**DOI:** https://doi.org/10.31073/mivg20180108-146
Available at: http://mivg.iwpim.com.ua/index.php/mivg/article/view/146
UDC 631.675.4:631.674.6:635.64

# ADJUSTMENT OF THE PENMAN-MONTEITH METHOD FOR GROWING TOMATO SEEDLINGS IN PRODUCTION CONDITIONS WHEN APPLYING DRIP IRRIGATION

**M.I. Romashchenko[1], Doc. Tech. Sciences, A.P. Shatkovskyi[2], Doc. Agricultural Sciences, O.V. Zhuravlev[3], PhD in Agricultural Sciences, V.V. Vasyuta[4], Doc. Agricultural Sciences, Yu.O. Cherevychny[5]**

[1] Institute of Water Problems and Land Reclamation NAAS. Kyiv, Ukraine;
https://orcid.org/0000-0002-9997-1346; e-mail: mi.romashchenko@gmail.com
[2] Institute of Water Problems and Land Reclamation NAAS. Kyiv, Ukraine;
orcid.org/0000-0002-4366-0397; e-mail: andriy-1804@ukr.net
[3] Institute of Water Problems and Land Reclamation NAAS. Kyiv, Ukraine;
https://orcid.org/0000-0001-7035-219X; e-mail: zhuravlov_olexandr@ukr.net
[4] Institute of Water Problems and Land Reclamation NAAS. Kyiv, Ukraine;
orcid.org/0000-0001-7786-1843; e-mail: v.vladvir1@gmail.com
[5] Institute of Water Problems and Land Reclamation NAAS. Kyiv, Ukraine;
https://orcid.org/0000-0002-9959-8297; e-mail: yurecgp@gmail.com

***Abstract.*** *The scientific-methodical approaches were substantiated and the need of testing of the Penman-Monteith method for tomato growing was proved. The regime of drip irrigation and parameters of tomato ETc in the production conditions of the Steppe of Ukraine were specified. The actual coefficients of the Cs tomato crop were calculated, taking into account the climatic conditions of the Steppe zone of Ukraine. It was proved that the actual values of Cc are lower by 40.9-43.5% compared to the Cc / FAO. It is recommended in the future to use the adjusted values of the Cc crop coefficient for determination of ETc and operative control of drip irrigation regime for tomato crop.*

***Key words:*** *total water consumption, crop coefficient, irrigation rate, drop irrigation, tomato.*

**Formulation of the problem**. Obtaining the maximum effect from irrigation to a large extent depends on the accuracy of the time of watering starting. The design regime of irrigation only approximately determines the terms of watering. The time of every next watering is determined in the process of growth and development of plants. In the practice of irrigated agriculture different methods and approaches to the scheduling of vegetative waterings are used. The scientists of the Institute of Water Problems and Land Reclamation of the NAAS [1, 2] divided the methods by the structural features and characteristics into four groups: by soil moisture reserves, calculation methods, biological and visual ones.

The use of various calculation methods in practice of irrigated agriculture is based on the existence of dependence between the total water consumption of plants (*ETc*) and meteoparameters. With the development of IT technologies, namely the introduction into the practice of digital Internet weather stations, the Penman-Monteith method became one of the most common method [3, 4]. The calculation equation for determining *ETc*, which is the basis of this method [5, 6], is used as an application to most modern Internet weather stations. It is known that the method involves determining the reference evapotranspiration (*ETo*) of a hypothetical crop (lawn grass) in height of 0.12 m, surface resistance of 70 cm-1 and albedo of 0.23. In its turn, the dependence of the *ETc* on *ETo* shows the crop coefficient *Cc/FAO*, which characterizes the differences between the crop and a reference lawn grass.

As previous studies of both IWPLR [7, 8] and foreign scientists showed [9], the value of the actual *Cc* crop coefficient in the Ukrainian Steppe is significantly different from the typical *Cc/FAO*. Consequently, for the practical use of the Penman-Monteith method, it is necessary to perform a study to correct *Cc* taking into account deviations from the standard conditions.

