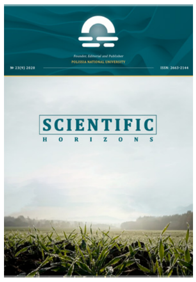
SCIENTIFIC HORIZONS

Journal homepage: https://sciencehorizon.com.ua
***Scientific Horizons*, 24(3), 45-51**



UDC 634.13:631.8
DOI: 10.48077/scihor.24(3).2021.45-51

Total and Fractional Composition of Water in Pear Leaves Depending on the Optimised Fertiliser

Roman Yakovenko*

Uman National University of Horticulture
20305, 1 Instytutska Str., Uman, Ukraine

Article's History:
Received: 05.05.2021
Revised: 29.06.2021
Accepted: 22.08.2021

Suggested Citation:
Yakovenko, R. (2021). Total and fractional composition of water in pear leaves depending on the optimised fertiliser. *Scientific Horizons*, 24(3), 45-51.

Abstract. The water content in tissues is an important indicator of the physiological state of the plant and is of great importance in the comparative assessment of their cultivation measures that increase productivity. One of such measures is rational fertilisation of plantings, which determines the relevance of the study. The purpose of the study was to establish the effect of optimised fertiliser on the water content in pear tree leaves and the fractional composition of water during stressful growing periods. One of the critical problems is drought, which negatively affects the growth and productivity of plantings. Under such conditions, the turgor of plant cells decreases and the passage of biochemical and physiological processes in the plant slows down. The paper considers the results of studying the water regime of leaves (the content of total, available, and inaccessible moisture) of pear varieties Konferentsia and Osnovianska on vegetative rootstock Quince A grown using optimised fertiliser in nonirrigated plantations. The study was conducted in 2011 and 2018 in a certified educational and research laboratory of the Uman National University of Horticulture. It was found that during the age periods of growth and fruiting, there was a change in the total water content in the pear leaves of the studied varieties. Leaves from pear trees of the Konferentsia variety had a higher water content compared to the Osnovianska variety. Fertiliser options increased the total water content in the leaves, which had a positive effect on the condition of the trees. It was found that at the beginning of the growing season, the free water content in the leaves of pear varieties Konferentsia and Osnovianska was higher, while it significantly decreased in the middle of the season. The bound water content was higher in all studied options. Under stressful situations (drought, temperature increase), fertiliser application had a positive effect on the water content in the leaves of both studied pear varieties. The practical significance of the study is to recommend the production of a rational fertiliser system for nonirrigated pear plantations in different age periods of growth and fruiting, which positively affected the water content in leaves and the fractional composition of water during stressful periods of cultivation

Keywords: pear leaves, Konferentsia, Osnovianska, leaves, free water, bound water, soil fertility

**Corresponding author*

INTRODUCTION

The water content in the plant tissues indicates their moisture supply. It is an important indicator of the physiological state of the plant and is of great importance in the comparative assessment of their cultivation measures that increase productivity. One of these measures is rational fertilisation of plantings, which determines the relevance of the study. The water in the leaf tissues is in a free and bound state. This characterises the water balance of the leaves and determines its corresponding physiological significance. Free water determines the physiological activity of fruit plants and determines the level of viability. Bound water, which plays a structure-forming role, is of great importance at critical (drought, high temperatures) moments of growing plantings [1-3].

The ratio of bound water to free water can be one of the physiological features indicating the degree of activity of physiological processes in the plant: the predominance of bound water slows down growth processes, and the content of free water, on the contrary, accelerates them [4; 5]. The amount of bound water and its ratio to free water varies depending on the age of the tree, water supply, air and soil temperature [6]. The leaf cover of fruit trees is the main structural element of photosynthesis. The level of productivity of plantings depends on its features of life activity in the future [4-7].

In recent years, there has been a change in climatic conditions, in particular, the air temperature rises and the amount of precipitation decreases during the main periods of plant vegetation. Climate change factors are mainly biotic processes, fluctuations in solar radiation, and certain types of human activity [8]. One of the most pressing problems is the drought. Air drought limits the normal growth and high productivity of cultivated plants. It also negatively affects photosynthesis, reducing the generation of chlorophyll grains in leaves and the assimilation of nutrients [9-11]. Stressful phenomena reduce the turgor of plant cells, which negatively affects the passage of biochemical and physiological processes in the plant [12; 13]. Under such conditions, one of the most effective ways to reduce stress is to use a rational system of fertilising plants, especially in nonirrigated plantations [14-16].

