.

Within the crop technologies, tillage represents an important element and therefore it is

necessary to be carried out in the best conditions (Khan et al., 2021). Therefore, farmers must know some particularities and type of soil, the presence of problematic weeds, and some characteristics of the crops in order to develop tillage methods, the necessary equipment and execution indices (Carr et al., 2013). Moreover, reality of climate changes requires a careful revision of traditional soil and plant management technologies (Țopa et al., 2010). Tillage is one of the most energy-intensive processes in the agricultural production (Stajenko et al., 2009). In addition to the classic tillage system that includes ploughing, in order to save energy embedded in field crop technology and to avoid repeated passes with tractors and agricultural machinery, with negative effects on the soil, more and more farmers are interested in alternative tillage system.

There are many types of tillage systems such as conventional tillage, conservation tillage, minimum tillage, reduced tillage and no tillage systems (Siemens et al., 1992; Shah et al., 2016).

The tillage system is an essential maize-growing practice for successful production (Chetan et al., 2023).

The application of the most advanced crop technologies is taken into account using larger quantities of fertilizers, insecticides, fungicides and herbicides, and impose knowledge of the particularities of the crops and the pedoclimatic conditions of the area where work is being done (Cionca et al., 2024).

On a global scale, nitrogen is the most used fertilizer nutrient in agriculture. Studies have shown that cultivated plant species use only about 50% of applied N effectively, while the rest is lost through various pathways to the environment (Govindasamy et al., 2023). The selection of the right nitrogen fertilizer product, the appropriate rate, time and method of application are essential for farmers (Velicu & Ion, 2024). The current climatic changes require from farmers to optimize nitrogen fertilization according to the specific growing conditions of their crops.

Fertilization on maize crops is a very important technological issue that significantly contributes to increased productivity. Nitrogen is considered a limiting macronutrient for maize plants, this being the nutrient the plants need the most. The growth and the development of maize plant are very much affected by nitrogen; therefore, nitrogen fertilizer's optimal use is essential (Fathi & Zeidali, 2021).

The aim of the performed research was to investigate the effects of different tillage and nitrogen rates on maize grain yield and yielding elements in the specific growing conditions of Danube Meadow from South Romania.

## MATERIALS AND METHODS

Research was performed in the years 2023 and 2024, in field experiments under rainfed conditions located in the Danube Meadow from South Romania, respectively near Oltenița city from Călărași County.

The relief in the area of research bears the imprint of meadow characteristics, this being characterized by a horizontal plane, with a land slope between 0.5 and 2%.

The soil is of alluvial type, and has a medium to heavy texture, an upper horizon of 20-35 cm

thick, a dark brown - yellowish colour, and a granular structure.

The temperature values recorded in both 2023 and 2024 are notable for exceeding values in summer time by over 2-3°C compared to the average for the area (27°C) (Figure 1). The maximum recorded value was 42.2°C on August 2024, and the minimum recorded value was -2.9°C on February 17, 2023. The year 2024 was warmer than the year 2023, especially in the summer and winter seasons.

Regarding rainfall, there was a major water deficit in February, but a rainy period in April, while the summer months had small rainfall (Figure 2). From May to July, when maize plants are in the most sensitive period to water stress, the year 2024 was droughter than the year 2023.

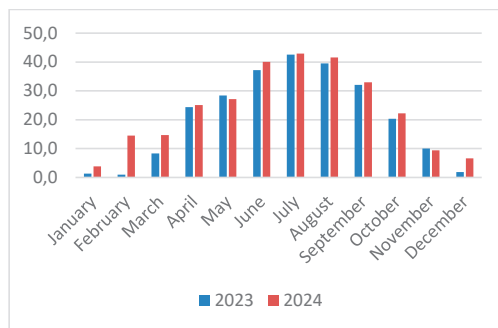


Figure 1. Temperatures in experimental field (2023-2024)

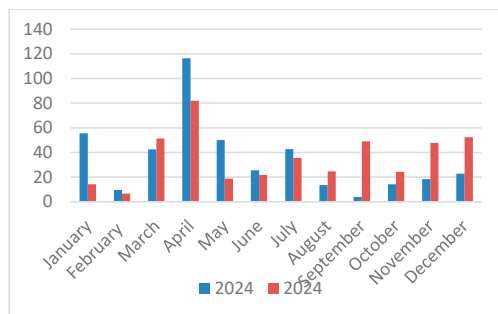


Figure 2. Rainfall in experimental field (2023-2024)