**Relevance of the research**. Tomato is the most common, and in a certain sense, strategic vegetable crop in Ukraine, which occupies the largest area among vegetables (more than 80 thousand hectares), and the gross harvest of its fruit is more than 1.5 million tons per year. For today, such a product of its processing as tomato paste is a highly liquid export product. The largest producer of tomatoes in Ukraine is the group of companies «Agrofusion» (TM «Inagro»). On the fields of this vertically inte-

grated agro holding each year, more than 600 thousand tons of fruit are grown in the area of about 5600 hectares. All these fields are equipped with modern systems of drip irrigation, therefore the issues of operative and effective control of soil water regime in these conditions are quite relevant.

**Purpose of the research** is to test the Penman-Monteith method of determination of *ETc* and scheduling waterings for tomato crop in the production conditions under drip irrigation in the steppe of Ukraine.

**Materials and methods of the research**. Field surveys were conducted in 2017 in the production conditions at four sites within the land of the holding «Agrofusion» in the Mykolaiv and Kherson regions: PAE «Agrofirma Rodnichok» (Balabanivka village (Mykolaiv town), field № RD2/3-94; Snihurivka town, field № In/28-30-78,41) and «Organic Systems» PE (Gola Prystan town, field № GP/18.5-102.24, Myrne village (Kalanchatsky district), field № KH1/2.2-80.60).

The research was conducted on typical for this zone soils. To determine and clarify the properties and characteristics of soils at the experimental sites, samples were taken and soil cuts were made in accordance with DSTU 4287 [10] (Table 1).

The weather conditions of the active growing season of transplanted tomato (May-July) were arid and hot-dry, as evidenced by the precipitation data (Table 2).

1. Consolidated data of water-physical properties of soils of the experimental sites (soil layer is 0-40 cm)

| Experimental sites | Soils | Bulk density, t/m$^3$ | FWHC % of mass | Dispersiveness factor by N.A. Kachynsky | |
|---|---|---|---|---|---|
| | | | | > 0,01 mm | < 0,01 mm |
| *PAE "Agrofirma" Rodnichok", South Steppe subzone, Mykolaiv region* | | | | | |
| SP "Agrofirma" Rodnichok", subzone" Steppe of the South", Mykolaiv region | dark chestnut light loamy | 1,31 | 29,0 | 40,77 | 59,23 |
| Snihurovka town | chernozem southern thin-humous middle loamy | 1,27 | 31,0 | 34,44 | 65,56 |
| *PE "Organic Systems", Arid Steppe subzone, Kherson region* | | | | | |
| Gola Prystan town | meadow chestnut sandy-loam | 1,56 | 14,3 | 83,41 | 16,59 |
| Myrne village | dark chestnut light loamy | 1,32 | 27,0 | 36,77 | 63,23 |

2. Average long-term and actual values of productive precipitation at the experimental sites in May-July 2017

| Experimental sites | Average long-term value, mm | Actual value, mm | Deviation, % |
|---|---|---|---|
| *PAE "Agrofirma" Rodnichok", South Steppe subzone, Mykolaiv region* | | | |
| Balabanivka village | 150,5 | 67,2 | -55,2 |
| Snihurovka town | 168,5 | 54,2 | -67,8 |
| *PE "Organic Systems", Arid Steppe subzone, Kherson region* | | | |
| Gola Prystan town | 110,0 | 64,6 | -41,3 |
| Myrne village | 129,0 | 59,4 | -54,0 |

The average daily temperature for the same period also exceeded the climatic norm by 1.5-2.20 °C, which is a stagnant phenomenon in the last 15-20 years.

