TECHNICAL UNIVERSITY OF MOLDOVA

Manuscript title

C.Z.U.: 634.232:631.5(043)

LOZAN ANDREI

OPTIMIZATION OF SWEET CHERRY PRODUCTION TECHNOLOGY BASED ON GROWTH REGULATORS AND STORAGE METHOD

SPECIALTY 411.06 - FRUIT GROWING

Summary of doctoral thesis in agricultural sciences

CHISINAU, 2025

The thesis was developed within the Department of Horticulture and Forestry, Faculty of Agricultural, Forestry and Environmental Sciences, Technical University of Moldova

Scientific supervisor:
PEȘTEANU Ananie, doctor, associate professor

Members of the Scientific Committee for public defence of the doctoral thesis:
1. BALAN Valerian, **president,** habilitated doctor, professor, Technical University of Moldova.
2. MANZIUC Valerii, **scientific secretary**, doctor, associate professor, Technical University of Moldova.
3. PEȘTEANU Ananie, **member**, doctor, associate professor, Technical University of Moldova.
4. BUJOREANU Nicolae, **member**, habilitated doctor, associate researcher, Institute of Genetics, Physiology and Plant Protection of USM.
5. ISTRATE Mihai, **referent**, doctor, professor, University of Life Sciences "Ion Ionescu de la Brad", Iasi, Romania.
6. CUMPANICI Andrei, **referent,** doctor, associate professor, Technical University of Moldova.
7. GROSU Ion, **referent**, doctor, associate researcher, IP National Institute for Applied Research in Agriculture and Veterinary Medicine.

Thesis presentation will take place on 27.05.2025, at 14:00, in the meeting of the Scientific Committee for public defence of the doctoral thesis of the Technical University of Moldova (www.utm.md) at the address: MD 2049, Chisinau, 48, Mircesti str., block 14A, room 100, Horticulture and Forestry Department.

The PhD thesis and the summary can be consulted at the Scientific Library of the Technical University of Moldova and on the website of the ANACIP (www.anacec.md) and on the TUM website (www.repository.utm.md).

The summary was sent on 23.04.2025

Scientific Secretary of the Committee of Public Defence,
MANZIUC Valerii, doctor, associate professor

Supervisor,
PESTEANU Ananie, doctor, associate professor

Author: LOZAN Andrei

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CONCEPTUAL LANDMARKS OF THE THESIS

Topicality and importance of the problem addressed. Sweet cherry is a valuable species for the horticultural sector of the Republic of Moldova due to its nutritional, technological and commercial attributes, which provides consumers with early fruits with exclusive appearance and taste, realizing significant production every year [3; 6; 7]. In 2024, 13.6 thousand tons of sweet cherries were exported from our country, worth 17.6 million USD [23].

However, sweet cherry is a challenging and high-risk crop to produce, store and market. As a result of the climate changes that have occurred over the last period of time, sweet cherry orchards are more frequently influenced by multiple abiotic and biotic factors, which require fruit producers to implement new technological elements in the production value chain in order to obtain high, constant and competitive harvests [2; 9; 10; 15].

Along with the modern technologies used in the development of the sweet cherry production sector, both in terms of quantity and quality, a major role is played by growth regulators, which have become a pressing necessity at certain stages of tree development [3*; 17; 18]. In sweet cherry breeding practice, auxins (NAD, NAAs) [3; 6*; 10*; 12*; 18; 21], gibberellins (GA_3) [14; 16] and ethylene inhibitors (AVG) [4], which, when applied during flowering and pre-harvesting periods increase fruit set and yield and improve the commercial fruit quality [5*; 11*; 12; 13; 20; 21].

Sweet cherries are highly perishable fruits, and the short harvesting season, together with the soft texture and low starch fruit content, limits their availability on the market for longer periods. Under normal atmospheric storage conditions, the shelf-life of sweet cherries is very short, 1-2 weeks, and they frequently cannot be made available to consumers at the demanded quality [5; 11]. The fresh appearance of the skin, green stem, specific flavour and texture are important physiological characteristics of sweet cherries that the consumer wants to see, qualities that are frequently negatively influenced during storage [1; 8; 9*].

A reliable solution for storing sweet cherries is using the modified atmosphere packing, which has a specific permeability for the diffusion of gases and relative humidity through the packaging film. Thus, in a short period of time, a balanced concentration of gases (CO_2, O_2, ethylene) and moisture is formed in these packages, thus natural spoilage processes are reduced, including oxidation of biochemical compounds in fruits and the development of pathogens in the post-harvest period [1; 4*; 20].

In the context of the opportunities to access the European fruit market, sweet cherry producers in the Republic of Moldova need to align with the new requirements for the fruit production and storage in order to maintain quality parameters over a longer period of time, and

for this, further investigations are needed.

Aim of the work is to evaluate the interaction of growth regulators on the degree of fruit set, increased productivity of sweet cherry orchard, as well as the method of storage at the post-harvest stage to maintain fruit quality for a longer period of time.

Research objectives include:

1. Studying the bioconstructive parameters of sweet cherry trees in relation to variety and growth regulators applied to increase the degree of fruit set and production.
2. Estimation of orchard productivity and fruit quality as a function of variety and growth regulators applied in the sweet cherry production technological chain.
3. Determining the degree of influence of storage method and period on gas concentration, physico-chemical and microbiological parameters, appearance and quality of fruit.
4. Economic estimation of the impact of growth regulators on orchard productivity and post-harvest storage method on fruit quality.

Research hypothesis. The technology used by sweet cherry producers for growing and storing sweet cherries under normal atmospheric conditions gives positive but not constant results from year to year; yields are not always adequate for the structure of the orchard and the variety/rootstock association. It is difficult to protect the fruits and stems from dehydration and to maintain the initial quality of the fruit; fungal diseases develop and physiological disorders occur. The use of growth regulators at different stages of fruit development in cultivated varieties would make it possible to develop methods to increase the degree of fruit set and orchard productivity, and their storage in different types of modified atmosphere packaging would make it possible to maintain the initial quality of the fruit in the post-harvest period, with priority destination for export.

Scientific research methodology. To prove the hypothesis, conventional research methods specific to the field of fruit growing and storage, described in specialized literature, were used. To obtain complementary data on the interaction of growth regulators on phytometric and fruiting indicators in late-ripening sweet cherry varieties and on the method of storage to maintain the initial fruit quality in the post-harvest period, methods such as morphological descriptions, biometrical evaluations, physiological and biochemical analyses, observation and experiment. Methods of analysis, comparison, synthesis, induction, deduction, graphical and tabular illustration of the collected data were applied to the interpretation of the results, which were subsequently systematized by mathematical and statistical methods, with subsequent verification of the theoretical data from production.

Scientific novelty and originality. For the first time in the country, new experimental

data were obtained on the influence of growth regulators on increased fruit set and yield in intensive sweet cherry orchards (NAD, NAA, GA_3, AVG) [1*; 2*; 4*; 6(*); 8*], as well as the impact of method and storage period on the maintenance of sweet cherry quality during the post-harvest period [2*; 5*; 7*; 9*].

Important scientific problem solved. The influence of growth regulators of different origin, dosage and period of application on the increase of fruit set, orchard productivity, as well as the method of storage on the maintenance of quality indices and the decrease of fruit damage by different sweet cherry pathogens in the post-harvest period was scientifically argued and experimentally demonstrated.

Theoretical relevance. The study contributes to the completion of the scientific database on the reaction of sweet cherry trees to the application of growth regulators on the degree of fruit set, orchard productivity, and by means of the progressive method of storage - to maintain the high quality of sweet cherries in the post-harvest period. The results presented in the paper can be used as a basis for theoretical concepts to supplement the sweet cherry production and storage value chain with new technological elements in order to obtain high, constant, competitive quality harvests and to enable consumers to enjoy the fruit freshness for a longer period.

Applicative value. It is reflected in the recommendations on the application of growth regulators to increase the degree of fruit set, orchard productivity in varieties with a higher share in the structure of sweet cherry areas in the country, as well as highlighting the most effective method and optimal period of sweet cherry preservation, providing consumers with access to a quality production in demand for an extended period.

Approval of the work in national and international scientific forums. Theoretical and applied aspects of the research have been presented and approved at various international and national scientific events, such as the International Scientific Symposium "Modern Horticulture - achievements and perspectives" (October 1-2, 2018, UASM, Chisinau); National Scientific Symposium "Growth regulators and productivity of agricultural crops", dedicated to the 110th anniversary of the birth of Prof. L.V. Kolesnik" (2020, Chisinau); International Agriculture Congress (December 16-17, 2021, Turkey); International Scientific Symposium "Agro-Food Sector - Achievements and Perspectives" (November 19-20, 2021, UASM, Chisinau); International Conference "Agriculture for Life, Life for Agriculture". (June 6-8, 2023, USAMV Bucharest, Romania) and the International Scientific Conference "Plant Genetics, Physiology and Plant Breeding" (7th edition, 2024, Chisinau, Moldova).

Volume and structure. The work includes: introduction, 4 chapters, conclusions and recommendations, 136 pages of basic text, bibliography with 291 sources, 36 tables, 6 figures

and 8 annexes.

THESIS CONTENT

The introduction describes the topicality and importance of the problem addressed, the need to study the impact of growth regulators on fruit set, orchard productivity and the method of storage to maintain high quality of sweet cherries in the post-harvest period. The aim, objectives and methodology of the scientific research are specified, the summary of the thesis compartments is presented, as well as the approval of the scientific results.

1. INFLUENCE OF GROWTH REGULATORS AND STORAGE METHOD ON SWEET CHERRY FRUIT PRODUCTION AND QUALITY

The chapter includes data analysis of literature data in relation to the research topic addressed. The updated information on the development of sweet cherry cultivation worldwide and nationally, biological, growth and fruiting particularities of the given species, the influence of growth regulators of different origin on sweet cherry varieties, the application dosage to enhance fruit set and orchard productivity were specified. The analysis of factors influencing the quality and storage period of sweet cherries, different types of films, gas regime formed in modified atmosphere packaging to maintain the quality parameters of sweet cherries was carried out. As a result of critical literature review, the research hypothesis was developed.

2. OBJECTIVES, METHODS AND RESEARCH CONDITIONS

2.1. Research objectives

The biological material used in the experiments is represented by sweet cherry trees of Kordia and Regina varieties, grafted on Gisela 6 rootstock [14].

2.2. Organization and location of experiments

To obtain scientifically substantiated results and achieve the proposed objectives, three experiments were organized. The first two experiments were organized in the period 2019-2020 in the sweet cherry orchard of the enterprise LLC "Staragro Group", Ustia village, Dubasari rayon. The orchard was established in the spring of 2015, using one-year-old trees of Kordia and Regina varieties, grafted on Gisela 6 rootstock. The planting spacing was 4.0 x 2.0 m, and the trees were trained as thin spindle crown.

Experiment 1. Influence of growth regulators on the degree of fruit set to increase the yield of sweet cherry orchard. To solve this objective, the following growth regulators were studied in Kordia and Regina varieties: B_1 - Spraying with water at full flowering stage (control); B_2 - Treatment with the product Stimolante 66f (NAA, 0.1 g/l), full dose 0.3 l/ha, two times: the first at the 30% flowering stage of the trees, and the second - after petal fall; B_3 - Treatment with the product Gobbi Gib 2LG (GA_3, 20.54 g/l), full dose 0.5 l/ha, two times: the

first at the 70% flowering stage of the trees and the second - after petal fall; B_4 - Treatment with the product ReTain (AVG, 150 g/kg) at 0.4 kg/ha at the 30% flowering stage of the trees; B_5 – Treatment with the product ReTain (AVG, 150 g/kg) at 0.8 kg/ha at the 30% flowering stage of the trees.

