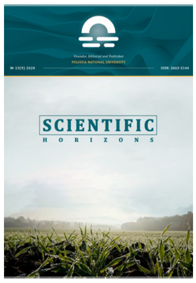
SCIENTIFIC HORIZONS

Journal homepage: https://sciencehorizon.com.ua

Scientific Horizons, 24(1), 45-53



UDC 631.8:635.71

DOI: 10.48077/scihor.24(1).2021.45-53

EFFICIENCY OF APPLICATION OF DIFFERENT FORMS OF SUPERABSORBENTS IN CROPS OF BASIL

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Article's History:
Received: 06.01.2021
Revised: 15.02.2021
Accepted: 14.03.2021

Suggested Citation:
Kucher, I., Ulianich, O., & Yatsenko, V. (2021). Efficiency of application of different forms of superabsorbents in crops of basil. *Scientific Horizons*, 24(1), 45-53.

Abstract. The main factors limiting the productivity of vegetables are the arid climate and uneven rainfall, but the use of absorbents can solve this problem. The purpose of the study was to investigate the influence of absorbents on the productivity of basil. This study used field and laboratory measurements, statistical, computational and analytical methods. The study revealed that absorbent in a form of gel positively influenced the increase of the leaf area index (+7.26% in Badioryi cultivar, +8.20% in the Rutan cultivar – leaf area, +34.55% in the Badioryi cultivar, 37.43% in the Rutan cultivar – leaf area index). Absorbents contributed to a slight decrease of sugar content (-0.86-2.68% in the Badioryi cultivar, -1.48–2.35% in the Rutan cultivar) and content (-8.8-13.2%) and yield of the essential oil (-19.6-39.5) in both cultivars. The activity of APX, CAT, SOD, tended to decrease in all variants, regardless of the form of the absorbent: APX (-12.8-35.1%), CAT (-10.9-22.0%), SOD (-11.9-17.0%). Results of the study have shown that the increase in the activity of antioxidant enzymes in control variants of basil varieties indicates their drought resistance. It has been substantiated that higher yield was observed in the variant with gel absorbent. Thus, the yield of the Badioryi and Rutan cultivars exceeded the control by 52.67 and 50.05%, respectively. In general, the productivity of basil has increased with the use of superabsorbent polymers. This practice can be recommended to agricultural producers who grow vegetables, in particular, basil in areas of unstable or insufficient moisture. Nevertheless, it is not desirable to use absorbents on industrial crops (to obtain essential oil), since with an increase in moisture and an increase in yield, it significantly decreases content and yield of essential oil

Keywords: antioxidant activity, *Ocimum basilicum*, chlorophyll, yield

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INTRODUCTION

The forest-steppe of Ukraine belongs to the zone of unstable moisture, therefore, ensuring optimal soil moisture throughout the growing season is a crucial issue in the technology of growing any crop and basil in particular. Optimisation of soil water regime and preservation of moisture reserves are urgent problems of agrocenoses. The current climate change towards warming with the contrasting change of excessively humid periods to hot days requires appropriate adjustments in the fertility management process.

Absorbents play an important role in agricultural production [1]. Over the last decade, hydrogels have been widely used to improve water supply to plants, due to their high water-retaining properties, the use of absorbents can be an effective means to increase the efficiency of both water and fertilisers [2; 3]. Studies indicate a good ability of absorbents to reduce water stress of plants and provide high productivity, which enhances growth and yield [4; 5].

In Ukraine, a small number of scientists study the influence of various forms of absorbents on the productivity of vegetable plants, in particular cucumbers [6], celery root [7] and petioles [8], garden spinach [9]. However, foreign scientists have achieved significant success in this area in the following crops: black pepper (peas) [10], which improved physiological processes that affect quality indicators. Soybeans [11] and potatoes [12], where plant growth and development and yields significantly improved. Cotton [13], where seed germination and root system development increased significantly and soil changes from the use of hydrogels showed that the introduction of absorbents into the soil delayed water evaporation, thus making water available to plants for a longer period. Greenhouse experiments showed that despite a significant sharp decrease in water supply (50%) to the soil, plant productivity was higher with the introduction of absorbents [14]. Other scientists stated that the introduction of absorbents increased soil moisture (regardless of type) by 14% and improved digestibility of macronutrients by plants [15; 16].

