ЗАХИСТ РОСЛИН

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Weed control of maize (*Zea mays* L.) in university farming

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Purpose. Regarding the area of maize in Hungary, we can state that it is one of the largest crops grown in the area. Maize was grown on 1,048,070 hectares in Hungary in 2019. The purchase price depends, among other things, on the size of the sown area and the yields, but many other things can also have an impact in either a positive or negative direction. In recent years, the purchase price of maize has been around HUF 50,000/tonne. Maize is one of the heat-demanding plants that needs 500 mm of rainfall during its growing season to develop smoothly. The expected yield is significantly influenced by the type of soil grown. Meadow chernozem and brown forest soil are the most favorable for maize. **Methods.** The maize was sown on April 17, 2020. In the experimental area were selected 5 squares. A square has a floor area of 4 m^2. In the research area were conducted three weed surveys. The dates were: May 18, June 22, and July 29, 2020. The following herbicides were released on 15th May: Sulcotrek (sulcotrione and terbuthylazine); Tegoplant (trisiloxane); Trend (adjuvant). **Results.** The area was harvested on 21 September by a combine harvester equipped with a corn tube breaker adapter. From an area of one hectare, 9.4 tons of crops were harvested with a moisture content of 14%. **Conclusions.** In the case of chemical weed control, it is recommended to use an agent or combination which is specifically aimed at reducing unwanted, in this case pine sorghum.

Keywords: *weed control; maize (Zea mays L.); experiment; square; herbicides.*

Introduction

Maize is native to Central America and Mexico, and has spread from there (Antal et al., 2005). The plant from America was introduced to Europe in 1493, thanks to Columbus. It spread very quickly on the new continent due to its versatility, high productivity, and many other advantageous properties. It was proven to have been produced in Hungary in 1590, but presumably before that. It probably came into Hungary in two different ways, from Italy and Turkey.

Zea mays L. is a monocotyledonous plant (Hajdú et al., 1993) belonging to the family of grasses and within it to the genus *Zea* (Ábrahám et al., 2019). The genus is a so-called monotypic genus, which means that only maize belongs here (Izsáki, 2004). Basically, the plant is very variable within the species, so the height, number of leaves, number of tubes and thousand grain weights also vary widely (Menyhért, 1985). Corn has a grain yield. Its color is determined by the color of the endosperm, it can be white, yellow, red or brown, or transitions of these colors (Nagy, 2009).

Crop rotation is basically a very important element of agrotechnics and an important factor in plant protection, which, if done properly, can eliminate many of the harmful effects. When planning the crop rotation, in addition to economic considerations, factors such as the effect of the plant on the soil, its condition after harvest, if treated with a plant protection product, its possible effects and the may also affect fertilizer demand (Sárvári, 2005). Maize would basically tolerate monoculture, although over time, yields would be smaller and smaller, but as the western corn rootworm (*Diabritica virgifera virgifera*) became widespread, this type of cultivation was made impossible (Borsos et al., 1994; Sárvári, 2005).

Maize is very sensitive to the presence of weeds, so weed control accounts for a significant portion of nursing work. It has been repeatedly demonstrated that maize is not able to successfully control weeds due to its large space, so it cannot be grown safely without weed control (Glits et al., 2008).

Chemical weed control in corn is a complex task that requires a high level of expertise. There are a number of factors to keep in mind when choosing which herbicides to use. The sensitivity of the hybrid we chose, the site conditions, the weeds in the culture, their tolerance to herbicides. You need to know the post-crop and choose a weed control that doesn't damage it. The presence of different weeds at the same time can further complicate the task, as other pesticides are suitable for their control due to their different biology. In this case, combinations must be used. The timing of spraying should be adapted to the development of the weed and maize. These activities need to be carried out carefully because, in the event of a failure, they not only cause additional costs but also significant crop losses (Hunyadi et al., 1988; Hunyadi et al., 2000; Hunyadi et al., 2011; Szentey, 2017).

The 10 most common weeds of maize in Hungary (Novák et al., 2009): *Echinochloa crus-galli, Ambrosia artemisiifolia, Chenopodium album, Amaranthus retroflexus, Setaria pumila, Cirsium arvense, Panicum miliaceum, Datura stramonium, Amaranthus chlorostachys, Convolvulus arvensis.*

The ***aim*** of the experiment was to get to know the weeds occurring in maize culture, which was established by multiple weed surveys. Furthermore, the effectiveness of the herbicides used against the harmful factors.