Experiment 2. Influence of growth regulators on orchard production and sweet cherry fruit quality. To solve this objective, the influence of two growth regulators, Gobbi Gib 2LG (GA_3, 20.54 g/l) and Auxiger LG (NAA, 6.7 g/l + NAD, 16.9 g/l), was studied in Kordia and Regina varieties, according to the following scheme of the experiment: C_1 - Spraying with water when fruit diameter is 12-13 mm (control); C_2 - Treatment with Gobbi Gib 2LG product when sweet cherry colour changes from green to yellow, dose 1.0 l/ha; C_3 - Treatment with Auxiger LG at fruit diameter 12-13 mm with 0,5 l/ha dosage; C_4 - Treatment with Auxiger LG at fruit diameter 12-13 mm with 0,7 l/ha dosage; C_5 - Treatment with Auxiger LG at fruit diameter 12-13 mm with 0,9 l/ha dosage.

Experiment 3. Influence of storage method and period on sweet cherry fruit quality. The fruits were collected from the commercial orchard of the enterprise SRL "Farm-Prod", Olanesti village, Stefan Voda rayon. The orchard was established in 2015 with Knip trees, planting distance 4.0 x 1.5 m; the trees were trained as thin spindle. To solve this task, a three-factor experiment was set up with the following gradation:

Factor S - Variety, where: S_1 - Kordia variety; S_2 - Regina variety.

Factor SM - Storage method of sweet cherries, where: SM_1 - Storage in normal atmosphere (NA) as control; SM_2 - Storage in Trendlife MAP; SM_3 - Storage in Decco MAP; SM_4 - Storage in ESL MAP; SM_5 - Storage in Xtend MAP.

Factor AS - Fruit quality assessment stage during the storage period, where: AS_1 - At setting in storage; AS_2 - At 2 weeks; AS_3 - At 4 weeks; AS_4 - At 5 weeks; AS_5 - At 6 weeks.

The research focused on this experience was carried out during 2019, 2020 and 2022 in the laboratories of the Faculty of Food Technology, TUM, and the Faculty of Horticulture, UASM.

2.3. Research methods

Investigations were carried out in the field according to the general methods for conducting experiments with fruit species, where biometric evaluations were performed [22], and in the laboratory, where physiological, spectrophotometric and biochemical analyses were performed using specific methods.

The investigations were performed with calibrated equipment and according to standardized methods, where the following indicators were studied: tree height and crown width, trunk diameter, average and summed length of annual branches, leaf area, number of

bunch branches and solitary buds, number of flowers, viability of flowers on different areas of the crown, degree of fruit set, number of fruits, fruit yield and quality (average weight, morphological parameters, firmness, soluble dry solids, titratable acidity, cracking degree).

The gas concentration (CO_2, O_2) was dynamically monitored by measuring with avi-gas Texa equipment, and relative humidity - with Humidity Meter 46011 TR Turoni. The ICA56 ethylene analyser, was used to determine the endogenous ethylene content, according to SM ISO 3659:2015 [26]. The firmness of sweet cherries was determined using the digital penetrometer FR 5120, with a piston with a surface area of 3 mm^2. The soluble dry solid content was determined by refractometric method according to SM ISO 2173:2014, using the portable device ATA60 N-20E, which expresses the data in Brix [24]. Titratable acidity was determined by the potentiometric method SM ISO 750:2014, and fruit pH - according to SM ISO 1842:2015 [24]. Determination of polyphenolic substances content was performed using Folin-Ciocalteu reagent according to Singleton V.L. et al. (1999) [19]. The anthocyanin content was carried out by spectrophotometric method at the wavelength of 540 nm, according to the methodical guidelines on the performance of laboratory work of the UTM [25]. Ascorbic acid content was determined spectrophotometrically according to ISO 6557-1:1986 [25].

The statistical analysis and interpretation of the obtained results was carried out by dispersion analysis, based on ANOVA, using the STATGRAPHICS 18 software package. In the tables, the results are presented as mean±standard deviation, and in the pictures the error bars represent the standard deviation of the research data. The graphical, tabular and textual presentation was performed using Microsoft 365 Office package.

2.4. Characteristics of the research conditions

The climatic conditions in the research years, during the flowering and fruit set phase, created favourable conditions for flower pollination and fertilization, tree growth and fruiting, except in the spring of 2020, when low temperatures affected flower viability in the Kordia variety. The soil is characterized by carbonated clay-loamy cernozem, and the techniques on the experimental plots were in accordance with the recommendations put forward for sweet cherry cultivation.

3. INFLUENCE OF GROWTH REGULATORS ON DEVELOPMENT, PHOTOSYNTHETIC ACTIVITY, PRODUCTIVITY AND ECONOMIC EFFICIENCY

3.1. Influence of growth regulators on phytometric indicators and leaf area of sweet cherry trees

Tree height. The higher height of the vegetative set for trees of the studied varieties was recorded in 2020 (320.3-338.4 cm) compared to 2019 (270.3-297.4 cm) (Table 3.1).

Insignificantly higher mean value in the control variant was obtained for trees of Regina variety (316.0 cm) compared to those of Kordia variety (312.3 cm). During the research, in the studied varieties, the growth regulators Gobbi Gib 2LG, 0.5 l/ha and ReTain, 0.8 kg/ha had a significant interaction on the height of the trees, while the variants Stimolante 66f, 0.3 l/ha and ReTain, 0.4 kg/ha showed an insignificant increase compared to the control variant. The multi-annual average results show that, according to the mode of interaction on the studied parameter, the growth regulators can be divided into two groups: low-acting (Stimolante 66f, 0.3 l/ha - 315.5 cm; ReTain, 0.4 kg/ha - 314.7 cm) and impactful (Gobbi Gib 2LG, 0.5 l/ha - 309.0 cm; ReTain, 0.8 kg/ha - 305.8 cm).

Table 3.1. Height of sweet cherry trees according to variety and growth regulators applied during flowering period, cm

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	287.2±7.1	337.4±11.7	312.3	297.4±6.4	334.5±6.8	316.0
Stimolante 66f, 0.3 l/ha	283.5±9.9	331.3±12.3	307.4	292.5±9.0	338.4±7.0	315.5
Gobbi Gib 2LG, 0.5 l/ha	270.3±8.5	325.5±8.1	297.9	287.4±8.1	330.5±11.3	309.0
ReTain, 0.4 kg/ha	274.8±8.0	330.8±10.5	302.8	293.3±6.8	336.0±12.1	314.7
ReTain, 0.8 kg/ha	271.3±9.6	320.3±10.7	295.8	283.8±5.0	327.7±8.0	305.8
DL 5%	12.7	14.3	-	13.4	14.4	-

Crown width. The values registered on sweet cherry trees of both varieties grafted on the Gisela 6 rootstock are considered optimal for this age period, ranging from 222.3 to 238.1 cm (Table 3.1). A greater crown width in 2019 was recorded in the trees of Regina (242.0 cm) compared to those of Kordia (234.6 cm). In the year 2020, an opposite rule was obtained, constituting 237.5 and 241.5 cm, respectively. An insignificantly greater width was registered in trees of Kordia variety (238.1 cm) compared to those of Regina variety (236.3 cm). A significant decrease in the given parameter was obtained only in ReTain, 0.8 kg/ha, where the crown width amounted to 222.6-227.9 cm compared to the control (234.6-242.0 cm), which is also confirmed by statistical data.

Tree trunk diameter. Higher values of the respective parameter were registered in both varieties in 2020 (115.6-118.5 cm) compared to spring 2019 (86.6-87.9 mm), constituting an increase with advancing age of 29.3-30.6 mm. The year of management influences trunk development through fruit production, registering a smaller increase in 2019 in Kordia (14.0 mm), and in 2020 in Regina (12.3 mm). A significant influence on the development of the studied parameter was registered in ReTain, 0.8 kg/ha (99.1-112.2 mm) compared to the control (101.9-118.5 mm). In the other variants, the influence of the studied growth regulators was not so evident (99.6-116.6 mm), which is also confirmed by the statistical data.

Average annual branch length. In 2019, lower values of the studied parameter were obtained in Kordia (58.1 cm) than in Regina (67.3 cm), an increase of 15.8%. Growth regulators

differentially influence the average length of annual branches in both varieties, with lower values recorded in the variants treated with ReTain, 0.8 kg/ha (45.0-61.0 cm), Gobbi Gib 2LG, 0.5 l/ha (46.4-64.1 cm), compared to the control (54.8-69.6 cm). Average values (51.7-67.1 cm) were recorded in the other variants. The statistical analysis of the data shows that the mean annual branch length is obviously determined by the *year-variety* interaction (74.36%), *treatments* (14.96%) and *variety* (3.58%) with a significant impact for $p \leq 0.001$.

Summed annual branch length. The given parameter is increasing due to a more balanced development of the trees, registering higher values for Kordia trees in 2020 (37.6 m/tree); 44.1% increase compared to 2019 (26.1 m/tree). In trees of Regina variety, as a result of higher fruit production in 2020 there was a decrease in the given parameter by 7.8%. An obvious relationship of the influence of variety on the summed length of annual branches was not evidenced. A higher sum of annual branch length was recorded in control (26.1-37.6 m/tree) than in the other variants, where growth regulators were applied (19.8-28.7 m/tree). The variants treated with growth regulators ReTain, 0.8 kg/ha and Gobbi Gib 2LG, 0.5 l/ha significantly decreased the studied parameter, constituting 19.8-28.7 and 21.3-31.4 m/tree, respectively. The other variants showed average values (22.5-33.8 m/tree).

Leaf area. A higher value of the studied parameter was registered for both varieties in 2020 (17.900-18.800 m^2/ha) compared to 2019 (16.200-17.300 m^2/ha) (Table 3.2). Studying the interaction of variety on leaf area (years 2019-2020), it is noted that there was no obvious rule for one variety (17.500-17.600 m^2/ha). However, in separate years, a higher value of leaf area was recorded in 2019 for trees of Regina variety (17.300 m^2/ha) and in 2020 for trees of Kordia variety (18.800 m^2/ha). An obvious decrease of this parameter was observed in ReTain, 0.8 kg/ha (15.100-17.200 m^2/ha) and Gobbi Gib 2LG, 0.5 l/ha (15.500-17.600 m^2/ha) compared to control (16.200-18.800 m^2/ha).

Table 3.2. Leaf area of the sweet cherry orchard according to variety and growth regulators applied during flowering period, thousand m^2/ha

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	16.2±0.4	18.8±0.6	17.5	17.3±0.5	17.9±0.5	17.6
Stimolante 66f, 0.3 l/ha	15.9±0.5	17.8±0.6	16.9	16.9±0.3	17.4±0.6	17.2
Gobbi Gib 2LG, 0.5 l/ha	15.5±0.4	17.6±0.7	16.6	16.5±0.4	17.0±0.4	16.8
ReTain, 0.4 kg/ha	15.6±0.5	18.1±0.5	16.9	16.7±0.6	17.4±0.3	17.1
ReTain, 0.8 kg/ha	15.1±0.6	17.2±0.4	16.2	15.9±0.5	16.5±0.7	16.2
DL 5%	0.7	1.0	-	0.8	0.9	-

3.2. Influence of growth regulators on the main indicators of fruiting and fruit quality

3.2.1. Number of fruit buds

Number of spur and solitary buds. Higher number of spur buds was recorded in 2019 in trees of Regina variety (231.4-247.5 pcs/tree) compared to Kordia variety (210.7-226.0

pcs/tree). In 2020, higher values were characteristic for trees of Kordia variety (253.6-278.5 pcs/tree), but any specific relationship on the number of spur buds was not evidenced. The growth regulators had insignificant interaction on the studied parameter, in the variants Gobbi Gib 2LG, 0.5 l/ha and ReTain, 0.8 kg/ha, scoring lower values (237.6 and 239.8 pcs/tree), compared to control (247.3 pcs/tree), and when applying Stimolante 66f, 0.3 l/ha and ReTain, 0.4 kg/ha, approximately similar to the previous variant (240.5 and 241.7 pcs/tree, respectively). The mean number of solitary buds during the studies in Kordia trees did not undergo major deviations (168.6 and 169.8 pcs., respectively), but in Regina trees a decrease of 20.6% was recorded. Studied growth regulators had an influence on the number of separately formed solitary buds, the increase in the case of Kordia being 1.2-13.4%, and Regina of 0.4-5.9%.