Therefore, the primary *purpose* of this study was to evaluate the effect of various forms of superabsorbents on plant growth, chlorophyll content, activity of antioxidant enzymes and productivity of basil.

MATERIALS AND METHODS

Studies of the influence of different forms of superabsorbent were conducted in 2019-2020 in the experimental field of the Department of Vegetable Growing of Uman National University of Horticulture (Right-Bank Forest-Steppe of Ukraine) according to generally accepted methods [17-19]. The soil of the experimental plot is podzolic heavy loam chernozem with a humus horizon (humus content about 2.2%) 40-45 cm thick; pH (salt) -6.0-6.2. The arable layer contains 64 mg/kg of soil of easily hydrolysed nitrogen (according to Cornfield); 102 mg/kg – mobile phosphorus (according to Chirikov); 123 mg/kg – exchangeable potassium (according to Chirikov) (Table 1).

***Table 1**. Physico-chemical parameters of podzolic heavy loam chernozem*

Indicator	Actual content
Organic matter (humus), %	2.2
pH	6.0-6.2
P_2O_5, mg/kg	102
K_2O, mg/kg	123
NO_3, mg/kg	64

Planting was carried out according to the scheme of 50×30 cm. The total area of the experimental plot was 400 m^2, the accounting area was 10 m^2. The study was carried out according to the two-factor experiment method with a randomised placement of variants in four replications. The two-factor experiment consisted in the use of Maxi Marin superabsorbent in the form of gel and granules.

Methods of application. During transplantation, the absorbent in the form of a gel was used, thoroughly mixing 2 g of hydrogel / 1 L of water. The solution was allowed to stand for half an hour until prepared. The roots of the plant were immersed in the solution and then transplanted into the field. Absorbent in the form of granules – 5 kg/ha, introduced before planting seedlings, locally in the furrows (according to the manufacturer's recommendations), the absorbent was applied to a depth of 20-25 cm.

Biometric research. The length and width of the leaves, the area of the leaf blade and the total area of the leaves per plant were measured on the 60th day after planting. The height of the plant, the number of leaves per plant, and the area of the leaf blade was determined by the calculation (linear) method, using the parameters of the length and width of the leaf by the equation (1):

$$Sn = 0.74 \times ab \quad (1)$$

where: Sn – area of one leaf, cm^2; a – the widest part of the leaf, cm; b – leaf length, cm; 0.74 – leaf configuration coefficient.

Plant material. Badioryi and Rutan cultivars of basil (*Ocimum basilicum* L.).

The content of assimilating pigments was determined by the spectrophotometric method of A. Ermakova [20].

Determination of the activity of antioxidant enzymes was carried out using a SF-2000 spectrophotometer. The activity of superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APO) was analysed. For enzyme extraction, the leaves, pre-frozen in liquid nitrogen, were homogenised in 50 mmol potassium phosphate buffer (pH 7.2) containing 0.1 mmol ethylenediaminetetraacetic acid (EDTA), 0.1% phenylmethylsulfonyl fluoride and 2% polyvinylpyrrolidone. The homogenate was centrifuged at 15,000 g for 15 minutes.

The total activity of SOD (superoxide dismutase) was determined by the ability of the enzyme to inhibit photochemical reduction of nitrosine tetrazolium to formazan according to the method [21; 22]. The reaction medium (2 ml) contained 0.1 MK, Na-phosphate buffer (pH 7.8), 9.3 mmol L-methionine, 152.3 µm nitrosonium tetrazolium, 1.1 µM Trilon B, 2.4% Triton X-100 and 100 µl of enzymatic preparation. The reaction was started by adding 50 µl of 111.3 µM riboflavin solution and performed in light (illumination of photosynthetic active radiation 180 µmol/m^2•s) for 30 min. The dark control was the complete reaction medium incubated in the dark, and the light control was the complete reaction medium incubated in light without the addition of the enzymatic extract, using 100 µl of 0.1 MK, Na-phosphate buffer (pH 7.8). The reaction was stopped by placing the samples in the dark. The optical density was determined at 560 nm on a spectrophotometer. The activity of SOD was expressed in the RU/mg protein.

