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WATER REGIME AND EFFICIENCY OF GROWING SUNFLOWER HYBRIDS DEPENDING ON THE ELEMENTS OF DRIP IRRIGATION TECHNOLOGY

V.V. Kaliley[1], A.P. Shatkovskyi[2], Doctor of Agricultural Sciences
[1] Institute of Water Problems and Land Reclamation of NAAS, Kyiv, 03022, Ukraine, https://orcid.org/0000-0001-7875-1240 ; e-mail: vkaliley@gmail.com;
[2] Institute of Water Problems and Land Reclamation of NAAS, Kyiv, 03022, Ukraine, https://orcid.org/0000-0002-4366-0397 ; e-mail: andriy-1804@ukr.net

Abstract. *The article presents the results of experimental research on the influence of micro-irrigation system designs on the water regime, productivity, and efficiency of sunflower cultivation. Based on this, the main economic parameters of agrotechnologies of sunflower cultivation were calculated. Short-term field research was carried out in the period 2020–2022 on the lands of the Brylivske experimental field of the Institute of Water Problems and Reclamation of the National Academy of Agrarian Sciences (Kherson Region, Dry Steppe subzone). Analytical and statistical methods were used to process experimental data. The scheme of field experiments provided different options for laying irrigation pipelines of micro-irrigation systems (in the horizontal and vertical planes) and the implementation of a pulsed water supply mode (standard). The control was the variant without irrigation. According to the results of experimental studies, it was proved that the method of laying irrigation pipelines of micro-irrigation systems significantly affects the parameters of the formation of the soil water regime and the yield of sunflower hybrids in the conditions of the Dry Steppe. It has been established that the introduction of subsurface drip irrigation is more appropriate than the cultivation of sunflower hybrids, which is explained by the drought resistance of this crop. When growing sunflowers, the variant with the subsurface laying of drip irrigation pipelines provided almost identical yield parameters at lower plant water consumption coefficients. The minimum water consumption coefficient (1077.8 m^3/t) was obtained by implementing the pulse water supply mode. The highest economic parameters of agricultural technology for growing sunflower hybrids were obtained with the subsurface drip irrigation: conditionally net profit (17.11–18.17 thousand UAH/ha), lower cost (11.03–10.90 thousand UAH/ton), and also a higher level of production profitability (31.10–32.62 %) (laying irrigation pipelines every 1,0 m, regardless of the sunflower hybrid). Due to the higher grain yield and specific savings of irrigation water in the pulse mode of water supply, the highest economic parameters were achieved: gross income amounted to 80.51 thousand UAH/ha, conditionally net profit – 21.24 thousand UAH/ha, cost of 1 ton of grain – UAH 10.6 thousand and the level of profitability of production – 35,8 %.*

Keywords: *drip irrigation, subsurface drip irrigation, pulse mode of water supply, evapotranspiration, soil water regime, economic efficiency, sunflower*

Relevance of research. It is known, that sunflower is one of the main technical agricultural crops in Ukraine, the cultivated area under which in 2021 amounted to 6.43 million hectares [1], which is almost 20 % of the total arable land. It should be noted that as of 1990, sunflower occupied only 1.57 million hectares, in the early 2000s – 3.0–3.2 million hectares, which amounted to 5–10 % of the total area of field crops in Ukraine. (Fig. 1). It is obvious, that such a large area is absolutely unjustified and leads to a decrease in soil fertility [2].

Current trends of climate changes towards aridity [3; 4; 5] may lead to a further increase in sunflower acreage, as the crop, compared to others, is quite drought-resistant. Possible directions for obtaining high and stable yields in these conditions are the creation of new drought-resistant varieties and hybrids and the development of more effective methods of adaptive growing technologies, the introduction of tillage technologies aimed at maximizing moisture conservation – mini-till, strip-till and no-till, mulching and slotting of the soil, etc. However, as evidenced by practice and scientific research, the most effective use of irrigation melioration is in combination with fertigation. The increase in yield from the optimization of water and nutrient regimes is the most effective and ranges from 100 to 380 % compared with non-irrigated conditions [7]. It should be especially noted, that in recent years, the irrigated area under sunflowers has increased sharply (by 65 % in the last 7 years) and amounted to about 72 thousand ha in 2020 [8]. Therefore, the main method of irrigating this culture is sprinkling.