Number of flowers. The number of flowers during the research is increasing in both varieties, with higher values in 2020 (3270-3410 pcs/tree), an increase compared to the previous year by 5.7-16.4% (Table 3.3). Lower values of this parameter were recorded in the variants treated with ReTain, in the doses of 0.4 and 0.8 kg/ha (2,683-3,205 pcs/tree) compared to control (2,929-3,410 pcs/tree). In the variants treated with Stimolante 66f, 0.3 l/ha and Gobbi Gib 2LG, 0.5 l/ha, the number of flowers marked average values (2,850-3,240 pcs/tree).

Table 3.3. Number of flowers in sweet cherry trees by variety and growth regulators applied during flowering period, pcs/tree

Experience variants	Kordia variety			Regina variety		
	2019	2020	2021	2019	2020	2021
Control	2,558±87	2,929±58	3,410±52	2,356±59	3,095±77	3,270±76
Stimolante 66f, 0.3 l/ha	2,540±52	2,850±86	3,240±43	2,415±63	2,926±87	3,200±52
Gobbi Gib 2LG, 0.5 l/ha	2,579±63	2,915±76	3,470±65	2,324±69	3,005±65	3,240±73
ReTain, 0.4 kg/ha	2,604±62	2,740±84	3,205±85	2,395±70	2,900±74	3,170±81
ReTain, 0.8 kg/ha	2,537±71	2,683±91	3,120±39	2,317±65	2,845±81	3,050±37
DL 5%	124.7	138.2	159.3	115.4	147.1	154.7

Degree of fruit set. Higher values of the studied parameter (Table 3.4) were recorded in 2019 in Kordia trees (28.3%) compared to Regina trees (23.8%). Low temperatures in spring 2020 decreased the degree of fruit set in Kordia (14.3%), which, in the end, also influenced the average values in favour of Regina (24.7%) compared to the previous variety (21.5%).

Table 3.4. Degree of fruit set according to variety and growth regulators applied during flowering period, %

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	28.7±0.8	14.2±0.4	21.5	23.8±0.4	25.6±0.5	24.7
Stimulant 66f, 0.3 l/ha	32.3±1.0	17.8±0.5	25.1	25.5±0.8	29.5±0.8	27.5
Gobbi Gib 2LG, 0.5 l/ha	34.4±0.9	21.2±0.5	27.8	29.2±0.9	31.8±0.9	30.5
ReTain, 0.4 kg/ha	34.4±0.7	19.1±0.7	26.8	27.2±0.7	30.0±0.6	28.6
ReTain, 0.8 kg/ha	41.3±1.1	28.4±1.0	34.9	35.5±0.8	36.3±0.7	35.9
Average	34.2	20.1	27.2	28.2	30.6	29.4

Growth regulators had a separate influence on the degree of fruit set in the studied

varieties, with higher values in ReTain, 0.8 kg/ha (34.9-35.9%). Variants treated with Gobbi Gib 2LG, 0.5 l/ha, ReTain, 0.4 kg/ha and Stimolante 66f, 0.3 l/ha had average values of 27.8 and 30.5%; 26.8 and 28.6% and 25.1 and 27.5%, respectively, compared to control (21.5-24.7%).

Statistical analysis of the data revealed that the degree of fruit set is determined primarily by the interaction of *year-variety* (37.83%), *treatments* (37.72%*)* and *year* (18.94%). The interaction of *year-treatments* had an insignificant influence on this parameter.

Number of fruits. A higher number of fruits was recorded in 2019 (Table 3.5) in the crown of Kordia trees (730.0-734.1 pcs.) compared to Regina trees (560.7-557.2 pcs.) In the case of 2020 an opposite rule was determined in Regina trees (787.3-791.8 pcs.). On average over the research years, a higher number of fruits was recorded in Regina trees (672.3-676.3 pcs.) than in Kordia trees (575.2-575.0 pcs.). A higher value of the studied parameter, as well as the average over this period, was recorded in ReTain, 0.8 kg/ha (904.4-928.1 pcs/tree), which was an increase compared to control of 37.2-57.3%. The variants treated with Gobbi Gib 2LG, 0.5 l/ha; ReTain, 0.4 kg/ha and Stimolante 66f, 0.3 l/ha had average values (663.9- 816.3 pcs/ha) compared to control (575.0-676.3 pcs/plot) and ReTain, 0.8 kg/ha.

Table 3.5. Number of fruits in the crown of sweet cherry trees according to variety and growth regulators applied during flowering period, pcs

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	734.1±15.8	415.9±12.2	575.0	560.7±15.9	791.8±22.2	676.3
Stimulant, 0.3 l/ha	820.4±25.8	507.3±15.0	663.9	615.8±16.3	863.2±24.4	739.5
Gobbi Gib 2LG, 0.5 l/ha	887.2±23.4	617.1±20.9	752.1	678.6±17.8	954.1±22.7	816.3
ReTain, 0.4 kg/ha	895.8±28.3	523.3±20.1	709.6	651.4±13.1	870.0±25.9	760.7
ReTain, 0.8 kg/ha	1,047.8±31.2	761.1±17.3	904.4	822.5±23.8	1,033.7±31.0	928.1
DL 5%	41.1	32.1	-	35.4	50.3	-

The growth regulators applied in the pre-harvest period had no major influence on the number of fruits in the crown, the difference between control and Auxiger LG, 0.9 l/ha on average in Kordia being 4.2% and in Regina of 2.7%. In the other variants the difference compared to the control was much smaller.

3.2.2. Fruit production

Fruit yield. In general, Kordia variety (2019) (Table 3.6) is characterized by high fruit yields (9.92-10.11 t/ha), although in 2020, Regina (11.23-11.29 t/ha) overtook it. The average yield over the research years, in the control variant of Regina, was 21.9% higher in Kordia. When growth regulators were applied during bloom period, a higher average yield was achieved in ReTain, 0.8 kg/ha (11.06-12.34 t/ha), followed by Gobbi Gib 2LG, 0.5 l/ha (9.94-11.20 t/ha), ReTain, 0.4 kg/ha (9.37-10.52 t/ha) and Stimolante 66f, 0.3 l/ha (9.01-10.49 t/ha).

Statistical data analysis established that fruit yield is primarily determined by the

interaction of *year-variety* (64.45%), *treatments* (20.44%) and *variety* (11.45%), where the impact is calculated for $p \leq 0.001$. The *variety-treatment* interaction is insignificant.

Table 3.6. Sweet cherry production by variety and growth regulator applied during flowering period, t/ha

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	10.11±0.41	5.86±0.13	7.99	8.19±0.29	11.29±0.30	9.74
Stimolante 66f, 0.3 l/ha	10.85±0.39	7.18±0.15	9.01	8.98±0.25	12.00±0.22	10.49
Gobbi Gib 2LG, 0.5 l/ha	11.38±0.33	8.50±0.23	9.94	9.45±0.28	12.94±0.25	11.20
ReTain, 0.4 kg/ha	11.38±0.37	7.36±0.29	9.37	9.06±0.23	11.97±0.30	10.52
ReTain, 0.8 kg/ha	12.54±0.36	9.59±0.34	11.06	11.06±0.34	13.62±0.43	12.34
DL 5%	0.42	0.33	-	0.39	0.53	-

The growth regulators applied in the pre-harvest period (Table 3.7) were higher in the variants treated with Gobbi Gib 2LG, 1.0 l/ha (8.91-10.78 t/ha), Auxiger LG, 0.7 l/ha (9.06-10.93 t/ha) and Auxiger LG, 0.9 l/ha (9.09-10.74 t/ha). The difference between these variants and the control was 11.0-13.2% for Kordia and 11.0-11.4% for Regina.

Table 3.7. Production of sweet cherry orchard according to variety and growth regulators applied in the pre-harvest period, t/ha

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	9.92±0.41	6.15±0.13	8.03	8.14±0.29	11.23±0.30	9.68
Gobbi Gib 2LG, 1.0 l/ha	10.92±0.26	6.89±0.17	8.91	9.21±0.24	12.35±0.25	10.78
Auxiger LG, 0.5 l/ha	10.37±0.45	6.23±0.26	8.30	8.79±0.31	11.69±0.28	10.24
Auxiger LG, 0.7 l/ha	11.22±0.27	6.89±0.23	9.06	9.25±0.38	12.61±0.23	10.93
Auxiger LG, 0.9 l/ha	11.15±0.31	7.04±0.29	9.09	9.23±0.41	12.26±0.46	10.74
DL 5%	0.47	0.29	-	0.42	0.51	-

3.2.3. Fruit quality

Average fruit weight. Higher values of the given parameter in both experiments (Table 3.8), the control version, were recorded in 2020 for Kordia fruits (11.70-11.73 g), and in 2019 for Regina fruits (11.68-11.71 g).

Table 3.8. Average crown fruit weight of sweet cherry trees by variety and growth regulators applied during flowering period, g

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	11.00±0.30	11.73±0.27	11.37	11.71±0.43	11.41±0.33	11.56
Stimolante 66f, 0.3 l/ha	10.58±0.29	11.32±0.33	10.95	11.63±0.29	11.12±0.31	11.38
Gobbi Gib 2LG, 0.5 l/ha	10.38±0.33	11.01±0.35	10.70	11.00±0.35	10.85±0.32	10.93
ReTain, 0.4 kg/ha	10.17±0.36	11.26±0.31	10.72	11.14±0.26	11.01±0.37	11.08
ReTain, 0.8 kg/ha	9.55±0.32	10.07±0.37	9.81	10.77±0.34	10.54±0.19	10.65
DL 5%	0.51	0.57	-	0.61	0.54	-

Depending on the variety, an insignificantly higher average weight was recorded for Regina (11.55-11.56 g) compared to Kordia (11.29-11.37 g). ReTain, 0.8 kg/ha decreased this parameter by 6.0-14.2% compared to control (Table 3.10). The products Gobbi Gib 2LG, 0.5 l/ha and ReTain, 0.4 kg/ha had a significant influence on the studied parameter, and the variant treated with the product Stimolante 66f, 0.3 l/ha were insignificant (10.58-11.63 g) compared to control (11.00-11.73 g). Studying the interaction of growth regulators applied in the pre-harvest period (Gobbi Gib 2LG, Auxiger LG) (Table 3.9), a lower average fruit weight

was recorded only in the variant treated with Auxiger LG, 0.5 l/ha (11.05-12.07 g), but higher than in control (10.87- 11.70 g).

Table 3.9. Average crown fruit weight of sweet cherry trees by variety and pre-harvest growth regulators applied in the pre-harvest period, g

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	10.87±0.30	11.70±0.27	11.29	11.68±0.43	11.41±0.33	11.55
Gobbi Gib 2LG, 1.0 l/ha	11.95±0.34	12.95±0.21	12.45	12.83±0.26	12.36±0.29	12.60
Auxiger LG, 0.5 l/ha	11.05±0.25	12.07±0.32	11.56	12.62±0.36	11.78±0.32	12.20
Auxiger LG, 0.7 l/ha	12.00±0.29	12.58±0.25	12.29	12.98±0.39	12.76±0.38	12.87
Auxiger LG, 0.9 l/ha	11.82±0.37	12.68±0.29	12.25	12.71±0.45	12.25±0.35	12.48
DL 5%	0.53	0.57	-	0.59	0.54	-

In the variants where the growth regulators Gobbi Gib 2LG, 1.0 l/ha and Auxiger LG, in the doses of 0.7 and 0.9 l/ha were applied, the parameter studied ranged from 11.82 to 12.98 g. Increasing the treatment rate of Auxiger LG from 0.7 to 0.9 l/ha did not significantly increase the fruit weight.