The field experiment was based on the method of subdivided plots into 3 replications, having two experimental factors (bifactorial experiment), respectively:

- Factor A: Tillage, with five variants:
  - a1. Plowing performed with a 4-furrow reversible plough at depth of 25 cm + 2

passes with a disc harrow (Control variant);

- a2. Scarifying with Artiglio Scarifier at a depth of 35 cm + 2 passes with a disc harrow;
- a3. Cultivation with Gruber Tiger cultivator at a depth of 25 cm;
- a4. Cultivation with Gruber Tiger cultivator at a depth of 15 cm;
- a5. Disc harrow with Horsh Joker Disc at a depth of 15 cm (2 passes).
- Factor B; Nitrogen rate, with four variants:
  - b1. N0 - unfertilized (Control variant);
  - b2. 80 kg/ha;
  - b3. 120 kg/ha;
  - b4. 160 kg/ha.

Each experimental variant had 120 m<sup>2</sup>, resulting from 20 m length and 6 m width.

The tillage according to the classic system (plowing and scarifying) took place in the previous fall, and the minimum tillage (Gruber Tiger 15 cm, Gruber Tiger 25 cm, Disc harrow (2 passes) were performed in the spring.

In all experimental variants, except for Control variant, before seedbed preparation there was applied the complex fertilizer 16:16:16 in a rate of 250 kg/ha, assuring 40 kg/ha as active substance of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. In May (1-5 of May), the nitrogen rate according to the experimental variant was assured by the second fertilization applying the liquid fertilizer UAN (Urea Ammonium Nitrate Solution) containing 32% nitrogen. Thus, in 2023, on 19<sup>th</sup> of May, and two weeks early in 2024, on 5<sup>th</sup> of May, there was applied 125 l/ha of UAN for the variant b2, 250 l/ha of UAN for the variant b3, and 375 l/ha of UAN for the variant b4.

The previous plant was maize, and the maize hybrid in the field experiment was P9911.

One day before sowing, the seedbed preparation was carried out with a combinatory. The sowing was carried out on 3<sup>rd</sup> of May in 2023 and 2 weeks early in 2024, respectively on 20<sup>th</sup> of April, because the weather was warm and dry. The sowing was carried out with a John Deer tractor and a Gaspardo Maestro seeder with 8 rows, at a depth of 5-6 cm, a distance between rows of 70 cm and a sowing density of 66,000 germinating grains/ha.

Herbicide treatments were applied for controlling annual and perennial weeds, such

as: Roundup Extra (360 g/l Glyphosate) herbicide applied pre-emergent at a rate of 1.5 l/ha; Adengo 465 SC (225 g/l Isoxaflutole + 90 g/l Thienencarbazone-methyl + 150 g/l Cyprosulfamide as safener) herbicide applied early post-emergent (on middle of May) at a rate of 0.4 l/ha; Principal Plus (92 g/kg Nicosulfuron + 550 g/kg Dicamba + 23 g/kg Rimsulfuron) herbicide applied post-emergent (at beginning of June) at a rate of 0.4 kg/ha against annual grasses and perennial and annual broadleaf weeds.

For controlling the adults of *Diabrotica virgifera* Leconte (western maize rootworm), Rexaris 25 WG (25 g/kg Lambda-Cyhalothrin) insecticide was applied at a rate of 0.25 kg/ha.

For controlling *Tanymecus dilaticollis* Gyll. (maize leaf weevil) and *Agriotes* spp. (wireworms), Krima 20 SG (200 g/kg Acetamiprid) insecticide was applied after plant emergence, at a rate of 0.1 kg/ha.

The insecticide Coragen (200 g/l Chlorantraniliprole), at a rate of 0.2 l/ha, was applied at the time of panicle emergence, against *Helicoverpa armigera* (Hübner) (corn earworm).

Harvesting was carried out with the New Holland CR9090 combine on 15<sup>th</sup> of September in 2023 and on 1<sup>st</sup> of September in 2024.

For each variant, the following determinations were performed at harvest: cob length (cm); number of grain rows per cob; number of grains per row; number of grains per cob; cob weight (g); grain weight per cob (g); grain yield (kg/ha).

## RESULTS AND DISCUSSIONS

In the year 2023, which was more favourable from a climatic point of view compared to 2024, all the yielding elements of the maize plant registered the smallest values in the case of variant with 0 kg/ha nitrogen and tillage method plowing, except the no. of grain rows per cob which had the smallest values in the case of variant with tillage method disc harrow (Table 1).