The activity of CAT (catalase) in the supernatant was determined by enzymatic decomposition of H_2O_2 at 240 nm [23; 24]. The reaction medium contained 2 ml of 0.1 MK, Na-phosphate buffer (pH 7.0), 50 µl of 19.4 mmol H_2O_2. 60 µl of enzymatic preparation was added to the resulting mixture and the dynamics of changes in optical density were recorded with a spectrophotometer for 1 min. CAT activity was expressed in µmol H_2O_2/min /1 mg protein.

The activity of APO (ascorbate peroxidase) was determined by the Asada method [25]. The reaction mixture contained 50 mmol potassium phosphate buffer (pH 7.2), 0.1 mmol EDTA, 1 mmol ascorbate and supernatant. The reaction was initiated by the addition of 0.1 mmol H_2O_2. The decrease in ascorbate content was recorded on a SF-2000 spectrophotometer (Russia) at 290 nm (ε=2.88 mS/cm).

Dry matter (%). The average dry weight (g) of the leaves was measured by drying 10 randomly selected leaves in an oven with forced circulation of hot air at 70°C to obtain a constant mass. The percentage of dry matter of the leaves was estimated by taking the ratio of dry weight to fresh weight of selected leaves and multiplying it by 100.

The analysis of vitamin C was determined by the iodometric method of Murray in accordance with DSTU 4958:2008 [26].

Soil moisture was determined by thermostatic weight method according to equation (2):

$$M,\% = (A\text{-}B) / (B\text{-}C) \times 100, \qquad (2)$$

where A – weight of box with wet soil, g; B – weight of box with dry soil, g; C – mass of the empty box, g.

Weather conditions in the years of research. According to the Uman meteorological station, hydrometeorological conditions in 2019 were characterised by slightly less precipitation compared to the average long-term indicators. The amount of precipitation during this period in 2020 was much higher than in 2019. Most of it fell in June, which allowed the plants to form better leaf mass. The air temperature in 2019-2020 at the time of planting was slightly higher than perennial, which had a positive effect on the development of basil plants (Table 2).

Statistical analysis. Statistical analysis was carried out using Microsoft Office Excel software, version 2016 (Microsoft Corp., USA). The results were calculated at significance levels of 0.01 and 0.05.

***Table 2**. Weather conditions during the growing season of basil in 2019 and 2020*

Month	Precipitation, mm			Temperature, °C		
	2019	2020	Average value	2019	2020	Average value
May	35.6	101.0	55	17.0	12.5	14.6
June	69.8	70.4	87	23.4	20.9	17.6
July	33.8	21.4	87	20.0	21.6	19.0
August	19.2	17.1	59	20.7	21.2	18.2
September	30.6	27.4	43	15.6	17.8	13.6

RESULTS AND DISCUSSION

Since the main root mass of basil plants is in the arable soil layer 0-30 cm, the productivity of this crop largely depends on the moisture content. In 2020, productive moisture reserves accumulated during the winter-spring period were higher than in 2019 due to heavy rainfall in May. The dynamics of the productive moisture reserves in the root zone is presented in Figure 1.

The superabsorbent in the form of a gel helped to increase the productive moisture reserves. On average over two years, the application of the gel increased this indicator relative to control by 27-29% in May; 25-37% in June; 28-29% in July. When the granules were applied, the soil moisture values were significantly lower compared to the gel variants. There was also a significant inter-varietal difference in moisture reserves. The soil in the variants with the Badioryi cultivar was characterised by large moisture reserves, which indicates its lower need for water and. Therefore, it can be assumed that this cultivar has a higher drought resistance.

Similar results were shown in studies with winter wheat and different hydrogel rates and in studies with soybeans and winter wheat, where productive moisture reserves increased significantly compared to control [27; 28].