Fruit morphological parameters. Growth regulators applied in the pre-harvest period destined to increase the fruit quality had a more significant contribution on the morphological fruit parameters. The large diameter in Auxiger LG, 0.7 l/ha in both varieties amounted to 30.0 mm. A more rational fruit distribution by large diameter (Table 3.10) was recorded for both varieties in the Auxiger LG, 0.7 l/ha variety, where fruits with diameter greater than 28 mm constituted 75.7-77.9%, compared to 54.8-58.2% in control. Average values were recorded in the other variants treated with growth regulators.

Table 3.10. Distribution of sweet cherry fruits by diameter according to variety and growth regulators applied in the pre-harvest period, % (average, years 2019-2020)

Experience variants	Kordia variety			Regina variety		
	Fruit size, mm					
	<24	24-28	>28	<24	24-28	>28
Control	2.6	42.7	54.7	0.0	41.9	58.1
Gobbi Gib 2LG, 1.0 l/ha	0.0	25.2	74.8	0.0	30.4	69.6
Auxiger LG, 0.5 l/ha	3.6	32.2	64.2	1.5	31.3	67.2
Auxiger LG, 0.7 l/ha	0.0	22.1	87.1	0.9	22.4	75.7
Auxiger LG, 0.9 l/ha	0.0	26.0	84.0	0.0	32.8	61.2

Variety and growth regulators influenced in some variants significantly the height, small and large diameter of sweet cherry fruits, in others - with a lesser degree. After statistical data analysis it was established that the large fruit diameter is primarily determined by the interaction *year-variety* (24.63%) and *treatments* (22.85%), followed by the interaction *variety-treatments* (10.33%). Variety and interactions *year-treatments* and *year-variety-treatments* had an insignificant impact on the studied parameter for $p \leq 0.001$.

Fruit firmness. In both experiments (Table 3.11), higher fruit flesh firmness was recorded in 2019 (0.61-0.62 kg/cm^2) compared to 2020 (0.57-0.59 kg/cm^2). In the studied varieties, an obvious relationship on fruit firmness was not recorded, a minor increase being recorded in Kordia (0.60-0.61 kg/cm^2) compared to Regina (0.59-0.60 kg/cm^2).

Table 3.11. Firmness of sweet cherry fruit depending on variety and growth regulators applied during flowering period, kg/cm^2

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	0.61±0.01	0.57±0.08	0.59	0.60±0.07	0.56±0.09	0.58
Stimolante 66f, 0.3 l/ha	0.63±0.10	0.61±0.09	0.62	0.61±0.08	0.57±0.10	0.59
Gobbi Gib 2LG, 0.5 l/ha	0.62±0.07	0.59±0.10	0.60	0.63±0.06	0.58±0.11	0.60
ReTain, 0,4 kg/ha	0.63±0.12	0.61±0.07	0.62	0.62±0.09	0.56±0.06	0.59
ReTain, 0,8 kg/ha	0.61±0.09	0.58±0.13	0.59	0.61±0.11	0.56±0.08	0.59
Average	0.62	0.59	0.61	0.61	0.57	0.59

Growth regulators applied during the flowering and pre-harvest periods showed a minor increase in fruit firmness (0.59-0.62 kg/cm^2), compared to the control (0.57-0.59 kg/cm^2). In the variants treated with growth regulators, no clear relationship on the studied parameter was recorded.

Soluble solids content. The studied varieties had a soluble solids content of 16.4-17.2% (Table 3.12), with a higher percentage of Kordia (16.5-17.2%) compared to Regina (15.9-17.1%). A higher percentage of this parameter was determined in 2019 (16.1-17.5%) compared to 2020 (15.8-17.3%).

Table 3.12. Concentration of soluble dry solids in sweet cherry depending on variety and growth regulators applied during flowering period, %

Experience variants	Kordia variety			Regina variety		
	2019	2020	Average	2019	2020	Average
Control	17.4±0.5	16.5±0.5	17.0	16.8±0.4	16.1±0.4	16.5
Stimolante 66f, 0.3 l/ha	16.8±0.6	17.3±0.3	17.0	16.1±0.5	15.6±0.6	15.9
Gobbi Gib 2LG, 0.5 l/ha	17.1±0.9	17.0±0.5	17.0	17.1±0.6	16.9±0.6	17.0
ReTain, 0,4 kg/ha	17.5±0.4	16.8±0.4	17.2	16.9±0.5	17.2±0.8	17.1
ReTain, 0,8 kg/ha	17.1±0.7	16.3±0.8	16.7	16.6±0.4	16.9±0.3	16.8
Average	17.2	16.8	17.0	16.7	16.5	16.6

A lower soluble solids content was recorded with the application of ReTain, 0.8 kg/ha (0.59%), while for the other variants the studied parameter showed the same or insignificantly higher values (0.59-0.62%). Growth regulators applied in the pre-harvest period had a clear influence on the studied parameter, increasing in the Kordia variety from 0.58% in control to 0.60- 0.61% in the treated variants. The soluble solids content in Regina fruit amounted to 0.57 and 0.59-0.62%, respectively. A higher increase in the studied parameter among the treated variants was recorded with the application of Auxiger LG, 0.9 l/ha (0.61%) and Gobbi Gib 2LG, 1.0 l/ha (0.61- 0.62%).

Titratable acidity. In the studied variants for Kordia and Regina, titratable acidity was 0.54-0.75%. A rule of the titratable acid content in fruit depending on the growth regulators applied during the flowering period was not identified, but for the years of research, a higher increase in this indicator was observed for the variety Kordia in 2019 in the variants: Stimolante 66f, 0.3 l/ha (0.75%) and ReTain, 0.4 kg/ha (0.66%). While application of growth regulators in the pre-harvest period, higher values of the studied parameter were recorded in the Gobbi Gib

2LG variant, 1.0 l/ha, where the average during the research was 0.63% in Kordia and 0.66% in Regina.

Degree of fruit cracking. The average over the course of the research shows that cherries of the Regina variety were 3.6 times less prone to cracking than those of the Kordia variety. Growth regulators applied during flowering period had a minor influence on the degree of fruit cracking. Treatments with growth regulators in the pre-harvest period had an obvious effect on the degree of cracking at 6 and 12 hours of immersion in water, which subsequently decreased significantly. In Kordia, during 24 hours of immersion in water, a lower degree of cracking was observed in fruits treated with Gobbi Gib 2LG, 1.0 l/ha (82.3%) and Auxiger LG, 0.9 l/ha (81.5%) compared to control (92.9%). A higher efficacy in reducing the degree of fruit cracking of Regina fruits was found with Gobbi Gib 2LG, 1.0 l/ha (30.4%) and Auxiger LG, 0.7 l/ha (31.9%) compared to control (41.3%).

3.3. Economic efficiency of growth regulators in sweet cherry trees

Among the studied varieties, a higher income from sales in control (Table 3.13) was recorded in Regina variety (420,770 lei/ha), the cost of production was lower (132,700 lei/ha), and the profit amounted to 288,060 lei/ha, which favoured a profitability level of 217.06%, compared to the value achieved by the Kordia variety (179.18%).

Table 3.13. Economic efficiency of sweet cherry fruit production by variety and growth regulators applied during flowering period (the average in 2019-2020)

Experience variants	Kordia variety				Regina variety			
	Sales income, thousand lei/ha	Cost of production, thousand lei/ha	Profit, thousand lei/ha	Level of profitability, %	Sales income, thousand lei/ha	Cost of production, thousand lei/ha	Profit, thousand lei/ha	Level of profitability, %
Control	361.15	129.52	231.79	179.18	420.77	132.71	288.06	217.06
Stimolante 66f, 0.3 l/ha	401.85	131.53	270.68	206.36	447.92	134.79	313.13	232.31
Gobbi Gib 2LG, 0.5 l/ha	437.36	130.95	305.00	230.43	470.40	135.79	334.61	246.42
ReTain, 0.4 kg/ha	417.90	131.42	280.43	203.99	449.20	139.87	309.33	221.16
ReTain, 0.8 kg/ha	481.11	131.58	337.52	235.06	512.11	146.70	365.41	249.09

A higher profit for both varieties was recorded in the variants: ReTain, 0.8 kg/ha (337.520-365.410 lei/ha) and Gobbi Gib 2LG, 1.0 l/ha (305.000-334.610 lei/ha). In these variants, the level of profitability was also higher, constituting 235.06-249.09 and 230.43-246.92%, respectively. The variants treated with the products ReTain, 0.4 kg/ha and Stimolante 66f, 0.3 l/ha had a lower level of profitability (203.99-232.31%).

Growth regulators applied during the pre-harvest period (Table 3.14) had a lesser influence on the economic efficiency of sweet cherry fruit production, with an increase in the level of profitability of Kordia from 6.04% in the Auxiger LG, 0.5 l/ha to 47.84% in the Auxiger LG, 0.9 l/ha, compared to control. Regina variety in Auxiger LG, 0.5 l/ha variant had the lowest yield (244.17%) and higher values were obtained in Auxiger LG, 0.7 l/ha (271.66%). The

variants treated with growth regulators Gobbi Gib 2LG, 1.0 l/ha and Auxiger LG, 0.9 l/ha recorded average values compared to the previous ones, constituting 254.13 and 271.66%, respectively.

Table 3.14. Economic efficiency of sweet cherry fruit production by variety and growth regulators applied in the pre-harvest period (the average in 2019-2020)

Experience variants	Kordia variety				Regina variety			
	Sales income, thousand lei/ha	Cost of production, thousand lei/ha	Profit, thousand lei/ha	Level of profitability, %	Sales income, thousand lei/ha	Cost of production, thousand lei/ha	Profit, thousand lei/ha	Level of profitability, %
Control	362.32	129.52	232.80	179.74	418.26	132.50	285.76	215.67
Gobbi Gib 2LG, 1.0 l/ha	416.83	131.53	285.30	216.91	479.70	135.46	344.24	254.13
Auxiger LG, 0.5 l/ha	374.23	130.95	243.28	185.78	460.67	133.85	326.82	244.17
Auxiger LG, 0.7 l/ha	423.86	131.42	292.44	222.52	502.89	135.31	367.58	271.66
Auxiger LG, 0.9 l/ha	431.03	131.58	299.45	227.58	487.64	134.82	352.82	261.70

4. THE INFLUENCE OF THE METHOD OF HARVEST ON FRUIT QUALITY

4.1. Influence of sweet cherry storage method and period on gas concentration and relative humidity

Carbon dioxide and oxygen concentrations. There was no significant difference in carbon dioxide and oxygen during storage between the studied varieties (Figure 4.1).