Materials and research methods

I performed the experiment in the Farm of the University of Szeged in Hódmezővásárhely (Csongrád-Csanád County). The area of the experiment is 1 hectare. Area coordinates: N 46°26'27.4"; E 20°22'27.6". The soil conditions of the area are very good, which is also proved by the fact that the yield of maize grown in this area in previous years can be between 12-13 t/ha.

The hybrid corn grown in the area is Fornad marketed by KITE. It is a grainy corn with a medium appearance and strong roots and stems. The pre-crop was winter wheat. After which deep plowing was done in the autumn and worked in the spring and then the seedbed was prepared. Sowing took place on 17 April 2020. In terms of nutrients, 200 kg of N fertilizer was applied, and then KITE start fertilizer was applied in one pass with sowing. The row spacing was 76 cm and 72,000 grains were spread per hectare, which can meet the needs of all plants with adequate soil nutrient supply, and the number of germs included the loss of game damage. The area was harvested on 21 September by a combine harvester equipped with a corn tube breaker adapter.

In the experimental area, 5 squares were selected (Figure 1) using stakes and a measuring device. The selected 4 m^2 units represent the weed flora of maize, we conducted a weed survey three times within the squares to examine what weeds are present in the area, how many, and how this changes from time to time. Furthermore, we investigated the effectiveness of the herbicides used against the weeds present.

Figure 1. The selected squares (2020)

The dates for the three weed surveys were: the first on 18 May 2020, the second on 22 June 2020, and the third on 29 July 2020. The sprays used were delivered in one pass in the form of post-emergence treatment on 15 May 2020.

The following pesticides were applied: Sulcotrek (2 l/ha), Tegoplant (0,2 l/ha), Trend (0,2 l/ha).

Results of researches

The first weed survey was conducted on May 18, 2020 in the designated squares, and a total of five different weeds (*Lamium purpureum*, *Chenopodium album*, *Chenopodium hybridum*, *Capsella bursa-pastoris*, *Convolvulus arvensis*) were discovered (Table 1).

Table 1

Maize weed survey on 18 May 2020

Species	I. area		II. area		III. area		IV. area		V. area	
	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value
Lamium purpureum	5	1–2	**50**	3–4	**40**	3	5	1–2	–	–
Chenopodium album	3	1	–	–	–	–	–	–	3	1
Chenopodium hybridum	5	1–2	5	1–2	10	2	10	2	5	1–2
Capsella bursa-pastoris	–	–	5	1–2	5	1–2	–	–	–	–
Convolvulus arvensis	–	–	–	–	–	–	–	–	5	1–2

The second weed survey took place on 22 June 2020. Examining the sample areas, we were able to identify two different weeds (*Convolvulus arvensis*, *Sorghum halapense*) (Table 2).

Table 2

Maize weed survey on 22 June 2020

Species	I. area		II. area		III. area		IV. area		V. area	
	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value
Lamium purpureum	–	–	–	–	–	–	–	–	–	–
Chenopodium album	–	–	–	–	–	–	–	–	–	–
Chenopodium hybridum	–	–	–	–	–	–	–	–	–	–
Capsella bursa-pastoris	–	–	–	–	–	–	–	–	–	–
Convolvulus arvensis	–	–	–	–	5	1–2	–	–	–	–
Sorghum halapense	10	2	5	1–2	30	2–3	**40**	3	10	2

The third and final survey was conducted on July 29, 2020. Two types of weeds (*Sorghum halapense*, *Alopecurus pratensis*) were found in the observed areas (Table 3).

Table 3

Maize weed survey on 29 July 2020

Species	I. area		II. area		III. area		IV. area		V. area	
	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value	Frequency	A-D value
Lamium purpureum	–	–	–	–	–	–	–	–	–	–
Chenopodium album	–	–	–	–	–	–	–	–	–	–
Chenopodium hybridum	–	–	–	–	–	–	–	–	–	–
Capsella bursa-pastoris	–	–	–	–	–	–	–	–	–	–
Convolvulus arvensis	–	–	–	–	–	–	–	–	–	–
Sorghum halapense	10	2	5	1	30	2–3	**50**	3–4	20	2–3
Alopecurus pratensis	20	2–3	10	2	20	2–3	10	2	10	2

The area was harvested on 21 September by a combine harvester equipped with a corn tube breaker adapter. From an area of one hectare, 9.4 tons of crops were harvested with a moisture content of 14%.

Conclusions

A total of 7 different weed species were identified in the five designated experimental squares during the three weed surveys. Two of these are monocotyledons: *Sorghum halapense* and *Alopecurus pratensis*. The remaining five can be classified as dicotyledonous: *Lamium purpureum, Chenopodium album*, *Chenopodium hybridum*, *Capsella bursa-pastoris*, and *Convolvulus arvensis*.

