ECONOMIC COST-EFFECTIVENES OF ETHYLENE CONSUMPTION IN THE TECHNOLOGICAL PROCESS OF BANANA RIPENING

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ABSTRACT:

Banana is a climacteric fruit that undergoes a ripening process in airtight chambers at a certain temperature, appropriate ethylene concentration, and the time it takes for the fruit to reach maturity level 4 on the ripening scale. For commercial purposes an ethylene concentration of 1000 ppm is used, and depending on other factors the concentration may vary. Through a research the best result has been achieved with an ethylene concentration of 900 ppm and the fruit exposure to 18°C for a treatment period of 120 h. These parameters reduced costs by RSD 91.896,95 at annual level compared to the commercial concentration of ethylene, the quality of the fruit did not deteriorate greater efficiency in business has been achieved.

Keywords: *banana, ethylene, ripening, costs*

INTRODUCTION

The tendency of every company should always be focused on achieving greater efficiency and effectiveness in business. A company operates economically if it manages to reduce the consumption of available resources, in order to achieve maximum performance and quality of products and services. Many businesses do not pay much attention to costs until the company falls into a serious financial crisis and is forced to make reductions. Costs are an inevitable factor in defining strategy, conducting business policy, pricing, managing business results, profit, etc. In order to achieve specific results costs must be managed, i.e. they should be monitored, analyzed, planned, controlled, etc. [1]. Ethylene is an herbal gaseous hormone that, at a very low concentration, exerts a strong impact on the metabolism of the harvested fruits [2].

Ethylene concentration of only 0.1-1.0 μL/ L is sufficient to initiate the ripening process in climacterial fruit [3]. Banana is a climacteric fruit that is harvested green and ripened later in special ripening chambers. Commercial banana varieties require the exposure of the fruit to ethylene for 24 to 48 h at a temperature ranging from 14°C to 18°C while in some cases a temperature of 20°C is required [4]. The objective of the paper is to identify possible solutions related to cost reduction in green fruit processing in order to increase economy and achieve better business results, which is the aspiration of every company. The focus is on the correction of ethylene consumption during the technological process of banana ripening. Through the paper we try to compare the researches on the mentioned

topic conducted in the world and here, in our country. To provide practical solutions that can be applied in these areas to achieve cost-effectiveness without losing product quality.

THEORETICAL PART

Company Business Efficiency

In order for a company to operate economically successfully, i.e. to maximize profits, it must first set and define the goals of its business. Business efficiency depends on the extent to which the goals have been successfully set, and their realization is possible only by applying certain rules and principles [5]. In order to achieve economic viability of a company, it is necessary to operate in an efficient and effective manner. A business operates effectively if *it does the right things.* If, in a competitive and demanding market it adjusts its production and service as much as possible to the needs of its users. A company that strives to do better what it does, achieves efficiency while minimizing costs and increasing the quality of products and services [6]. To what extent and how the efficiency and effectiveness of the company (positive or negative) will be realized depends on many factors: the degree and speed of utilization of resources, the quality of the results obtained, technological solutions, organization of work, etc.

The economy or thrift of a company is one of three economic principles, designed to maximize the performance of products or services, with minimal (rational) costs in operating and doing business. The goal is to achieve a positive difference between the results of operations and the resulting values on the one hand and the costs incurred during production and service for a given volume of business on the other [5]. In production, the elements of the work process are consumed over time, changing their physical-chemical and other characteristics, creating appropriate use values. Finished products are the result of part of the cost of reproduction. Their sale creates funds that will be used further in the organization of a new cycle of reproduction. In order to increase sales, companies strive to reduce costs in the process of reproduction, which would create the possibility of reducing the price of manufactured material goods, which would ultimately provide a greater competitive position in the market [1]. The company should manage costs in all segments, by types, by organizational parts, production programs, etc.