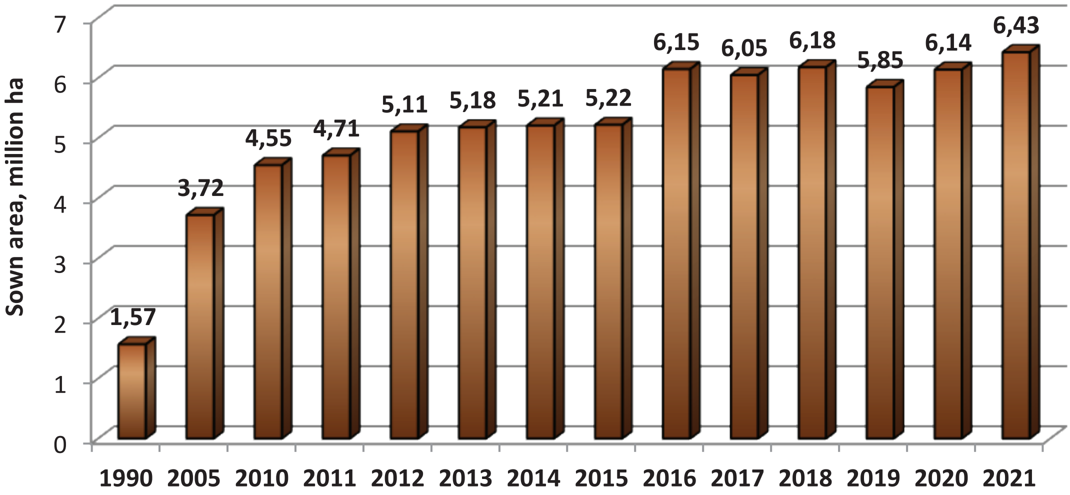

Fig. 1. Dynamics of sunflower acreage in Ukraine (1990–2021)

Therefore, the substantiation of the water regime of the soil and the evaluation of the effectiveness of sunflower cultivation with the introduction of micro-irrigation methods are relevant today.

Analysis of recent research and publications. Given the relevance of the subject, in different years a significant complex of diverse studies was carried out on the introduction of irrigation in agricultural technologies for growing sunflowers. Preferably, these studies concerned sprinkling [9; 10; 11]. As for studies on the study of the water regime with various methods of micro-irrigation, they are more thoroughly carried out by foreign scientists [12; 13; 14], while in Ukraine they are only fragmentary [15; 16].

Therefore, **the purpose of the study** was to establish the parameters of the water regime of the soil and to substantiate the effectiveness of growing sunflower hybrids depending on the various designs of micro-irrigation systems.

Materials and methods of research. Field research was carried out on the lands of the Brylivske experimental field of the National Academy of Agrarian Sciences of the Russian Academy of Sciences (Privytne village, Vynogradivska rural community of Kherson district, Kherson region, Dry Steppe subzone, 46°40´N. 33°12´E.) during 2020–2022. The three-factor field experiment envisages the following designs of micro-irrigation systems: drip irrigation (DI) with ground laying of irrigation pipelines (IP), subsurface drip irrigation (SDI) with laying of IP to a depth of 30 cm (factor C). In addition, the design parameter was the distance between IP (factor B) – 0.7 m (1,0 m) and 1.4 m. The reference was the option of subsurface drip irrigation with pulse water supply mode (SDIP), and the conditional control was the option of natural moisture supply – without irrigation (W/I). The studies were carried out according to generally accepted methods: placement of plots – systematic, replication – four times, the area of accounting plots – 32 m^2 [17; 18], sunflower hybrids for confectionery use – Ukrainian F1 and Rimisol F1 (factor A).

The soil of the experimental site is a dark chestnut light loam, the density of the 0–50 cm layer is 1.47 g/cm^3, the content of humus is 1.44 %, and alkaline hydrolyzed nitrogen (the method of determination is according to Kornfield) is 7.0 mg/100 g of soil, mobile compounds of phosphorus and potassium in the soil according to the Chirykov method – 32.3 mg/100 g and 9.3 mg/100 g of soil, respectively.