Allocation of experimental sites is systematic; repetition is four-fold [11]. Internet weather stations iMetos® Eco D2 were used to record meteorological parameters and determine soil moisture. *ETo* was determined using the application «IRRIMET» from Pessl Instruments and software CROPWAT 8.0. *ETc* were determined using Watermark SS200 type sensors based on the digital Internet weather station [3, 4], which were installed at different depths of the soil profile and different distance from water supply point. (Figure 1), with periodic (once a decade) control using the thermostatic-weight method [12].

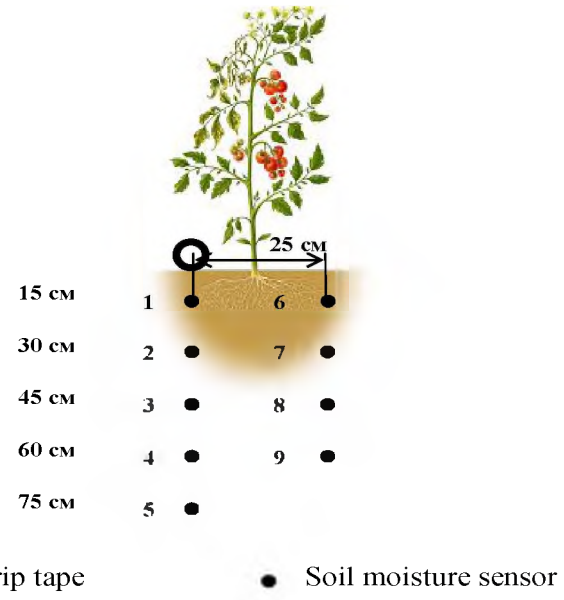


Fig. 1. Diagram of soil moisture sensors Watermark SS200 installation

Commonly accepted [13] and improved [14] for drip irrigation methods were used for conducting surveys and observations.

The crop coefficient *Cc* was determined as the ratio of the actual water consumption *ETc* to the standard evaporation *ETo* [6]:

$$Kc = \frac{ETc}{ETo},$$

where: *ETc* – actual water consumption, mm or m³/ha; *ETo* – reference evaporation, mm or m³/ha.

**Results of the research and their discussion.** Depending on weather conditions, the tomato hybrid Heinz (H 12/81) was planted from 03 to 15 May. During the growing season for keeping antecedent soil water ation at the level of 85% of FWHC 63-69 waterings were conducted with a general irrigation rate of 3,45-4,19 thousand m³/ha in PAE «Agrofirma Rodnichok» and 72-75 waterings with an irrigation rate of 4,68-6,02 thousand m³/ha in PE «Organic Systems» (Table 3).

3. Actual balance of total water consumption of tomato seedlings (soil layer is 0-100 cm)

| Experimental sites | Number of waterings | Irrigation rate | | Productive precipitation | | Soil moisture | | Total water consumption, ETc, m³/ha |
|---|---|---|---|---|---|---|---|---|
| | | m³/ra | % | m³/ra | % | m³/ra | % | |
| PAE "Agrofirma" Rodnichok ", South Steppe subzone, Mykolaiv region | | | | | | | | |
| Balabanivka village | 69 | 4191 | 66,7 | 672 | 11,1 | 1395 | 22,2 | 6258 |
| Snihurovka town | 63 | 3448 | 63,3 | 542 | 10,4 | 1430 | 26,3 | 5420 |
| PE "Organic Systems", Arid Steppe subzone, Kherson region | | | | | | | | |
| Gola Prystan town | 72 | 4687 | 75,5 | 646 | 10,7 | 862 | 13,9 | 6195 |
| Myrne village | 75 | 6025 | 79,1 | 594 | 8,0 | 980 | 12,9 | 7599 |

The actual *ETc* at the experimental sites was 5.42 thousand m³/ha (Snihurivka town), 6.26 thousand m³/ha (Balabanivka village), 6.20 thousand m³/ha (Gola Prystan town), and 7,60 thousand m³/ha (Myrne village).