Importance of ripening banana fruit under controlled conditions

Today, banana is available in almost every part of the world throughout the year and has become part of the daily nutrition of mankind. It is precisely the merits in this regard that can be mostly attributed to the technology of ripening green fruit that is spreading all over the world. Banana occupies one of five leading positions in agri-food trade along with cereals, sugar, coffee and cocoa. The world's largest producers are: India, China, Philippines, Ecuador, Brazil, Tanzania, etc. Banana fruit has great energy and nutritional value, is rich in carbohydrates and poor in fats and nitrites. For overseas trade, the banana is harvested green. Such fruit is too hard, tasteless, unfit for consumption. Green fruit has the ability to ripen after harvest. The disadvantage of green fruit that ripens naturally after harvest for commercial production is the emergence of uneven skin color that later discourages consumers due to its unattractive appearance. In order for the fruit to achieve a uniform light skin color, compact and juicy meat, pleasant aroma and taste, it is exposed to the technological process of ripening.

During the process of fruit ripening there are dramatic changes in the chemical composition, physical and organoleptic characteristics of the fruit [7]. The most important factors that influence the ripening of bananas are: temperature, ethylene and time which are inter-correlated. The fruits exposed to lower temperatures and lower concentrations of ethylene need more time to ripen than those fruits that ripen at higher temperatures and with higher concentrations of ethylene. On the other hand, higher temperatures and higher concentrations of ethylene have a major effect on the deterioration of the quality and faster deterioration of the fruit. Exposing bananas to unwanted temperatures leads to many physiological disorders, such as texture decay due to over-cooling or overheating [8].

One of the main reasons for the poor efficiency of agri-food production in Serbia, generally seen through history, has been the deficiency of modern techniques and technology. Serbia has always been in a great gap in terms of innovation compared to the developed part of the world, although it has always built its economic growth and development on the basis of agricultural production. This reduced the functionality and organization of the agri-food sector, and affected the profitability of the business [9]. Banana ripening technology under controlled conditions has been growing in Serbia for the last twenty years. The centralization and influence of large cities is being reduced by positioning ripening plants in smaller local communities and cities. Of the significant bananas in Serbia, the following ones should be noted: Mercator S d.o.o.; Darkom d.o.o.; MDD Group Kac; Ahold Delhaize Serbia d.o.o. Beograd; Nesa-Komerc d.o.o. Vranje; Fruti Company d.o.o. Dobanovci; Fruti World d.o.o. Nova Pazova, etc. The great importance of the ripening plants is reflected in the fact that this technology has responded to the increasingly demanding market in terms of supply and demand, thereby establishing a continuous supply.

This technology allows for better distribution and transport conditions particularly across the ocean, which extends the shelf life and quality of the fruit. All of the above mentioned provides the company with significant economic profit, has the effect of reducing business costs, gaining market competitiveness in terms of prices and product quality, etc. Therefore, in general, the technology of ripening fruits and vegetables should be given much greater importance, because it represents the future of storage and processing of fruits that will meet the challenges of growing population on the planet and the need for healthy and quality food.

The role of ethylene in fruit ripening process

Ethylene is a plant hormone of great importance for fruit ripening, including banana fruit. Ethylene drives and accelerates ripening, stimulating development, color, aroma and taste [10]. Green fruits immediately after harvest are characterized by a very low concentration of ethylene [11]. While in the climacteric stage there is a rapid increase in ethylene content and respiratory intensity, which is, at the same time, the beginning of fruit ripening [2].According to the authors Thompson & Seymour, even a low ethylene concentration of 10 to 50 μL L^{-1} is sufficient for the ripening of the fruit and has a strong effect on the metabolism of the harvested fruits. Concentration of 1000 μL L^{-1} is generally used for commercial purposes. The aforementioned concentration ensures even maturity of the fruit.

