RESEARCH OF THE EFFECT OF ORGANIC FERTILIZER SIAPTON ON PRODUCTIVITY OF OIL ROSE (*ROSA DAMASCENA MILL*)

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Abstract. *In Bulgaria there are centuries-old traditions in the cultivation of oil rose (Rosa damascena Mill). Bulgarian rose oil and other products made from the colors of rose oil are well known and sought after in international markets. Since the beginning of the 19th century are exported to countries in Europe, USA, Australia, Japan, the Middle East, etc. Oil rose (Rosa damascena Mill) is grown for their flowers, which contain essential oils, producing rose oil. Rose-growing is a traditional industry in the economy of Bulgaria and the products produced by the pink color, are widely used in medicine, cosmetics, food. The aim of this study was to determine the influence of fertilizer "Siapton" on the productivity of oil rose (Rosa damascena Mill) and qualitative indicators of the received rose oil. The experiment was carried out in an experimental field at IREMK, Kazanlak in the period 2015-2017. The object of the study is the pink plantation of the "Svezhen" variety grown on leached forest soils. The bio fertilizer Siapton is a versatile organic fertilizer and biostimulant for leaf and soil applications containing amino acids and peptides. Ingredients: Total nitrogen 9.1%; organic nitrogen 8.7%; Ammonium nitrogen 0.4%; Organic carbon 25%; Total amino acids (of animal origin) 54.4%; Free amino acids 10.0%; Dry matter content 63%. For implementation of the objective study of the impact of liquid fertilizer on the productivity of the culture and quality of essential oil have been conducted biometric measurements and phenological observations during the growing season. And in the three years of the study pink color is retracted manually in phenophase blooms. The yield of rose oil is accounted for by micro distillation apparatus - Clevinger.For the purpose of the study, experiments were conducted under irrigation and irrigation conditions. Applying fertilizer Siapton leads to an increase in the mass and diameter of the color of oil rose. After treatment with the organic fertilizer Siapton yield of the pink color of the oil rose (Rosa damascena Mill) increases. Treatment at a dose of 350 ml/da under irrigated conditions ensures an increase to 21.57%, while under irrigation - 21.20%. With natural moisture supply, the highest yields of rose oil were obtained by treatment with biotor at a dose of 250-350 ml/da. At irrigation, the yields were 28.7% higher after treatment with 350 ml/da.*

Keywords: *oil rose, irrigation regime, fertilize, yield,*

INTRODUCTION

In Bulgaria there are centuries-old traditions in the cultivation of oil rose (*Rosa damascena Mill*). Bulgarian rose oil and other products made from the colors of rose oil are well known and sought after in international markets. Since the beginning of the 19th century are exported to countries in Europe, USA, Australia, Japan, the Middle East, etc. Oil rose (*Rosa damascena Mill*) is grown for their flowers, which contain essential oils, producing rose oil. Rose-growing is a traditional industry in the economy of Bulgaria and the products produced by the pink color, are widely used in medicine, cosmetics, food.

Rose oil and rose water are among the valuable raw materials for the food, perfume, cosmetics and pharmaceutical industries (Farooq et al., 2011; Rusanov et al., 2012). There are four main species of rose (*Rosa damascena Mill, Rosa gallica L., Rosa moshata Herrm and Rosa centifolia L.),* which are used in the production of essential oil worldwide. The most important of these is *Rosa damascena Mill* (Baydar et al., 2004).

Rose oil is the most expensive natural product. Many researchers have studied over the years, factors influencing the development of culture (Yankulov, 2000; Zlatev et al. 2001; Dobreva et al. 2007). For the original composition of the rose oil and authentic aroma of rose oil matter, which must be sent climate, the factors containing material, and some elements of technology for growing plants.

The application of vegetative nourish the crops is an issue that a number of researchers working in different cultures. In terms of oil rose (*Rosa damascena Mill*) the studies are limited. The application of "Humus Life-universal" at a dose of 300 ml / da has a positive influence on the vegetative growth of shrubs, sets in a study Lambev (2011). The application of this organic fertilizer helps increase the yield of color with 7% to 11%.