The purpose of the study is to establish the effect of optimised fertilisation of pear trees on leaf water content and fractional composition (free, bound) of water during stressful growing periods.

MATERIALS AND METHODS

Studies were conducted in 2011 and 2018 in a certified educational and research laboratory for optimising soil fertility in fruit and vegetable plantations with the status of a research laboratory for mass analysis of the Uman National University of Horticulture. An experiment included variants of optimised fertilisation of a pear garden with Konferentsia and Osnovianska varieties on a vegetative rootstock Quince A planted according to the 5x3 m scheme. Experimental plantings were not irrigated.

The experimental design included the following options: 1. Without fertiliser (absolute control); 2. $N_{90}P_{60}K_{90}$ (production control); 3. calculated fertiliser rates (background); 4. Background + N_{30}; 5. Background + $N_{30}K_{30}$; 6. Background + $N_{30}P_{30}K_{30}$. The options were laid down in three repetitions with a randomised placement of plots, each of which grows five accounting trees. When laying the experiment, the level of soil supply with nitrate nitrogen (by nitrification ability) was insufficient ($N\text{-}NO_3$ content in the 0-40 cm layer was 16.5 mg/kg of soil, which is less than the optimal level (23.5 mg/kg) by 7 mg/kg). The soil supply with mobile phosphorus compounds was higher, and potassium forms were within the optimal level in the layer of 0-60 cm (P_2Oh_5 content was 166 mg/kg at an optimal rate of 70-100 mg/kg and K_2O – 250 mg/kg with an optimal 230-280 mg/kg of soil). To create an optimal background of nitrogen nutrition, according to the indicators of agrochemical analyses, the norm of only nitrogen fertiliser was calculated to bring the $N\text{-}NO_3$ content in the soil to the optimal level. Further, the soil in the experiment was analysed annually and based on the results of the analyses, the norms of nitrogen fertiliser were calculated to maintain the optimal $N\text{-}NO_3$ content in the root layer of the soil (0-40 cm). The amount of K_2O, which was applied with potash fertiliser, was designed to maintain its optimal content in the soil for a 3-4-year period.

The total moisture in the leaf was determined by the thermogravimetric method [17] by drying it in a drying cabinet at a temperature of 100-105°C to a constant weight. Washed glass weighing cups with an open lid were pre-dried in a drying cabinet at a temperature of 105°C, cooled and weighed on an analytical scale with an accuracy of 0.01 g. Then 15-20 g of fresh leaf clippings were added into the weighing cup and weighed. Weighing cups with an open lid were placed in a drying cabinet and the leaves were dried first at a temperature of 50-60°C (4-5 hours), and then at 100-105°C (4-6 hours). After drying, the weighting cup was covered with a lid, cooled, and weighed. This procedure was repeated to a constant weight (the difference between the two weighings should not exceed 0.02 g). The moisture content (Y), as a percentage of dry weight, was calculated by the equation (1):

$$Y = \frac{(a-b)*100}{\mathrm{m}} \quad (1)$$

where a – weight of the weighting cup with leaves before drying, G; b – weight of the weighting cup with leaves after drying, G; m – weight of the weighing batch after drying, g; 100 – for conversion to percentages.

Determination of bound water was carried out by the refractometric method [18], placing a weighing batch of leaves in a sucrose solution of a known concentration. After the weighing batch stayed in such a solution, its concentration decreased due to the release of free water from the leaves. Bound water is firmly held in the cell and was calculated from the difference between the total amount of water and free water that passed into the sucrose solution. The 10 g weighing batch of leaf clippings was filled into 100 cm^3 flasks, in which 25 cm^3 of sucrose solution were added (25% concentration). Flasks with the solution were pre-weighed on analytical scales, and after adding the leaves, they were weighed again for the reliability of weighing batch and solution. Next, the material with the filled solution was kept in flasks for two hours. At the end of the prescribed time, the contents of the flask were mixed with a glass stick and several drops were taken to determine the sucrose concentration on a refractometer.

