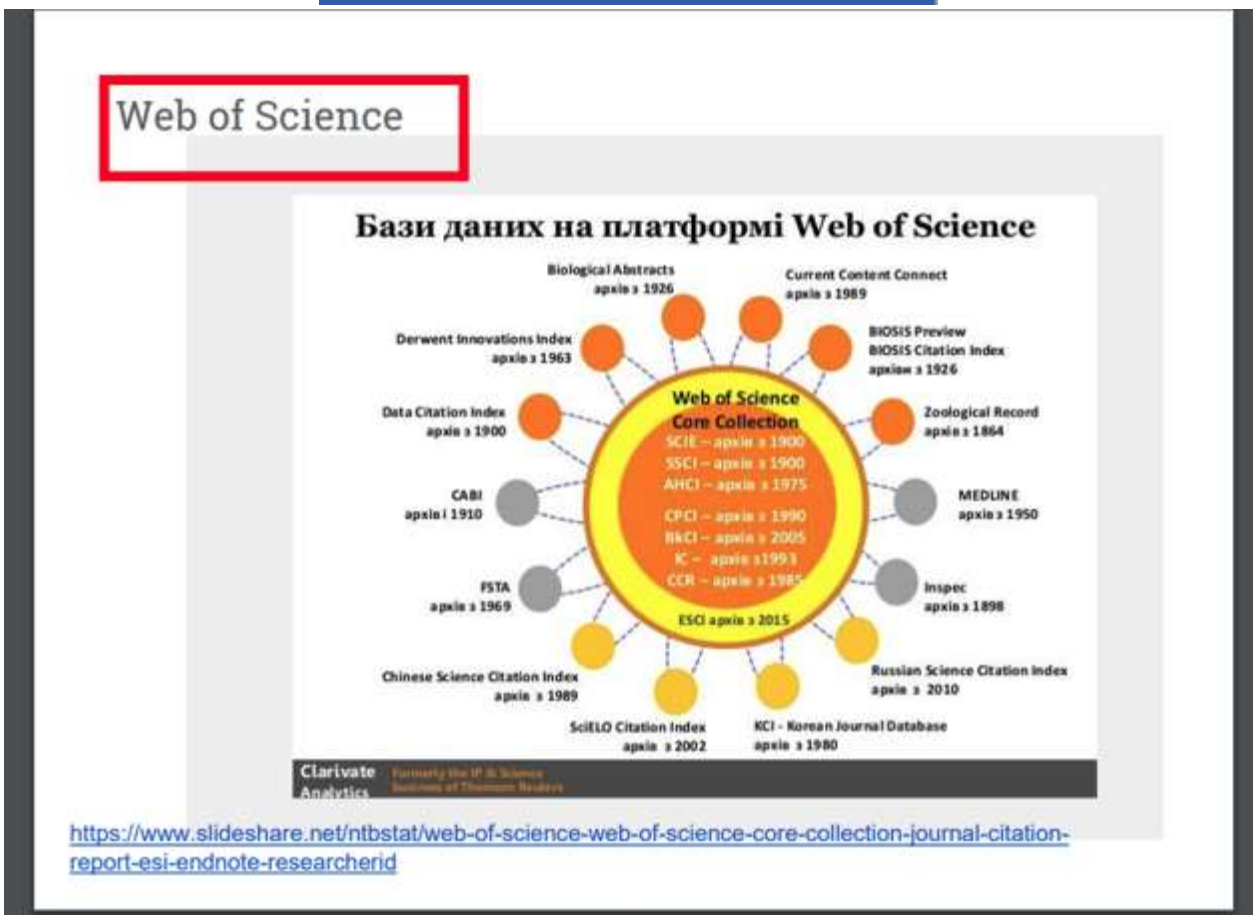
У 2021 році викладачами кафедри біотехнології та хімії було опубліковано **10 статей** у виданнях, що індексуються у наукометричних базах **Scopus та *Web of Science.***

В Журналі ***International Journal of Botany Studies (BIOSIS, Web of Science)*:**



https://www.slideshare.net/ntbstat/web-of-science-web-of-science-core-collection-journal-citation-report-esi-endnote-researcherid

1. Hanhur V., Marenych M., Korotkova I., Gamayunova V., Len O., Marinich L., Olepir R. Dynamics of nutrients in the soil and spring barley yield depending on the rates of mineral fertilizers. *International Journal of Botany Studies*. 2021. Vol. 6, Is. 5, P. 1298-1306 ***(Web of S)*** **Impact Factor: RJIF 8.0**)
2. ChaikaT., Korotkova I., Barabolia O., Shokalo N., Chetveryk O., Bilenko O., Krykunova V. Technological peculiarities of the mustang and *Triticum dicoccum (Schrank) Schuebl* wheat cultivation according to organic farming standards. *International Journal of Botany Studies*. 2021. Vol. 6. No 6. P. 205-210 (***Web of Sci***) **Impact Factor: RJIF 8.0**
3. Velit I., Korotkova I., Marenych M., Bilovod I., Kolesnikova L., Khomenko B. Effect of supplemental lighting spectral composition on the tomato yield in greenhouses. *International Journal of Botany Studies*. 2021. Vol. 6. No 6. P. 226-233 (***Web of Sci***) **Impact Factor: RJIF 8.0**
4. Horobets M., Chaika T., Korotkova I., Pysarenko P., Mishchenko O., Shevnikov M., Lotysh I. Influence of growth stimulants on photosynthetic activity of spring barley (*Hordeum vulgare* L.) crops. *International Journal of Botany Studies*. 2021. Vol. 6. No 2. P. 340-345. (***Web of S***, **Impact Factor: RJIF 8.0**)