In the structure of *ETc*, the share of irrigation water dominated: 63.3-66.7% in the Southern Steppe subzone and 75.5-79.1% in the Arid Steppe subzone. The productive precipitation was the smallest share in the formation of *ETc*: 10.4-11.1% in the fields of

PSE «Agrofirma Rodnichok» and 8.0-10.7% in the conditions of PE «Organic Systems».

Calculations of the standard evaporation showed that during the months of May-July, the values of *ETo* ranged from 38.7 to 64.2 m³/day in the Southern Steppe subzone and from 42.2 to 64.7 m³/day in the Arid Steppe subzone.

Calculations of the average daily *ETc* showed that the minimum moisture consumption was in May – 22.8-35.6 m³/ha (PE «Agrofirma Rodnichok») and 29.5-36.2 m³/ha (PE «Organic Systems»). Starting from the third decade of May and up to the third decade of June, the daily *ETc* of tomato plants gradually increased from 35-40 up to 115-120 m³/ha, reaching its maximum values in the I-II decades of July – 124-127 m³/ha. A mild decrease in the daily values of *ETc* was recorded started from the III decade of July (up to 114-118 m³/ha), and a sharp decrease – at the beginning of August, at the end of the growing season (46-71 m³/ha) (Figure 2).

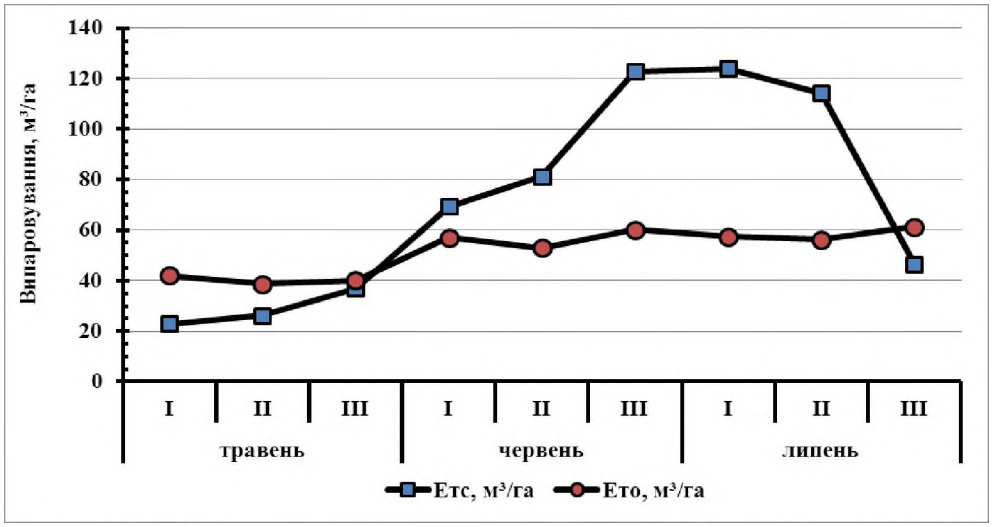


Fig. 2 Dynamics of average daily water consumption (ETc) of tomato plants and reference evaporation (ETo) (as in the case of PAE «Agrofirma» Rodnichok», Balabanivka village)

Using the ratio of average daily water consumption of plants (*ETc*) to the standard evaporation (*ETo*) it was calculated the actual crop coefficient of *Cc* for tomato seedlings. It was established that during the growing season, the value of *Cc* actually reflects the phases of plant growth and development (leaf area, photosynthetic productivity) and *ETc* parameters: the gradual increase in values from the time of seedlings planting to the I-II decades of July and their sharp decrease at the end of the vegetation (Figure 3).