It can be observed that the applied herbicide completely eliminated the initially present dicotyledonous weeds, so at the beginning of the maize growing season, when the weeds are still able to suppress the crop, weed-free conditions were created and the young plant could develop undisturbed. The effect of the herbicide was also noticeable at the last weed survey, as only monocotyledonous weeds were detected at that time as well.

The biggest concern was *Sorghum halapense*. The application of the right agrotechnics can provide a solution against this weed.

If feasible, an area should be selected that is not or less infested with pine sorghum based on previous weed surveys. The best protection is to prevent the introduction, care must be taken to keep the seed clean and to clean the tillage, sowing and harvesting machines.

Avoiding monoculture is vital, and if it can be solved, it is usually typical of small farms to cultivate mechanically in a row with a cultivator, which can be used to significantly reduce already hatched pine sorghum.

In the case of chemical weed control, it is recommended to use an agent or combination which is specifically aimed at reducing unwanted, in this case pine sorghum.

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Мета. За площею посівів кукурудзи в Угорщині, ми можемо стверджувати, що це одна з найпоширеніших культур, вирощуваних у цьому районі. У 2019 р. в Угорщині кукурудзу вирощували на площі 1 048 070 га. Закупівельна ціна залежить, поміж іншого, від розміру посівної площі та врожайності. Проте, на неї також можуть впливати багато інших факторів, як позитивно, так і негативно. В останні роки закупівельна ціна кукурудзи становила близько 50000 форинтів за тонну. Кукурудза належить до теплолюбних рослин. Для нормального

розвитку вона потребує 500 мм опадів протягом вегетаційного періоду. Урожайність істотно залежить від типу ґрунту. Луговий чорнозем і бурий лісовий ґрунт найбільш сприятливі для кукурудзи. **Методи.** Кукурудзу висівали 17 квітня 2020 р. На дослідній площі було виокремлено 5 квадратів площею 4 м^2. На експериментальній ділянці було проведено три обстеження бур'янів: 18 травня, 22 червня й 29 липня 2020 р. 15 травня було застосовано такі гербіциди: Сулкотрек (сулькотріон і тербутилазин), Тегоплант (трисілоксан), Тренд (добавка). **Результати.** Урожай було зібрано 21 вересня зернозбиральним комбайном, оснащеним подрібнювачем кукурудзяних стебел. З одного гектара було зібрано 9,4 т врожаю з вологістю 14 %. **Висновки.** У разі хімічної боротьби з бур'янами рекомендується застовувати такий препарат або комбінацію, які спеціально призначені проти небажаного, в даному випадку, сорго алепського.

Ключові слова: *боротьба з бур'янами; кукурудза (Zea mays L.); експеримент; квадрат; гербіциди.*

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Фітонематоди як обмежуючий біотичний чинник аграрного виробництва у світі (огляд)

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Мета. Проаналізувати вітчизняні й зарубіжні наукові джерела щодо видового складу та шкідливості найбільш небезпечних у світі паразитичних видів фітонематод у посівах сільськогосподарських культур. **Результати.** На сьогодні за існуючими літературними даними до найбільш небезпечних видів фітонематод належать: галові (*Meloidogyne* spp.) і цистоутворювальні (*Heterodera* spp. та *Globodera* spp.) нематоди; пратиленхи (*Pratylenchus* spp.); бананова свердлова *Radoholus similis*, стеблова *Ditylenchus dipsaci* та соснова стовбурова *Bursaphelenchus xylophilus* нематоди; ротиленхулус ниркоподібний *Rotylenchulus reniformis*; ксифінема індекс *Xiphinema index*; несправжня галова нематода *Nacobbus aberrans* та рисовий афеленх *Aphelenchoides besseyi*. **Висновки.** Результати досліджень з поширеності та шкідливості паразитичних видів нематод у посівах сільськогосподарських культур переконують нас у необхідності більш детального вивчення цієї групи мікроорганізмів. Завдяки швидкому розвитку в останнє десятиліття молекулярно-генетичних методів науковці змогли розширити та удосконалити свої знання з ідентифікації видів, рас та патотипів фітонематод, їхніх біологічних та екологічних особливостей, а головне – розкрити та зрозуміти надзвичайно складні механізми взаємодії паразитів та рослини-господаря. Нематологи упевнені, що подальші дослідження у цих та інших напрямках дозволять в майбутньому створити основу для розробки нової стратегії тривалого та екологічно безпечного контролю над цими небезпечними рослинними паразитами.

Ключові слова: *фітопаразитичні нематоди; сільськогосподарські культури; втрати врожаю; захист рослин.*