Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.191	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.100	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2025 **Issue:** 02 **Volume:** 142

Published: 24.02.2025 **http://T-Science.org**

Issue Article

Teona Dolidze
ATSU
Agronomy Program, Agro-Ecology Module
III year doctoral student
T: 595 956 056
dolidze.teona@atsu.edu.ge

IMPROVING GRAPE QUALITY WITH MODERN TECHNOLOGIES

Abstract: *The article discusses the history of Imereti Region Baghdati Municipality Private Research conducted on the farm . The aim of the research was to improve the quality indicators of grapes in a climate-changed landscape using modern technologies. The task was to observe the growth and development of grape bunches against the background of the use of a biostimulant. The paper analyzes and selects effective agroecological methods for high-quality grape care and cultivation for an old, fruitful vineyard in the Imereti region, identifies the results of the action of an effective biostimulant, and describes the process of the research methods used and the results achieved.*

Key words: *landscape; wine; biostimulator; Durdo.*

Language: *English*

Citation: Dolidze, T. (2025). Improving grape quality with modern technologies. *ISJ Theoretical & Applied Science, 02 (142),* 72-78.

Soi: https://s-o-i.org/1.1/TAS-02-142-14 ***Doi***: https://dx.doi.org/10.15863/TAS.2025.02.142.14

Scopus ASCC: *1100.*

Introduction

The increase in the world's population and, consequently, the demand for food, led to the industrialization of agriculture. Along with the development of technologies, average yields have increased sharply, which has had a serious impact on soil fertility and product quality. The increase in the use of pesticides and agrochemicals, as well as global warming related to climate change, have further accelerated and deepened the process of soil degradation. According to UN data, 12 million hectares of land become unusable for crop production every year.

Climate change and global industrialization processes have led to the spread of new types of pests and diseases in agriculture and an increase in the scale of pests, which has posed difficult challenges to producers. In order to maintain the quality of products, it is necessary to develop measures that will adequately withstand these modern challenges and make it possible to harvest the desired quantity and quality even in dramatically changed climate and environmental conditions. Reception. (7,8)

In the agricultural sector, one of the main directions today is viticulture. In the reality of Georgia, of the two main directions (table and wine), only the production of grapes for wine is so far more developed. Viticulture and winemaking are an important source of economy for our country, where the quality of raw materials required for the production of the final product is of crucial importance. (2,4,9) In addition, it should be noted that Georgia is recognized as the homeland of vines and wine, which places special responsibility on farmers employed in the field of viticulture and winemaking. (3,7) It is necessary to introduce new scientific approaches and modern plant care technologies in the field.

Materials and methods.

The task of grapevine agrotechnology is to enhance nutrition, especially at the beginning of fruit growth. This obliges us to choose the correct formulation of grapevine nutrition, and for this we need a lot of It is a factor to consider. To improve the quality of grapes, we planned measures in the study area so that the amount of chemical elements in the fruit did not exceed the standard rate. These measures, on the one hand, will allow us to help the plant reduce the impact of stress factors caused by adverse climate

and will also help the plant to maximize its potential, which is crucial It is a factor, To obtain quality raw materials.

The research was conducted in Bagdati, one of the traditional wine-growing regions of Imereti . To reduce the negative effects of climatic conditions, we used Spanish-produced, ecologically friendly Pure , innovative biostimulant "Frutmax 10". This is a biostimulant consisting of plant amino acids, osmolytes, algae extracts and bioactive substances. Since it promotes the processes of plant cell proliferation and growth, in the experimental vineyard on the study area, it was used during the fruit formation process. It has the ability to supply the plant with more energy, contains: 3.46% N + 1.96% K_2O + 1.15% B + 0.11% Mo + 11.55% free amino acids + 9.47% marine plant extract. This formulation ensures an increase in the quality and caliber of grapes, the fruit enters maturity relatively early and easily accumulates sugar. We have well and evenly developed fruits. The size and shape of the fruit improves. The overall yield increases. It is with these characteristics in mind that we selected “Fruitmax 10” for use in a middle-aged (2-5 year old) grape-bearing vineyard located in the study area, where the quality of grapes deteriorated due to the difficult terrain and complicated climatic factors, which resulted in a decrease in the overall yield . This plot is located on yellow-earthy soils, which are excessively waterlogged due to poor physical properties. Under these conditions, the normal growth and development of vines is hampered. Although vines grow on almost all types of soils , the climate With change Related Environmental Results Negatively It is reflected Vineyard Growth And Productivity. In conditions of excess moisture, due to a poorly developed rhizosphere, it becomes difficult for the plant to absorb the required amount of nutrients, which leads to various problems, including nutrient deficiencies, which leads to low-quality grapes and, accordingly, low wine quality. We divided the plot into two parts - treated with "Fruitmax 10" and without "Fruitmax 10", so that we had the same microclimate and both parts were in equal climatic and relief conditions, so that the experiment could be carried out with maximum quality. Based on monitoring, we observed the effect of "Fruitmax 10" on On grape quality and yield. (6)