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Dynamics of nutrients in the soil and spring barley yield depending on the rates of mineral fertilizers

Volodymyr Hanhur[1], Mykola Marenych[2], Irina Korotkova[3*], Valentina Gamayunova[4], Len Oleksandr[5], Liubov Marinich[1], Roman Olepir[6]

[1] Department of Plant, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

[2] Department of Selection, Seed Growing and Genetics, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

[3] Department of Biotechnology and Chemistry, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

[4] Department of Agriculture, Geodesy and Land Management, Faculty of Agro-Technology, Mykolayiv National Agrarian University, Mykolayiv, Ukraine

[5] Poltava State Agricultural Research, Poltava, Ukraine

[6] Department of Agriculture and Agrochemistry, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

Abstract

The study aim was to evaluate nitrogen, mobile phosphorus and exchangeable potassium efficiency from different mineral fertilizers applied to soil at the spring barley cultivation. The impact of fertilization systems with different doses and ratios of nutrients ($P_{45}K_{30}$, N_{45}; $N_{23}P_{23}K_{15}$; $N_{45}P_{45}K_{30}$; $N_{68}P_{68}K_{45}$) on the spring barley yield from 3-years of experiments in the Poltava (Ukraine) was analyzed. The study of doses and forms of mineral fertilizers influence on the main elements content of plant nutrition at all stages of spring barley organogenesis was carried out in the soil layer of 0–20 cm and at a depth of 20–40 cm. It was found the application of fertilizers with increased nutrients content at sowing provide an increase in their content in the soil compared to the control. The highest effect was observed when the fertilizers at a dose of $N_{68}P_{68}K_{45}$ was used. An increase in nitrogen content in the first stage of organogenesis (BBCH 01–02) in the soil layer of 0-20 cm was 17.6%, phosphorus 35.4%, potassium 19.8% compared to control. In the deeper layer of soil 20–40 cm, the content of these elements was much lower. A significant decrease of nutrients content in the soil was observed between stages III–XII of organogenesis, but no external signs of nitrogen, phosphorus and potassium deficiency were detected in spring barley plants. The application of $N_{68}P_{68}K_{45}$ kg ha^{-1} of active substance and full protection crops from pests, diseases and weeds resulted in the highest grain yield of spring barley 5.27 t ha^{-1}.

Keywords: spring barley, precursors, doses of mineral fertilizers, productivity, nitrogen, phosphorus, potassium

Introduction

Barley (*Hordeum vulgare L.)* is an important grain crop grown worldwide for food and feed production. In world agriculture, barley production ranks fourth after wheat, rice and corn. Barley grain yield depends on a number of factors, in particular differences in varieties, soil, climate and growing conditions. Low soil pH, lack of moisture, poor soil drainage and imperfect agricultural technologies are negative factors which affect yield [1]. The most important factor in regulating the yield and quality of barley grain is undoubtedly fertilizers. The share of a crop harvest formed by using fertilizers can reach 23-70%. Plant growth and yield are highly dependent on the ability of the soil to provide plants with sufficient amount of nitrogen. Nitrogen fertilizers play a potential role in the formation of soil nitrogen [2]. The effectiveness of nitrogen use by grain crops is influenced by the ability of root system to absorb nitrogen from the soil, assimilation of nitrogen in the plant and its redistribution from vegetative parts to grain. It is known that only 30–50% of the applied nitrogen fertilizers and 25% of phosphorus are absorbed by crops or tied up in soil organic pools, which include both microbial biomass and soil organic matter. The rest of the nitrogen is losses from denitrification, leaching and evaporation into the environment, which leads to the various negative ecological effects [3, 4]. To recoup the losses, it is necessary to apply nitrogen from 28.0 to 46.5%. To some extent, the amount of mineral fertilizers applied can reduce the use of inorganic growth stimulants [5] and bio stimulants [6].

In the process of growth, plants absorb not only the mineral nitrogen from the soil, but also nitrogen from organic fertilizers, the so-called mineralized nitrogen [7]. Plants use several forms of nitrogen in the natural soils. In most aerated soils, nitrate is a predominant form absorbed by plants from the soil, while ammonium may be the predominant form in some acidic and/or anaerobic environments [8].

The nitrogen uptake by the soil is low, which means that plants can only use about 50–75% of the nitrogen coming from fertilizers [9]. In general, the availability of nitrogen largely depends on the amount of water in the soil [10].