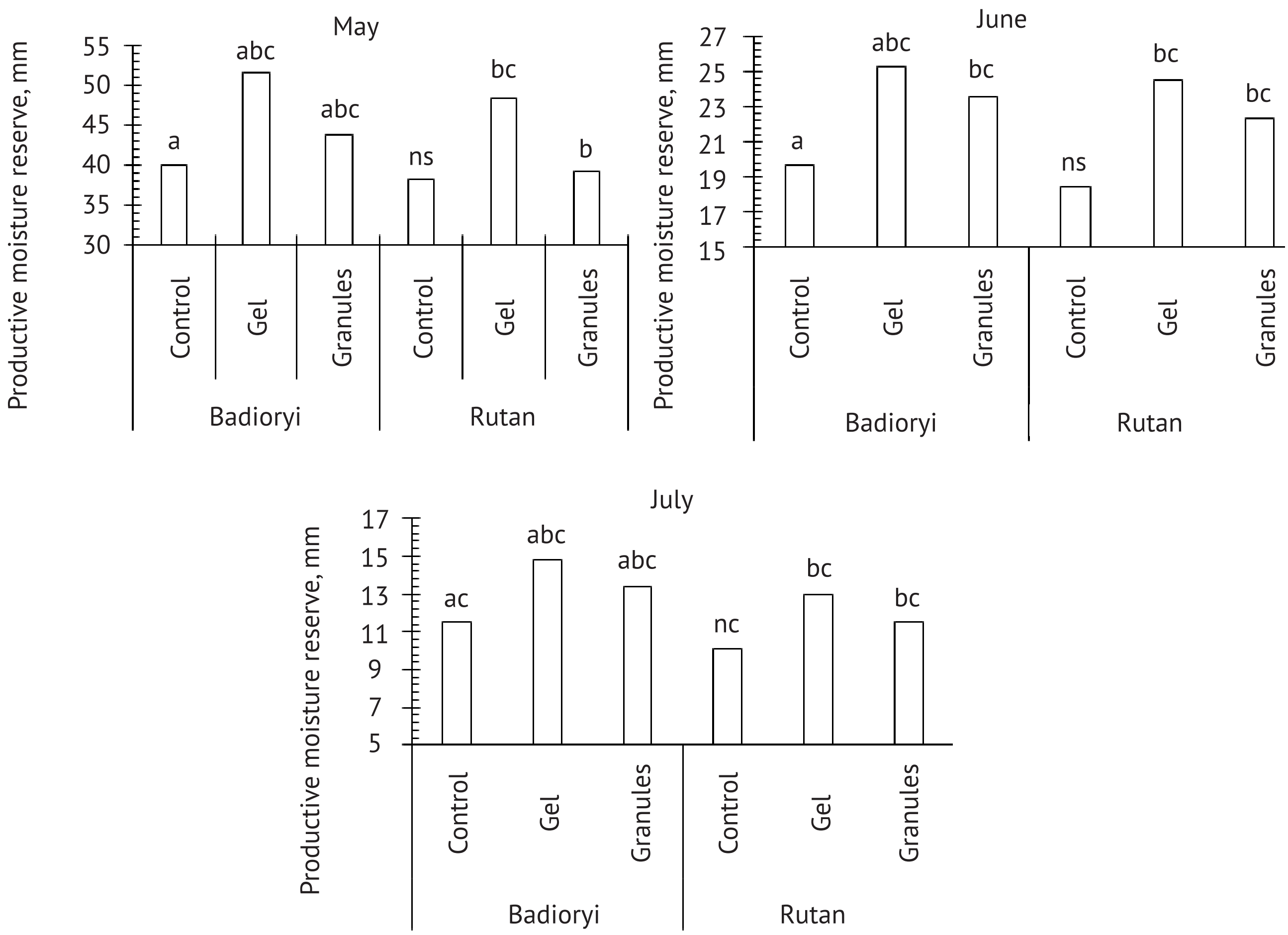


***Figure 1**. Dynamics of the productive moisture reserve (mm) in the root zone (in the soil layer 0-30 cm) of basil plants depending on the form of the superabsorbent (2019-2020)*

***Note**: a – A; b – B; c – A×B the difference is significant and ns – insignificant at the level p≤0.0*

The results of statistical processing	May	June	July
$LSD_{0.05}$ A	1.51	0.57	0.29
B	1.85	0.70	0.35
A×B	2.62	0.99	0.50

