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STRATEGY FOR THE DEVELOPMENT OF CORN GROWING TECHNOLOGY UNDER CLIMATE CHANGE

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The research was conducted during 2018–2020 at the experimental field of the Institute of Irrigated Agriculture of the NAAS, located in the subarid zone of the Southern Steppe of Ukraine under drip irrigation conditions. A two-factor experiment was conducted using the method of split randomized blocks. The research was carried out in four repetitions. The sown area of the plots was 50.0 m^2, the accounting area was 30.0 m^2.

During the years of the study, the weather conditions were typical for the South of Ukraine with the amount of precipitation ranging from 150 to 170 mm. Insufficient precipitation is compensated by irrigation, the pre-irrigation soil moisture level was 80% of the lowest moisture content in the 0–50 cm layer, which is the optimal regime for all FAO groups.

Factor A – sowing period (date): April 15, April 25, May 5, May 15.

Factor B – innovative corn hybrids with different maturity groups: precocious Stepovyi (FAO 190), DN Meotyda (FAO 190); middle early Skadovs`kyi (FAO 290), DN Halateia (FAO 250); medium-ripe Inhul`s`kyi (FAO 350), DN Zbruch (FAO 350); middle-late Arabat (FAO 420), DN Anshlah (FAO 420).

Our experimental studies in the irrigated conditions of the Southern Steppe of Ukraine showed that the timing of sowing significantly affects the development of plants, the formation of the grain yield of corn hybrids of different FAO groups. Depending on the factors of the experiment, corn plants fall into different agrometeorological conditions, grow and develop in different ways, and have different productivity. During research during 2018–2020, the grain yield of corn hybrids of different FAO groups varied depending on the sowing dates from 8.03 to 15.92 t/ha.

According to the results of the conducted research, it was established that under irrigation conditions, corn hybrids of different FAO groups showed the maximum yield during the late sowing periods (May 5 and 15).

Thus, the precocious hybrid Stepovyi (FAO 190) showed the maximum grain yield in 2018 and 2019 for sowing on 05.05 – 9.14 and 9.75 t/ha, respectively, in 2020 for sowing on 05.05 – 9.37 t/ha. The minimum yield of 8.15 t/ha was shown for sowing on 04/15, yield reduction – 0.92 t/ha, or 9.9% of the maximum yield for the optimal sowing period of 05/05.

The hybrid DN Meotyda (FAO 190) also showed the maximum grain yield in 2018, 2019 for sowing on 05.05 – 8.97 and 9.34 t/ha, in 2020 for sowing on 05.15 – 9.26 t/ha. The minimum yield of 8.04 t/ha was shown for sowing on April 15, but the average decrease in yield was insignificant – 0.82 t/ha, or 9.1%.

The mid-early hybrid Skadovs`kyi (FAO 290) also showed the maximum grain yield in 2018 and 2019 for sowing on 05.05 - 12.56 and 12.85 t/ha, in 2020 for sowing on 05.15 – 12.92 t/ha. The minimum yield was 8.67 t/ha for sowing on April 15, the decrease in yield was more significant and amounted to 4.18 t/ha, or 33.3%.

The mid-early hybrid DN Halateia (FAO 250) showed the maximum grain yield in 2018, 2019 for sowing on 05.05 – 12.72 and 13.34 t/ha, in 2020 for late sowing on 05.15 – 13.56 t/ha. The minimum productivity of 8.74 t/ha was shown for sowing on 15.04 with a decrease in productivity of 4.60 t/ha, or 28.1%.

The medium-ripe hybrid Inhul`s`kyi (FAO 350) showed the maximum grain yield in 2018, 2019 for sowing on 05.05 – 13.51 and 14.17 t/ha, in 2020 for sowing on 05.15 – 13.85 t/ha. The minimum yield of 8.92 t/ha was shown for early sowing on April 15. The yield reduction was 5.25 t/ha, or 36.8%.

The medium-ripe hybrid DN Zbruch (FAO 350) showed the maximum grain yield in 2018, 2019 for sowing on 05.05 – 13.73 and 14.54 t/ha, in 2020 for sowing on 05.15 – 14.15 t/ha. The minimum yield of 9.14 t/ha was shown for sowing on 15.04 with a decrease in yield of 5.40 t/ha, or 37.2%.

The mid-late hybrid Arabat (FAO 420) showed the maximum grain yield in 2018, 2019 for sowing on 05.05 – 15.56 and 15.92 t/ha, in 2020 for sowing on 05.05 – 15.62 t/ha. The minimum yield of 9.89 t/ha was shown for sowing on April 15. The yield reduction was 6.03 t/ha, or 38.3%.

The hybrid DN Anshlah (FAO 420) showed the maximum grain yield in 2018, 2019 for sowing 05.05 – 15.34 and 15.63 t/ha, in 2020 for sowing 5.05 – 15.21 t/ha. The minimum yield of 9.23 t/ha was shown for sowing on April 15, with a decrease in yield of 6.40 t/ha, or 41.1%.