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Technological peculiarities of the mustang and *Triticum dicoccum (Schrank) Schuebl* wheat cultivation according to organic farming standards

Tetiana Chaika[1], Irina Korotkova[2*], Olha Barabolia[3], Nataliia Shokalo[4], Oksana Chetveryk[4], Oksana Bilenko[5], Valentyna Krykunova[2]

[1] Department of Ecology, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Sustainable Use of Natural Resources and Environmental Protection, Poltava, Ukraine

[2] Department of Biotechnology and Chemistry, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

[3] Department of Plant, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

[4] Department of Selection, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Seed Growing and Genetics, Poltava, Ukraine

[5] Department of Agriculture and Agrochemistry, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

Abstract

The research aim was to determine the technological peculiarities of growing mustard and *Triticum dicoccum* wheat by the organic farming methods on virgin lands in order to obtain agricultural products with the status of "organic". Crop rotation: winter rye – mustard – *Triticum dicoccum* wheat, where winter rye is a green manure, but mustard and *Triticum dicoccum* wheat are organic products was offered. Field experiments were conducted in the experimental field of Poltava State Agrarian University (Ukraine) over the period of three years (2018–2020). It was found that in the first year of the rotation, it is better to grow winter rye as a green manure crop, the residues of which correspond to the organic fertilizer system. For growing mustard in the second year, financial expenses of €81.5 ha^{-1} are required, and if organic products are sold locally, the profit will be €2987.5 ha^{-1}. For the third year, the financial expenses for growing *Triticum dicoccum* wheat will be €182.1 ha^{-1}, and the profit from its sale will be €13200 ha^{-1} under the same conditions. The cultivation of *Triticum dicoccum* wheat according to the organic technology provided a significant yield increase by 21.4% compared to the traditional technology, as evidenced by the analysis of the yield structure elements. It was determined that on virgin lands it is possible to obtain agricultural products with the status of "organic" in the second year after meeting the requirements of organic standards.

Keywords: organic farming, crop rotation, soil fertility, winter rye, mustard, *Triticum dicoccum* wheat

Introduction

At the present stage of human society development, the involvement of natural resources in the economic turnover has become so extensive and comprehensive that the links, relationships and circulation established in the biosphere are damaged, the face of the earth is degraded, i.e. the law of balanced use of natural resources is violated.

Increasingly, the effectiveness of the economic development model in developed countries is being questioned. The degree of contradictions in the society-nature interaction determines the need to restore the balanced use of natural resources. The integration of social production and the natural environment in the ecological production raises the problem of mutual transformation of the economic effect into the ecological one and vice versa.

Recognizing the necessity of introducing new production forms and methods on the principles of natural and anthropogenic balance of resources and environmental conservation, many countries have adopted special laws and developed various concepts. In Ukraine, the concept of agriculture sustainable development or organic farming is the most widespread. In fact, all known concepts indicate the need for ecologization of agriculture. One such area is organic farming. Organic agriculture involves the use of biological factors to increase the natural fertility of soils [1, 2], agroecological methods and biological means of pest and disease control [3, 4], creates conditions for the biodiversity protection [5]. This system is effective only under the balanced activity of all parts and can independently restore the used substances.

Organic agriculture can be defined as a multifunctional agro-ecological model of organic agricultural production with defined objectives, principles and methods, which is based on scientifically proven management of agro-ecosystems [6, 7].

In crop rotations of organic agriculture, built under such conditions, the sustainable ecological equilibrium of agrocenoses is achieved in the long run [8]. However, despite the sufficient advantages of organic agriculture over traditional [9, 10, 11], modern agricultural producers are in no hurry to implement it in practice.

So, scientists are faced with the necessity to assist domestic producers to develop technological solutions and justify their effectiveness (economic, technological, environmental and social), some experience of which has already existed [12, 13, 14].

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Effect of supplemental lighting spectral composition on the tomato yield in greenhouses

Irina Velit[1], Irina Korotkova[2], Mykola Marenych[3], Ivan Bilovod[4], Larysa Kolesnikova[5], Bogdan Khomenko[2]

[1] Department of Technology and Means of Mechanization of Agricultural Production, Faculty of Engineering and Technology, Poltava State Agrarian University, Poltava, Ukraine

[2] Department of Biotechnology and Chemistry, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

[3] Department of Selection Seed Growing and Genetics, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

[4] Department of Industrial Engineering, Faculty of Engineering and Technology, Poltava State Agrarian University, Poltava, Ukraine

[5] Department of Ecology Sustainable Nature Management and Environmental Protection, Faculty of Agro-Technology and Ecology, Poltava State Agrarian University, Poltava, Ukraine

Abstract

Transplants of tomato cultivar 'Hybrid Tarasenko' and 'De Barao' were grown under the additional lighting of different high-intensity light sources in greenhouses. As lighting sources were tested: mercury arc lamps with a luminophores covering (MALF 400), standard high-pressure sodium lamps (HPS 400) and high-pressure sodium lamps with additive of Cesium (HPS-Cs 400) and amalgam content: Hg-20 %, Na-75 %, Cs-5%. It was established that introduction of Cesium 5% in the amalgam composition of high-pressure sodium lamps, leads to increase of radiation intensity in red (600-700 nm) and near Infrared region to 58%. The growth dynamic and the most important morphological attributes of the transplant were investigated. Our investigations revealed that the increase of red light proportion in spectral composition of such lamp radiation promoted an intensification of tomato plants growth processes and photosynthesis. Increase in yield was result of the carried-out greenhouse experiment with tomatoes plants which is grown up when lighting by HPS-Cs 400 lamps. The yield of 'Hybrid Tarasenko' and 'De Barao' tomato cultivars, grown under HPS-Cs 400 lighting, exceeded the yield of plants grown under HPS 400 lighting by 7.4% and 6%, respectively. The irradiation of 'Hybrid Tarasenko' and 'De Barao' tomatoes plants by HPS-Cs 400 lamps promoted to the more significant yield increase on 22.8% and 24.5%, respectively, as compared with the plants cultivated under the lamps of MALF 400.