The highest values of the yielding elements of the maize plant were registered in 2023 in the case of tillage method with disc harrow and nitrogen fertilization with the highest rate, respectively 160 kg/ha, except the case of no.

of grain rows per cob were the highest values was registered at the nitrogen rate of 120 kg/ha. Also very close to maximum values of the cob weight and grain weight per cob were registered in the case of variant of tillage with Gruber Tiger at 25 cm depth, and again fertilized with the highest nitrogen rate of 160 kg/ha. The high values in the case of this tillage method have led to the highest value of the grain yield of 11,494 kg/ha. The smallest grain yield was registered also in the case of the tillage method with Gruber Tiger at 25 cm depth, but with no nitrogen fertilization (0 kg/ha of nitrogen).

Compared to plowing variant with 0 kg/ha of nitrogen in 2023, all the other tillage methods determined negative differences in the case of no nitrogen fertilization, while adding nitrogen determined positive differences regardless of tillage method, the highest grain yields being at the highest nitrogen rate (160 kg/ha). But, increasing the nitrogen rate (80, 120, and 160 kg/ha) determined the highest yield increase in the case of tillage with Gruber Tiger at 25 cm depth, while the smallest yield increase was registered in the case of tillage method with Gruber Tiger at 15 cm depth (Table 1).

In the year 2024, which was less favourable from a climatic point of view compared to 2023, as in the case of the year 2023, all the yielding elements of the maize plant registered the smallest values in the case of variant with 0 kg/ha nitrogen but at tillage method scarifying, except the cob length were the smallest value was in the case of tillage method plowing and except the no. of grain rows per cob were the smallest value was in the case of tillage method disc harrow (Table 2).

The highest values of the yielding elements of the maize plant were registered in 2024 at the highest rate of nitrogen of 160 kg/ha and tillage method of Gruber Tiger at 25 cm depth in the case of no. of grains per cob and grain weight per cob, the tillage method of Gruber Tiger at 15 cm depth in the case of cob length and no. of grains per row.

Some of the yielding elements registered the highest values at the nitrogen rate of 120 kg/ha and the tillage method Gruber Tiger at 25 cm depth in the case of cob weight, and the tillage

method disc harrow in the case of no. of grain rows per cob.

The highest value of the grain yield of 3972 kg/ha was registered in the variant with tillage method Gruber Tiger at 15 cm depth and nitrogen rate of 160 kg/ha. The smallest value of the grain yield was registered in the variant with tillage method with scarifying and no nitrogen fertilization (0 kg/ha of nitrogen).

Compared to plowing variant with 0 kg/ha of nitrogen in 2024, only the variant with tillage method scarifying determined a negative difference in the case of no nitrogen fertilization. Adding nitrogen determined positive differences regardless of tillage method, the highest grain yields being at the highest nitrogen rate (160 kg/ha). But, increasing the nitrogen rate (80, 120, and 160 kg/ha) determined the highest yield increase in the case of tillage with Gruber Tiger at 15 cm depth, as well as with Gruber Tiger at 25 cm depth (Table 2).

As average values for tillage methods in 2023, generally the variant with tillage method disc harrow gave the highest values for the yielding elements except the case of cob weight which was the highest at tillage method Gruber Tiger at 25 cm depth, the variant which gave also the highest grain yield, this having a good effect also on plants population and on the no. of cobs per plant, respectively per hectare (Table 3).

As average values for tillage methods in 2024, the variant with tillage method Gruber Tiger at 25 cm depth gave the highest values for the yielding elements, except for no. of grain rows per cob, as well as the highest value for the grain yield (Table 4).

As average values for the nitrogen rate, in both experimental years (2023 and 2024), the highest values for yielding elements and grain yield were obtained in the case of variant fertilized with 160 kg/ha of nitrogen (Tables 5 and 6). It can be highlighted that generally the nitrogen rate had a beneficial effect on all the analysed parameters, but especially at the highest rate.

Comparatively assessing the results obtained during the two experimental years, for the less favourable year 2024, it can be seen that the values of all analysed parameters were lower compared to year 2023.