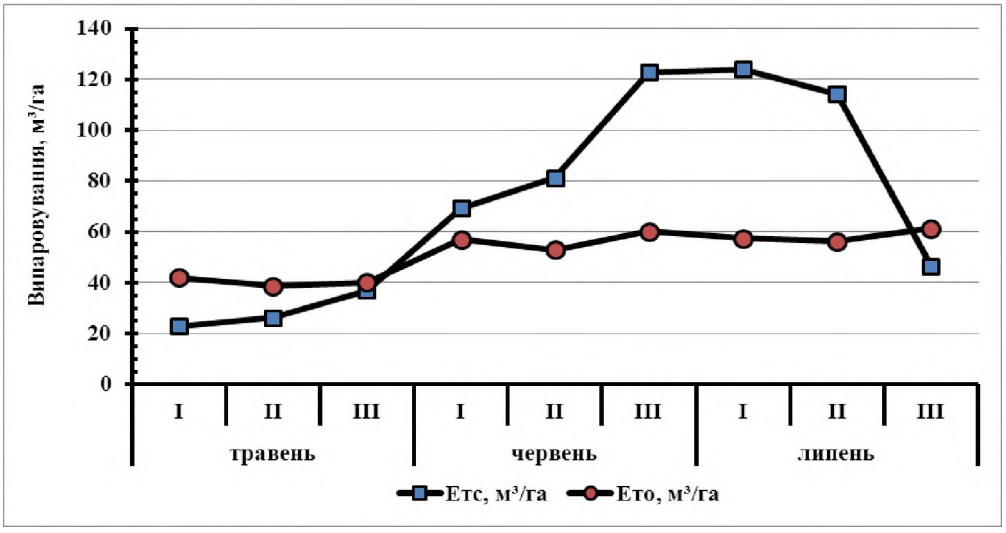


Fig. 3 Dynamics of the crop coefficient Cc for tomato seedlings (for example, PPP «Agrofirma» Rodnichok», village Balabanivka Mykolaiv region)

Thus, during May, the average value of *Cc* of tomato for the conditions of the subsoil of the Southern Steppe was 0.62-0.94, during June there was an increase to 1.20-2.04, the absolute maximum was recorded in the beginning of July – 2.17, followed by a decrease to 2,07-0.92 at the end of the growing season. The average value of *Cc* for vegetation in this zone was 1.34 (Table 4).

4. Calculated values of the crop coefficient Cc for tomato seedlings during the vegetation period

| Number of days from the seedlings planting | 7 | 17 | 27 | 37 | 47 | 57 | 67 | 77 | 87 | Average for the season |
|---|---|---|---|---|---|---|---|---|---|---|
| *PAE "Agrofirma" Rodnichok ", South Steppe subzone, Mykolaiv region* | | | | | | | | | | |
| Balabanivka village | 0,54 | 0,68 | 0,92 | 1,22 | 1,53 | 2,04 | 2,16 | 2,03 | 0,76 | 1,32 |
| Snihurovka town | 0,69 | 0,72 | 0,95 | 1,17 | 1,34 | 2,04 | 2,17 | 2,10 | 1,08 | 1,36 |
| *Average value* | 0,62 | 0,70 | 0,94 | 1,20 | 1,44 | 2,04 | 2,17 | 2,07 | 0,92 | ***1,34*** |
| *PE "Organic Systems", Arid Steppe subzone, Kherson region* | | | | | | | | | | |
| Gola Prystan town | 0,66 | 0,70 | 0,75 | 1,16 | 1,62 | 1,98 | 2,13 | 1,90 | 1,17 | 1,34 |
| Myrne village | 0,71 | 0,73 | 1,05 | 1,19 | 1,27 | 2,10 | 2,15 | 2,17 | 1,06 | 1,38 |
| Average value | 0,69 | 0,72 | 0,90 | 1,18 | 1,45 | 2,04 | 2,14 | 2,04 | 1,12 | ***1,36*** |
| ***Value Kc/FAO*** | **0,40** | **0,50** | **0,70** | **0,80** | **1,05** | **1,25** | **0,80** | **0,95** | **0,60** | **0,78** |

The value of *Cc* was calculated also for the conditions of the Arid Steppe subzone: 0.69-0.90 during May, 1.18-2.04 – in June, the maximum value was 2.14 – at the beginning of July and the decrease (up to 2.04-1,12) at the end of vegetation. The average value of *Cc* of tomato for vegetation in this zone was 1.36.