Keywords: tomato, high-pressure sodium lamps, photosynthetically active radiation, photosynthesis

Introduction

The most widespread cultures grown up in the closed soil in the majority world countries are tomatoes plants. The ways of the tomatoes production intensification at decrease in energy consumption in the closed soil, are based on plants supplemental artificial lighting. It was established that for most crops a 1% light increment results in 0.5% to 1% increase in harvestable product, including for 0.8-1% for closed soil grown vegetables [1]. The use of different spectral ranges radiation for pre-sowing seed treatment has a positive effect on the biometric parameters of plants grown and in the open soil [2]. The most important problem to achievement of high production for vegetables cultivated in closed soil is establishment and optimization of mane optical radiation parameters such as radiation spectra, light level, and photoperiod. The energy efficiency of supplemental lighting systems is reached due to use of highly effective light sources with spectral composition of radiation which favorably influences on biological processes. Among the different spectra used in supplemental lighting, red (600 to 700 nm) is often considered the most efficient in driving photosynthesis [3]. Red and far-red (700-800 nm) light are sensed by the phytochromes that trigger several morphological and developmental processes that impact productivity and yield quality [4]. However, it is established that plants do not develop normally when grown solely under monochromatic red light ("red light syndrome"). The plants lighting only by red light leads to leaf curling and decreases in photosynthetic capacity, leaf thickness and leaf pigmentation [5, 6]. The best wavelengths of visible light for photosynthesis fall within the blue range (425–450 nm) and red range (600–700 nm). The natural sunlight in greenhouses includes 27–31% of blue light, which may be sufficient even in winter [7]. Blue light produces "sun-type" leaves even when overall light intensity is low and suppresses symptoms damage of the plants and promotes to their normal development [8, 9]. It was established that addition of 6-12% of blue light against the background of the overall photosynthetic active radiation (PAR), can be advantageous for growth and yield, while adding 24% blue light can lead to inhibition of tomatoes plants [9]. A significant amount of red light (80-90%), for example, from light emitting diodes (LEDs), can lead to leaf curling and yield decreases by 3-6% concerning lighting by sources, in which radiation spectra a share of red light does not exceed 37% (lamp HPS 400) [10].

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Influence of growth stimulants on photosynthetic activity of spring barley (*Hordeum vulgare* L.) crops

Maksym Horobets[1], Tetiana Chaika[2], Iryna Korotkova[3*], Pavlo Pysarenko[1, 2], Oleh Mishchenko[2], Mykola Shevnikov[4], Ihor Lotysh[5]

[1] Poltava State Agrarian Academy, Faculty of Agro-Technology and Ecology, Department of Agriculture and Agrochemistry named After V.I. Sazanov, Poltava, Ukraine

[2] Poltava State Agrarian Academy, Faculty of Agro-Technology and Ecology, Department of Ecology, Sustainable Use of Natural Resources and Environmental Protection, Poltava, Ukraine,

[3] Poltava State Agrarian Academy, Faculty of Agro-Technology and Ecology, Department of Biotechnology and Chemistry, Poltava, Ukraine,

[4] Poltava State Agrarian Academy, Faculty of Agro-Technology and Ecology, Department of Plant, Poltava, Ukraine

[5] Separated Structural unit Agrarian-Economic Professional College Poltava State Agrarian Academy, Economic Department Cyclic Commission of Land Management Disciplines, Poltava, Ukraine

Abstract
Well-timed and reliable forecasting of grain yields is a key condition for effective crop management. In this research, we evaluated the effect of natural growth stimulants Epin-extra, Zircon and Bischofite on the duration of the main vegetation phases of spring barley varieties 'Helios', 'Pamas' and 'Vakula' of Ukrainian selection. Field trials were carried out during the period of three years (2017–2019). Their aim was to determine the most effective stimulant for growing different spring barley varieties under the conditions of unstable moisture. It has been established that pre-sowing treatment of seed and spraying of crops in the tillering phase with these stimulants help to reduce the vegetation phases and enhance the photosynthetic activity of spring barley crops. Application of 1% Bischofite aqueous solution provided the maximum effect. The treatment of crops with this preparation increased the area of assimilation leaf surface of plants by 11.1%, photosynthetic potential by 5.7% and the photosynthesis productivity by 10%.