Table 1. Yielding elements of maize plants and grain yield at different tillage methods and nitrogen rates, in 2023

| Tillage methods                               | Yielding elements     |                 |                           |                       |                       |                |                          | Grain yield (kg/ha) |                     |                                 |
|-----------------------------------------------|-----------------------|-----------------|---------------------------|-----------------------|-----------------------|----------------|--------------------------|---------------------|---------------------|---------------------------------|
|                                               | Nitrogen rate (kg/ha) | Cob length (cm) | No. of grain rows per cob | No. of grains per row | No. of grains per cob | Cob weight (g) | Grain weight per cob (g) | Value               | <i>Dif. from N0</i> | <i>Dif. from plowing and N0</i> |
| Plowing (25 cm + 2 disc harrows)<br>(Control) | N0                    | 15.1            | 16.6                      | 24.4                  | 404.1                 | 108.8          | 93.1                     | 8871                | 0                   | 0                               |
|                                               | N80                   | 17.1            | 17.3                      | 29.6                  | 511.4                 | 149.8          | 129.6                    | 9105                | 234                 | 234                             |
|                                               | N120                  | 17.3            | 17.2                      | 30.9                  | 532.0                 | 155.5          | 133.3                    | 9218                | 347                 | 347                             |
|                                               | N160                  | 17.3            | 17.3                      | 30.4                  | 525.0                 | 161.0          | 139.8                    | 9488                | 617                 | 617                             |
| Scarifying (35 cm + 2 disc harrows)           | N0                    | 17.1            | 17.1                      | 30.3                  | 518.6                 | 164.6          | 140.7                    | 8625                | 0                   | -246                            |
|                                               | N80                   | 17.6            | 16.8                      | 32.9                  | 551.2                 | 186.7          | 160.2                    | 9153                | 528                 | 282                             |
|                                               | N120                  | 17.5            | 17.4                      | 32.3                  | 560.8                 | 180.3          | 156.6                    | 9209                | 584                 | 338                             |
|                                               | N160                  | 18.0            | 17.2                      | 33.6                  | 578.4                 | 189.8          | 165.2                    | 9935                | 1310                | 1064                            |
| Gruber Tiger (25 cm)                          | N0                    | 17.0            | 17.0                      | 30.1                  | 511.4                 | 157.8          | 135.8                    | 8397                | 0                   | -474                            |
|                                               | N80                   | 18.0            | 17.1                      | 33.1                  | 565.4                 | 185.9          | 153.8                    | 9559                | 1162                | 688                             |
|                                               | N120                  | 18.1            | 17.4                      | 33.4                  | 580.3                 | 194.8          | 168.2                    | 10618               | 2221                | 1747                            |
|                                               | N160                  | 18.6            | 17.3                      | 34.5                  | 596.3                 | 207.3          | 177.5                    | 11494               | 3097                | 2623                            |
| Gruber Tiger (15 cm)                          | N0                    | 18.0            | 16.9                      | 31.4                  | 531.6                 | 162.7          | 139.1                    | 8822                | 0                   | -49                             |
|                                               | N80                   | 17.6            | 17.0                      | 32.2                  | 546.6                 | 172.0          | 147.0                    | 9037                | 215                 | 166                             |
|                                               | N120                  | 17.9            | 17.1                      | 32.3                  | 552.6                 | 179.8          | 153.3                    | 9107                | 285                 | 236                             |
|                                               | N160                  | 18.3            | 17.0                      | 34.7                  | 591.3                 | 192.9          | 166.0                    | 9349                | 527                 | 478                             |
| Disc harrow (15 cm x 2 passes)                | N0                    | 17.4            | 16.3                      | 32.2                  | 524.0                 | 178.3          | 150.6                    | 8560                | 0                   | -311                            |
|                                               | N80                   | 17.6            | 17.5                      | 32.2                  | 563.5                 | 185.7          | 160.2                    | 8840                | 280                 | -31                             |
|                                               | N120                  | 17.9            | 17.9                      | 33.1                  | 591.1                 | 184.3          | 158.8                    | 9054                | 494                 | 183                             |
|                                               | N160                  | 19.2            | 17.5                      | 36.1                  | 630.7                 | 206.0          | 177.6                    | 9253                | 693                 | 382                             |

Table 2. Yielding elements of maize plants and grain yield at different tillage methods and nitrogen rates, in 2024