For comparison, Table 4 shows the values of the crop coefficient *Cc FAO* for typical conditions [15]. Probably, the value of *Cc FAO* is less than the established parameters of *Cc* by 6.7-70.5% in different phases of development and by 40.9-43.5% then the average value during the growing season.

Experimentally determined *Cc* for tomato seedlings was used in 2018 by the specialists of the group of companies "Agrofusion" under drip irrigation by the Penman-Monteith method in the production conditions of Mykolaiv and Kherson regions in a total area of over 5,000 hectares. The adapted method for determining the *ETc* showed a high efficiency and correlation ($r$=0,77-0,89) along with the instrumental methods of drip irrigation control while reducing energy and resource costs for its implementation.

**Conclusions**. The scientific and methodological approaches were grounded and the necessity of adjustment of the Penman-Monteith method in the production conditions of the South of Ukraine for growing tomato seedlings was proved.

The actual regime of drip irrigation and the parameters of *ETc* of tomato seedlings in the production conditions of the Ukrainian Steppe were determined: for keeping RPVG 85% of FWHC the number of waterings was 63-75, the irrigation rate was 3.5-4.2 thousand m$^3$/ha in the Southern Steppe and 4,7-6,0 thousand m$^3$/ha in the Arid Steppe subzone, *ETc* – 6,2-5,4 thousand m$^3$/ha and 6,2-7,6 thousand m$^3$/ha, respectively. In the structure of *ETc* formation a share of irrigation water significantly prevailed and amounted 63.3-79.1%.

The crop coefficients *Cc* of tomato seedlings were calculated, taking into account the local climatic conditions of the Steppe zone of Ukraine. It was proved that the actual values are different from the *Cc FAO*, whose parameters are lower by 40.9-43.5% then the average value of *Cc* during the growing season.

It is recommended for determining *ETc* and operative control of dip irrigation for tomato seedlings in the future to use the adjusted values of the crop coefficient *Cc*.

**Бібліографія**

1. Ромащенко М.І., Шатковський А.П., Рябков С.В. Краплинне зрошення овочевих культур і картоплі в умовах Степу України: наукове видання. Київ: «ДІА», 2012. 248 с.

2. Шатковський А.П., Чабанов А.С. Методи призначення строків вегетаційних поливів // Водне господарство України. 2012. № 4. С. 18-24.

3. Полегенько А.А. Метеостанция iMetos® – уникальный инструмент в руках агронома // Овощеводство. 2008. № 2. С. 60-61.

4. iMetos-ECO-D2. A reliable and cost-effective solution for Soil Moisture monitoring, Rain, Water level and Irrigation Management. Retrieved from: http://metos.at/page/en/products/2/iMetos-ECO-D2

5. Penman H.L. Evaporation. An Introductory Survey // Neth. J. Agr. Sci. 1956. № 4. P. 9-29.

6. Allen R.G., Pereira L.S., Raes D.S., Smith M.L. Crop evapotranspiration – Guidelines for computing crop water requirements // FAO Irrigation and drainage paper 56. Food and Agriculture Organization of the United Nations. Rome, 1998.

7. Romashchenko M., Shatkowski A., Zhuravlev O. Features of application of the «Penman – Monteith» method for conditions of a drip irrigation of the Steppe of Ukraine (on example of grain corn)// Journal of Water and Land Development. Raszyn, Poland,. Wydawnictwo ITP. 2016. № 31. P. 123-127.