This is partly because many of the chambers where the fruit is being ripened are not adequately hermetically sealed, which can lead to leakage and loss of a certain amount of gas. The fruits, which ripen at 16°C to 17°C and have exposed to an ethylene concentration of 1000 ppm, successfully complete the ripening process in 6 days with a ripeness level 6 on the ripeness scale. At lower temperatures of 13°C to 15°C and an ethylene concentration of 1000 ppm, it took the fruit 15 to 18 days to ripen. The most significant indicator of the fruit ripeness degree is the change in the color of the banana skin. The degree of ripeness can be shown by a scale from 1 to 7, as follows: 1) dark green shade; 2) light green shade; 3) more green than yellow; 4) more yellow than green; 5) yellow with green tips; 6) completely yellow shade; 7) completely yellow shade with brown spots [13].

Dosing gas in artificial ripening chambers. After preparing the green banana for ripening, when the fruit reaches the appropriate (set) temperature in the ripening chamber, an automatic gas dosing is performed depending on the concentration selected (usually 20 to 40 minutes). The gas flow rate is 50 l/min at a pressure of 3 bar. The concentration of ripening gas in the chambers ranges from 8 to 12 l/m^3. On completion of dosing, banana fruits are exposed to gas for 24 h, in some cases it is recommended about 18 h due to the harmful effects of CO_2. During the mentioned period, the chambers are under a blockage where ventilation, i.e. oxygen and fresh air supply is eliminated.

During the ripening of the fruit, ethylene production increases with the intensity of respiration [14]. For the first four days, the ethylene production rate is almost stable, rising rapidly and reaching its maximum on the fifth day [15]. From the 4th day onwards, frequent venting of the chambers (some 3 to 6 hours for 30 to 45 min) is performed to eliminate excess CO_2 and excess endogenous ethylene generated after the initiation of the fruit ripening process and whose increased concentration would now adversely affect the quality of bananas. When the ripening process begins with climacterial fruit,

ethylene begins to stimulate its own synthesis, which increases its concentration in the fruit texture [16].

METHODOLOGY OF WORK

In order to explain the cost-effectiveness of ethylene consumption, the following calculation will be made: a) determination of ethylene consumption for one gasification (20.000,00 kg); b) calculation for monthly ripening in the amount of 480.000,00 kg of green banana fruit; and c) calculation of ethylene consumption on an annual basis with production of 5.760.000,00 kg. Ethylene consumption will be influenced by a constant temperature of 18 °C, gas dosing time and other factors.The second part of the research refers to the ripening treatments that were conducted in the period from 2019 to the sixth month of 2020. 10 ripening samples were selected with the aim of presenting the influence of temperature on the duration of the process and on the consumption of ethylene, and consequently on the increase in costs.

The third part of the research was conducted on a sample of up to 120 ripening (2.400.000,00 kg) of banana fruit over the territory of Serbia, the consumption of ethylene was researched and a comparison of poor and good business organization was performed for two time periods: a) year A, followed a six month period, from January to June 2018, which included 60 ripening of green banana fruit; b) year B which followed the same period and the same number of ripening in 2019.

Survey data were collected and statistically processed in SPSS (*SPSS ver.18 for Windows*). The confidence interval is calculated by the correlation coefficient. The following will be researched in the paper: *By regulating the amount of ethylene in the process of banana ripening, the cost of processing green fruit changes*. The largest part of the survey covers data related to the municipality of Nis and "MERCATOR S" company, as well as ripening chambers from the mentioned territory. The survey used the Cavendish banana fruit, which is the most important commercial variety in the world market. Green banana is from different countries of import (Ecuador, Costa Rica, Colombia, Panama, Honduras etc.) and different brands (Derby, Slobana, Chiquita, Sentiliver, Pamela, Amigo, Bonanza, Consul etc.).

