На 9 эпохе обучения модель перестала обучаться достигнув наилучшего результата средней абсолютной ошибки 4.3 ц/га. Оправдываемость прогноза при данной ошибки составила 82%, относительная ошибка соответственно 18%. Следует отметить, на последующих эпохах модели проявляется эффект переобучения, однако модель использовала гиперпараметры полученные на 9 эпохе.

На основании полученной относительной ошибки в 18% при заблаговременности два месяца, можно сделать вывод о применимости метода машинного обучения, однако, следует расширить набор входных параметров, также следует учесть условия осеннего и весенне-летнего периодов. Необходимо также использовать данные по запасам продуктивной влаги в почве.

Библиографический список

1. Грингоф И. Г., Клещенко А. Д. Основы сельскохозяйственной метеорологии. Том 1 – Обнинск: ВНИИГМИ-МЦД – 2011 – 808 с.

2. Лебедева В.М., А.И. Страшная. Основы сельскохозяйственной метеорологии. Том 2. Методы расчетов и прогнозов в агрометеорологии. Книга 2. Оперативное агрометеорологическое прогнозирование. Обнинск: ФГБУ "ВНИИГМИ-МЦД", 2012. – 2016 с.

3. Мартин О. Байесовский анализ на Python / пер. с анг. А.В. Снастина. – М.: ДМК Пресс, 2020. – 340 с

УДК 633.853

ROLE OF ASCOBIN AS AN ANTIOXIDANT IN ENHANCING PLANTS GROWTH

***Nowar M.E.**, Postgraduate Student,* RUDN, *mnowar2000@gmail.com*
***Vvedenskiy V.V.,** Associate Professor, RUDN, vaval-ved@yandex.ru*

Abstract: *Nowadays we are experiencing significant climate change, especially as it affects the natural growth of agricultural crops, either directly or indirectly and thus leads to a decrease in their productivity. In this concern, antioxidants have synergistic effects on the growth and productivity of many plant species. Antioxidants are natural and safe compounds that prevent oxidation that can produce free radicals. Foliar application with antioxidants helps crop crops to resist environmental stresses and restore their capacity, thus obtaining the highest possible yield.*

Keywords: *climate change; ascobin; antioxidants; free radicals.*

Introduction. Climate change impacts on most sectors, especially the agricultural sector, and therefore its impact on the economies of countries, especially developing ones. Climate change consider one of the biggest research challenges currently facing plant biologists, agricultural scientists and conservation biologists. With global greenhouse gas emissions expected to continue to rise in the foreseeable

future, the impact of elevated atmospheric CO_2 (eCO_2), and associated shifts in temperature and precipitation are all expected to impact plant ecophysiology, distribution and interactions with other organisms [1]. In this regard, antioxidants have their role in reducing harmful effects, especially sudden ones, by climate changes, which by trapping the free radicals or active oxygen, and thus some things maintain high plant productivity and avoid major damage to the crops yield.

Climate change in recent past resulted into warming of oceans, shrinking of ice sheets, glaciers retreat, rise of sea level, ocean acidification, dryness etc. That directly or indirectly disturbs human life and economies. But agriculture is the most affected sector by climate change. The soils become drier and needs additional amount of water to irrigate. Plants, especially horticultural crops, are under stress because of the drought, intermittent and unprecedented rains which followed by floods and erosion. Results of recent studies broke decades old myth that high amount of CO_2 is actually beneficial for plants but in fact it is found that high CO_2 level had no effect on growth of plants. Conversely, increase temperature due to high amount of atmospheric CO_2 would have negative impact on plant growth [2].

Climate change associated with increases in temperature, increases in carbon dioxide, and changing rainfall patterns may cause a significant decrease in crop production and could be a great challenge for farmers as they face the challenge of meeting the requirements of overpopulation. Therefore, we need more attention to research on climate change mitigation and adaptation**.** It is estimated that global wheat production will decrease by 6% per degree Celsius of additional temperature increase and become more variable over time and space.

The effects of climate change on crop yields differ in different regions, and will increase in some regions, and in other areas it will decrease, which is concerned with latitude in the region and the application of irrigation. Crop yield can be increased with application of irrigation and increased precipitation during growth of crop; meanwhile, crop yields are more sensitive to precipitation than temperature. If future water availability is reduced, soils with a high-water retention capacity will be better to reduce droughts frequency and improve crop yields.

Recently, attention has been to focus heavily on the potential use of natural materials and to improve the safety of plant growth and flowering and fruit preparation. In this concern, the antioxidants have synergistic impacts on growth, yield and quality of yield of many species of plant. These compounds have a useful impact on trapping the free radicals or active oxygen (singlet oxygen, hydrogen peroxide, hydroxyl radicals, superoxide anion and ozone) that are produced during processes photosynthesis and respiration**.**

Antioxidants compounds consist of enzymatic antioxidants [such as guaiacol peroxidases (GPOX), ascorbate peroxidase (APX), catalase (CAT), superoxide dismutase (SOD) and AsA-GSH cycle enzymes like glutathione reductase (GR), monodehydroascorbate reductase (MDHAR), dehydroascorbate reductase (DHAR)] and nonenzymtic antioxidants [carotenoids, glutathione (GSH), metabolites such as ascorbate (AsA) and proline], which work together to detoxify the reactive oxygen species (ROS) and the reactive nitrogen species (RNS).