Summarizing the productivity indicators, we observe that the productivity of all hybrids decreases with the use of early sowing dates. However, a minimal difference in yield at different sowing times was observed in precocious hybrids FAO 190. The decrease in yield at early sowing times was insignificant – in the range of 9.1–9.9%, which indicates their cold resistance. However, the grain yield of these hybrids was also low (in the range of 8–9 t/ha), which indicates their low productivity potential. These hybrids were created according to programs of cold resistance and early ripening, so their use may be appropriate for sowing in relatively cold soil.

In the modern conditions of agro-industrial production, when the cost of energy carriers has increased significantly, the creation of corn hybrids of different groups of maturity with a rapid return of moisture during ripening is an actual direction of selection. The intensity of grain moisture loss largely depends on the conditions of the external environment, in particular weather factors: temperature, relative humidity. The rate of moisture release by grain is determined not only by environmental conditions, but also by heredity. Low harvesting moisture of corn grain is primarily determined by the duration of the vegetation period, while the factor of early maturity is dominant.

During the 2018-2020 research, this indicator for the grain of hybrids of different FAO groups before harvesting fluctuated within the hybrid maturity group and sowing dates.

The grain moisture of all corn hybrids of different maturity groups at the time of harvesting was in the range from 12.1 to 27.0%, which indicates the extreme importance of studying this indicator as the main indicator of the technology of growing corn with high efficiency and profitability. Different sowing dates and FAO groups of hybrids determine the variation of this indicator. Increased moisture content of grain above 14%, in addition to the main additional costs for drying grain, increases costs for transportation, storage, loss of grain quality from fungal diseases and entomophages, which have been spreading in recent years under irrigation conditions.

The cost of dried grain can also be lower due to damage to the grain by cracks and fungal mycelia, so production is extremely interested in low harvesting humidity. Low harvesting moisture also depends on harvesting dates, and the delay in harvesting and postponement of dates to late autumn does not bring the expected natural drying of grain due to low rates of moisture transfer at low temperatures and secondary moistening during autumn rains.

The maximum grain moisture content varied from 12.5% in hybrids FAO 190 to 27.0% in hybrids corn FAO 420 for sowing on May 15. The minimum moisture content of the grain varied from 12.1% to 14.9% for the studied hybrids of different FAO groups for sowing on April 15. With regard to the dependence of the harvesting moisture on the maturity groups of the hybrids, a clear pattern was observed – the minimum grain moisture characteristic of the hybrids FAO 190 Stepovyi and DN Meotyda – 12.1–13.1%, the maximum - in the hybrids FAO 420 Arabat and DN Anshlah – 14.8– 27.0%. The moisture content of hybrids FAO 250–290 in the early, optimal and late periods was almost at the same level.

Thus, almost all hybrids, except for the FAO 420 hybrids, had the basic moisture content of the grain during all sowing periods, which allowed not carrying out the drying of the grain after harvesting, to bear losses from additional transportation and price discounts. This is important in the process of using energy-saving technologies for growing corn.

The difference in grain moisture depending on the time of sowing was more clearly defined in hybrids with an extended growing season. These are such hybrids as Arabat and DN Anshlah. During the late sowing periods, the moisture content of the grain of these hybrids increased in some years by 10.7–11.2%, compared to the early ones. The difference in grain moisture between the early and optimal term (May 5) in Arabat and DN Anshlah hybrids was much smaller (from 1.9 to 2.5%).

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ВПЛИВ НОРМ ВИСІВУ ТА СПОСОБІВ СІВБИ НА ВМІСТ ХЛОРОФІЛУ В РОСЛИНАХ НУТУ

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Серед бобових культур, які вирощуються в Україні, щороку зростають посівні площі нуту – культури, яка займає третє місце за посухостійкістю серед бобових. Культура здатна формувати врожай зерна на рівні 2,5 т/га за досить високих температурних показників та низького вологозабезпечення під час вегетації. Нут досить поширений у світі, його вирощують на площі більше 14 млн. га [1, 2]. В Україні посівна площа нуту незначна (близько 100 тис. га), та незважаючи на це, вона щороку збільшується завдяки високій конкурентоспроможності серед інших бобових культур. Крім підвищеної стійкості до посухи, культура вирізняється високим азотфіксуючим потенціалом, накопичуючи в ґрунті близько 150 кг екологічно чистого азоту доступного для рослин, і таким чином є відмінним попередником для більшості культур у сівозміні Важливим є і досить висока вартість нуту на зовнішньому ринку, що робить його перспективним в плані реалізації продукції [3, 4].

Збільшити рівень реалізації генетичного потенціалу продуктивності нуту можна за рахунок удосконалення елементів технології його вирощування. Формування досить високого рівня продуктивності посівів нуту забезпечується за рахунок фотосинтезу, який є одним із складових процесів, що впливає на формування у рослин вегетативних та генеративних органів. Активність та