The ripening gas, a mixture containing 95% N (Nitrogen) and 5% ethylene (C_2H_4) manufactured by "MESSER" Tehnogas AD 11090 Belgrade, was used for ripening. Ripening gas is usually delivered in 50 l high-pressure bottles, is flammable and requires particularly careful handling and knowledge of safety at work studies. The price of 50 l bottle on 18th February 2019 is 4.467,99 RSD + 20% VAT. For the purpose of expressing the real value of performance, due to fluctuations in market prices and deviations from production values, average market prices have been used, which are approximate values of the price stated for the date.

RESULTS

The objective of this paper is to examine the costs of consuming ripening gas in the technological process of green fruit ripening. Ethylene concentration depends on other parameters of the ripening process (time, temperature, degree of ripeness, quality of the fruit) and they are also taken into consideration. The calculation of the consumption of ripening gas for one year was performed on the type of a six-space ripening chamber for controlled fruit ripening. The capacity of a banana processing in a week is 120.000,00 kg, i.e. 20.000,00 kg x 6 chambers. On a monthly basis, production of 480.000,00 kg or 24 ripening x 20.000,00 kg of banana fruit is achieved. Under ideal operating conditions, if the ripening plant were operating at full capacity throughout the year, a fruit processing of 5.760.000,00 kg i.e. 288 ripening processes would be achieved. For the calculation related to the ethylene economy test, a constant temperature was taken during the process, i.e. ripening was carried out at 18°C.

The final objective of ripening is to ensure the degree of ripeness of the fruit 4 on the ripening scale, an ideal color for retail. The optimum process time is on average about 5 days or 120 h to achieve

satisfactory quality. Optimal ripening parameters have been taken from previous research in the world, with the average values of 120 ripening processes conducted. As well as on the basis of the parameters of the mathematical calculation of MCDM by the multi-criteria decision method, which the authors conducted on a sample of 80 ripening processes in the territory of Serbia. The objective of the research was to determine the best alternative to ripening green banana fruit in this territory. Alternative A_2 achieved significant value when applying the TOPSIS method. The best quality with minimal investment and losses was achieved at a temperature of 18°C, with an ethylene concentration of 920 ppm and 120 hours of time to complete the process. The results obtained also proved to be the best alternative in practical application [17].

A 50-liter bottle provides about 70 minutes (2.100,00 ppm) of gasification including flow, bottle pressure, bottle fill, etc., i.e. 0,714 l/min. A 20-minute treatment (600,00 ppm) would provide a total of 3,5 gasification per a bottle. The average price of ripening gas for the researched period coincides with the price as of 18th February 2019 and is about 89,38 RSD / min. If the gas consumption were expressed in minutes as presented on the central computer, then the gasification minute would be 63,81 RSD, which gives the same gasification values as the calculation with liters (63,817 RSD x 20 minutes = 1.276,35 RSD).

Table 1 presents the price of one gasification of 20 minutes (600,00 ppm) with the consumption of ripening gas of 14,28 l/minute and amounts to 1.276,35 din, which should include the price of 20% VAT. Exposure of green bananas to gasification of 40 minutes (1.200,00 ppm) increases the cost of processing by 50, 01% and amounts to RSD 2.552,69 no VAT included. On a monthly basis, applying the first alternative of 20 minutes (600,00 ppm) versus 40 minutes (1.200,00 ppm) would save on ripening 30.632,32 RSD no VAT included. The same treatment for a year would save 367.587,76 din no VAT included.

Table 1. Ethylene consumption calculation for one year, source: author's review.