The amount of productive rainfall during the growing season of sunflowers and chickpeas varied over the years of research. So, in 2020, only 68.0 mm fell, which is only 31.9 % of the climatic norm for the growing season, during 2021–205.5 % of the climatic norm, which is also an anomalous phenomenon for the conditions of the Dry Steppe, and in 2022 – 167.6 mm or 121.9 % of the climatic norm. The level of pre-irrigation moisture in the experiments was -21 kPa in a 0–50 cm soil layer. To set the irrigation time, instrumental complexes were used: the Drill and Drop moisture meter from Sentek and the iMetos soil moisture station with Echo Probe EC-5 sensors [19]. Statistical analysis of research results was carried out by dispersion, correlation and regression methods using the "Statistica 6.0" program.

Economic efficiency was calculated based on the accepted standards, norms and prices [20] of the current year, energy efficiency – according to the methodology for energy assessment of technologies for growing crops [21]. The depreciation period for components and parts of irrigation systems (except for the PT of the annual period of use of drip irrigation) is 10 years.

Results of the study and their discussion. The results of the field studies showed that the water regime of the soil and the evapotranspiration of sunflower hybrids were formed depending on the design of micro-irrigation systems and meteorological conditions of the growing season in a particular year. We averaged the number of vegetation irrigations, the values of irrigation rates and evapotranspiration in the context of years of research (Table 1).

So, on average, over three years of research, in order to maintain soil moisture reserves at a level of minus 21 kPa (80 % of the lowest soil moisture capacity), from 11 to 14 vegetation irrigations were carried out for growing sunflower hybrids with an irrigation rate of 1.67–1.96 thousand m^3/ ha with subsoil irrigation and 14–19 irrigations with an irrigation rate of 1.96–2.43 thousand m^3/ha with drip irrigation. Consequently, according to the averaged data, the irrigation rate for subsurface irrigation was less by 0.384 thousand m^3/ha or 17.4 % than with ground-based irrigation pipelines.

Sunflower evapotranspiration parameters were at the level of 2.94–3.05 thousand m^3/ha in non-irrigated conditions, 4.36–4.62 thousand m^3/ha under subsurface irrigation (IP placement at a depth of 0.3 m) and 4.73–5.24 thousand m^3/ha for ground placement of irrigation pipelines. Evapotranspiration among hybrids was almost the same: 4.35 thousand m^3/ha Rimisol F1 and 4.44 thousand m^3/ha – Ukrainian F1.

When implementing the pulse mode of water supply, on average, 148 vegetation irrigations were carried out with a total irrigation rate of 2.22 thousand m^3/ha. The value of evapotranspiration at the same time amounted to 4.85 thousand m^3/ha. The lowest water consumption coefficient (WCC) for sunflower is typical for options with subsoil drip irrigation – 1088.7–1254.2 m^3/t. The maximum WCC was in rainfed growing conditions – 1839.8–1847.8 m^3/t.

It should be noted the relatively low value of the water consumption coefficient in the experimental version with pulsed water supply mode according to SDI – 1077.8 m^3/t, which indicates the most efficient use of moisture by sunflower plants.

The key motivational mechanism for the introduction of drip irrigation technologies is obtaining economic profit on the basis of preserving the ecological sustainability of reclaimed agricultural landscapes [22]. Therefore, there is a need to evaluate the most effective combinations of the studied factors not only according to the productivity criterion, but also according to a number of basic (basic) economic indicators. The economic evaluation of the effectiveness of the investigated options was carried out according to the actual costs of material funds for the cultivation of products as of September 2022 (Table 2).