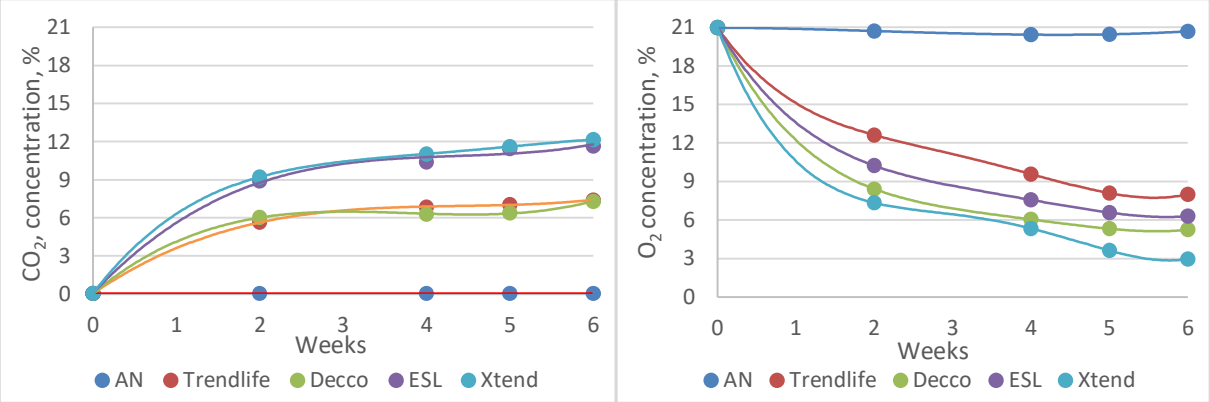

Figure 4.1. Dynamics of CO2 and O2 concentrations as a function of method and storage period of sweet cherry fruits, % (average, years 2019, 2020 and 2022)

After two weeks of storage of sweet cherries, the CO_2 concentration increased from 0.04% in the normal atmosphere to 5.65-9.23% while storage in modified atmosphere, from another side the O_2 concentration decreased from 20.69 to 7.33-12.60%, respectively. At the end of the storage period, the concentration of CO_2 and O_2 in the control version did not change significantly, constituting 0.06 and 20.67%, respectively. Storage in packages with controlled atmosphere increased the CO_2 concentration by 21-32% and the O_2 content decreased by 64-165% compared to the previous period. After six weeks of storage, for both varieties, the average CO_2 concentration values were lower in Decco (7.30%) and Trendlife (7.40%) packages, and higher in ESL (11.65%) and Xtend (12.15%), where the difference was 60-65% higher than in the first two types of packages. Related to the oxygen, a higher average concentration was found

in the Trendlife (7.70%) type of packages, followed by ESL (5.43%), Decco (4.01%) and Xtend (2.77%).

Ethylene concentration. Lower values of ethylene concentration were registered in normal atmosphere, showing a steady increase in both varieties at the end of the storage period (0.3-0.4 ppm). The ethylene concentration in Kordia at the end of the storage period in the modified atmosphere variants was 1.1-1.8 ppm, and in Regina it represented 0.6-1.7 ppm (Figure 4.2).

The concentration of ethylene also changes under the influence of the packaging included in the research, with higher values in the Xtend (1.7-1.8 ppm) and Trendlife (1.2-1.7 ppm) variants than in the Decco (0.6-1.1 ppm) and ESL (0.9-1.1 ppm) variants. A significant increase in ethylene concentration was observed during the last two weeks of storage of cherries in Xtend and Trendlife packages, which subsequently had a minor negative influence on the quality of the fruit stems.

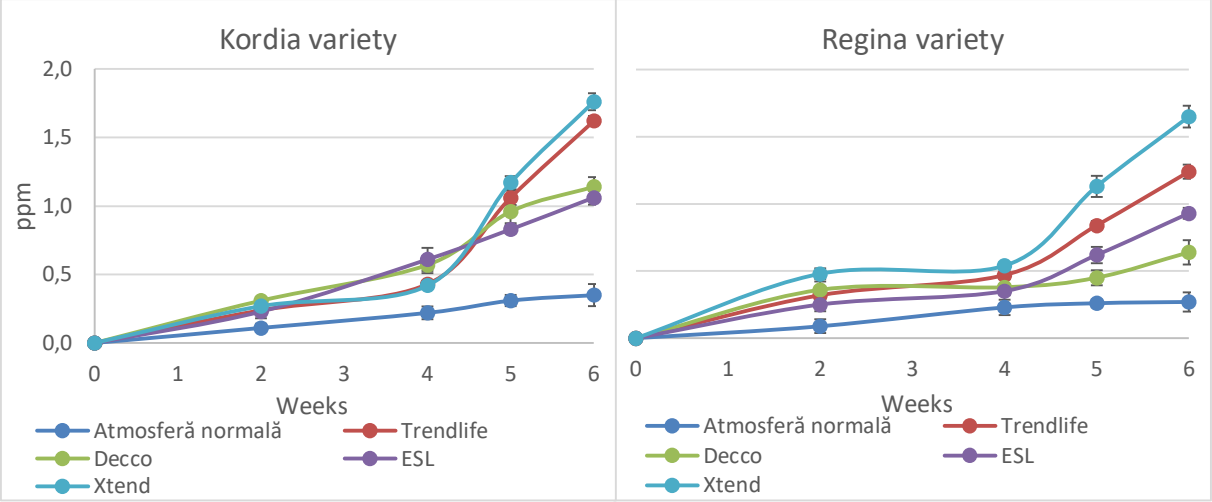

Figure 4.2. Ethylene concentration depending on the method and period of fruit storage, ppm, 2020

Relative humidity. The influence of variety on the studied parameter did not show any significant difference. Relative humidity increased more slowly (80.6-83.1%) in the normal atmosphere variants, with higher values in modified atmosphere packages (90.6-93.6%).

A higher average air relative humidity was recorded for both varieties in Decco packages (93.5-93.6%) compared to Trendlife, ESL and Xtend (90.3-91.7%). In modified atmosphere packaging (MAP), already after two weeks of storage, a more balanced relative air humidity was recorded, with Kordia at 88.3-94.3% and Regina - at 90.2-93.2%. In the following period of fruit storage, the given parameter showed minor changes, in some variants insignificantly increasing, others - decreasing.

4.2. Influence of storage method on physico-chemical fruit parameters

Fruit weight loss. In 2022, the Kordia variety fruits recorded higher weight losses (18.75%) compared to Regina variety (18.11%). The storage method had a significant impact

on this parameter, recording 18.11-18.75% in normal atmosphere, compared to packaging with modified atmosphere of 3.06-5.18%, where the degradation process of acids and carbohydrates proceeded more slowly in the post-harvest period (Table 4.1).

Table 4.1. Weight loss of fruit by method and period of fruit storage, %, 2022

Experience variants	Kordia variety			Regina variety		
	Evaluation period, weeks					
	2	4	6	2	4	6
NA (Control)	4.13±0.10	9.11±0.42	18.75±0.36	3.47±0.09	6.42±0.19	18.11±0.48
Trendlife	0.28±0.01	2.07±0.07	4.30±0.12	0.01±0.02	1.03±0.07	4.23±0.14
Decco	0.94±0.02	1.60±0.09	3.06±0.08	0.50±0.03	0.99±0.09	4.30±0.12
ESL	0.35±0.01	1.20±0.08	3.65±0.10	1.20±0.04	1.68±0.09	4.41±0.10
Xtend	0.10±0.00	0.57±0.02	4.56±0.15	0.32±0.05	1.54±0.07	5.18±0.11
Average MAP	0.42	1.36	3.89	0.51	1.31	4.53

On average over the years of research, Decco packages at the end of the storage period showed a lower rate of weight loss (4.04%) than ESL (4.90%), Xtend (5.36%) and Trendlife (5.49%). The difference in the rate of fruit weight loss is correlated with the relative humidity and oxygen concentration in the packages. In the studied varieties, fruit dehydration increased with the extension of the fruit storage period up to six weeks, with a 3.50-6.12-fold difference between the normal and MAP variants. The ANOVA test established that the fruit weight loss was primarily determined by the *method of storage*, which was 81.43% at two weeks and 97.24% at six weeks, with a significant impact for $p \leq 0.001$.

Fruit firmness. A higher value of the studied parameter was obtained in Kordia (0.61 kg/cm^2) compared to Regina (0.59 kg/cm^2) (Table 4.2). A lower average value during the storage period was identified in the normal atmosphere variant of 0.41-0.47 kg/cm^2, compared to 0.49-0.56 kg/cm^2 in MAP variants, which is associated with oxidation processes of organic compounds in the epidermis and pulp of sweet cherries. At the end of the storage period, a higher fruit firmness was recorded in Decco variant (0.46-0.50 kg/cm^2) compared to the other types of MAP (0.37-0.44 kg/cm^2).

Table 4.2. Dynamics of fruit firmness according to method and fruit storage period, kg/cm^2, 2022

Experience variants	Kordia variety				Regina variety			
	Evaluation period, weeks							
	2	4	6	Average *	2	4	6	Average *
NA (Control)	0.52	0.44	0.33	0.47	0.50	0.38	0.26	0.41
Trendlife	0.56	0.46	0.45	0.51	0.59	0.47	0.37	0.49
Decco	0.64	0.55	0.50	0.56	0.60	0.50	0.46	0.53
ESL	0.54	0.47	0.40	0.50	0.60	0.44	0.43	0.50
Xtend	0.56	0.46	0.42	0.50	0.56	0.51	0.44	0.51
Average MAP	0.58	0.48	0.44	0.52	0.59	0.48	0.43	0.51

***** Average over all assessment periods.

Statistical data analysis established that fruit firmness at two weeks of storage is determined by the *year-storage method* interaction (26.73%), *storage method* (19.97%) and *year* (16.33%), at four weeks *variety* has a higher impact (26.68%), followed by *year-storage method* interaction (23.61%). At five weeks, *variety* and *storage method* determined fruit firmness,

constituting 33.97 and 30.35%, respectively, and at six weeks the contribution of *storage method* was definitive (62.44%). All the analysed factors have a significant impact for $p \leq 0.001$.

Soluble solids content. Kordia fruits had an insignificantly higher soluble solids content (17.8%) compared to Regina (17.6%) (Table 4.3).

Table 4.3. The dynamics of soluble solids content of sweet cherry fruits according to the storage method and storage period, %, 2022

Experience variants	Kordia variety				Regina variety			
	Evaluation period, weeks							
	2	4	6	Average	2	4	6	Average
NA (Control)	16.5±0.6	15.6±0.3	16.8±0.5	16.6	16.8±0.6	18.5±0.6	16.2±0.6	17.1
Trendlife	17.0±0.5	16.8±0.7	18.4±0.4	17.5	17.2±0.5	18.7±0.3	17.5±0.4	17.7
Decco	18.2±0.4	16.7±0.5	16.9±0.5	17.2	17.8±0.4	16.8±0.6	18.2±0.6	17.6
ESL	17.6±0.4	17.5±0.6	15.8±0.7	17.2	17.3±0.6	16.2±0.5	18.0±0.5	17.2
Xtend	17.5±0.6	17.2±0.5	18.1±0.3	17.7	17.8±0.6	16.4±0.3	17.1±0.5	17.3
Average MAP	17.6	17.1	17.3	17.4	17.5	17.0	17.7	17.4

***** Average over all assessment periods.

On average over the evaluation period in 2022, higher soluble solids content in Kordia fruit was recorded in Xtend (17.7%) and Trendlife (17.5%) and in Regina fruit in Decco (17.6%) and Trendlife (17.7%) packages compared to the other studied variants (17.2-17.3%). Thus, any clear link on the influence of modified atmosphere packaging on soluble solids content was not definitive. In dynamics, during the storage period, the studied parameter showed minor changes of 2-5% at each interval of fruit quality evaluation, which shows that during the storage period the temperature and relative humidity were maintained in optimal parameters, and the respiration and transpiration rates were limited.

Fruit titratable acidity. On average over the years of research, an insignificantly higher titratable acidity at the end of the storage period was recorded in fruits of Kordia variety, when the studied parameter was 0.17% in control and 0.37% in MAP, compared with 0.13 and 0.29% in Regina variety, respectively (Table 4.4).