The amount of free water as a percentage (x) was determined by the equation (2):

$$\mathrm{x} = \frac{100 * (a - b) * v}{b * n} \qquad (2)$$

where a – percentage of sucrose in solution (before determination); b – percentage of sucrose in the experimental solution after holding the weighing batch in it; v – weight of the solution before analysis (G); m – weighing batch of the studied material.

Describing the weather conditions that prevailed during the surveys, it is worth noting that in 2011, the amount of precipitation in June exceeded the long-term data by 42.2 mm, while in August it was 8.6 mm less (Fig. 1). In 2018, there was a lack of moisture in the study months, respectively, by 4.6 and 56.4 mm, which further affected the fractional composition of pear leaves. The temperature regime in 2011 in June and August was higher than the annual average. The excess temperature in June and August was 2.1 and 0.7°C, respectively (Fig. 2). The summer months in 2018 were hotter. The excess of the average annual temperature in June was 2.6, while in August – 3.9°C. Fluctuations in climatic indicators over the years of study have had different effects on the total water content and its fractional composition in pear leaves due to different fertilisation of plantings.

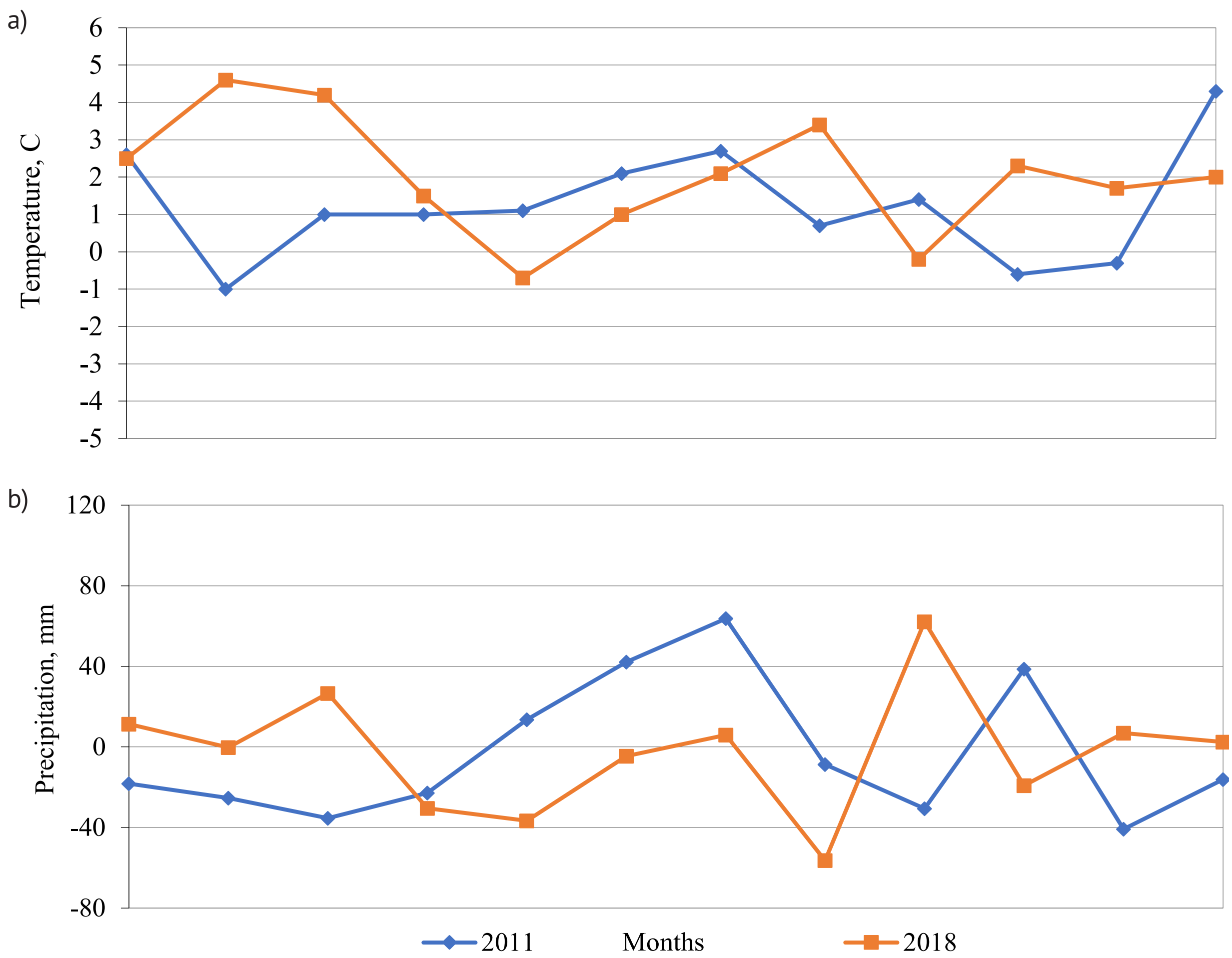


***Figure 1**. Deviation of average monthly temperatures (a) and precipitation (b) from long-term data in 2011 and 2018 (data from the Uman weather station)*

RESULTS AND DISCUSSION

Studies have established that the total moisture content in pear leaves differed by age periods of cultivation and experimental varieties. There was also a decrease in the total water content in the leaves of experimental pear varieties during the growing season (Table 1). During the period of growth and fruiting (2011) in June, under excellent climatic conditions and active growth of biomass by young trees, the leaves of the Konferentsia variety were characterised by a significantly higher water content compared to Osnovianska variety. Among the fertiliser options, more moisture in the leaves was in the option with an additional application of $N_{30}K_{30}$ against the background of optimised fertiliser, where the excess of control options for the Konferentsia variety was 2.2 and 0.6%, respectively, while for the Osnovianska variety – 1.8 and 0.4%. No significant differences in fertiliser options were found, which was obviously conditioned by the equally active increase in biomass.

***Table 1**. Total water content in pear leaves depending on the optimised fertiliser, %*

Variety	Fertiliser option	Periods			
		Growth and fructification 2011		Fructification and growth 2018	
		VI*	VIII	VI	VIII
Konferentsia	Without fertiliser (control)	58.9	57.1	57.7	51.0
	$N_{90}P_{60}K_{90}$ (production control)	60.5	59.4	58.9	52.6
	Calculated fertiliser rates (background)	60.0	59.0	58.3	51.4
	Background + N_{30}	59.7	59.1	56.8	51.7
	Background + $N_{30}K_{30}$	61.1	60.0	59.1	53.0
	Background + $N_{30}P_{30}K_{30}$	60.7	59.5	58.9	52.3
Osnovianska	Without fertiliser (control)	57.5	56.0	54.0	50.8
	$N_{90}P_{60}K_{90}$ (production control)	58.9	57.8	55.8	51.2
	Calculated fertiliser rates (background)	58.7	57.1	55.8	52.0
	Background + N_{30}	58.9	58.0	55.6	52.4
	Background + $N_{30}K_{30}$	59.3	58.2	56.0	52.4
	Background + $N_{30}P_{30}K_{30}$	58.9	57.9	55.6	51.6
	LSD_{05}	*1.3*	*1.3*	*1.1*	*0.8*

***Notes**: *Sampling time (months)*

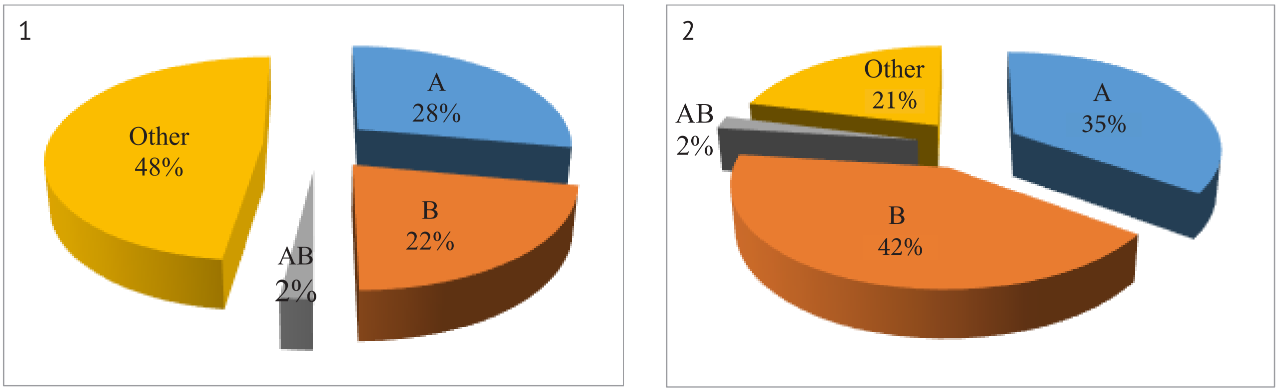


***Figure 2**. Influence of factors and their interaction on the water content in pear leaves depending on the variety and fertiliser in 2011*