Keywords: growth stimulants, leaf surface area, photosynthetic potential, photosynthesis productivity

Introduction

Modern technologies of growing spring barley (*Hordeumvulgare L.*) highlight the great importance of seed treatment and plants with different methods especially with the use of environmentally friendly preparations in order to increase yield. Application of numerous plant growth stimulants is one of the most promising areas of the latest technology in crop production. The favourable effect of growth stimulants has been found in the cultivation of many crops [1, 2]. Their effect increases biomass and productivity of agricultural crops [3, 4], they can perform a protective function against plant diseases and pests [5, 6]. Growth stimulants, due to changes in hormonal status and activation of the plant antioxidant systems, are able to facilitate the plants response to biotic [7, 8] and water stress which not only affects seed germination, but also further increases the average ripening period of crops [9, 10]. They also reduce the impact of negative weather factors; provide resistance of plants to drought or excess moisture under high or low environment temperatures. Climatic factors adversely affecting growth and development of crops, include late spring frosts, heavy rainfall, snowfall and winds [11, 12]. However, according to the numerous studies, plants treated with growth stimulators suffer less from weather instability [13, 14]. Growth stimulants compensate for the deficiency of nutrients [15], which activate the fermentation activity of all plant cells and the formation of stimulating compounds by the plant itself. An increased permeability of the root cell membrane and an improved penetration of mineral nutrients of the soil solution to plants are the results. In addition, due to the application of growth stimulants, the absorption of oxygen by plants is accelerated, which, in turn, enhances photosynthesis and photosynthetic activity of grain crops agrocenoses and results in yields increase [16]. The effect of the growth stimulants use on grain crops is connected with the plants ability to increase the accumulation of macro- and microelements [17, 18], with growth of the assimilation surface area [19, 20], an increase in the chlorophyll content [21, 22] and, as a consequence, the activation of photosynthetic processes [23, 24] and the growth of crop productivity [25, 26, 27]. Due to this, growth stimulants are able to improve grain quality and yield [28, 29]. In addition, plant growth stimulants accelerate or slow down plant maturation, shorten the vegatation season, optimize plant growth, and help to improve crops affected by adverse environmental conditions [30]. The application of growth stimulants can reduce the amount of used mineral fertilizers and pesticides, which affect product safety and have negative impact on the natural environment. Known, the plants adaptation to the environment, including unfavorable environmental conditions, is accompanied by changes in metabolism with the participation of the NADPH enzyme [31]. Growth

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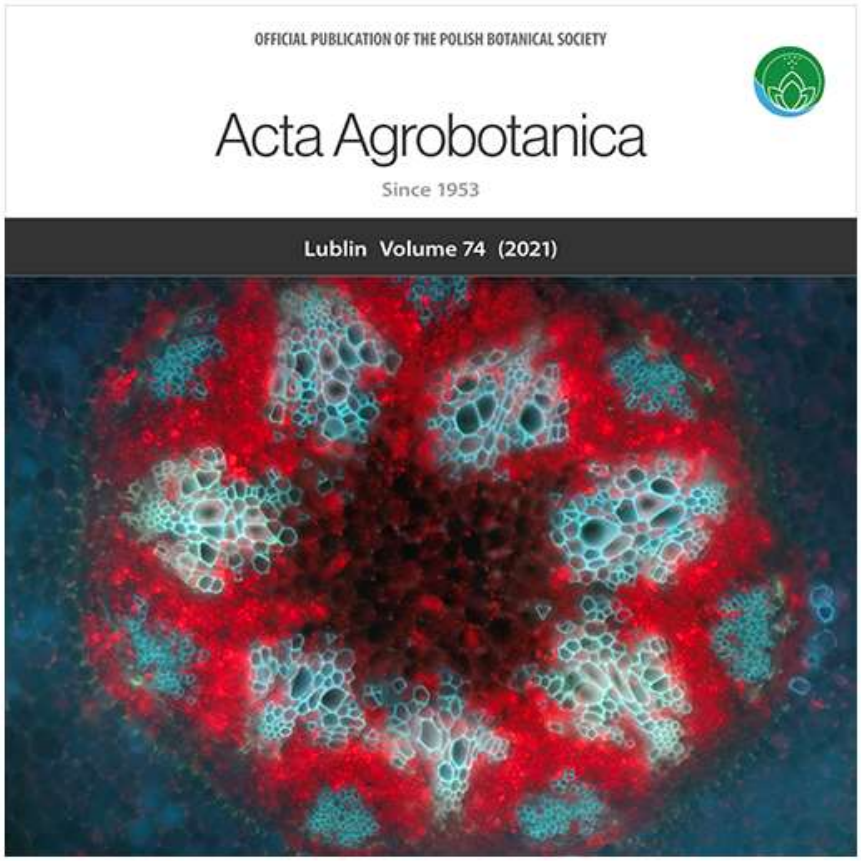

On the cover Stele cross section of broad bean (*Vicia faba* L.) tap root; fresh hand section, UV-induced autofluorescence.
[Author: Barbara Łotocka]

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ORIGINAL RESEARCH PAPER in PHYSIOLOGY

Weed Control and Winter Wheat Crop Yield With the Application of Herbicides, Nitrogen Fertilizers, and Their Mixtures With Humic Growth Regulators

Irina Korotkova [1*], Mykola Marenych [2], Volodymyr Hanhur [3], Oksana Laslo [4], Oksana Chetveryk [2], Viktor Liashenko [3]