| Tillage methods                               | Yielding elements     |                 |                           |                       |                       |                |                          | Grain yield (kg/ha) |                     |                                 |
|-----------------------------------------------|-----------------------|-----------------|---------------------------|-----------------------|-----------------------|----------------|--------------------------|---------------------|---------------------|---------------------------------|
|                                               | Nitrogen rate (kg/ha) | Cob length (cm) | No. of grain rows per cob | No. of grains per row | No. of grains per cob | Cob weight (g) | Grain weight per cob (g) | Value               | <i>Dif. from N0</i> | <i>Dif. from plowing and N0</i> |
| Plowing (25 cm + 2 disc harrows)<br>(Control) | N0                    | 12.4            | 12.4                      | 20.1                  | 249.7                 | 121.6          | 99.8                     | 1630                | 0                   | 0                               |
|                                               | N80                   | 13.3            | 13.2                      | 19.0                  | 250.4                 | 164.0          | 159.9                    | 2111                | 481                 | 481                             |
|                                               | N120                  | 14.8            | 13.7                      | 26.2                  | 358.1                 | 168.3          | 141.6                    | 2081                | 451                 | 451                             |
|                                               | N160                  | 15.3            | 13.9                      | 23.3                  | 324.4                 | 171.8          | 160.8                    | 2966                | 1336                | 1336                            |
| Scarifying (35 cm + 2 disc harrows)           | N0                    | 13.7            | 13.9                      | 14.7                  | 203.9                 | 109.2          | 91.0                     | 1585                | 0                   | -45                             |
|                                               | N80                   | 15.1            | 12.7                      | 16.1                  | 204.1                 | 147.8          | 122.1                    | 2400                | 815                 | 770                             |
|                                               | N120                  | 15.3            | 13.3                      | 22.5                  | 299.8                 | 148.8          | 123.9                    | 2429                | 844                 | 799                             |
|                                               | N160                  | 15.7            | 13.3                      | 23.3                  | 310.9                 | 157.7          | 130.5                    | 2667                | 1082                | 1037                            |
| Gruber Tiger (25 cm)                          | N0                    | 14.4            | 13.3                      | 22.6                  | 301.7                 | 137.8          | 113.3                    | 1891                | 0                   | 261                             |
|                                               | N80                   | 15.0            | 14.1                      | 25.2                  | 355.1                 | 206.5          | 169.8                    | 2918                | 1027                | 1288                            |
|                                               | N120                  | 15.5            | 15.4                      | 27.0                  | 415.0                 | 208.2          | 172.8                    | 3253                | 1362                | 1623                            |
|                                               | N160                  | 15.8            | 15.6                      | 28.6                  | 445.5                 | 207.3          | 177.5                    | 3735                | 1844                | 2105                            |
| Gruber Tiger (15 cm)                          | N0                    | 13.0            | 12.6                      | 16.7                  | 210.5                 | 140.7          | 114.4                    | 1799                | 0                   | 169                             |
|                                               | N80                   | 13.6            | 13.0                      | 26.8                  | 347.7                 | 172.0          | 140.6                    | 2358                | 559                 | 728                             |
|                                               | N120                  | 14.9            | 13.8                      | 28.1                  | 387.1                 | 179.8          | 153.3                    | 3143                | 1344                | 1513                            |
|                                               | N160                  | 15.9            | 14.4                      | 29.4                  | 422.6                 | 192.9          | 166.0                    | 3972                | 2173                | 2342                            |
| Disc harrow (15 cm x 2 passes)                | N0                    | 12.6            | 12.2                      | 21.4                  | 261.4                 | 169.9          | 139.0                    | 1679                | 0                   | 49                              |
|                                               | N80                   | 13.4            | 17.8                      | 15.3                  | 272.0                 | 175.7          | 143.9                    | 2251                | 572                 | 621                             |
|                                               | N120                  | 14.6            | 17.9                      | 19.8                  | 353.8                 | 184.3          | 151.8                    | 2622                | 943                 | 992                             |
|                                               | N160                  | 15.1            | 17.5                      | 20.6                  | 359.9                 | 206.0          | 172.6                    | 3235                | 1556                | 1605                            |

Table 3. Yielding elements of maize plants and grain yield at different tillage methods in 2023

| Yielding elements and grain yield | Tillage method                             |                                     |                      |                      |                                |
|-----------------------------------|--------------------------------------------|-------------------------------------|----------------------|----------------------|--------------------------------|
|                                   | Plowing (25 cm + 2 disc harrows) (Control) | Scarifying (35 cm + 2 disc harrows) | Gruber Tiger (25 cm) | Gruber Tiger (15 cm) | Disc harrow (15 cm x 2 passes) |
| Cob length (cm)                   | 16.7                                       | 17.6                                | 17.9                 | 17.9                 | 18.0                           |
| No. of grain rows per cob         | 17.1                                       | 17.1                                | 17.2                 | 17.0                 | 17.3                           |
| No. of grains per row             | 28.8                                       | 32.3                                | 32.8                 | 32.6                 | 33.4                           |
| No. of grains per cob             | 493.1                                      | 552.3                               | 563.3                | 555.5                | 577.3                          |
| Cob weight (g)                    | 143.8                                      | 180.3                               | 186.4                | 176.8                | 188.6                          |
| Grain weight per cob (g)          | 123.9                                      | 155.7                               | 158.8                | 151.3                | 161.8                          |
| Grain yield (kg/ha)               | 9171                                       | 9231                                | 10017                | 9079                 | 8927                           |