8. Шатковський А.П., Журавльов О.В. Діагностика поливів буряка цукрового за методом «Penman – Monteith» в умовах краплинного зрошення Степу України // Вісник Дніпропетровського державного аграрно-економічного університету. Дніпро: Свідлер А.Л., 2017. Вип. 1 (43). С. 63-69.

9. Dirirsa G., Bekele D., Hordofa T. (2017). Crop Coefficient and Water Requirement of Tomato at Melkassa, Central Rift Valley of Ethiopia. Acad. Res. J. Agri. Sci. Res. 5(5): 336-340.

10. ДСТУ 4287:2004. [Чинний від 2005.07.01]. Якість ґрунту. Відбирання проб. Київ: Держспоживстандарт України, 2005. 10 с. (Національний стандарт України).

11. Бондаренко Г.Л., Яковенко К.І. Методика дослідної справи в овочівництві і баштанництві. Харків: Основа, 2001. 369 с.

12. ДСТУ Б В.2.1–17:2009. [Чинний від 2010.10.01]. Ґрунти. Методи лабораторного визначення фізичних властивостей. Київ: Мінрегіонбуд України, 2010. 36 с. (Національний стандарт України).

13. Основи наукових досліджень в агрономії: підручник / В.О. Єщенко та ін. Київ: «ДІА», 2005. 288 с.

14. Ромащенко М.І., Шатковський А.П., Усата Л.Г. Методичні рекомендації з проведення польових досліджень за краплинного зрошення. Київ: ІВПіМ НААН, 2014. 46 с.

15. Salazar L., Tolisano J., Crane K. (1994) Irrigation Reference Manual // Peace Corps Information Collection & Exchange, Washington, USA, 485 p.

**References**

1. Romashchenko, M.I., Shatkovskyi, A.P., & Riabkov, S.V. (2012). Kraplynne zroshennia ovochevykh kultur i kartopli v umovakh Stepu Ukrainy [Drip irrigation of vegetable crops and potatoes in the conditions of the Ukrainian Steppe]. Kyiv: DIA. [in Ukrainian]

2. Shatkovskyi, A.P., & Chabanov, A.S. (2012). Metody pryznachennia strokiv vehetatsiinykh polyviv [Methods of determining the terms of vegetative irrigation]. Vodne hospodarstvo Ukrainy, 4. 18-24. [in Ukrainian]

3. Polehenko, A. A. (2008). Meteostantsyia iMetos® – unikalnyi instrument v rukakh ahronoma [Weather station iMetos® – a unique tool in the hands of an agronomist]. Ovoshchevodstvo, 2. 60-61. [in Ukrainian]

4. iMetos-ECO-D2. A reliable and cost-effective solution for Soil Moisture monitoring, Rain, Water level and Irrigation Management. metos.at. Retrieved from: http://metos.at/page/en/products/2/iMetos-ECO-D2

5. Penman, H.L. (1956). Evaporation. An Introductory Survey. Neth. J. Agr. Sci., 4. 9-29.

6. Allen, R.G., Pereira, L.S., Raes, D.S., & Smith, M.L., (1998). Crop evapotranspiration: Guidelines for computing crop water requirements: Rome, United Nations Food and Agriculture Organization, FAO Irrigation and Drainage Paper 56. 300.

7. Romashchenko, M., Shatkowski, A., & Zhuravlev, O. (2016). Features of application of the Penman–Monteith method for conditions of a drip irrigation of the steppe of Ukraine (on example of grain corn). Journal of water and land development, 31, 123-127.

8. Shatkovskyi, A.P., & Zhuravlev, O.V. (2017). Diahnostyka polyviv buriaka tsukrovoho za metodom «Penman – Monteith» v umovakh kraplynnoho zroshennia Stepu Ukrainy [Diagnostic of sugar beet`s irrigation by the method of «Penman – Monteith» in the conditions of a drip irrigation of the Steppe of Ukraine]. Visnyk Dnipropetrovskoho derzhavnoho ahrarno-ekonomichnoho universytetu. 1 (43). 63-69. [in Ukrainian]

9. Dirirsa, G., Bekele, D., & Hordofa, T. (2017). Crop Coefficient and Water Requirement of tomato at Melkassa, Central Rift Valley of Ethiopia. Acad. Res. J. Agri. Sci. Res. 5(5). 336-340.