[1] Department of Biotechnology and Chemistry, Poltava State Agrarian Academy, Skovorody Str. 1/3, Poltava, Ukraine
[2] Department of Selection, Seed Growing and Genetics, Poltava State Agrarian Academy, Skovorody Str. 1/3, Poltava, Ukraine
[3] Department of Plant, Poltava State Agrarian Academy, Skovorody Str. 1/3, Poltava, Ukraine
[4] Department of Ecology, Sustainable Nature Management and Environmental Protection, Poltava State Agrarian Academy, Skovorody Str. 1/3, Poltava, Ukraine

* To whom correspondence should be addressed. Email: 2irinakorotkova10@gmail.com

Abstract

The aim of the present study was to determine the efficacy of the application of mixtures containing various combinations of humic substances, with herbicides and nitrogen fertilizers, in weed control and optimizing the plant nutrition system. We also aimed to evaluate the influence of these substances on winter wheat productivity. Five Ukrainian winter wheat cultivars ('Kryzhynka,' 'Smuhlyanka,' 'Slavna,' 'Kubus,' and 'Mulan') were sown in a randomized complete block design, with three replications, in the years 2014–2019. The analysis of the effect of the compositions containing herbicides, with various physiologically active substances, in a mixture with humic preparations (Humifield, 4R Foliar concentrate) was performed by counting weeds per square meter in each experimental plot. The best performance in weed control, including perennial species, was obtained from using a mixture of Grodil Maxi herbicide with the humic preparation, Humifield. The crop treatment of this mixture resulted in a 23.6% reduction in weeds, compared to the treatment with the Grodil Maxi herbicide only. At the same time, the complex application of a number of herbicides in a mixture with the humic preparation, 4R Foliar concentrate led to the opposite effect. Various applications of mixtures of humates (4R Foliar concentrate, 5R SoilBoost) with nitrogen fertilizers (ammonium nitrate; carbamide-ammonium mixture) to optimize the winter wheat nutritional system and yield increases have been studied. The highest yield increase of 20%–22% was harvested in the plots treated with 5R SoilBoost and 4R Foliar concentrate plus ammonium nitrate. In addition, the efficacy of wheat crop foliar feeding with mixtures of humates, plus a carbamide-ammonia mixture, in different phases of vegetation has been established. A yield increase of 10.0%–21.4% resulting from the use of such compositions was obtained.

Keywords
tillering phase; pests; stem-extension phase of plants; surface and foliar application; air-dry biomass; perennial weed's species

1. Introduction

One of the ways to improve the technology of crop cultivation is to use chemicals to control biological processes with the help of plant growth regulators (Das et al., 2019; Moumita et al., 2019). The physiologically active substances of plant growth

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Article

Optimizing Protocols for Arabidopsis Shoot and Root Protoplast Cultivation

Taras Pasternak [1,*], Ivan A. Paponov [2] and Serhii Kondratenko [3,*]

[1] Institute of Biology II/Molecular Plant Physiology, Centre for BioSystems Analysis, BIOSS Centre for Biological Signalling Studies University of Freiburg, 79104 Freiburg, Germany
[2] Department of Food Science, Aarhus University, 8200 Aarhus, Denmark; ivpa@food.au.dk
[3] Institute of Vegetables and Melon Growing of National Academy of Agricultural Sciences of Ukraine, 62478 Kharkiv, Ukraine
* Correspondence: taras.p.pasternak@gmail.com(T.P.); serg-kondratenko@hotmail.com(S.K.)

Abstract: Procedures for the direct regeneration of entire plants from a shoot and root protoplasts of *Arabidopsis thaliana* have been optimized. The culture media for protoplast donor-plant cultivation and protoplast culture have been adjusted for optimal plant growth, plating efficiency, and promotion of shoot regeneration. Protocols have been established for the detection of all three steps in plant regeneration: (i) chromatin relaxation and activation of auxin biosynthesis, (ii) cell cycle progression, and (iii) conversion of cell-cycle active cells to totipotent ones. The competence for cell division was detected by DNA replication events and required high cell density and high concentrations of the auxinic compound 2,4-D. Cell cycle activity and globular structure formation, with subsequent shoot induction, were detected microscopically and by labeling with fluorescent dye Rhodamine123. The qPCR results demonstrated significantly upregulated expression of the genes responsible for nuclear reorganization, auxin responses, and auxin biosynthesis during the early stage of cell reprogramming. We further optimized cell reprogramming with this protocol by applying glutathione (GSH), which increases the sensitivity of isolated mesophyll protoplasts to cell cycle activation by auxin. The developed protocol allows us to investigate the molecular mechanism of the de-differentiation of somatic plant cells.

Keywords: *Arabidopsis thaliana*; protoplasts; reprograming; auxin

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1. Introduction

Arabidopsis thaliana represents the best-studied model among higher plants. Numerous investigations have been performed to characterize the fundamental mechanisms underlying totipotency, pluripotency, and nuclear reprogramming, including epigenetic regulation (for a review see Birnbaum, K. D., & Roudier, F. (2017) [1], and the use of Arabidopsis has added significant new insights into these mechanisms. However, the heterogeneity of the cells in Arabidopsis tissues complicates any attempts to track the developmental lineage and limits the application of state-of-the-art gene expression methods, such as microarrays and proteomics, which require a population of homogeneous cells. These limitations have been described recently and have been extended to include the additional complexity presented by individual organs that contain cells with different responses to stimuli and different regenerative potentials [2].