The key aspect in the calculation of economic parameters was the total cost of growing products. Thus, regardless of the higher yield of sunflower

1. Parameters of soil water regime and evapotranspiration (ETc) of sunflower hybrids depending on micro-irrigation system designs (2020–2022)

A variant of the experiment			The number of waterings	Irrigation rate, m^3/ha	Precipi-tation, m^3/ha	Soil moisture, m^3/ha			ETc, m^3/ha	WCC, m^3/ha
factor A	factor B	factor C				begining	final	balans		
Rimisol F1	DI	0.7	18	1960	2098	1363	693	670	4728	1127.5
		1.4	14	2313		1317	490	827	5238	1414.4
	SDI (-30 cm)	1.0	13	1667		1380	783	597	4362	1088.7
		1.4	11	1872		1303	813	490	4460	1226.4
	control (W/I)		–	–		1327	487	840	2938	1847.8
Ukr. F1	DI	0.7	19	2140		1377	753	624	4862	1102.5
		1.4	14	2427		1307	750	557	5082	1298.6
	SDI (-30 cm)	1.0	14	1803		1403	700	703	4604	1125.7
		1.4	11	1963		1310	747	563	4624	1254.2
	control (W/I)		–	–		1317	367	950	3048	1839.8
Impulse mode of water supply in subsurface drip irrigation										
Ukr. F1	SDIP (-30 cm)	1.0	148	2222	2098	1335	805	530	4850	**1077.8**

2. The main economic parameters of growing sunflower hybrids depending on the designs of micro-irrigation systems (2022)

A variant of the experiment			Costs, thousand UAH/ha, for:				Gross income, thousand UAH/ha*	Conditionally net profit, UAH/ha	Cost price, thousand UAH/t	Profitability level, %
factor A	factor B	factor C	cultivation technology	micro-irrigation system (depreciation, operation)	harvest & logistics	general				
Rimisol F1	DI	0.7	36.76	27.85	2.62	67.23	75.60	8.37	12.85	12.45
		1.4	38.82	20.79	2.31	61.92	66.78	4.86	13.40	7.85
	SDI (-30 cm)	1.0	34.98	17.69	2.50	55.17	72.28	17.11	11.03	31.10
		1.4	36.47	11.32	2.27	50.06	65.63	15.57	11.03	31.01
	control (W/I)	25.37	–	1.02	26.39	29.63	3.24	12.87	12.28	
Ukrainian F1	DI	0.7	37.20	27.85	2.75	67.8	79.50	11.7	12.33	17.26
		1.4	39.41	20.79	2.44	62.64	70.54	7.9	12.84	12.61
	SDI (-30 cm)	1.0	35.45	17.69	2.56	55.7	73.87	18.17	10.90	32.62
		1.4	37.07	11.32	2.30	50.69	66.49	15.8	11.02	31.17
	control (W/I)	25.69	–	1.08	26.77	31.37	4.6	12.34	17.18	
Pulse mode of water supply in subsurface drip irrigation										
Ukr. F1	SDIP (-30 cm)	1.0	38.79	17.69	2.79	59.27	5.57	80.51	21.24	10.64

In the calculations, the selling price of sunflower seeds is 14.455 thousand UAH/t (as of September 6, 2022). *Source: https://tripoli.land/analytics/podsolnechnik*

under surface drip irrigation, the higher economic indicators were under the underground laying of pipelines. The highest are conditionally net profit (17.11–18.17 thousand UAH/ha), lower cost price (11.03–10.90 thousand UAH/ton), as well as a higher level of profitability of production (31.10–32.62 %) provided the option with subsurface laying of irrigation pipelines every 1.0 m regardless of the sunflower hybrid.

The analysis of the calculations shows that, basically, such parameters according to the PCZ were achieved by optimizing the operating costs of the micro-irrigation system against the background of almost the same crop yield. Without an irrigation, the sunflower cultivation was at the minimum level of profitability (+12.2 – +12.6 %).

It is necessary to note the economic parameters in the variant with the implementation of the pulse water supply mode, where due to the higher grain yield and the specific saving of irrigation water, the highest indicators of the technology were achieved: gross income – 80.51 thousand UAH/ha, conditional net profit – 21.24 thousand UAH/ha, the cost of 1 ton is UAH 10.6 thousand and the level of profitability of production is 35.8 %.