***Notes**: A – rootstock; B – fertiliser; AB – interaction; 1 – June; 2 – August*

In August, there was a decrease in moisture in all fertiliser options of the studied varieties. All fertiliser options had a significantly higher moisture content compared to the control, with the exception of the option with the calculated application of fertilisers in Osnovianska variety. The leaves of the Konferentsia variety had a higher moisture content compared to Osnovianska, although this increase was not significant.

According to the data of the variance analysis (Fig. 2) on the moisture content in the leaves in June, the influence of factors was almost at the same level – factor A – 28%, factor B – 22%. In August, there was a noticeable effect of fertiliser (factor B) – 42% and a decrease in the influence of the variety (factor A) to 35%.

During the growth and fruiting period (2018), a similar trend was observed regarding changes in leaf moisture during the growing season. The June was characterised by close to the average annual climate data and the moisture content in pear leaves in the studied fertiliser options ranged from 54.0-59.1%. Describing the varieties among themselves, the leaf moisture content in Konferentsia trees was significantly higher by 3.7% with LSD_{05}=1.1. There is also the highest leaf humidity in both varieties in the background + $N_{30}K_{30}$ option.

In August, due to the drought, the moisture content in the leaves of the studied pear trees significantly decreased compared to June. Among the studied fertiliser options in trees of the Konferentsia variety, the moisture content in leaves in the background + $N_{30}K_{30}$, $N_{90}P_{60}K_{90}$ and background + $N_{30}P_{30}K_{30}$ options was significantly higher compared to the control, where the excess of control was 2.0, 1.6, and 1.3%. Leaves of the Osnovianska variety were characterised by a significantly higher moisture content in the areas of options where calculated fertiliser rates were applied and additionally – N_{30} and $N_{30}K_{30}$. Excess in control (without fertilisers) was 1.2 and 1.6%, while in production control – 0.8 and 1.2%.

According to the data of the variance analysis (Fig. 3) the moisture content in the leaves was highly influenced by the variety (factor A) – 71%, the fertiliser effect (factor B) was 14%, and their interaction – 11%. In August, there was a noticeable effect of fertiliser (factor B) – 48% and a decrease in the influence of the variety (factor A) to 4%. The interaction of factors was 23%.

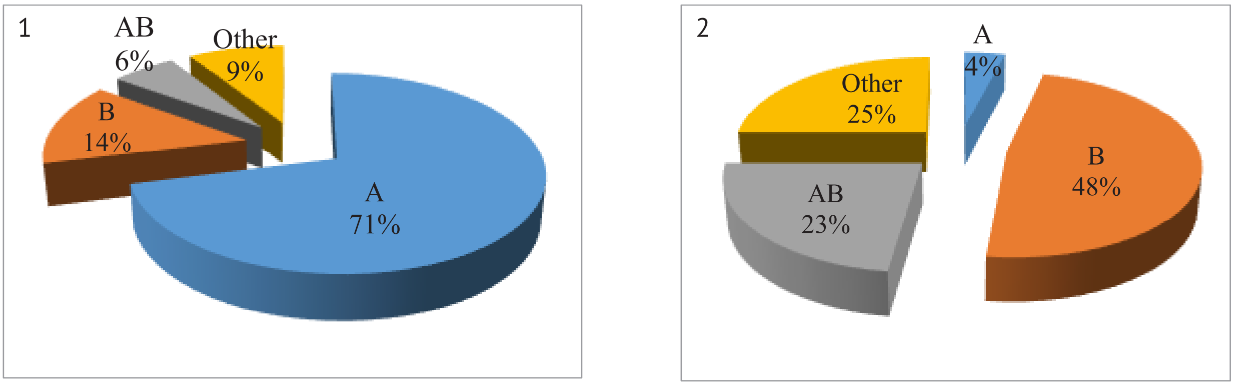


***Figure 3**. Influence of factors and their interaction on the water content in pear leaves depending on the variety and fertiliser in 2018*