Table 4. Yielding elements of maize plants and grain yield at different tillage methods in 2024

| Yielding elements and grain yield | Tillage method                             |                                     |                      |                      |                                |
|-----------------------------------|--------------------------------------------|-------------------------------------|----------------------|----------------------|--------------------------------|
|                                   | Plowing (25 cm + 2 disc harrows) (Control) | Scarifying (35 cm + 2 disc harrows) | Gruber Tiger (25 cm) | Gruber Tiger (15 cm) | Disc harrow (15 cm x 2 passes) |
| Cob length (cm)                   | 14.0                                       | 14.9                                | 15.2                 | 14.4                 | 13.9                           |
| No. of grain rows per cob         | 13.3                                       | 13.3                                | 14.6                 | 13.4                 | 16.3                           |
| No. of grains per row             | 22.2                                       | 19.1                                | 25.8                 | 25.2                 | 19.3                           |
| No. of grains per cob             | 295.7                                      | 254.7                               | 379.3                | 342.0                | 311.8                          |
| Cob weight (g)                    | 156.4                                      | 140.6                               | 189.9                | 171.3                | 184.0                          |
| Grain weight per cob (g)          | 140.5                                      | 116.9                               | 158.4                | 143.6                | 151.8                          |
| Grain yield (kg/ha)               | 2197                                       | 2271                                | 2950                 | 2818                 | 2447                           |

Table 5. Yielding elements of maize plants and grain yield at different nitrogen rates in 2023

| Yielding elements and grain yield | Nitrogen rate (kg/ha)       |       |       |       |
|-----------------------------------|-----------------------------|-------|-------|-------|
|                                   | N0 - Unfertilised (Control) | N80   | N120  | N160  |
| Cob length (cm)                   | 16.9                        | 17.6  | 17.8  | 18.3  |
| No. of grain rows per cob         | 16.8                        | 17.1  | 17.4  | 17.3  |
| No. of grains per row             | 29.7                        | 32.2  | 32.4  | 33.9  |
| No. of grains per cob             | 498.0                       | 547.6 | 563.4 | 584.3 |
| Cob weight (g)                    | 154.4                       | 176.0 | 178.9 | 191.4 |
| Grain weight per cob (g)          | 131.9                       | 150.2 | 154.0 | 165.2 |
| Grain yield (kg/ha)               | 8655                        | 9139  | 9441  | 9904  |

Table 6. Yielding elements of maize plants and grain yield at different nitrogen rates in 2024

| Yielding elements and grain yield | Nitrogen rate (kg/ha)       |       |       |       |
|-----------------------------------|-----------------------------|-------|-------|-------|
|                                   | N0 – Unfertilised (Control) | N80   | N120  | N160  |
| Cob length (cm)                   | 13.2                        | 14.1  | 15.0  | 15.6  |
| No. of grain rows per cob         | 12.9                        | 14.1  | 14.8  | 14.9  |
| No. of grains per row             | 19.1                        | 20.5  | 24.7  | 25.0  |
| No. of grains per cob             | 245.4                       | 285.9 | 362.8 | 372.7 |
| Cob weight (g)                    | 135.8                       | 173.2 | 177.9 | 187.1 |
| Grain weight per cob (g)          | 111.5                       | 147.3 | 148.7 | 161.5 |
| Grain yield (kg/ha)               | 1717                        | 2408  | 2706  | 3315  |



## CONCLUSIONS

The results obtained under the experimental conditions from the Danube Meadow in South Romania show the positive effect of nitrogen fertilization on maize yielding elements and grain yield, especially at the highest rate regardless of the tillage method or climatic conditions of the year.

The variant of conventional tillage with plowing followed by 2 passes with a disc harrow gave the smallest grain yields regardless of the climatic conditions of the year.

The highest average grain yields were obtained in the case of tillage variant with Gruber Tiger at 25 cm depth, especially in better climatic conditions associated with high nitrogen rate (160 kg/ha). In less favourable climatic conditions, good maize yields were obtained also in the case of tillage with Gruber Tiger at 15 cm depth, also associated with high nitrogen rate.

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