Conclusions. The results of experimental studies proved that the method of laying irrigation pipelines of micro-irrigation systems reliably affects the parameters of the formation of the water regime of the soil and the yield of sunflower hybrids in the conditions of the Dry Steppe. It was established that the introduction of subsoil drip irrigation is more appropriate for growing sunflower hybrids, which is explained by the drought resistance of the culture. For the cultivation of this agricultural crop, the variant with in-soil laying of irrigation pipelines of drip irrigation provided almost identical yield parameters with lower coefficients of plant water consumption. The minimum coefficient of water consumption (1077.8 m^3/t) was obtained under the condition of implementation of the pulse water supply mode.

Higher economic parameters of agrotechnology for growing sunflower hybrids were also obtained with subsurface drip irrigation: conditionally net profit (17.11–18.17 thousand UAH/ha), lower cost price (11.03–10.90 thousand UAH/t), and a higher level of profitability of production (31.10–32.62 %) (laying of irrigation pipelines after 1.0 m regardless of the sunflower hybrid). Due to the higher grain yield and the specific saving of irrigation water under the impulse mode of water supply, the highest economic parameters of the technology were achieved: gross income – 80.51 thousand UAH/ha, conditional net profit – 21.24 thousand UAH/ha, cost price of 1 ton – 10.6 thousand UAH and the level of profitability of production – 35.8 %.

References

1. Posivni ploshchi silskohospodarskykh kultur za yikh vydamy u 2021 rotsi – [Sown areas of agricultural crops by their types in 2021]. *Derzhavna sluzhba statystyky Ukrainy ukrstat.gov.ua*. Retrieved from http://www.ukrstat.gov.ua/ [in Ukrainian]

2. Tkalich, Yu.I., Tkalich, I.D. & Kokhan, A.V. (2014). Yaki kultury vysnazhuiut grunt bilshe? – [Which crops deplete the soil more?] *Propozytsiia*, 1, 64–66. [in Ukrainian]

3. Krakovska S.V. et al. (2018). Projections of air temperature and relative humidity in ukraine regions to the middle of the 21st century based on regional climate model ensembles. *Geoinformatics*, 3(67), 62–77.

4. Romashchenko, M., Husyev, Y., Shatkovskyi, A., Saidak, R., Yatsyuk, M., Shevchenko, A., & Matiash, T. (2020). Vplyv suchasnykh klimatychnykh zmin na vodni resursy ta silskohospodarske vyrobnytstvo – [Impact of modern climate changes on water resources and agricultural production]. *Melioratsiia i vodne hospodarstvo*, 1, 5–20. https://doi.org/10.31073/mivg202001-235 [in Ukrainian]

5. Vozhehova, R.A. (Ed.). (2018). Naukovi osnovy adaptatsii system zemlerobstva do zmin klimatu v Pivdennomu Stepu Ukrainy – [Scientific basis of adaptation of agricultural systems to climate changes in the Southern Steppe of Ukraine]. Kherson : OLDI-PLUS. [in Ukrainian]

6. Romashchenko, M.I., Tarariko, Yu.O., Shatkovskyi, A.P., Saidak, R.V., & Soroka, Yu.V. (2015). Naukovi zasady rozvytku zemlerobstva u zoni Stepu Ukrainy – [Scientific principles of agricultural development in the Steppe zone of Ukraine]. *Visnyk ahrarnoi nauky*, 10, 5–9. DOI: https://doi.org/10.31073/agrovisnyk201510-01 [in Ukrainian]

7. Fomichov, M.V. (2019). Zroshennia yak chynnyk pidvyshchennia efektyvnosti vyroshchuvannia silskohospodarskykh kultur v Ukraini – [Irrigation as a factor in increasing the efficiency of growing agricultural crops in Ukraine]. *Ekonomika ta derzhava*, 4, 92–96. DOI: 10.32702/2306-6806.2019.4.92 [in Ukrainian].