No. treatment	I	II	III	IV	V
Temperature in ^{0}C	18	18	18	18	18
C_2H_5 in ppm	600	750	900	1050	1200
Ripering time	131	124	120	98	91
Ripering degree	4	4	4	4	4
Gasification time	20	25	30	35	40
Gas consumption l/min	0,714	0,714	0,714	0,714	0,714
Gas consumption during gasification	14,28	17,85	21,42	24,99	28,56
Ethylene price/l	89,38	89,38	89,38	89,38	89,38
Gas cost for gasification	1.276,35	1.595,43	1.914,52	2.233,61	2.552,69
No. of ripering on a monthly basis	24	24	24	24	24
Gas cost for one month	30.632,31	38.290,39	45.948,47	53,606,55	61.264,63
No. of ripering on a annual basis	288	288	288	288	288
Gas cost for one year	367.587,76	459.484,70	551.381,64	643.278,59	735.175,53

Legend: No- Number; °C- Celsius; C_2H_4- ethylene; ppm-parts per million ($\mu L\ L^{-1}$); min-minutes; l-liter;
Gas consumption during gasification = gasification time x gas consumption / min;
Gas cost for gasification = gas consumption for gasification x ethylene price / l;
Gas cost for one month = gas consumption during gasification x monthly number of ripening;
Gas cost for one year = gas consumption during gasification x annual number of ripening.

Table 2 shows the correlation coefficient and connection direction. For this calculation, the variables from Table 1, (gasification time, liters per gas, price per ripening) were used and processed by statistical methods in the SPSS program. The correlation coefficient and the connection direction are

positive, i.e. there is a positive correlation between the variables. On the basis on the value of the Pearson correlation coefficient r = 1, it is concluded that there is a strong relationship between the variables. In the continuation of the study, the coefficient of determination was calculated, which shows how much of the variance of one variable is caused by the other variables.

Table. 2. Pearson correlations. Correlation of gas consumption,
process time and ripening price, source: author's review.

		1	2	3
1	gasification time in minutes	-	1,000**	1,000**
2	price per ripening		-	1,000**
3	liter per gasification			-

** Correlation is significant at the 0.01 level

Determination coefficient on the example of Pearson Correlation is 100%, which shows the height of the percentage impact of one variable caused by the other variables. The level of significance is the information with how much confidence the obtained result should be viewed. The level of significance of the obtained results is influenced by the size of the sample, where the significance increases with the increasing data. The sample in the research is small, and therefore the level of significance may be irrelevant, although according to the obtained results a high confidence interval is obtained. Based on the above, conditions have been created that the research hypothesis can be accepted with certainty, i.e. to reject H_0. The same values were obtained by checking the Spearman correlation, where it is concluded that there is a strong relationship between the variable and that the coefficient of determination shows a high degree of explanation of the researched phenomenon (100%). From everything presented, it is concluded that our calculation can be accepted with certainty

In Figure 1, 10 treatments for ripening bananas in the period from 2019 to mid-2020 conducted in Nis are separated. The values of the implemented treatments taken for the research were realized at: ripening temperature ranging from 18 °C to 21 °C; fruit ripening time from 128 h to 96 h; and ethylene consumption ranging from 1050 ppm (35 minutes) to 690 ppm (or 23 minutes) during the process.
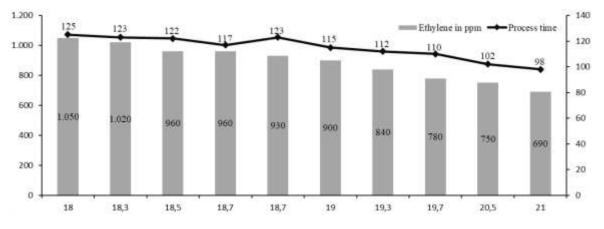

Figure 1. Influence of temperature and process time on ethylene consumption, source: author's review
Legend: The average temperatures of 10 ripening treatments are presented on the horizontal axis

The sample was systematically used and presented in this order with the aim of more subjective insight into changes in ethylene concentration caused by corrections of temperature and ripening time. The mentioned order of treatments in the research in practical application usually does not have such a continuous course. It depends on various factors and conditions, and based on that, it is decided which parameters will be used for ripening, and the higher or lower consumption of ethylene depends on them and the choice. With an increase in the ripening temperature of the fruit from 18 °C to 21 °C, there is a decrease in the time for the process to take place for 27 hours and a decrease in ethylene consumption for 360 ppm, i.e. the gas dosage is lower for 12 minutes or 8,568 l / minute, which saves 765.80 RSD no VAT included (8,568 l / minute x 89.38 RSD price of ethylene per liter).