***Notes**: A – rootstock; B – fertiliser; AB – interaction; 1 – June; 2 – August*

During two age periods of pear trees of the Konferentsia and Osnovianska varieties (Table 2) when using the studied fertiliser options in leaves with changes in soil moisture and age of plantings, water forms were redistributed within the options, in particular, there was an increase in free and a decrease in bound water. This is confirmed by other researchers [1; 2; 6].

***Table 1**. Influence of the variety and optimised fertiliser on the state (fractional composition) of water in the leaves of pear trees, %*

Variety	Fertiliser option	Periods							
		Growth and fructification 2011				Fructification and growth 2018			
		Free		Bound		Free		Bound	
		VI*	VIII	VI*	VIII	VI*	VIII	VI*	VIII
Konferentsia	Without fertiliser (control)	23.6	18.2	35.3	38.9	19.3	10.7	38.4	40.3
	$N_{90}P_{60}K_{90}$ (production control)	22.7	17.7	37.8	41.7	21.3	10.7	37.6	41.9
	Calculated fertiliser rates (background)	22.2	16.8	37.8	42.2	20.5	10.7	37.8	40.7
	Background + N_{30}	22.0	16.9	37.7	42.2	21.0	10.1	35.8	41.6
	Background + $N_{30}K_{30}$	22.4	17.4	38.7	42.6	21.3	10.7	37.8	42.3
	Background + $N_{30}P_{30}K_{30}$	22.6	17.7	38.1	41.8	21.2	10.8	37.7	41.5

Table 1, Continued

Variety	Fertiliser option	Periods							
		Free		Bound		Free		Bound	
		VI*	VIII	VI*	VIII	VI*	VIII	VI*	VIII
Osnovianska	Without fertiliser (control)	22.1	17.1	35.4	38.9	20.8	10.7	33.2	40.1
	$N_{90}P_{60}K_{90}$ (production control)	22.1	17.3	36.8	40.5	21.2	10.6	34.6	40.6
	Calculated fertiliser rates (background)	22.6	17.7	36.1	39.4	21.4	10.7	34.4	41.3
	Background + N_{30}	22.2	17.4	36.7	40.6	21.2	10.8	34.4	41.6
	Background + $N_{30}K_{30}$	22.0	16.9	37.3	41.3	21.6	10.1	34.4	42.3
	Background + $N_{30}P_{30}K_{30}$	22.3	17.5	36.6	40.4	21.6	10.9	34.0	40.7
	LSD_{05}	*0.5*	*0.3*	*0.7*	*0.8*	*0.4*	*0.2*	*0.7*	*0.8*

***Notes**: *Sampling time (months)*

During the period of growth and fruiting (2011) in June, when the amount of precipitation exceeded the annual average by 48.3%, young leaves retained moisture and a higher content of free water, which positively affected the growth and development of trees. At the same time, a higher content of free water was observed in trees of the Konferentsia variety in the areas of absolute and production control and when applying full mineral fertiliser against the background of optimised nutrition of 58.9%. In August, there was some lack of moisture (15% less precipitation), which affected a decrease in free water and an increase in bound water. For trees of the Konferentsia variety, it was most significant in control at 18.2, and for the Osnovianska variety – in the option with estimated fertiliser rates of 17.7%. The background + $N_{30}K_{30}$ option was characterised by the largest amount of bound water. During the period of fruiting and growth (2018) in June, when the amount of precipitation and air temperature of free water in the leaves of both varieties were close to optimal, according to the studied options, it was in the range of 19.3-21.6%. A significant increase was noted in the Osnovianska variety compared to the Konferentsia. In August, when precipitation was 23 times less than the annual average and the air temperature increased by 3.9°C, there was a significant decrease in the free water content and an increase in bound water in all fertilised options of both experimental varieties, which positively affected the water content in the leaves, and among the fertiliser options, the best result was obtained in the background + $N_{30}K_{30}$ option – 42.3%.