***Note**: a – A; b – B; c – A×B the difference is significant and ns – insignificant at the level p≤0.05*

Plant growth and leaf area development. The absorbent in the form of a gel contributed to a significant increase in the height of plants of both Badioryi and Rutan cultivars (+10.71% and +8.45% relative to control). The use of the absorbent in the form of a gel had a positive effect on the increase in the diameter of the bush of basil plants of these two studied varieties (+16.14% and +14.10% relative to control). Absorbent in the form of a gel contributed to a significant increase in the number of leaves on the plants of Badioryi and Rutan cultivars (+8.76 and +5.96% relative to control) (Table 3). The use of absorbent in the form of a gel contributed to a significant increase in the number of leaves on the plant (+8.76% in the Badioryi cultivar and +5.96% in the Rutan cultivar). The absorbent in the form of granules was less effective and caused a slight increase, +3.59 and +1.58%, respectively) of this indicator in both cultivars. The height of the plant and the number of leaves were increased due to the high moisture content in the soil, which contributed to increased cell activity, causing an increase in plant height and the number of leaves per plant. The obtained results are consistent with the results on cucumber crops [29].

Calculation of the area of basil leaves indicated that it significantly increases with the use of the absorbent in the form of gel (+7.26% in the Badioryi cultivar, +8.20% in the Rutan cultivar).

Biochemical indicators. In the control variants, the dry matter content of the Badioryi and Rutan cultivars was higher in 2020 by 9.05% and 9.42%. The use of absorbents in the cultivation technology helps to increase yields, but at the same time slightly reduces the dry matter content, regardless of the form of the absorbent (Table 4).

Table 3*. Plant growth and leaf area of basil plants depending on the form of the superabsorbent (2019-2020)*

Cultivar (Factor A)	Superabsorbent (Factor B)	Plant height, cm	Plant diameter, cm	Number of leaves on the plant, pcs	Number of leaves, pcs	Leaf area, cm^2
Badioryi	Control	40.68^{bc}	37.08^{ns}	10.01^{a}	185.06^{ns}	25.24^{ab}
	Gel	45.04^{ns}	43.06^{bc}	10.53^{c}	201.27^{ns}	31.00^{ab}
	Granules	42.43^{ns}	40.51^{ns}	10.41^{ns}	192.28^{ns}	27.40^{ab}
Rutan	Control	40.90^{ns}	37.48^{ns}	6.73^{ns}	186.04^{ns}	17.37^{ns}
	Gel	44.35^{bc}	42.76^{b}	7.73^{b}	197.13^{ns}	22.34^{b}
	Granules	42.09^{ns}	40.35^{ns}	7.64^{bc}	188.98^{ns}	19.54^{b}
	$LSD_{0.05}$ A	1.12	1.40	0.24	5.54	0.52
	B	1.38	1.71	0.30	6.78	0.64
	A×B	1.95	2.43	0.42	9.59	0.90
	CV%	4.2	6.3	18.8	3.3	21.3

Note*: a – A; b – B; c – A×B the difference is significant and ns – insignificant at the level p≤0.05*

Table 4*. Biochemical indicators of basil plants depending on the form of superabsorbent (2019-2020)*

Cultivar (Factor A)	Superabsorbent (Factor B)	Sugars, mg/100 g	Dry matter, %	Ascorbic acid, mg/100 g	Essential oil, %	Yield of essential oil, kg/ha
Badioryi	Control	9.10^{ns}	8.88^{ns}	13.17^{b}	1.09^{ns}	7.02^{ac}
	Gel	9.02^{ns}	8.71^{ns}	10.51^{ns}	0.99^{b}	4.25^{a}
	Granules	8.86^{ns}	8.76^{ns}	12.26^{b}	1.01^{b}	5.39^{abc}
Rutan	Control	18.66^{a}	9.23^{ns}	15.76^{abc}	1.51^{abc}	6.52^{c}
	Gel	18.38^{a}	8.98^{ns}	12.65^{a}	1.31^{abc}	3.94^{ns}
	Granules	18.22^{a}	9.07^{ns}	14.41^{ab}	1.35^{abc}	5.24^{bc}
	$LSD_{0.01}$ A	0.51	0.36	0.60	0.05	0.14
	B	0.63	0.44	0.74	0.06	0.18
	A×B	0.89	0.62	1.03	0.09	0.25
	CV%	37.7	2.2	13.8	17.4	22.5