Table 4.4. Dynamics of titratable acidity of sweet cherry fruits according to method and storage period, %, a. 2022

Experience variants	Kordia variety					Regina variety				
	Evaluation period, weeks									
	0	2	4	6	Average *	0	2	4	6	Average *
NA (Control)	0.69	0.50	0.34	0.17	0.39	0.62	0.39	0.26	0.15	0.32
Trendlife		0.66	0.53	0.41	0.55		0.52	0.40	0.28	0.44
Decco		0.54	0.43	0.40	0.51		0.58	0.42	0.37	0.48
ESL		0.59	0.53	0.32	0.53		0.62	0.50	0.41	0.53
Xtend		0.55	0.56	0.33	0.51		0.51	0.35	0.32	0.43
Average MAP		0.59	0.51	0.36	0.53		0.56	0.42	0.35	0.47

***** Average over all assessment periods.

The difference in titratable acidity between these two storage methods is explained by the reduced oxygen concentration, which significantly decreases fruit metabolism. To maintain a better taste of sweet cherries, the titratable acidity should not be less than 0.3%. Depending on the type of packaging, higher average values in 2022 were recorded in Kordia variety in ESL

(0.53%) and Trendlife (0.53%) variants, and lower were identified in Decco and Xtend (0.51%) packages. For Regina variety, higher acidity was recorded in fruits stored in Decco (0.48%) and ESL (0.53%) packages, compared to Xtend (0.43%) and Trendlife (0.44%).

Three-factor data dispersion analysis established that titratable acidity is determined by *year* (30.23%), *storage method* (30.15%) and *variety* (14.98%). At two weeks, titratable acidity is determined by *year-variety* interaction (21.35%) and *year* (14.24%), and from four weeks - *by storage method* (32.47-39.90%) and *year* (31.22-35.07%). All factors have a significant impact for $p \leq 0.001$.

Polyphenol content. Higher values of this parameter were obtained in Kordia (156.9 mg/100 g) than in Regina (141.5 mg/100 g), with a difference of 10.3% (Table 4.5).

Table 4.5. Dynamics of total polyphenols of sweet cherry fruits according to storage method and period, mg/100 g, a. 2022

Experience variants	Kordia variety			Regina variety		
	Evaluation period, weeks					
	2	4	6	2	4	6
NA (Control)	217.1±6.2	200.5±7.2	142.9±3.2	154.3±2.2	148.4±4.4	116.3±3.0
Trendlife	178.5±5.0	161.7±4.6	143.3±6.1	161.3±4.5	132.7±3.7	107.0±3.7
Decco	164.9±3.2	155.1±4.7	126.0±3.1	166.6±5.4	138.0±5.2	98.5±2.3
ESL	175.8±4.5	147.3±3.3	132.0±4.4	159.0±4.3	148.3±3.4	119.2±3.1
Xtend	188.2±7.5	168.8±4.7	139.3±3.3	166.1±4.2	147.0±3.8	123.3±3.3
Average MAP	176.9	158.2	135.2	163.2	141.5	112.0

After two weeks of storage, the total polyphenol content of sweet cherries increased in the studied variants, with maximum values in Kordia fruit in normal atmosphere (30.0%), compared to Regina (10.9%). When sweet cherries were stored in MAP, the polyphenol content changed more slowly, constituting 6.9 and 11.7%, respectively. A slower reduction in this parameter was recorded from the fourth week of storage, after which, over the following two weeks, sweet cherries of the Kordia variety showed a decrease of 23.4% in normal atmosphere and 12.0% in MAP variants, and in the Regina variety a decrease of 21.2 and 15.0% respectively. During this period, the cell structure deteriorated more intensively and polyphenols oxidized at the highest rate.

After six weeks of storage, in both varieties, lower values of polyphenol content were recorded in Decco packages, constituting 126.0 mg/100 g in Kordia variety and 98.5 mg/100 g in Regina, followed by Trendlife and ESL.

Sweet cherries are rich in anthocyanins, which are phenolic compounds of the flavonoid class that contribute extensively to the sensory fruit characteristics. A higher anthocyanin content was determined in Kordia (72.1 mg/100 g) than in Regina (46.4 mg/100 g), which is characterized by a more intense skin colour (Figure 4.3).

The anthocyanin content of Kordia cherries in storage in normal atmosphere increased from the fourth week of storage (43.4%) and in Regina sweet cherries after two weeks (39.5%), indicating that Kordia sweet cherries have a higher capacity to store in normal atmosphere than

Regina sweet cherries.

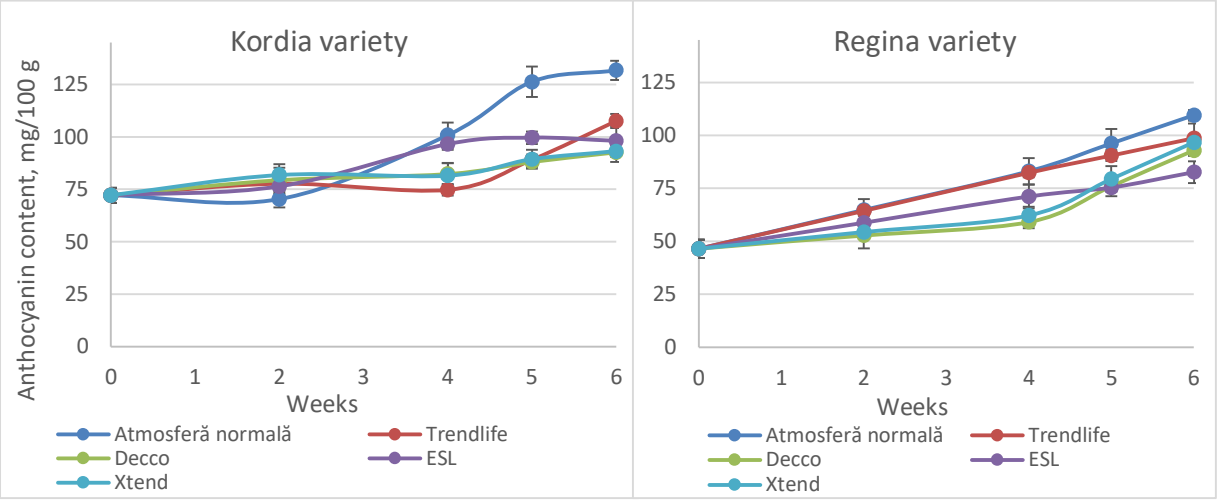

Figure 4.3. Dynamics of anthocyanin content of sweet cherry fruit according to storage method and period, mg/ 100 g, 2020

Vitamin C content. Ascorbic acid, together with phenols and anthocyanins, are largely responsible for the antioxidant potential of sweet cherries. After two weeks of storage, the vitamin C content in the studied varieties was relatively stable (16.7-20.3 mg/100 g).

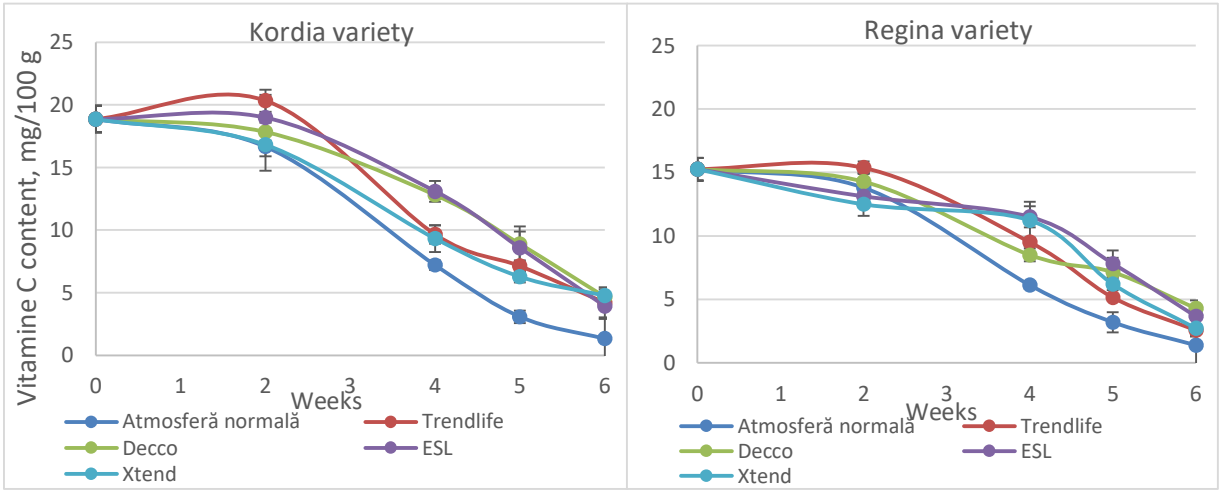

Figure 4.4. Dynamics of vitamin C content in sweet cherry fruit by storage method and storage period, mg/ 100 g, 2020

In the following weeks of storage, the studied parameter in both varieties decreased significantly, reaching minimum values during the six-week storage period, which in control amounted to 1.4 mg/100 g, and in MAP variants to 2.5-2.8 mg/100 g. Although the Kordia variety initially had higher vitamin C content (18.9 mg/100 g) than the Regina (15.3 mg/100 g), at the end of the storage period this parameter showed similar results. After six weeks of storage, the highest vitamin C content among MAP was obtained in the Decco variant, where the vitamin C content of Kordia variety was 4.7 mg/100 g, and in Regina represented 4.3 mg/100 g.

4.3. Influence of storage method on fruit appearance and quality

Fruit stem quality. On average, after six weeks of storage, the weight loss of Kordia fruit stems was 40.2%, and that of Regina fruit stems of 49.8%, a difference of 23.8%. Among the MAP, the lowest weight loss of fruit stems after six weeks of storage was identified in Decco, with 15.85% in Kordia variety and 18.88% in Regina, while the other variants recorded 17.50-21.93% and 19.95-21.96%, respectively.

Statistical data analysis determined that the weight loss of fruit stems was driven by *storage method* (65.70%) and *year-storage method* interaction (12.26%). Storage method was the dominant factor throughout the evaluation period, increasing from 53.94% at two weeks to 81.29% at six weeks of storage. The *variety-storage method* and *year-storage method* interaction factors reduced their impact from 20.17% to 3.16% and from 13.18% to 4.65%, respectively. All mentioned factors had a significant impact for $p \leq 0.001$.

Fruit pitting. The first fruit pitting occurred within the first two weeks of storage (Table 4.6). A lower rate of pitting at the end of the storage period in 2020 was recorded on Kordia fruit (39.8-52.3%) compared to Regina fruit (35.6-75.2%), a trend that was also valid for the other years of the survey. A higher degree of damage of fruit with pitting was recorded from the end of the fifth week, when it amounted to 44.1-56.6% in normal atmosphere and averaged 37.1-41.8% in MAP. A lower rate of fruit affected by pitting in Kordia variety was recorded in ESL (37.6-39.8%) and Xtend (31.6-43.5%), and in Regina variety was represented by Xtend (31.6-35.6%) and Decco (37.1-56.6%).

Table 4.6. Dynamics of occurrence of sweet cherry fruit pitting according to storage method and period, %, 2022

Experience variants	Kordia variety				Regina variety			
	Evaluation period, weeks *							
	2	4	5	6	2	4	5	6
NA (Control)	11.6	46.1	44.1	49.5	19.3	48.1	56.6	71.2
Trendlife	4.1	39.2	41.0	47.3	14.4	45.4	49.2	75.4
Decco	5.9	45.0	36.5	52.3	7.9	28.7	36.5	56.6
ESL	6.3	28.9	35.4	39.8	18.8	40.4	45.8	75.4
Xtend	9.9	37.2	35.4	43.5	5.9	33.0	35.4	35.6
Average MAP	6.5	37.6	37.1	45.7	11.7	36.9	41.8	60.7

* At the initial (before storage) phase, this value in all variants was 0.0%.