CONCLUSIONS

During the age periods of growth and fruiting, the total water content in pear leaves in nonirrigated plantings changed. Leaves from pear trees of the Konferentsia variety had a higher water content compared to the Osnovianska variety. At the young age of trees (the period of growth and fruiting) in the month of June, additional application of $N_{30}K_{30}$ against the background of optimised fertiliser, it contributed to an increase in moisture in the leaves, compared to the control, in the Konferentsia variety by 2.2% and 0.6%, while in the Osnovianska variety – 1.8% and 0.4%. In August, all fertiliser options had a significantly higher moisture content compared to the control, with the exception of the option with the calculated application of fertilisers in Osnovianska varieties.

During the growth and fruiting period in August, due to the drought, the moisture content in the leaves of the studied pear trees significantly decreased. Under such conditions, the Konferentsia variety had a significant increase in leaf moisture in the background + $N_{30}K_{30}$, $N_{90}P_{60}K_{90}$ and background + $N_{30}P_{30}K_{30}$ options, where the excess of control was 2.0, 1.6% and 1.3%. Leaves of the Osnovianska variety had a significantly higher content in the options where the calculated fertiliser rates were applied + additional N_{30} and $N_{30}K_{30}$. It was found that at the beginning of the growing season, the free water content in the leaves of pear varieties Konferentsia and Osnovianska was higher, while in the middle it significantly decreased. The bound water content was higher in all studied options. Under stressful situations (drought, rising temperatures), fertiliser application had a positive effect on the water content in the leaves of both studied pear varieties.

REFERENCES

[1] Dolgova, L.G. (1997). Forms of water in plants – indicators of the ecological state of the environment. *Problems of Bioindications and Ecology,* 2, 115-120.

[2] Galasheva, A.M., Krasova, N.G., & Yanchuk, T.V. (2013). Fractional composition of water in leaves in apple varieties (*Malus Mill*). *Plant Varieties Studying and Protection,* 1, 18-21.

[3] Galasheva, A.M., Krasova, N.G., Makarkina, M.A., & Yanchuk, T.V. (2017). The content of bound and valuable water in leaves and tissues of annual apple shoots on low vigorous rootstocks. *Contemporary Horticulture*, 1, 17-25.

[4] Krasova, N.G., Ozherelyeva, Z.E., Golyshkina, L.V., Makarkina, M.A., & Galasheva, A.M. (2014). *Winter resistance of apple varieties*. Orel: VNIISPK.
[5] Zholkevich, V.N., Gusev, N.A., & Kaplya, A.V. (1989). *Water exchange of plants*. Moscow: Nauka.
[6] Galasheva, A.M., & Pavel, A.R. (2016). The content of free and fixed water in the leaves of apple varieties on dwarf rootstocks. *Fruit Growing and Viticulture of the South of Russia,* 40(04). Retrieved from https://goo.su/7rUC.
[7] Yakovenko, R., Kopytko, P., & Pelekhatyi, V. (2021). The content of chlorophyll and nutrients in apple leaves depending on long-term fertiliser. *Scientific Horizons,* 2021, 24(2), 93-98. doi: 10.48077/scihor.24(2).2021.93-98
[8] Novak, V.G., & Novak A.V. (2020). Agricultural meteorology terms 2018-2019 agricultural year from data of weather station Uman. *Bulletin of Uman National University of Horticulture*, 1, 47-49. doi: 10.31395/2310-0478-2020-1-47-49.
[9] Havryliuk, O., & Kondratenko, T. (2020). The intensity of photosynthesis of the surface of columnar apple-tree in the conditions of Kyiv. *Scientific Reports of NUBIP of Ukraine,* 2(84). doi: 10.31548/dopovidi2020.02.013.
[10] Sehgal, A., Sita, K., Bhandari, K., Kumar, S., Kumar, J., Prasad, V.P.V., Siddique, K.H., & Nayyar, H. (2019). Influence of drought and heat stress, applied independently or in combination during seed development, on qualitative and quantitative aspects of seeds of lentil (Lens culinaris Medikus) genotypes, differing in drought sensitivity. *Plant, Cell & Environment,* 42, 198-211. doi: 10.1111/pce.13328.
[11] Liang, D., Ni, Z., Xia, H., Xie, Y., Lv, X., Wang, J., Lin, L., Deng, Q., & Luo, X. (2019). Exogenous melatonin promotes biomass accumulation and photosynthesis of kiwifruit seedlings under drought stress. *Scientia Horticulturae,* 246, 34-43.
[12] Manivannan, P., Jaleel, C.A., Sankar, B., Kishorekumar, A., Somasundaram, R., Lakshmanan, G.A., & Panneerselvam, R. (2007). Growth, biochemical modifications and proline metabolism in *Helianthus annuus* L. as induced by drought stress. *Colloids and Surfaces B: Biointerfaces*, 59, 141-149.
[13] Mamnabi, S., Nasrollahzadeh, S., Ghassemi-Golezani, K., & Raei, Y. (2020). Improving yield-related physiological characteristics of spring rapeseedby integrated fertilizer management under water deficit conditions. *Saudi Journal of Biological Sciences,* 27, 797-804.
[14] Trunov, I.A., & Khlustovich, I.A. (1998). Water regime of fruit and berry crops. *Horticulture and Viticulture,* 1, 6-7.
[15] Yakovenko, R.V., & Kopitko, P.G. (2012). Water regime of apple leaves depending on the fertilizer for repeated culture. *Collected Works of Uman National University of Horticulture,* 79, 106-111.
[16] Hosseinzadeh, S.R., Amiri, H., & Ismaili, A. (2018). Evaluation of photosynthesis, physiological, and biochemical responses of chickpea (Cicer arietinum L. cv. Pirouz) under water deficit stress and use of vermicompost fertilizer. *Journal of Integrative Agriculture*, 17, 2426-2437.
[17] Horodnyi, M.M. (Ed.). (2005). *Agrochemical analysis*. Kyiv.
[18] Yermakov, A.I. (Ed.). (1972). *Methods of biochemical research of plants.* Leningrad: Kolos.