Figure 2 shows the results of the research conducted in southern Serbia. The research included a total sample of 120 ripening. For a period of 6 months in year A, there were 60 ripening and a total of 2.350,00 min, i.e. 1.677,90 l of ripening gas was consumed.
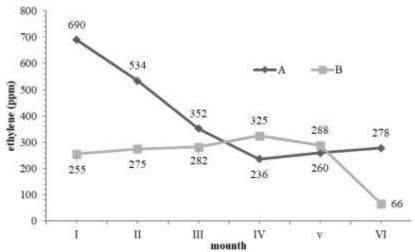

Figure 2. Ripening gas consumption in years A and B expressed in minutes, source: author's review
Legend: I-January; II-February; III-March; IV- April; V-May; VI-June; A - 2018; B - 2019

For the same period in year B, under the same conditions on the same number of ripening 1.491 min i.e. 1.064,57 l of ripening gas was consumed. It can be seen from the above figure that there is a cost reduction in year B of 613,33 l of ripening gas which resulted in saving of 54.819,43 RSD (613,33 l of ripening gas x 89,38 RSD ethylene price per liter).

DISCUSSION

Process optimization, i.e. rational business operations at lower costs and higher profitability, is the aspiration of every company. Business activity should be based on achieving the highest possible quality of products and services, i.e. obtaining the planned effect at the lowest cost per unit of product. To make profit on the one hand, and to ensure the satisfaction of the consumers with the quality and prices of their products and services on the other.

During the research of the cost-effectiveness of treatments in this area, at a constant temperature of 18 °C and correction of gas dosing time, the results showed a reduced concentration of ripening gas consumption relative to commercial 1000 ppm (Table 1), which was discussed by Thompson and Seymour [12]. As it can be seen from Figure 1, due to the increase in temperature in the process, a lower consumption of ripening gas was achieved.

Unlike some other researches conducted worldwide which stated that with increasing temperature and ethylene there is a decrease in process time, from the treatments carried out in this area there were results that show that there is a possibility that with increasing temperature in addition to reducing the concentration of ethylene there is also the reduction of ripening time.

By reducing the time for the realization of the process, the consumption of electricity and labor is reduced, and the process is successfully completed. In the technological process of ripening, apart from the influence of temperature and time, there are other factors that influence the reduction of ethylene consumption, which to a greater or lesser extent impact the process of banana ripening. The reduction of ripening gas consumption in year B (diagram 2) was influenced by the human factor by conducting the correct choice of parameters and their application. This confirms our assumption that with increasing or decreasing ethylene concentration, there is an increase or decrease in the cost of processing banana fruit.

It should be noted that all the treatments used for ripening mentioned in this paper provided a successful completion of the process, which achieved a uniform degree of ripening on the ripening scale of 4. Satisfactory quality of the fruit was achieved which responded to the challenge of standards.

Business efficiency is also achieved in the technological process of ripening bananas, without deteriorating the quality of the fruit, which is very important for sales and consumers and their need for the production of healthy food. Apart from the large number of factors that affect the process itself, which are mentioned in the paper and those that are not, the manager or process technologist are in charge of for the ripening itself and the process of proper realization of ripening. It depends on his decision whether there is a possibility to apply parameters in the process that will provide greater economy in order to save the elements of production (subjects of work, means of work and labor).

On the other hand, if the quality of the fruit is questioned before ripening, will the person responsible for the process direct the resources to the safest possible realization so as not to threaten the completion of ripening and the quality of the fruit. For example, according to the values in Table 1, a banana fruit at a temperature of 18 °C and an ethylene concentration of 1050 ppm needed 98 h to ripen. In the ripening sample from Figure 1, 125 h was required at the same temperature and ethylene parameters. The difference was influenced by: fruit quality, degree of ripening, storage conditions, country of origin, etc.