We used this biostimulant during the fruit formation phase, the first time at the beginning of flowering on 11.06.2023 and the second time on 04.07.2023. On 05.09.2023, we conducted the first monitoring in the vineyard plantation treated with the biostimulant. As a result:

Results, discussion, conclusion.

The caliber of Tsolikouri berries treated with “Fruitmax 10” was larger than that of untreated berries (Photo 1,2), and they entered maturity relatively early (Table 1,2,3,4).

Table 1. Tsolikouri Fruitmax 05.09.2023

No.	Number of clusters	Bunch weight	Grain weight	Grain radius
1	30 pcs	312g	4g	17mm
2	60 pcs	323g	3.96g	16mm
3	35 pcs	310g	2.67g	16mm
4	24 pcs	310g	2.77g	15mm
5	26 pcs	330g	3.09g	16mm
6	30 pcs	315g	4.15g	16mm
7	30 pcs	300g	2.56g	18mm
8	41 pcs	400g	3.77g	15mm
9	35 pcs.	81g	2.67g	17mm

Table 2. Tsolikouri without Fruitmax 05.09.2023

No.	Number of clusters	Bunch weight	Grain weight	Grain radius
1	48 pcs	117g	1.97g	15mm
2	30 pcs	120g	1.80g	14mm
3	3 0pcs	83g	2.84g	16mm
4	30 pcs	100g	1.70g	14mm
5	35 pcs.	110g	1.90g	14mm
6	40 pcs	270g	1.49g	14mm

7	43 pcs.	320g	3.30g	17mm
8	11 pcs.	280g	2.18g	14mm
9	25 pcs.	300g	2.48g	15mm
10	21 pcs.	29	1.53g	13mm

