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**PRODUCTIVITY AND ADAPTIVE ABILITIES OF CORN HYBRIDS
UNDER DIFFERENT IRRIGATION MODES AND MOISTURE SUPPLY IN
THE ARID STEPPE OF UKRAINE**

Ivanyv Mykola Oleksandrovich

Candidate of Agricultural Science

Mychalenko Iryna Valentynyvna

Candidate of Agricultural Science

Lavrynenko Iurii Oleksandrovich

Doctor of Agricultural Science, Professor

Kherson State Agrarian University

Ukraine, Kherson

The study presents the results of the research on the productivity features and adaptability parameters of domestic corn hybrids under different irrigation modes and water supply under conditions of the Arid Steppe.

The research object was modern corn hybrids of domestic selection of different maturity groups. The hybrids were sown under different irrigation modes (common sprinkling, drip irrigation, sub-irrigation) and without irrigation to compare their drought resistance. The characteristics of the interaction genotype–environment, differentiation of the varieties by productivity and stability were realized by the method of Eberhart S.A. and Russell W.A. The coefficient of ecological plasticity b_i and the variance of stability S^2_{di} were determined. The coefficient of drought resistance was determined by the correlation of productivity without irrigation and irrigation conditions. The methods used in the research are field, laboratory, statistical and retrospective.

The retrospective analysis of the productivity of main grain crops in the area of the Arid Steppe over a 130-year period showed that the highest rates of an increase in productivity were recorded in corn. An annual increase in its productivity was 31 kg/ha per year and it was due to the use of new varieties (hybrids) and the improvement of growing techniques. Irrigation made it possible to realize potential productivity of new hybrids and increase the productivity from 6.59 to 82.3 c/ha. The

productivity rose 12.5 times over a 130-year period, the annual increase being 58 kg/ha per year.

We established that though the hybrids FAO 180-290 (Stepovyi, DN Pyvykha, Skadovskyi) had less productivity, they had the highest stability under different irrigation modes within 10.12-11.46 t/ha. Without irrigation the grain productivity was the highest in early-maturing hybrids – 3.28 and 3.05 t/ha indicating their high drought resistance. The use of these hybrids is appropriate under conditions of water-saving irrigation modes on irrigated lands with a low hydro-module and on dry massifs (table 1).

Table 1

Productivity and adaptive abilities of corn hybrids under different irrigation modes and moisture supply (2016–2018)

Varieties	Grain yield, t / ha				Plasticity and stability parameters		
	yield on irrigation	yield without	Min–max on irrigation	Min–max without irrigation	drought resistance	b_i	S^2_{di}
Stepovyi	11,13	3,28	10,38–11,68	2,28–3,53	0,29	0,94	0,25
DN Pivykha	11,02	3,05	10,13–11,53	2,25–3,28	0,28	0,93	0,25
Skadovsky	10,95	2,57	9,88–11,82	2,16–2,90	0,23	0,99	0,77
DN Khotin	12,10	2,74	10,03–12,84	2,25–3,05	0,22	1,01	1,33
Kakhovsky	12,65	2,13	11,14–13,70	1,55–2,45	0,17	1,06	0,42
DN Rostock	13,37	2,35	11,92–14,51	1,84–2,76	0,18	1,23	0,29
Arabat	14,19	1,81	12,60–16,04	1,36–2,16	0,13	1,35	0,21
DN Sophia	14,67	1,92	13,03–16,43	1,45–2,15	0,13	1,28	0,46

The hybrid Khotyn (FAO 280) was the best one by productivity regardless of irrigation modes among the hybrids of a middle-early maturity group (FAO 280-290). Under drip irrigation its productivity was 12.47 t/ha. Sprinkler irrigation and sub-irrigation reduced the productivity by 0.84 and 0.28 t/ha, that is related to greater possibilities of efficient moisturizing of the surface soil under drip irrigation during critical dry periods of vegetation.

The hybrids Kakhovskyi and DN Rostok of a middle maturity group also had the highest grain productivity under drip irrigation – 13.2 and 14.15 t/ha. A fall in the productivity under other irrigation modes was from 0.41 to 1.93 t/ha. The greatest advantages of a drip irrigation mode were recorded in the middle-late maturing

hybrids Arbat and DN Sofiia, their productivity reached 15.23 and 15.78 t/ha. The productivity was higher by 1.02–2.35 t/ha when compared to other irrigation modes. Such a reaction of the middle-late hybrids with FAO 420-430 is caused by the fact that water consumption of the hybrids with a longer period of vegetation by 70-80% is provided by irrigation water. The daily evapotranspiration of corn in the Arid Steppe exceeds 100 m³/ha and such amount of water can be provided by drip irrigation in the period of the largest water consumption (July-August). Regular sprinkler irrigation with the installations of frontal or circular action can be applied with a minimal term of 4-5 days, and it cannot always ensure a timely and optimal level of moistening. Sub-irrigation is realized by putting an irrigation tape 30 cm deep in the soil profile and the moistening of a surface soil layer is realized due to a drip tape, but it does not ensure timely water supply for the surface soil layer of 0-10 cm.

The highest drought resistance was recorded in the hybrids FAO 180-290 Stepovyi, DN Pyvykha and Skadovskyi. The coefficient of drought resistance fell sharply when there was an increase in the maturity groups of the hybrids and it was at minimum in the hybrids Arabat and Sofiia.

The greatest advantages of a drip irrigation mode were recorded in the middle-late hybrids Arabat and Sofiia, their productivity was 15.23 and 15.78 t/ha and it was higher by 1.02–2.35 t/ha when compared to other irrigation modes. Under irrigation conditions it is necessary to use corn hybrids with a genetically programmed reaction to optimal growing conditions (an optimal mode of soil moisture and mineral nutrition). The violation of growing techniques leads to considerable losses in grain productivity, especially in the hybrids of a late maturity group.