8. Analityka stanu zroshuvanykh zemel v Ukraini – [Analysis of the condition of irrigated lands in Ukraine]. *https://kurkul.com.* Retrieved from https://kurkul.com/spetsproekty/1072-analitika-stanu-zroshuvanih-zemel-v-ukrayini [in Ukrainian]

9. Paul, W. Unger (1983). Irrigation effect on sunflower growth, development, and water use. *Field Crops Research*, 7, 181–194 https://doi.org/10.1016/0378-4290(83)90021-7

10. Bing Jing, Farooq Shah, Enshi Xiao, Jeffrey A.Coulter & Wei Wu. (2020). Sprinkler irrigation increases grain yield of sunflower without enhancing the risk of root lodging in a dry semi-humid region. *Agricultural Water Management*, 239, 106–110 https://doi.org/10.1016/j.agwat.2020.106270

11. Vozhehov, S.H., Rudyi, O.E., Kokovikhin, S.V., Drobitko, A.V., Kazanok, O.O., & Kerimov, A.N. (2021). Vrozhainist, ekonomichna ta enerhetychna efektyvnist vyroshchuvannia hibrydiv soniashnyku zalezhno vid rezhymiv zroshennia ta obrobitku gruntu v umovakh Pivdnia Ukrainy – [Yield, economic and energy efficiency of growing sunflower hybrids depending on irrigation and tillage regimes in Southern Ukraine]. *Zroshuvane zemlerobstvo*, 75, 114–118. DOI https://doi.org/10.32848/0135-2369.2021.75.21 [in Ukrainian].

12. Kadasiddappa, M.M., Rao, V.P., Reddy, K.Y., Ramulu, V., Devi, M.U. & Reddy, S.N. (2017). Effect of Irrigation (Drip/Surface) on Sunflower Growth, Seed and Oil Yield, Nutrient Uptake and Water Use Efficiency – A Review. *Agricultural Reviews*, 38, 152–15. https://doi.org/10.18805/ag.v38i02.7947

13. Akcay, S. & Dağdelen, N. (2016). Water use effıciency, yield and yield components of second crop sunflower under deficit irrigation. *Turkish Journal of Field Crops*, 21(2), 190–199. DOI: 10.17557/tjfc.05690

14. Sezen, S.M., Tekin, S. & Bozdoğan Konuşkan, D. (2019). Effect of Irrigation Strategies on Yield of Drip Irrigated Sunflower Oil and Fatty Acid Composition and its Economic Returns. *Journal of Agricultural Sciences*, 25(2), 163–173. DOI: 10.15832/ankutbd.382617

15. Vozhehova, R.A. & Kovalenko A.M. (2014). Efektyvnist zastosuvannia kraplynnoho zroshennia na Pivdni Ukrainy za vyroshchuvannia soniashnyku – [Effectiveness of using drip irrigation in the South of Ukraine for sunflower cultivation]. *Kraplynne zroshennia yak osnovna skladova intensyvnykh ahrotekhnolohii XXI stolittia*: III Mizhnarodna nauk.-praktych. konf. Kyiv , 29–30. [in Ukrainian]

16. Sheludko, O.D. et al. (2015). Vyroshchuvannia soniashnyka na kraplynnomu zroshenni – [Sunflower growing on drip irrigation]. *Propozytsiia*, 6, 60–63. [in Ukrainian]

17. Ushkarenko, V. O. at al. (2014). Metodyka polovoho doslidu (zroshuvane zemlerobstvo) – [Methodology of field experiment (irrigated agriculture)]. Kherson : Hrin D.S. [in Ukrainian]

18. Romashchenko, M.I. at al. (2014). Metodychni rekomendatsii z provedennia doslidzhen za kraplynnoho zroshennia – [Methodological recommendations for conducting research on drip irrigation]. Kyiv : DIA. [in Ukrainian]
19. Shatkovskyi, A.P., & Zhuravlov, O.V. (2016). Upravlinnia kraplynnym zroshenniam na osnovi vykorystannia internet-meteostantsii iMetos® – [Management of drip irrigation based on the use of Internet weather stations]. *Naukovi dopovidi NUBiP Ukrainy*, 2(59). http://journals.nubip.edu.ua/index.php/Dopovidi/article/view/6489/6373 [in Ukrainian]
20. Zhuikov, H.Ie., & Dymov, O.M. (2005). Normatyvy vytrat materialno-tekhnichnykh resursiv pry vyroshchuvanni osnovnykh zernovykh i tekhnichnykh kultur – [Norms of expenditure of material and technical resources in the cultivation of the main grain and technical crops]. Kherson : Ailant. [in Ukrainian]
21. Tarariko, Yu.O., Nesmashna, O.Ie. & Hlushchenko, L.D. (2001). Enerhetychna otsinka system zemlerobstva i tekhnolohii vyroshchuvannia silskohospodarskykh kultur – [Energy assessment of farming systems and technologies for growing agricultural crops] : methodical recommendations. Kyiv : Nora-Print. [in Ukrainian]
22. Shatkovskyi, A.P. Stasiuk, S.R. & Knysh, V.V. (2012). Ekonomicheskye aspekty primeneniya kapelnoho orosheniya – [Economic aspects of drip irrigation]. *Ovoshchevodstvo*, 9(93). 59–61. [in Ukrainian]