Fruit pebbling. Regina variety is more prone to pebbling at the epidermis fruit level, registering 91.0% after six weeks of storage in 2022 compared to 47.5% for the Kordia variety (Table 4.7). The storage method had a major influence on the studied parameter, constituting on average over the years of research in MAP 19.5-81.5%, compared to normal atmosphere, 47.5-91.0%. At the end of storage, a lower proportion of fruit affected by pebbling in both varieties was found in the Xtend (17.8-33.6%) and Decco (19.5- 31.2%).

The studied parameter is increasing while advancing the storage period, with a more

visible effect recorded for both varieties after four weeks of storage.

Table 4.7. Dynamics of the occurrence of fruit pebbling according to storage method and period, %, 2022

Experience variants	Kordia variety				Regina variety			
	Evaluation period, weeks *							
	2	4	5	6	2	4	5	6
NA (Control)	0.0	10.0	35.7	47.5	0.0	52.1	88.1	91.0
Trendlife	0.0	0.0	12.3	26.5	0.0	43.4	80.0	93.7
Decco	0.0	0.0	15.4	19.5	0.0	24.6	51.9	70.2
ESL	0.0	0.0	14.6	29.3	0.0	27.0	70.8	94.2
Xtend	0.0	0.0	15.8	17.8	0.0	33.0	61.0	85.1
Average MAP	0.0	0.0	14.5	23.3	0.0	32.0	66.0	85.8

* At the initial (before storage) phase, this value in all variants was 0.0%.

Variety-specific colour. Fruits with a lower rate of luster loss at the end of the storage period in 2022 were recorded in Kordia variety (41.5%) compared to Regina (61.3%). On average in the research years, higher rates of luster loss were recorded in 2020 compared to 2019 and 2022.

An increase in the studied parameter was recorded in normal atmosphere (41.5- 61.3%), compared to MAP variants (11.9-32.9%). Higher percentage of fruits with lost luster is recorded from the fourth week of storage (0.0-22.0%). After six weeks of storage (a. 2022), in Kordia variety, a more balanced rate of fruits that maintained their luster and skin colour was reported in ESL (12.5%) and Decco (15.6%), and in Regina variety in Xtend (11.9%) and Decco (13.7%). The other MAP variants recorded average values (23.0-32.6%).

4.4. Influence of storage method of sweet cherries on microbiological indices of fruit

In the storage period in 2022, among the studied varieties, the fruits of Regina variety were more affected by molds (9.40%) than those of Kordia (6.92%), a trend that was also valid for the other years of research (Table 4.8). Fruits with a higher rate of fungal diseases in the storage period were obtained in both varieties in 2020.

Table 4.8. Dynamics of the occurrence of moldy fruits according to the method and storage period, %, 2022

Experience variants	Kordia variety				Regina variety			
	Evaluation period, weeks *							
	2	4	5	6	2	4	5	6
NA (Control)	0.72	4.76	6.03	6.92	0.00	5.01	7.87	9.40
Trendlife	1.28	1.03	2.05	2.80	0.00	0.52	1.03	2.29
Decco	0.00	0.00	0.72	1.46	0.00	0.00	0.72	1.46
ESL	0.00	0.24	1.04	1.31	0.00	0.24	0.52	1.05
Xtend	0.00	0.00	1.23	1.98	0.00	0.00	0.98	1.24
Average MAP	0.40	0.32	1.26	1.89	0.00	0.19	0.81	1.51

* At the initial (before storage) phase, this value in all variants was 0.0%

While storage in normal atmosphere a higher rate of fruits was affected by fungal diseases in both varieties (6.92-9.40%) than in MAP (1.05-2.80%). At the end of the storage period, a lower degree of fungal fruit disease was observed in Decco, ESL and Xtend packages compared to Trendlife, where this parameter in Regina in 2022 was 1.46; 1.05; 1.24 and 2.29% respectively

compared to control (9.40%). After two weeks of storage, fruits affected by *Monilinia* and *Botrytis* species were identified only in control; at four weeks of storage, a low rate of fruits was also recorded in MAP (0.26-1.03%), with higher values recorded at six weeks (1.31-3.66%). These minimum values of affected fruits by fungal diseases were caused by the high CO_2 concentration and stable relative humidity of the air in the package.

4.5. Economic efficiency in fruit storage

Production costs after two weeks of storage showed minor differences in all variants (40,300-43,340 lei/t) (Table 4.9).

Table 4.9. Economic efficiency of two-week storage of sweet cherries according to variety and storage method (average, 2019, 2020 and 2022 years)

Experience variants	Kordia variety				Regina variety			
	Sales income, thousand lei/t	Production cost, thousand lei/t	Profit, thousand d lei/t	Profitability level, %	Sales income, thousand lei/t	Production cost, thousand lei/t	Profit, thousand d d lei/t	Profitability level, %
NA (m)	45.67	42.30	3.37	7.98	44.30	40.30	4.00	9.92
Trendlife	51.85	42.64	9.21	21.59	52.00	40.64	11.36	27.94
Decco	56.55	43.34	13.21	30.49	54.71	41.34	13.37	32.34
ESL	51.81	43.34	8.47	19.54	49.44	41.34	8.10	19.58
Xtend	54.94	43.34	11.60	26.77	53.81	41.34	12.47	30.17

A higher profit for both varieties was obtained in Decco (13,210-13,370 lei/t), where the profitability level registered values of 30.49-32.34%, followed by Xtend (26.77-30.17%), Trendlife (21.59-27.94%) and ESL (19.54-19.58%) packages. In control, the profitability level was only 7.98% for Kordia and 9.92% for Regina.

Table 4.10. Economic efficiency of four-week storage of sweet cherries according to variety and storage method (average, 2019, 2020 and 2022 years)

Experience variants	Kordia variety				Regina variety			
	Sales income, thousand lei/t	Production cost, thousand lei/t	Profit, thousand d lei/t	Profitability level, %	Sales income, thousand lei/t	Production cost, thousand lei/t	Profit, thousand d d lei/t	Profitability level, %
NA (m)	10.92	42.60	-31.68	-74.36	11.18	40.60	-29.42	-72.47
Trendlife	52.96	42.94	10.02	23.34	49.45	40.94	8.51	20.79
Decco	64.87	43.64	21.23	48.65	62.34	41.64	20.70	49.71
ESL	59.32	43.64	15.68	35.93	56.90	41.64	15.26	36.66
Xtend	59.72	43.64	16.08	36.85	57.05	41.64	15.41	37.01

The production costs for six-week storage on the studied variants ranged from 40.60 to 43.64 thousand lei/t (Table 4.10). The highest level of profitability was obtained for both varieties in Decco (48.65 and 49.71%, respectively), followed by Xtend (36.85 and 37.01%, respectively), which showed minor differences compared to ESL (35.93 and 36.66%, respectively). In Trendlife, the profitability level was twice lower (23.34 and 20.79%, respectively) compared to Decco.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

1. ReTain, 0.8 kg/ha, had a greater influence on the bioconstructive parameters of the trees of both sweet cherry varieties, where it was identified a decrease in the tree width compared to control (3.0-5.9%), and a decrease in trunk diameter with 2.8-5.4%. The average length of annual branches was 45.0-69.6 cm, which represents a balanced growth for sweet cherry trees and next branching with a fruit-bearing microstructure and obtaining constant yields in the following years.

2. The number of spur and solitary buds is increasing, constituting 237.6-255.3 and 148.0-179.2 pcs/tree, respectively, with no obvious relationship on the applied growth regulators. The number of flowers formed in the tree crown was in direct correlation with the rate of spur and solitary buds during the research, a lower value being recorded in ReTain variant, 0.8 kg/ha (2683-3120 pcs/tree), characterized by higher yields compared to the other variants.

3. Higher fruit set in both varieties was recorded in ReTain variant, 0.8 kg/ha (34.9-35.9%), compared to the other treated variants (25.1-30.5%) and control (21.5-24.7%). Growth regulators applied in flowering period scored higher fruit set (9.3-57.2%) in the tree crown, and a higher influence was reported for both varieties in ReTain, 0.8 kg/ha (37.0- 57.2%) compared to control.

4. Higher fruit yields were recorded in Regina compared to Kordia with a difference of 21.9%. Growth regulators applied in both periods had a significant influence on the studied parameter, with a higher average yield value in the researches on the flowering period being recorded in ReTain, 0,8 kg/ha (11,06-12,34 t/ha), and in the pre-harvest period being represented by the variants treated with the products Gobbi Gib 2LG, 1,0 l/ha (8,91-10,78 t/ha), Auxiger LG, 0,7 l/ha (9,06-10,93 t/ha) and Auxiger LG, 0,9 l/ha (9,09-10,74 t/ha).

5. An insignificantly higher average fruit weight was recorded in Regina (11.55-11.56 g) compared to Kordia (11.29-11.37 g). ReTain, 0.8 kg/ha significantly decreased this parameter (6.0-14.2%) compared to control. In the variants treated with growth regulators Gobbi Gib 2LG, 1.0 l/ha and Auxiger LG, in the doses of 0.7 and 0.9 l/ha, the studied parameter ranged from 11.82 to 12.98 g. Increasing the treatment rate of Auxiger LG from 0.7 to 0.9 l/ha did not significantly increase the fruit weight.

6. The growth regulators intended to increase fruit quality applied in the pre-harvest period had a greater contribution on the morphological parameters of the fruit and a more rational distribution of their diameter compared to those intended to increase the fruit set. A more optimal distribution of fruits by diameter was recorded in both varieties in Auxiger LG, 0.7 l/ha, where fruits bigger than 28 mm constituted 75.7-77.9%, compared to 54.8-58.2% in control. In the other variants treated with growth regulators, mean or insignificantly lower values were

recorded compared to Auxiger LG, 0.7 l/ha variant.

7. The concentrations of oxygen of 5-7% and carbon dioxide of 10-12% recorded after two weeks of storage in all MAP variants helped to maintain the quality parameters, which were well maintained in Decco and Xtend packages (CO_2 – 12.15%, O_2 – 2.77%). A more balanced concentration of ethylene (0.64-1.06 ppm) was marked in Decco and ESL packages. Higher relative air humidity (85-92%) was recorded in the MAP variants compared to control (80.6-83.1%), where the fruit weight loss during six weeks was 3-5 and 18-19%, respectively, and stems weight loss represented 22 and 45%, respectively.

8. Research period, variety and growth regulators applied in different periods had an insignificant influence on fruit firmness, soluble solids content and titratable acidity. A higher fruit firmness at the end of the storage period was reported in Decco (0.53-0.56 kg/cm^2), soluble solids were determined in Xtend (17.6-17.7%) and Trendlife (17.5-17.7%), and titratable acidity was identified in ESL (0.53%).

9. A lower polyphenol content after six weeks of storage was recorded in Decco packages (98.5-126.0 mg/100 g), which subsequently balanced the anthocyanin rate in the fruits throughout the research period. After six weeks of storage, a higher vitamin C content among the modified atmosphere packages was obtained in Kordia in Decco (4.7 mg/100 g) compared to Regina (4.3 mg/100 g).

10. Storage in modified atmosphere packages reduces the rate of fruits with physiological damages. The first pits appear on fruits after four weeks of storage, and by the fifth week pebbling and stem browning are evident. ESL (1.1-3.7%) and Xtend (1.2-3.5%) variants showed a lower rate of fruits affected by mold. Higher fruit quality parameters were obtained after two weeks of storage in normal atmosphere, and in variants where modified atmosphere packages were used in Kordia variety - in Decco packages after five weeks, and Regina – after four weeks of storage.