Note*: a – A; b – B; c – A×B the difference is significant and ns – insignificant at the level p≤0.05*

When using the absorbent in the form of a gel in the Badioryi and Rutan cultivars, the dry matter content was the lowest (-1.61% and -1.99% in 2019 and -2.10% and -3.40% in 2020). The use of absorbents contributed to a slight reduction in sugar content, but the difference between the varieties on average for two years of growing plants was very significant: Badioryi cultivar – 8.86-9.10 mg/100 g wwt, Rutan cultivar – 18.22-18.66 mg/100 g wwt. The content of ascorbic acid in the Badioryi and Rutan cultivars, regardless of the form of the absorbent, decreased significantly during both years (-6.76%-20.30% and -8.04%-19.28% in 2019, -7.10%-19.86% and -9.05%-20.21% in 2020, respectively), in all variants of the experiment. But the use of the absorbent in the form of granules contributed to its largest and less significant reduction in content.

The absorbent in the form of a gel significantly reduced the content and yield of essential oil in both cultivars. The use of the absorbent in the form of granules contributed to a less significant decrease in concentration, which contributed to a significant reduction (-23.2%-39.5% and -19.6%-39.6% of the Badioryi and Rutan cultivars) of the yield of essential oil per unit area. There is an assumption that under stress the number of oil-forming glands increases due to a decrease in leaf area, which leads to increased accumulation of essential oil. There are no similar data using superabsorbents, but there are studies on the effect of irrigation, which indicate a decrease in the content of essential oil in other crops at optimal and excessive humidity [29], *Ocimum* spp. [30], *Salvia officinalis* [30].

Activity of antioxidant enzymes and pigment complex of leaves. The activity of APO, CAT, SOD, as a rule, decreased in all variants, regardless of the form of the absorbent. The studied cultivars had significantly lower activity of APO and SOD (-12.84%-24.13% APO and 11.85%-11.97% SOD – in the Badioryi cultivar – 21.15%-35.12% APO and 16.01%-16.99% SOD – in the Rutan cultivar). But the activity of KAT had a slight decrease in this indicator for both cultivars in all variants of the experiment (-10.89-18.43% – in the variety Badioryi and 13.11-21.95% in the variety Rutan). The obtained results indicate that the highest physiological activity is shown by SOD. The activity of the antioxidant complex is much higher both for control and for other options.

Results of the study have shown that the increase in the activity of antioxidant enzymes in control variants of basil varieties indicates their drought resistance. The use of absorbents increased the amount of chlorophyll a+b, but with the use of the absorbent in the form of a gel, the increase was most significant for control (+21.31% in the Badioryi cultivar, 22.51% in the Rutan cultivar). The absorbent in the form of granules also contributed to a significant increase in the concentration of chlorophyll a+b by an average of 12.45% in the Badioryi cultivar and 10.29% in the Rutan cultivar. The intervarietal difference in this indicator was insignificant: the Badioryi cultivar accumulated 1.43%-1.74%, the Rutan cultivar – 1.43-1.75 mg/g wwt. (Table 5).

***Table 5**. The activity of antioxidant enzymes in the leaves and the chlorophyll content in basil plants, depending on the form of superabsorbent (2019-2020)*

