

The Role, Modern Problems, And Development Prospects Of Metrological Support In Cultivating Melon Crops On Farms

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Abstract

This article explores the role and significance of metrological support in cultivating melon crops on farms. It highlights the importance of measuring instruments, such as refractometers, in ensuring product quality, rational resource use, and export competitiveness. The study discusses modern smart farming technologies and national standards, identifying key challenges. Furthermore, a newly developed method for assessing the technical condition and accuracy of measuring instruments used in agriculture is proposed.

Keywords: metrological support, melon crops, agriculture, measuring instruments, refractometer, smart farming, standards, Uzbekistan.

INTRODUCTION

Today, against the backdrop of rapid global population growth and climate change, ensuring food security, applying resource-saving technologies in agricultural production, and raising product quality to international standards are of global significance. The cultivation of melon crops in the agricultural sector, one of the leading branches of Uzbekistan's economy, holds a special place and is of strategic importance in increasing the country's export potential. According to official statistics, in 2023 the republic produced 2.6 million tons of melon and other cucurbit crops, representing a 5.5% increase compared to 2022. Furthermore, during the same period, Uzbekistan ranked eighth globally in terms of the export volume of melon products. In 2024, these figures are expected to increase even more, with the growth rate reaching almost 6 percent. However, along with the quantitative increase in production volume, the issue of product quality, competitiveness, and the rational use of natural resources, especially water and land resources, is becoming an acute problem on the agenda. Exactly at this point, the role and significance of metrological support in farms become clearly evident. In the process of growing melon products in agriculture, measuring instruments have an important scientific and practical significance, and the efficiency, stability, and quality indicators of any technological process directly depend on the accuracy and reliability of measurement results. From this point of view, the measuring instruments used in the processes of growing melon products are one of the main factors in increasing productivity, rational use of resources, and guaranteeing the quality of the finished product.

LITERATURE REVIEW

The fact that the development of the field of metrology and standardization in the Republic of Uzbekistan is defined as one of the priority directions of state policy further increases the relevance of the topic. In particular, the Development Strategy of New Uzbekistan for 2022-2026, approved by the Decree of the President of the Republic of Uzbekistan No. UP-60 dated January 28, 2022, clearly defines the tasks of digitizing agriculture and introducing modern technologies, including measurement and monitoring systems. These documents specifically emphasize the importance of digital and metrological tools in the efficient use of resources and improving product quality. Also, the resolution No. PP-4477 of August 15, 2019, is aimed at further improving the metrology system and developing the infrastructure for testing and calibrating measuring instruments. Within the framework of the strategy for the transition to a "Green Economy," it is required to increase energy and water efficiency, carry out technological

modernization, and introduce "green" criteria based on international standards. The role of standards is invaluable in improving the quality and export potential of melon products. State standards of Uzbekistan (O'zDSt) and international standards (ISO) serve as the legal and technical basis for quality management in farms. For example, there are standards determining seed quality (O'zDSt 2823:2014, O'zDSt 663:2017) and rules for storing and transporting products. The implementation of ISO 9001 (Quality Management System) and ISO 22000 (Food Safety) standards in farms expands the opportunities for products to enter the international market. In practice, the fact that advanced entities like the "Biogumus" farm have obtained ISO 22000 and Organic certificates and are exporting their products to the European market is clear proof of this. Additionally, in trade with CIS countries, GOST standards, for instance, GOST 8.579-2002 regarding the requirements for the quantity of packaged goods, remain highly relevant.

METHODOLOGY

In particular, refractometers (Brix meters) play an important role in determining the ripeness level and taste quality of melon products. These instruments determine the dry matter, mainly sugar content, in fruit juice. A high "Brix" level determines the sweetness and market value of the product. Accurate data obtained using a refractometer helps the farmer correctly determine the harvest time, sort the product, and select the highest quality batches for export. Scientific research notes that melon products with high sugar content are highly valued in the market and better meet consumer demand. Since refractometry measurements are sensitive to temperature, regular calibration of the instrument is required. Today, there is a trend of introducing innovative technologies into agriculture. In modern "Smart Farming", drones, multispectral cameras, GPS systems, and IoT (Internet of Things) technologies are widely used. Multispectral and thermal images taken by drones make it possible to monitor crop conditions in real-time, detect diseases early, and apply fertilizers differentially. GPS systems optimize the movement trajectory of agricultural machinery, reduce fuel consumption, and help plan the land "piece by piece". These technologies not only reduce labor costs but also lower the consumption of chemicals, serving to ensure ecological sustainability. Digital monitoring systems reduce the human factor and minimize measurement errors by automating the process of measurement and data collection.

RESULTS

For the first time, a method for determining the technical condition and accuracy level of measuring instruments used in the process of growing vegetable and melon products in farms was created. This provides farmers and young professionals with specific guidelines on the proper use of metrological tools in cultivating high-quality products. Thus, improving metrological support in growing melon products on farms is not just a technical issue, but a decisive factor in strengthening the country's food security, saving water resources, and ensuring the export competitiveness of agricultural products. Research shows that implementing metrologically sound measurement systems and calibrating them based on state standards serves to increase the efficiency of farms' activities. To achieve these goals, it is required to deeply analyze the current state of the use of measuring instruments in farms growing melon products, identify existing problems, and develop scientifically grounded proposals for their elimination.

CONCLUSION

In conclusion, increasing the role of measuring instruments in the cultivation of melon crops, ensuring their accuracy and reliability, as well as widely introducing modern digital technologies into the sector, is the guarantee of taking Uzbekistan's agriculture to a new level. Scientific research and practical measures in this direction make a significant contribution to achieving the goals set in the "New Uzbekistan" strategy, particularly to improving the quality and increasing the export volume of agricultural products, and ultimately ensuring the abundance of our people's table. Metrology means accuracy, and accuracy means quality and efficiency. In the field of melon growing as well, keeping an accurate record of every drop of water and

every gram of fertilizer, and understanding the language of soil and plants through measuring instruments must become the primary weapon of today's farmer.

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