Table 3. Dry matter in Tsolikouri on September 12 with Frutmax

No.	1	2	3	4	5	6	7	8	9	10
Brix	17	19	19	17	19	18	19	20	19	22

Table 4. Dry matter in Tsolikouri on September 12 without Fruitmax

No.	1	2	3	4	5	6	7	8	9	10
Brix	15	18	13	13	14	18	18	16	15	19

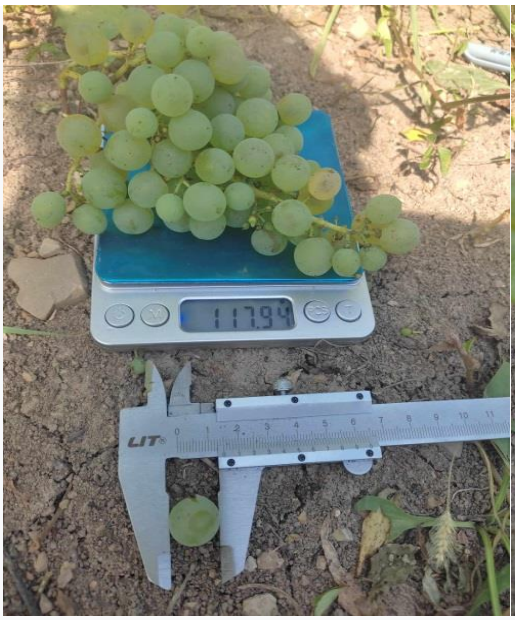

Photo 1

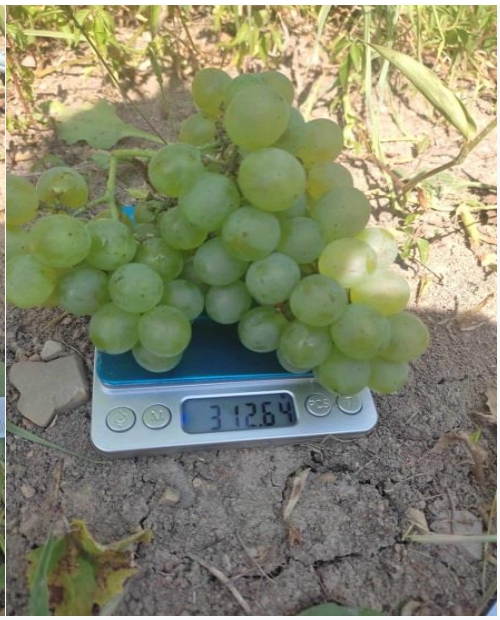

Photo 2

In the case of Krakhuna, the difference was small, both the Frutmax-treated and untreated ones were almost equal in size (Table 5,6), although the Frutmax-treated ones entered maturity relatively earlier (Photo 3,4) (Table 7,8).

Table 5. Fruitmax processed 05.09.2023

No.	Number of clusters	Bunch weight	Grain weight	Grain radius
1	35 pcs.	240g	3.17g	16mm
2	22 pcs.	250g	3.65g	16mm
3	22 pcs.	235g	3.57g	17mm
4	20 pcs	230g	3.79g	18mm
5	19 pcs.	240g	3.40g	17mm

Table 6. Without Fruitmax 05.09.2023

No.	Number of clusters	Bunch weight	Grain weight	Grain radius
1	49 pcs.	245g	3.57g	17mm
2	41 pcs	255g	2.70g	16mm

3	50 pcs	230g	3.65g	17mm
4	30 pcs	250g	3.50g	16mm
5	50 pcs	240g	3.44g	17mm

Table 7. Dry matter on Krakhuna on September 12 with Frutmax

No.	1	2	3	4	5
Brix	15	20	21	18	21

Table 8. Without Fruitmax

No.	1	2	3	4	5
Brix	15	19	12	17	15

Photo 3

Photo 4

We continued monitoring. We conducted a final census on 06.10.2023, and the weight, radius, and sugar content of the grapes increased. Overall, there was a difference in bunch length, berry weight, caliber, and bunch weight between the vines treated with and without Frutomax (Photos 5,6).

Photo 5

Photo 6

According to the vine growth and development data as a result of monitoring on 6.10.2023:

Table 9. Processed with Fruitmax Tsolikouri

No.	Number of clusters	Grain weight	Grain radius	Dry matter Brix
1	48 pcs	4.65g	18mm	20
2	30 pcs	4.65g	16mm	20
3	3 0pcs	3.1g	17mm	20
4	30 pcs	3.45g	17mm	20
5	35 pcs.	4.20g	17mm	19
6	40 pcs	3.41g	15mm	20
7	43 pcs.	3.33g	17mm	20
8	11 pcs.	2.79g	16mm	20
9	25 pcs.	3.22g	17mm	20
10	21 pcs.	2.79g	15mm	22

Table 10. Without Fruitmax Tsolikouri

No.	Number of clusters	Grain weight	Grain radius	Dry matter Brix
1	48 pcs	2.19g	15mm	19
2	30 pcs	2.87g	15mm	20
3	3 0pcs	2.25g	15mm	18
4	30 pcs	2.86g	15mm	20
5	35 pcs.	2.19g	15mm	20
6	40 pcs	2.68g	14mm	20
7	43 pcs.	2.68g	15mm	19
8	11 pcs.	1.95g	16mm	21
9	25 pcs.	2.50g	15mm	20
10	21 pcs.	2.95g	16mm	20

Table 11. Processed with Fruitmax Krakhuna

No.	Number of clusters	Grain weight	Grain radius	Dry matter Brix
1	48 pcs	3.45g	17mm	17
2	30 pcs	3.57g	16mm	22
3	3 0pcs	3.77g	16mm	21
4	30 pcs	3.55g	17mm	21
5	35 pcs.	3.41g	17mm	21

Table 12. Processed cereal without fruit juice

No.	Number of clusters	Grain weight	Grain radius	Dry matter Brix
1	48 pcs	3.55g	17mm	18
2	30 pcs	3.70g	18mm	21
3	3 0pcs	2.57g	15mm	17
4	30 pcs	2.78g	16mm	21
5	35 pcs.	3.00g	15mm	18

We planned the harvest for October 28th. At this stage, the study vineyard had reached full maturity, the fruits were well developed, and by this time the sugar content of the grapes had reached:

Table 13. Dry matter by mid-October treated with Frutamax

Brix		
No.	No. 1Tsolikouri	No. 2 Krakhuna
1	23	23
2	22.5	23
3	22	23
4	21	22
5	21	24
6	23	
7	23	
8	24	
9	25.3	

Table 14. Dry matter for mid-October without Frutamax

Brix		
No.	No. 1Tsolikouri	No. 2 Krakhuna
1	22	23
2	22	23
3	20	20
4	21	23
5	20	22
6	21	
7	23	
8	23	
9	23	

Stressful conditions change the metabolism of plants, which is what happens in the vine. Prolonged stress leads to weakening of the plant and premature depletion of organic acids. "Frutmax 10" has shown in the trial that it has the ability to mitigate the risk factors caused by climate change. The use of the biostimulator increased the quality and yield of the product. In addition to cell division, the amino acids in its composition helped the vine to overcome the stress factors caused by climate change. (1)

Another goal of our study area was to ensure high-quality photosynthesis of the green mass. For photosynthesis to proceed well, the leaf needs light, heat, and water. We adjusted the pruning and greening operations so that the leaf surface received maximum and intensive direct sunlight. (10) For this, we selected leaves with a large surface area. Since the sugar content in grape juice is an important factor for the quality of grapes. It plays a very important role in the metabolic process, for the formation of various substances, e.g. acids and aromatic substances. The high photosynthetic capacity of the green mass determines the high-quality harvest. We conducted an observation: we removed a large number of leaves from the roots of certain vines, or left a leaf with a small surface area. We left some of the vine roots with leaves with a large surface area so that there were 10-15 leaves per bunch. Based on monitoring, it was found that the sugar level on the roots where we had left 15 leaves was higher when tested with a refractometer than on the roots with fewer leaves (photos 7,8). Based on the observations, in our climate, an average of 15 leaves per bunch are required for full photosynthesis and a high-quality harvest.

Photo 7-vine with more leaves

Photo 8-vine with fewer leaves

It is worth noting that leaving more than 15 leaves causes shading and deterioration of aeration, which in itself increases the risk of pests and diseases. If we had a large number of clusters at the base of the vine, but the number of leaves was small, we regulated the number of leaves to ensure full photosynthesis by regulating the development of the axillary leaves during green operations. In droughty areas, we left leaves with a small leaf surface, because leaves with a large surface area would spend more water for photosynthesis and there would be an early lack of water. When we have a lack of water, photosynthesis proceeds poorly or stops altogether. In the case of little water, the leaf openings close, which suppresses and prevents the intake of carbon dioxide necessary for photosynthesis.

Ultimately, our modern approaches in a climate-changed landscape led to an increase in grain caliber, a relatively early entry of the fruit into maturity, and easy accumulation of sugar. In the end, we received well-developed and evenly ripened fruits. Improved fruit size and shape compared to previous years. Overall yield increased. As a result of the 2023 harvest, we received a harvest of doubled and improved quality compared to the previous year. The results of the above research confirm that we can combat the problems arising from climate change with modern technologies, one of the main components of which is the use of biostimulants adapted to the climate and culture and the implementation of the necessary complex measures.

References:

1. (n.d.). Retrieved from https://pmc.ncbi.nlm.nih.gov/static/img/ncbi-logos/nih-nlm-ncbi--white.svg
2. (2004). *Colette Navarre, Françoise Langlade - Enology*. Tbilisi.
3. (2014). *Winemaking - According to Emile Peynot - "Union of Traditional Winemaking of Georgia"*. Tbilisi.
4. Peino, E. (2014). “ *Winery* ”.
5. Baghaturia, N. (2015). *Enology (Wine Production and Winemaking)*. Tbilisi.
6. Lortkipanidze, R., & Kheladze, M. (2015). *Agroecological monitoring.* Kutaisi.
7. Kharaishvili, E. (2017). *Wine Market and Competitive Models of Viticulture-Winery Diversification in Georgia.* Tbilisi.
8. (2018). *Private Sector Development and Vocational Training in the South Caucasus (TVET SC).* Winemaking (Textbook). Tbilisi.
9. (2021). *Viticulture textbook*. Tbilisi.
10. Razmadze, G. (2022). *Regenerative Agriculture*. Tbilisi.