11. A higher level of profitability when growth regulators were applied during flowering period was recorded in both varieties in ReTain, 0.8 kg/ha (235.06-249.09%) and Gobbi Gib 2LG, 1.0 l/ha (230.43-246.12%), and in the pre-harvest time in Auxiger LG, 0.7 l/ha (222.52-271.65%) and Auxiger LG, 0.9 l/ha (227.58-261.70%). Higher profitability after two weeks of fruit storage was obtained in Xtend (26,77-30,17%) and Decco (30,49-42,40%) packages, and after four weeks was determined in Decco (48,65-49,71%) packages, followed by ESL and Xtend (35,93-37,01%), while control showed negative values (-74,36...-72,47%).

RECOMMENDATIONS

The degree of fruit set of Kordia and Regina sweet cherries can be influenced by applying ReTain, 0.8 kg/ha at 30% bloom or Gobbi Gib 2LG, 0.5 l/ha, the first treatment at 70% bloom and the second one after petal fall.

To increase the yield of sweet cherry trees of Kordia and Regina varieties, it is recommended to apply Auxiger, in the doses of 0.7 and 0.9 l/ha, taking in consideration the weather conditions, when the fruit diameter is 12- 13 mm, or Gobbi Gib 2LG, 1.0 l/ha when the colour of sweet cherries changes from green to yellow.

While storing sweet cherries for up to two weeks, it is recommend using Decco and Xtend modified atmosphere packages, and up to four weeks applying Decco packages.

Personal contribution. The research design was carried out by the author under the guidance of the scientific supervisor. The results obtained, their analysis, generalizations, conclusions and recommendations belong entirely to the author.

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*(Note * from the list of own publications) [*].*

ADNOTARE

Lozan Andrei, „Optimizarea tehnologiei de producere a cireșului în baza regulatorilor de creștere și metodei de păstrare”, teză de doctor în științe agricole, Chișinău, 2025.

Structura tezei: introducere, 4 capitole, concluzii și recomandări, bibliografie din 291 surse, 136 pagini text de bază, 36 tabele, 6 figuri, 8 anexe. Rezultatele obținute sunt publicate în12 lucrări științifice.

Cuvinte-cheie: cireș, grad de legare, regulator de creștere, productivitate, păstrare, ambalaj cu atmosferă modificată, boli fiziologice, boli microbiologice, calitate.

Scopul lucrării: Evaluarea interacțiunii regulatorilor de creștere asupra gradului de legare a fructelor, productivității plantației de cireș, precum și a metodei de păstrare în perioada postrecoltă pentru menținerea calității fructelor pentru o perioadă mai îndelungată de timp.

Obiectivele cercetării: Studierea parametrilor bioconstructivi ai pomilor de cireș în funcție de soi și regulatorii de creștere aplicați pentru sporirea gradului de legare și a producției fructelor; Estimarea productivității plantației și a calității fructelor în funcție de soi și regulatorii de creștere aplicați la tratare în lanțul tehnologic de producere a cireșelor; Stabilirea gradului de influență a metodei și perioadei de păstrare asupra conținutului de gaze, a indicilor fizico-chimici, microbiologici, aspectului și calității fructelor; estimarea economică a impactului regulatorilor de creștere asupra productivității plantației și a metodei de păstrare în perioada postrecoltă asupra calității fructelor.

Noutatea și originalitatea științifică: Pentru prima dată în țară s-au obținut date experimentale noi despre influența regulatorilor de creștere asupra sporirii gradului de legare a fructelor și majorării recoltei în plantația intensivă de cireș, precum și impactul metodei, perioadei de păstrare asupra calității cireșelor pe parcursul perioadei postrecoltă.

Rezultatul obținut: A fost argumentată științific și demonstrată experimental influența regulatorilor de creștere de diferită origine, dozei și perioadei de aplicare asupra sporirii gradului de legare a fructelor, productivității plantației, precum și metodei de păstrare asupra menținerii indicilor de calitate și diminuarea gradului de afecțiune cu diferiți patogeni a cireșelor în perioada postrecoltă.

Semnificația teoretică: Studiul realizat contribuie la completarea bazei de date științifice privind reacția pomilor de cireș la aplicarea regulatorilor de creștere asupra gradului de legare a fructelor, productivității plantației, iar prin intermediul metodei progresive de păstrare de a menține calitatea înaltă a cireșelor în perioada postrecoltă. Rezultatele incluse în lucrare pot sta la baza unor concepte teoretice pentru a completa lanțul valoric de producere și păstrare a cireșelor cu elemente noi tehnologice, pentru a obține recolte înalte, constante, de calitate competitivă și pentru ca consumatorul să poată savura prospețimea fructelor o perioadă mai îndelungată.

Valoarea aplicativă: Se reflectă în recomandările privind aplicarea regulatorilor de creștere pentru sporirea gradului de legare a fructelor, productivității plantației la soiurile cu pondere mai mare în structura suprafețelor de cireș din țară, precum și evidențierea metodei și perioadei de păstrare a cireșelor, oferind consumatorilor acces la o producție de calitate superioară pe termen extins.

Implementarea rezultatelor științifice: Rezultatele obținute în perioada anilor de cercetare au fost expuse în cadrul seminarelor practice în domeniu și implementate în cadrul întreprinderilor membre ale APEF „Moldova Fruct”: SRL „Farm-Prod”, SRL „Staragro Group”, SRL „Lucventas”, SRL „Nerdica” și SRL „Viva Igna”. Rezultatele expuse în teză pot fi utilizate în calitate de material științifico-didactic la predarea cursului de Pomicultură specială și Păstrarea producției horticole.

ANNOTATION

Lozan Andrei, "Technology optimization of the sweet cherry production by using growth regulators and the storage methods ", PhD thesis in agricultural sciences, Chisinau, 2025.

Structure of the thesis: introduction, 4 chapters, conclusions and recommendations, bibliography from 291 sources, 136 pages of basic text, 36 tables, 6 figures, 8 annexes. The results are published in 12 scientific papers.

Keywords: fruit quality, fruit set, growth regulators, yield, storage, modified atmosphere packages, physiological and microbiological diseases.

Aim of the work: Evaluating the interaction of growth regulators on the degree of fruit set, the productivity of the cherry plantation, as well as the method of storage in the post-harvest period to maintain fruit quality for a longer period of time.

Research objectives: Studying the bioconstructive parameters of cherry trees depending on the variety and growth regulators applied to increase the degree of fruit set and fruit production; evaluating the plantation production and fruit quality depending on the variety and growth regulators applied to treatment in the technological chain of fruit production; determination of the degree of influence of modified atmosphere packaging on respiration processes and ethylene emission, physico-chemical indices, fruit appearance and quality; economic estimation of the action of growth regulators on the production of the plant and modified atmosphere packaging on fruit quality.

The novelty and scientific originality: For the first time in the country broad experimental data were obtained on the influence of growth regulators on the increase of fruit set and yield in intensive cherry plantation, as well as the impact of the method, storage period on the quality of cherries during the post-harvest period.

The result obtained: The influence of growth regulators of different origin, dose and period of application on the increase of fruit set, plantation productivity, as well as the method of storage on the maintenance of quality indices and the decrease of the degree of affection of cherry trees with different pathogens in the post-harvest period was scientifically argued and experimentally demonstrated.

The theoretical significance: The study contributes to the completion of the scientific database on the reaction of cherry trees to the application of growth regulators on the degree of fruit set, plantation productivity, and by means of the progressive method of preservation to maintain the high quality of cherry trees in the post-harvest period. The results included in the paper can form the basis for theoretical concepts to complete the cherry production and storage value chain with new technological elements, to obtain high, constant, competitive quality harvests and to allow the consumer to enjoy the freshness of the fruit for a longer period.

Applicative value of the work: It is reflected in the recommendations on the application of growth regulators to increase the degree of fruit set, plantation productivity in varieties with a widely shared in the sweet cherry areas in the country, as well as highlighting the storage method and period, giving consumers access to a higher quality production in the extended term.

The implementation of the scientific results: The results obtained during the years of research have been presented in practical seminars in the field and implemented in the member enterprises of APEF "Moldova Fruct": "Farm-Prod" Ltd, "Staragro Group" Ltd, "Lucventas" Ltd, "Nerdica" Ltd and "Viva Igna" Ltd. The results presented in the thesis can be used as scientific and didactic material for teaching the course of Special Pomiculture and Storage of Horticultural Production.

АННОТАЦИЯ

Лозан Андрей, «Оптимизация технологии производства черешни на основе применения регуляторов роста и методов хранения», диссертация на соискание ученой степени доктора сельскохозяйственных наук, Кишинёв, 2025.

Структура диссертации: введение, 4 главы, выводы и рекомендации, библиография из 291 источника, 136 страниц основного текста, 36 таблиц, 6 рисунков, 8 приложений. Полученные результаты опубликованы в 12 научных работах.

Ключевые слова: черешня, степень завязываемости, регулятор роста, урожайность, хранение, упаковка с модифицированной атмосферой, физиологические заболевания, микробиологические заболевания, качество.

Цель исследования: Оценка воздействия регуляторов роста на степень завязываемости плодов, продуктивность насаждений черешни, а также влияние метода хранения в после уборочный период на сохраннось качества плодов в течение длительного времени.

Задачи исследований: изучение биоконструктивных параметров деревьев черешни в зависимости от сорта и применяемых регуляторов роста для повышения степени завязываемости и урожайности плодов; оценка продуктивности насаждений и качества плодов в зависимости от сорта и регуляторов роста, применяемых в технологической цепочке производства черешни; определение влияния метода и срока хранения на газовый состав, физико-химические и микробиологические показатели, внешний вид и качество плодов; экономическая оценка влияния регуляторов роста на продуктивность насаждений и метода хранения в послеуборочный период на качество плодов.

Научная новизна и оригинальность: впервые в Республике Молдова получены новые экспериментальные данные о влиянии регуляторов роста на повышение степени завязывания плодов и увеличение урожая в интенсивных насаждениях черешни, а также об их воздействии на качество плодов в зависимости от метода и срока хранения в послеуборочный период.

Полученные результаты. Научно обосновано и экспериментально доказано влияние регуляторов роста различного происхождения, дозировки и сроков применения на повышение завязываемости плодов, продуктивность насаждений, а также влияние метода хранения на сохранение качественных показателей и снижение поражения черешни различными патогенами в послеуборочный период.

Теоретическая значимость. Проведенные исследования вносят вклад в расширение научной базы данных о реакции деревьев черешни на применение регуляторов роста в контексте завязываемости плодов и продуктивности насаждений. Кроме того, применение передовых методов хранения способствует качественной сохранности плодов черешни в послеуборочный период. Результаты работы могут служить основой для разработки новых теоретических концепций, направленных на совершенствование способа производства и хранения черешни с внедрением новых технологических элементов. Это обеспечит стабильные высокие урожаи конкурентоспособного качества и позволит потребителям дольше наслаждаться свежестью плодов.

Практическая ценность: Результаты исследования представлены в виде рекомендаций по применению регуляторов роста для повышения завязываемости плодов и продуктивности насаждений наиболее распространённых сортов черешни в стране. Кроме того, выявлены оптимальные методы и сроки хранения, позволяющие обеспечить потребителям доступ к черешне высокого качества на длительный период.

Внедрение научных результатов: Полученные в ходе исследования результаты были представлены на специализированных практических семинарах и внедрены на предприятиях – членах АПЕФ «Moldova Fruct», среди которых SRL "Farm-Prod", SRL "Staragro Group", SRL "Lucventas", SRL "Nerdica" и SRL "Viva Igna". Представленные в диссертации результаты могут быть использованы в качестве научно-методического материала при преподавании дисциплин Часное плодоводство и Хранение плодоовощной продукции.

LOZAN ANDREI

OPTIMIZATION OF SWEET CHERRY PRODUCTION TECHNOLOGY BASED ON GROWTH REGULATORS AND STORAGE METHOD

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Approved for printing: 18.04.2025
Offset paper. RISO printing.
Printing sheets: 2,0
Paper size 60x84 1/16
Print run 50 copies
Order No. 2592

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