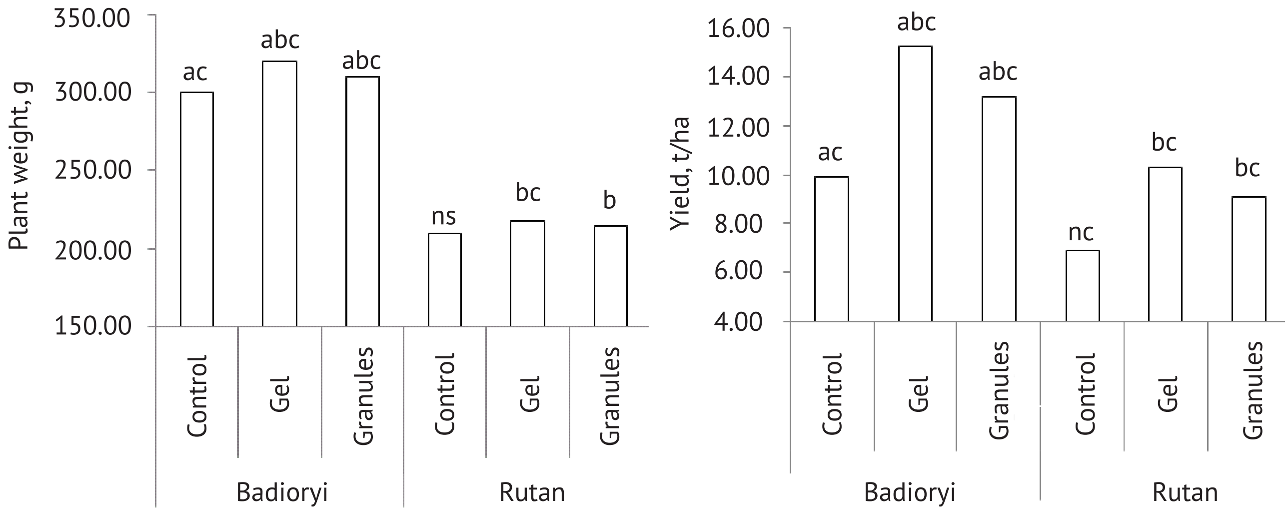
Cultivar (Factor A)	Superabsorbent (Factor B)	APO	CAT	SOD	Chlorophyll content, mg/g wwt		
		RU/mg protein			a	b	∑ a + b
Badioryi	Control	0.23	0.40	74.75	1.05	0.38	1.43
	Gel	0.17	0.32	65.90	1.29	0.45	1.74
	Granules	0.20	0.35	65.80	1.23	0.38	1.61
Rutan	Control	0.15	0.33	67.75	0.99	0.43	1.43
	Gel	0.10	0.26	56.23	1.23	0.52	1.75
	Granules	0.12	0.29	56.90	1.09	0.48	1.57
	$LSD_{0.01}$ A	0.007	0.013	2.506	0.05	0.046	0.053
	B	0.010	0.016	3.069	0.06	0.056	0.070
	A×B	0.013	0.022	4.341	0.09	0.079	0.093
	CV%	30.1	15.1	10.9	10.3	12.3	8.9

***Note**: a – A; b – B; c – A×B the difference is significant and ns – insignificant at the level p≤0.05*

Mass and yield of plants. The findings indicated a significant effect of absorbents on the change in plant weight of basil, regardless of the form of the absorbent in all variants of the experiment. The use of the absorbent in the form of a gel was more effective for the Badioryi and Rutan cultivars during both years of cultivation (+27.46 and +30.45 g in 2019 and +19.97 and +7.99 g in 2020). Absorbent in the form of granules also contributed to a significant increase in this indicator in both varieties (+15.98 and +18.97 g in 2019 and +9.98 and +5.09 g in 2020 relative to control).

Yield is the most important indicator of the effectiveness of cultivation technology. The use of Maxi Marin absorbent in the form of granules significantly increased the yield of basil of both varieties (+2.46 and +2.55 tonnes in 2019 and +2.89 and +2.4 tonnes in 2020 relative to control). The use of the absorbent in the form of a gel was more effective. Higher yields were observed when using the absorbent in the form of a gel. Thus, the yield of Badioryi and Rutan cultivars was at the level of 16.11 and 10.93 t ha, which exceeded the control by 5.56 and 3.64 t ha.

The use of superabsorbent polymer improves plant growth. For example, the total amount of raw cucumber biomass (*Cucumis sativus* L.) and fruit biomass increased by 840 and 494 g per plant, respectively [31]. Another study with different varieties of potatoes (*Solanum tuberosum* L.) found an increase in tuber yield using superabsorbents locally in the furrows to a depth of 25 cm [32]. A similar result was found when applying 60 and 90 kg/ha of superabsorbents to a depth of 20 cm, which increased the yield of potatoes by 38.2% and 50.5% relative to the control [33]. Although the use of superabsorbents can improve plant growth, the depth of its application can significantly affect its effectiveness (Fig. 2).