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ВОДНИЙ РЕЖИМ ТА ЕФЕКТИВНІСТЬ ВИРОЩУВАННЯ ГІБРИДІВ СОНЯШНИКУ ЗАЛЕЖНО ВІД ЕЛЕМЕНТІВ ТЕХНОЛОГІЇ КРАПЛИННОГО ЗРОШЕННЯ

В.В. Калілей[1], А.П. Шатковський[1], докт. с.-г. наук

[1] Інститут водних проблем і меліорації НААН, Київ, Україна;
https://orcid.org/0000-0001-7875-1240 ; e-mail: vkaliley@gmail.com;
[2] Інститут водних проблем і меліорації НААН, Київ, Україна;
https://orcid.org/0000-0002-4366-0397 ; e-mail: andriy-1804@ukr.net

Анотація. *У статті наведено результати експериментальних досліджень з вивчення впливу конструкцій систем мікрозрошення на водний режим, продуктивність та ефективність вирощування соняшника. За цього розраховано основні економічні параметри агротехнологій вирощування соняшника. Польові короткотермінові дослідження проведено у період 2020–2022 рр. на землях Брилівського дослідного поля Інституту водних проблем і меліорації НААН (Херсонська область, підзона Степу Сухого). Для обробки експериментальних даних використано аналітичні і статистичні методи. Схемою польових дослідів було передбачено різні варіанти укладання поливних трубопроводів систем мікрозрошення (у горизонтальній та вертикальній площині) та реалізація імпульсного режиму водоподачі (еталон). Контрольним був варіант без зрошення. За результатами експериментальних досліджень доведено, що спосіб укладання поливних трубопроводів систем мікрозрошення достовірно впливає на параметри формування водного режиму ґрунту та врожайність гібридів соняшнику в умовах Степу Сухого. Встановлено, що впровадження підґрунтового краплинного зрошення є більш доцільним за вирощування гібридів соняшнику, що пояснюється посухостійкістю цієї культури. За вирощування соняшнику варіант із внутрішньоґрунтовим укладанням поливних трубопроводів краплинного зрошення забезпечив практично ідентичні параметри врожайності за нижчих коефіцієнтів водоспоживання рослин. Мінімальний коефіцієнт водоспоживання (1077,8 м^3/т) отримано за умови реалізації імпульсного режиму водоподачі. Вищі економічні параметри агротехнології вирощування гібридів соняшника отримано за підґрунтового краплинного зрошення: умовно чистий прибуток (17,11–18,17 тис. грн/га), нижчу собівартість (11,03–10,90 тис. грн/тонну), а також вищий рівень рентабельності виробництва (31,10–32,62 %) (укладання поливних трубопроводів через 1,0 м не залежно від гібриду соняшника). За рахунок вищої врожайності зерна і питомої економії поливної води за імпульсного режиму водоподачі досягнуто найвищих економічних параметрів: валовий дохід становив 80,51 тис. грн/га, умовно чистий прибуток – 21,24 тис. грн/га, собівартість 1 тонни зерна – 10,6 тис. грн та рівень рентабельності виробництва – 35,8 %.*

Ключові слова: *краплинне зрошення, підґрунтове краплинне зрошення, імпульсний режим водоподачі, евапотранспірація, водний режим ґрунту, економічна ефективність, соняшник*