10. Yakist gruntu. Vidbyrannia prob [The quality of the soil. Sampling]. (2005). DSTU 4287:2004. Natsionalnyi standart Ukrainy. Kyiv: Derzhspozhyvstandart Ukrainy. [in Ukrainian]

11. Bondarenko, G.L., & Yakovenko, K.I. (2001). Metodyka doslidnoi spravy v ovochivnytstvi i bashtannytstvi [Methodology of experimental work in vegetable and melon]. Kharkiv: Osnova. [in Ukrainian]

12. Grunty. Metody laboratornoho vyznachennia fizychnykh vlastyvostei [Soils. Methods of laboratory determination of physical properties]. (2010). DSTU B V.2.1–17:2009. Natsionalnyi standart Ukrainy. Kyiv: Minrehionbud Ukrainy. [in Ukrainian]

13. Yeshchenko, V.O., Kopytko, P.G., Opryshko, V.P., & Kostohryz, P.V. (2005). Osnovy naukovykh doslidzhen v ahronomii [Fundamentals of scientific research in agronomy]. Kyiv: DIA. [in Ukrainian]

14. Romashchenko, M.I., Shatkovskyi, A.P., & Usata, L.G. (2014). Metodychni rekomendatsii z provedennia pol'ovykh doslidzhen za kraplynnoho zroshennia [Methodical recommendations for field studies on drip irrigation]. Kyiv: DIA. [in Ukrainian]

15. Salazar, L., Tolisano, J., & Crane, K. et al. (1994). Irrigation Reference Manual. Peace Corps Information Collection & Exchange, Washington, USA.

**М.И. Ромащенко А.П. Шатковский, А.В. Журавлев, В.В. Васюта, Ю.А. Черевичный**
**Адаптация метода «Penman-Monteith» на культуре томата рассадного в производственных условиях на капельном орошении**

***Аннотация.*** *Обоснованы научно-методические подходы и подтверждена необходимость адаптации метода «Penman-Monteith» на культуре томата. Установлен режим капельного орошения и параметры ETc томата в производственных условиях Степи Украины. Рассчитано фактические коэффициенты культуры Kc томата с учетом климатических условий зоны Степи Украины. Подтверждено, что фактические значения Kc меньше на 40,9-43,5 % от Kc FAO. Рекомендовано в дальнейшем для определения ETc и оперативного управления режимом капельного орошения томата использовать скорректированные значения коэффициента культуры Kc.*

***Ключевые слова:*** *суммарное водопотребление, коэффициент культуры, норма орошения, капельное орошение, томат.*

**М.І. Ромащенко А.П. Шатковський, А.В. Журавльов, В.В. Васюта, Ю.А. Черевичний**
**Адаптація методу «Penman-Monteith» на культурі томата россадного у виробничих умовах на краплинному зрошенні**

***Анотація.*** *Обґрунтовано науково-методичні підходи та підтверджено необхідність адаптації методу «Penman-Monteith» на культурі томата. Встановлено режим краплинного зрошення та параметри ETc томата у виробничих умовах Степу України. Розраховано фактичні коефіцієнти культури Kc томата з урахуванням кліматичних умов зони Степу України. Підтверджено, що фактичні значення Kc є меншими на 40,9-43,5 % від Kc FAO. Рекомендовано в подальшому для визначення ETc і оперативного управління режимом краплинного зрошення томата використовувати скореговані значення коефіцієнта культури Kc.*

***Ключові слова:*** *сумарне водоспоживання, коефіцієнт культури, норма зрошення, краплинне зрошення, томат.*