The results of statistical processing	Plant weight (g)	Yield (t/ha)
$LSD_{0.05}$ A	8.46	0.166
B	10.36	0.096
A×B	14.65	0.118

Figure 2. *Plant weight (g) and yield (t/ha) of basil varieties depending on the form of superabsorbent on average over two years*

Note*: a – A; b – B; c – A×B the difference is significant and ns – insignificant at the level p≤0.05*

In conditions of insufficient humidity, superabsorbents have a greater impact on plant productivity [34; 35]. The dry matter of sorghum (*Sorghum bicolor* L. Moench) increased only when there was a lack of water in the sandy loamy soil [34]. In a three-year study, the use of superabsorbents increased the yield of beans (*Phaseolus vulgaris* L.) grown on superabsorbents [36].

CONCLUSIONS

The findings showed that an increase in the activity of antioxidant enzymes (catalase, superoxide dismutase and ascorbate peroxidase) in varieties of basil indicates their resistance to drought, and this is accompanied by an increase in chlorophyll content. Therefore, the use of superabsorbent, which has the ability to absorb significant amounts of water, improves growth and physiological reactions of plants and can help plants in conditions of water shortage. On the other hand, with improvement of water regime, the concentration of sugar, ascorbic acid, essential oil decreases.

The productivity of basil plants is increased with the use of superabsorbent polymers. Higher growth and yield were observed with the introduction of the absorbent in the form of a gel compared with the control. This practice can be recommended to agricultural producers who grow vegetables, including basil, in areas of unstable or insufficient moisture.

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ЕФЕКТИВНІСТЬ ЗАСТОСУВАННЯ РІЗНИХ ФОРМ СУПЕРАБСОРБЕНТІВ У ПОСІВАХ ВАСИЛЬКІВ СПРАВЖНІХ

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Анотація. Основними чинниками, що обмежують продуктивність овочів, є посушливість клімату та нерівномірність надходження опадів, тому застосування абсорбентів може вирішити цю проблему. Метою досліджень було вивчення впливу суперабсорбуючих матеріалів на продуктивність васильків справжніх. Для досліджень використовували польові, лабораторні, статистичні і розрахунково-аналітичні методи. Площа листка та показник листкового індексу також істотно збільшується за застосування абсорбенту у формі гелю (+7,26 % у сорту Бадьорий, +8,20 % у сорту Рутан – площа листка, +34,55 % у сорту Бадьорий, 37,43 % у сорту Рутан – листковий індекс). Абсорбенти сприяли неістотному зменшенню вмісту цукрів (-0,86–2,68 % у сорту Бадьорий, -1,48–2,35 % у сорту Рутан) та вмісту (-8,8–13,2 %) і виходу ефірної олії з гектару (-19,6–39,5) в обох сортах. Відзначалася динаміка зниження активності антиоксидантних ферментів АПО, КАТ, СОД у всіх варіантах експерименту, незалежно від форми абсорбенту. АПО (-12,8–35,1 %), КАТ (-10,9–22,0 %), СОД (-11,9–17,0 %). Результати цього дослідження показали, що підвищення активності антиоксидантних ферментів у контрольних варіантах сортів базиліку вказує на їх посухостійкість. Обґрунтовано, що більшу урожайність відзначали у варіанті з внесенням абсорбенту у формі гелю. Так, урожайність сортів Бадьорий і Рутан переважала контроль на 52,67 та 50,05 % відповідно. Загалом, продуктивність базиліку підвищується із застосуванням суперабсорбуючих полімерів. Дану практику можна рекомендувати сільськогосподарським виробникам, які вирощують овочі, зокрема, васильки справжні, у районах з нестабільною або недостатньою кількістю опадів, але не бажано використовувати абсорбенти на технічних посівах (для отримання ефірної олії), оскільки з підвищенням вологості та збільшенням врожайності істотно знижується вміст і вихід ефірної олії

Ключові слова: антиоксидантна активність, васильки справжні, хлорофіл, урожайність