Specifically, only a restricted number of cells in the plant body maintain their full regenerative potential, while other cells very rapidly lose this capacity because of their rapid differentiation, polyploidization, and an inability to enter into the cell cycle.

One way to overcome these limitations' complexity is to use protoplasts, which represent a relatively homogenous plant cell population that lacks cell-to-cell communication and can be easily isolated. The first protoplast isolation and culture experiments in Arabidopsis were performed 45 years ago [3]. Subsequently, Damm and Willmitzer [4]

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ORIGINAL RESEARCH PAPER

Pre-sowing treatment of vetch hairy seeds, *vicia villosa* using ultraviolet irradiation

A. Semenov[1], T. Sakhno[1,2], O. Hordieieva[2], Y. Sakhno[3,*]

[1]*Department of Commodity Science, Poltava University of Economics and Trade, Poltava, Ukraine*
[2]*Department of Agro-Technology and Ecology, Poltava State Agrarian Academy, Poltava, Ukraine*
[3]*Department of Plant and Soil Sciences, University of Delaware, Newark, DE 19713, USA*

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Moisture content
Seed vigour
ultraviolet irradiation (UV-C radiation)

ABSTRACT

BACKGROUND AND OBJECTIVES: Aiming to increase crop yield the antimicrobial/bacterial or fungicidal pre-sowing seed treatment received more attention in modern agronomy. Ultraviolet-C irradiation of pre-sowing seeds is an environmentally friendly method that became of great importance in recent years. It is, hereafter, being shown that, along with known antimicrobial use, there is additional important advantage of Ultraviolet-C irradiation of pre-sowing seeds. It was revealed that Ultraviolet-C radiation on Vetch Hairy seeds stimulates seeds germination and vigour.

METHODS: Various doses of Ultraviolet-C irradiation of seeds were used. The main sowing qualities of seeds were determined: seed vigour and germination, as well as the content of photosynthetic pigments in plant leaves and the main parameters of the kinetic values of hydration–moisture and hydration rate.

FINDINGS: It was found that ultraviolet-C radiation has a positive effect on sowing qualities and content of photosynthetic pigments in plant leaves of Vetch vary. The most effective dose of ultraviolet irradiation applied to vetch hairy seeds; *vicia villosa* was 1000 J/m2. At this dose the seed vigour increases by 23.6%, germination by 15.1%, the mass of germinated seeds by 17.3%, the content of a- and b-chlorophyll by 12.4%, and 17.5%, respectively, the carotenoid content increased by 13.9%. The parameters of seeds hydration kinetics such as moisture content and hydration rate were determined. It was revealed that the hydration rate of seeds increased significantly in the first 100-minute time range. Later in time the hydration rate progressively decreased, achieving a saturated moisture content after 700 minutes. Additionally, it was found that Ultraviolet-C irradiation decreases the imbibition damage.

CONCLUSION: The results indicated that ultraviolet-C irradiation has a positive effect on sowing qualities of Vetch Hairy seeds, thus, could be proposed as a promising candidate for application in treatment pre-sowing agriculture seeds.

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NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
31	4	2

*Corresponding Author:
Email: *ysakhno@udel.edu*
Phone: +1 30228 76925
Fax: +1 30228 76925

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В Журналі ***Journal of Achievements in Materials and Manufacturing Engineering*** (**Scopus**):

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Photobiological safety of lamps and lamp systems in agriculture

A. Semenov [a,*], T. Sakhno [a,b], Y. Sakhno [c]
[a] Department of Commodity Studies, Biotechnology, Expertise and Customs, Poltava University of Economics and Trade, 3 Koval str., 36014, Poltava, Ukraine
[b] Department Biotechnology and Chemistry, Poltava State Agrarian University, 1/3 Skovorody str., 36000, Poltava, Ukraine
[c] Department of Plant and Soil Sciences, University of Delaware, Newark, DE, 19716, USA
* Corresponding e-mail address: asemen2015@gmail.com
ORCID identifier: https://orcid.org/0000-0003-3184-6925 (A.S.); https://orcid.org/0000-0001-7049-4657 (T.S.); https://orcid.org/0000-0001-8115-739X (Y.S.)

ABSTRACT

Purpose: The article aims to study the photobiological safety of ultraviolet radiation of UV lamps in agriculture.

Design/methodology/approach: The research and analysis of the lighting characteristics of samples of LUF 80 and LE 30 lamps, which are the most widely used in the agrarian complex.

Findings: Experimental studies have shown that the photobiological safety of LUF 80 lamps belongs to the low-risk group RG1, while LE 30 lamps show high risk and are thus assigned to group RG3.

Research limitations/implications: It is advisable to continue studying the characteristics of lamps and lamp systems for various fields of agriculture on the market in Ukraine to assess their compliance with safety requirements.

Practical implications: The application of the proposed approach allows increasing the level of labor safety in commercial greenhouses or any other industry by choosing the suitable lamps for agriculture that at present are not regulated by additional safety measures.

Originality/value: The originality of the article is showing the results of the experimental data of the studies of light-technical characteristics of ultraviolet lamps for agriculture.