Загальний і фракційний склад води в листі груші залежно від оптимізованого удобрення

Роман Володимирович Яковенко

Уманський національний університет садівництва
20305. вул. Інститутська, 1, м. Умань, Україна

Анотація. Вміст води у тканинах є важливим показником фізіологічного стану рослини та має велике значення при порівняльній оцінці заходів їх вирощування, які підвищують врожайність. Одним із таких заходів є раціональне удобрення насаджень, що й визначає актуальність досліджень. Метою наукової роботи було встановлення впливу оптимізованого удобрення дерев груші на обводненість листя та фракційний склад води у стресові періоди вирощування. Однією з критичних проблем є посуха, що негативно впливає на ріст і продуктивність насаджень. За таких умов зменшується тургор рослинних клітин і уповільнюється проходження біохімічних та фізіологічних процесів у рослині. У статті розглядаються результати вивчення водного режиму листя (вміст загальної, доступної та недоступної вологи) груші сортів Конференція та Основ'янська на вегетативній Айва А підщепі, вирощуваної на фонах оптимізованого удобрення в незрошуваних насадженнях. Дослідження проводились у 2011 і 2018 рр. у сертифікованій навчально-дослідній лабораторії з оптимізації родючості ґрунту в плодоягідних насадженнях зі статусом наукової лабораторії масових аналізів Уманського НУС. Встановлено, що протягом вікових періодів росту і плодоношення відбувалася зміна вмісту загальної води в листі груші досліджуваних сортів. Листя з дерев груші сорту Конференція мало вищий вміст води, як порівняти з сортом Основ'янська. Варіанти удобрення підвищували загальний вміст води в листі, що позитивно впливало на стан дерев. З'ясовано, що на початку вегетації вміст вільної води в листі груші сортів Конференція і Основ'янська був більший, тоді як у середині значно зменшується. Вміст зв'язаної води був вищим у всіх досліджуваних варіантах. За стресових ситуацій (посуха, підвищення температури) внесення добрив позитивно вплинуло на обводненість листя обох досліджуваних сортів груші. Практична цінність наукової роботи полягає у рекомендації виробництву раціональної системи удобрення незрошуваних насаджень груші в різні вікові періоди росту і плодоношення, яка позитивно впливала на обводненість листя та фракційний склад води у стресові періоди вирощування

Ключові слова: листя груші, Конференція, Основ'янська, листя, вільна вода, зв'язана вода, родючість ґрунту