If it was decided to save time and means of production, and if the banana was of good consistency, quite fresh, preserved and not so old, the unevenness of the peel of the fruit would occur and the quality would be threatened. In that case, the company would not achieve business efficiency and satisfy the market with a good product, but the process would incur a higher cost.

Palomer and other researchers [2] stated that a lower concentration of ethylene could cause fruit ripening. This statement is reached in this paper as well. A lower ethylene dosing concentration of 690 ppm at a higher temperature of 21 °C did not prolong the duration of the process, but achieved cost savings (Figure 1). However, the amount of gas of 600 ppm in the case where there was no increase in temperature but was kept at 18 °C caused a time increase in fruit ripening to 131 h (Table 1). Although the treatment did not impair the quality of the fruit, there was an increase in other ripening costs.

According to Lebibet and other authors, with an increase in the amount of ethylene, all processes within the banana fruit take place much faster [18]. Similarly, in this study, the fruit exposed to an ethylene dosing concentration of 40 minutes (1200 ppm) ripened in 91h, while the fruit exposed for 20 minutes (600 ppm) required 131h (Table 1). There were savings in the amount of ripening gas dosing time as well as in terms of fruit heating temperature which caused lower electricity consumption. However, on the other hand, the length of the process time increased the cost of electricity.

Jayanty et al concluded that a small amount of ethylene had a negative effect on the green color of the fruit. Although satisfactory quality has been achieved in the research by adequate and careful work, poor ripening design and insufficient amount of ethylene can cause uneven ripening [19]. It is also possible to get a gray-yellow color, where the fruit loses its visual appearance. The following assumption should also be considered that the less consumed ethylene concentration in the 1000 ppm work given by Thompson and Seymour [12] is the reason for: better functionality of the ripening plant, better sealing of the chambers, reduction of gas leakage, new technological solutions, new software, etc.

One of the main reasons for the high consumption of ethylene in year A, among other things, was the human factor. Consequence of poor organization of the whole process, i.e.: staff incompetence, poor management, inadequate management of resources, etc. Due to the above-mentioned deficiencies, education of employees and application of modern technology and business in Serbia are required.

CONCLUSION

Ethylene plays great role in the technological process of ripening green banana fruit. The final outcome of ripening depends on the regulation of time and concentration of ethylene, as well as the influence of temperature and other factors. The benefits of ethylene control are not only reflected in the final quality of the fruit, but also in reducing the cost of production, thereby achieving a better price on the market, therefore gaining a competitive advantage and greater profitability of the company. The research showed that the best results are achieved by treating with 900 ppm and exposing the banana fruit to gas for 30 minutes, where ripening is performed within an optimum period of 120 h.

This method achieves a ripening price of 1.914,52 RSD and a consumption of ripening gas of 21,42 l. Satisfactory quality and shelf life of bananas has been achieved and optimum reduction in the cost of banana ripening has been impacted, as well. Savings of 183.793,89 RSD were achieved at the annual level compared to a 40-minute treatment. The saving of ethylene and ripening time of 765.80 RSD no VAT included per treatment was achieved by correcting or increasing the ripening temperatures of the fruit. A good selection of parameters by the responsible persons of the process achieved savings in the observed period of two years for 54,819.43 RSD no VAT included.

All of the above facts, which have an impact on the ripening of the fruit and the consumption of ethylene, should be considered when deciding on the ripening process. Adequate treatment and appropriate parameters bring the process to an end without major consequences. The right decisions referring to ripening can contribute to increased profits, improved fruit quality, consumer satisfaction and greater motivation of the employees in the organization. The results obtained in this paper open the possibility for new research on the mentioned topic and provide good conditions for practical application.

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