Foliar application with antioxidants like ascoin acid, which is a small molecule antioxidant soluble in water works as a substrate core in the periodic track to remove toxins and neutralize the superoxide radicals and singlet oxygen. Ascobin as an Antioxidant which consist of ascorbic acid and citric acid in a ratio of 2:1.

Ascorbic acid, (vitamin C) is one of the main products of D-glucose metabolism, which is synthesized in higher plants. It has proven to play multiple roles in plant growth and development, ie, cell division, and the expansion of the cell wall. Ascorbic acid, carotenoids, flavonoids, and tocopherols, due to its antioxidant properties and health-promoting effects, are attractive targets for programs of bio-immunization. Increasing specific antioxidant products, whether with molecular or conventional methods, is a vital and interesting topic of plant breeding and biotechnology [3]. Ascorbic acid reacts non-enzymatically with superoxide, singlet oxygen and hydrogen peroxide. Also, foliar nutrient of ascobin (ascorbic acid and citric acid in a ratio of 2:1), had a promotional effect on the growth and compounds of the active ingredients in different plants.

Citric acid is an organic compound that belongs to the group of carboxylic acids. It is one of an arrangement of compounds that included within the physiological oxidation of proteins, fats and carbohydrates to CO2 and water.

An essential role of plant ascorbic defense system is to protect metabolic processes against H_2O_2 and other toxic oxygen derivatives. The main thing is to reduce, interact with and / or scavenging many types of free radicals. Ascorbic acid reacts non-enzymatically with superoxide, singlet oxygen and hydrogen peroxide. The ascorbic acid or α-tocopherol inhibitory effect may be on the lipid peroxide caused by antioxidant effects, which would inhibit the stress caused by increased leakage of essential electrolytes.

Application with ascorbic and citric acids work together like a concert that indicates a complete set of an antioxidant defense system, rather than protection with a single antioxidant under stressful conditions.

Foliar application with ascorbic acid (at the rate of 400 ppm) on sugar beet plants led to an increase in all the parameters of growth, yield and its quality as compared with untreated plants. While wheat yield and its components showed gradual increases with ascobin treatment by partially alleviate the negative effects of salinity. Also, the nutritional values of the grains produced were increased in response to the treatment of ascobin in wheat [4]. Also, application of citric acid significantly increased the fresh and dry weight of shoot, and the weight of dry and fresh root of sweet basil. The magnitude of increases was more pronounced in response to 600 mg / l of ascobin. Grain weight/ear, length of ear, 100 grain weight, grain yield, straw yield, and maize crop harvest index increased significantly with the foliar application by 100 ppm of ascorbic acid (AA), citric acid (CA) and salicylic acid (SA) compared with untreated plants (control). As for the effect of antioxidants on sweet potato yield and its components. The highest total yield was obtained from plants sprayed with ascorbic acid at 200 ppm. While non-marketable yield significantly reduced by antioxidants treatments [5].

Conclusions. Climate change is considered a global environmental threat to all sectors, specifically the agricultural sector. To cope with and relieve the negative

impacts due to climate variability, there is a requirement for the improvement of drought and heat resistant high yielding varieties, changing planting dates as well as use some natural materials like antioxidants that help plants recovery under these stresses and to ensure world food security.

The prime aim of this study was to analyze the role of ascobin as an antioxidant in acquiring agricultural crops some ability to cope with climate changes and help them recover quickly and give the highest possible yield under the influence of these pressures.

References

1. IPCC. (2014). Summary for policymakers. In: Climate Change: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.
2. Zhu, K., Chiariello, N.R., Tobeck, T., Fukami, T., Field, C.B. (2016). Nonlinear, interacting responses to climate limit grassland production under global change, Proceedings of the National Academy of Sciences. pp. 10589-10594.
3. Racchi, M.L. (2013). Antioxidant Defenses in Plants with Attention to Prunus and Citrus spp. Antioxidants 2, 340–369.
4. Sadak, M., Tawfik, M.M. and Abd Elhamid, E.A. (2015). Role of Antioxidants in Mitigating the Negative Impact of Salinity. Lap Lambert Academic Publishing, Saarbriuecken, Pages: 64.
5. El Hawary, M. M. & Nashed, M. E. (2019). Effect of Foliar Application by some Antioxidants on Growth and Productivity of Maize under Saline Soil Conditions. Journal of Plant Production. 10. 93-99. 10.21608/jpp.36238.

УДК: 633.18.03

ПРИМЕНЕНИЕ ГИПЕРСПЕКТРАЛЬНОЙ СЪЕМКИ ДЛЯ РАСПОЗНАВАНИЯ РАЗНЫХ ВИДОВ РАСТЕНИЙ

Веллер Владислав Евгеньевич., *аспирант кафедры земледелия и методики опытного дела,, факультет агрономии и биотехнологии, ФГБОУ ВО РГАУ-МСХА имени К.А. Тимирязева, vellervladislav@gmail.com*
Железова Софья Владиславовна, *к.б.н., доцент кафедры земледелия и методики опытного дела, факультет агрономии и биотехнологии, ФГБОУ ВО РГАУ-МСХА имени К.А. Тимирязева, szhelezova@rgau-msha.ru*

Аннотация: *съёмка различных видов растений. Исследование проводили в лабораторных условиях, в качестве объектов были выбраны сорные и культурные растения, произрастающие в Нечернозёмной зоне.*