Keywords: UV irradiation, Photobiological safety, UV lamp code

Reference to this paper should be given in the following way:

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CLEANER PRODUCTION AND BIOTECHNOLOGY

1. Introduction

The working environment includes everything that surrounds a person in the process of work. Often, the body of an employed person is affected by certain factors of the working environment and the labour process, such as radiation during the production process of irradiating the surface with highly concentrated fluxes of femtosecond

В Журналі ***Bulgarian Journal of Agricultural Science*** (**Scopus**)

Samovol A., Kondratenko S., Mogilnaya E. Variability of meiotic recombination and cyto-logical parameters in F1 tomato hybrids under extreme environmental conditions. *Bulgarian Journal of Agricultural Science*. 2021. Vol. 27. No 2. P. 342–349

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Variability of meiotic recombination and cytological parameters in F1 tomato hybrids under extreme environmental conditions

Aleksey Samovol*, Sergey Kondratenko and Elena Mogilnaya

National Academy of Agrarian Sciences of Ukraine, Institute of Vegetable and Melon Growing, 62478 Selektsiyne Village of Kharkiv Region, Ukraine
**Corresponding author:* ovoch.iob@gmail.com

Abstract

Samovol, A., Kondratenko, S. & Mogilnaya, E. (2021). Variability of meiotic recombination and cytological parameters in F_1 tomato hybrids under extreme environmental conditions. *Bulg. J. Agric. Sci., 27 (2)*, 342–349

This paper presents the results of the impact of the environmental conditions in the three regions of the high-mountain Western Pamirs (Vanj, Khorugh and Ishkashim) located at different altitudes above sea level (2300, 2320 and 2600 meters) on the meiotic replicating and transforming functions in the interspecies of F_1 tomato hybrids, as well as on the Mendelian segregation displacement and the variability of recombination parameters for linked and unlinked maker genes. Generally, a direct coherence between the frequency of interstitial chiasm, the variability of meiotic recombination parameters and the combined conditions within the specified ecological niche have been determined, in particular: the increased radiation on the experimental site at the soil level and the reproductive organs of F_1 hybrid plants, high intensity of solar radiation in the UV, PHAR, IR spectral bands and increased temperature fluctuations during a month and a day.

Keywords: F_1 tomato hybrids; meiotic recombination; cytological parameters; climatic conditions; Western Pamirs

Introduction

It is believed that in order to control recombination and genotypic variation, apart from the wide application of the already known artificially created basic endogenous (Wu & Burgess, 2006; Dolgin, 2008; Wu et al., 2008; Naranjo, 2015) and exopathic (Khlebova, 2010; Vranis et al., 2010; Gulfishan et al., 2012; Bilgir et al., 2013; Garvin et al., 2013; Feller et al., 2015; Samovol et al., 2017) causes, it is of high importance to search for brand new integrated approaches and ways rooted in the evolutionary past.

From this point of view, the identification of possible causes that led to the "explosive" course of evolution will provide us with an opportunity to outline innovative ways and approaches as well as to determine environmental factors, which may deem to be quite effective inducers for mutations and recombination (Zhuchenko, 2010). In this regard, according to the author, of significant interest are to be considered mountain conditions that combine a wide range of factors (high fluctuations in temperature and solar UV radiation, an increased background radiation, special humidity conditions, etc.), within which the speed of mutation and recombination processes, and in particular, speciation are being accelerated.

According to the renowned evolutionist V. A. Blagoveshchensky, plant speciation occurs in those areas where nature has created extreme conditions for their existence (mountains, deserts). We find a similar statement in the published scientific works of E.N. Sinskaya: "*The intensity of the species-forming process increases where there is a wide variety of ecological niches, as happens in mountainous countries*" (Filatenko, 2010). In confirmation of the above, it is also considered that the spontaneous processes that affect the landscapes and anthropogenic loads in the high-mountain ecosystem of Pamir-Alai rather quickly form ecological elements ("primary-forming knots"), which, having entered the

В Журналі ***Cytology and Genetics*** (**Scopus**):

Balatsky V. N., Oliinychenko Y. K., Korinnyi S.M., Buslyk T. V., *et al.* Associations of QTL Region Genes of Chromosome Two with Meat Quality Traits and Productivity of the Ukrainian Large White Pig Breed. *Cytology and Genetics*. 2021. Vol. 55. No. 1. P. 53–62.

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Associations of QTL Region Genes of Chromosome 2 with Meat Quality Traits and Productivity of the Ukrainian Large White Pig Breed

V. N. Balatsky, Y. K. Oliinychenko, T. V. Buslyk, I. B. Bankovska, S. N. Korinnyi, A. M. Saienko & K. F. Pochernyaev

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Abstract

In recent decades, selection in pig farming has been aimed at obtaining animals with a high growth rate and increased meat yield in the carcass, resulting in a tendency for deteriorated quality characteristics of pork. One way to solve this problem is to develop genetic markers of pig meat quality and to use them in breeding programs along with the markers of other productive traits. The article presents the results of the analysis of the association of genes *IGF2* (SNP g.3072G > A), *CTSD* (SNP g.70G > A), and *CTSF* (SNP g.22G > C) localized in the QTL region of the distal end of the p-arm of chromosome 2, with the meat quality traits and