Foliar application of nutrients plays a vital role in plant metabolism. Very little research has been carried out with foliar spray of nutrients on growth, yield, essential oil content and composition of damask rose (*Rosa damascena Mill*.). The composition of the essential oil is significantly influenced by the foliar application of various nutrients (Kumar et al., 2015).

Various aspects of the technology of the culture were under investigation. Bergougnoux et al. (2007) point out that essential oil in roses is mostly extracted from the petals of color. Quantities are small and this determines the high cost and low efficiency of production. Soil moisture affects the productivity of plantations of oil rose. A team of scientists (Nedkov et al., 2013) establish the influence of the variation of the absolute canopy air temperature differences (dT) of white oil bearing rose (*Rose Alba L*.) grown in the region of Kazanluk without irrigation and by optimum irrigation with drip system at oil bearing rose (*Rose Alba L*.).

According to Mirzaei et al. (2016), the processing of flowers after harvest before oil extraction is considered a key point in the production of rose essential oil. The dynamic changes in the content of essential oil of the oil-bearing rose are studied systematically. The results show the most appropriate time for harvesting, the dynamics of growth, how it affects the composition of essential oils and other technological moments from the preparation and processing of the rose flower (Xihan et al., 2006; Baydar et al., 2008; Baydar et al., 2013;Verna et al., 2010).

A number of problems are associated with the rose production. Some of them are discussed in RORIAC (2018). In this report not only identified the key points and weaknesses, but solutions are set to regulate the production of rose oil.

The aim of this study was to determine the influence of fertilizer "Siapton" on the productivity of oil rose (*Rosa damascena Mill*) and qualitative indicators of the received rose oil.

MATERIAL AND METHODS

The experiment was carried out in an experimental field at IREMK, Kazanlak in the period 2015-2017. The object of the study is the pink plantation of the "Svezhen" variety grown on leached forest soils. For the purpose of the study, experiments were conducted under irrigation and irrigation conditions. The field experience is based on the Zade method (long plots), in four variants of five repetitions. Size of the test plot 25 m^2.

The assay was performed with specialized fertilizer based on natural hydrolysed proteins - Siapton. Treatment was foliar, twice with a period between importation 20 days for

the following options: treated with Siapton -150ml/da, treated with Siapton 250 ml/da, treated with Siapton 350 ml/da and untreated control.

The bio fertilizer Siapton is a versatile organic fertilizer and biostimulant for leaf and soil applications containing amino acids and peptides. Ingredients: Total nitrogen 9.1%; organic nitrogen 8.7%; Ammonium nitrogen 0.4%; Organic carbon 25%; Total amino acids (of animal origin) 54.4%; Free amino acids 10.0%; Dry matter content 63%.

For implementation of the objective study of the impact of liquid fertilizer on the productivity of the culture and quality of essential oil have been conducted biometric measurements and phenological observations during the growing season. And in the three years of the study pink color is retracted manually in phenophase blooms. The yield of rose oil is accounted for by micro distillation apparatus - Clevinger.

Quality indicators are determined by gas-chromatographic analysis in the chemical laboratory of IREMK. Test conditions: Column: capillary length 30 m, diameter 0,32 mm, film thickness of 1,0μm, oven temp 70 °C to 240 °C at rise 8 ° C/min, isotherm at 240 ° C-10 min, injector - 300 ° C, detector 300 ° C. Standards/Validated Methods - BDS ISO 9842- 2004, BDS ISO 11024-1.

RESULTS AND DISCUSSION

Months	2015				2016				2017				Rain for 30 years, mm	Temperatures for a 30 year period
	Average daily temperature, T°C	Max. °C	Min. °C	Rainfall, mm	Average daily temperature, T°C	Max °C	Min. °C	Rainfall, mm	Average daily temperature, T°C	Max. °C	Min. °C	Rainfall, mm		
I	1,9	7,5	-1,9	42,1	-0,8	5,1	-7,5	69,4	-4	1,5	-9,4	47,1	31	-0,3
II	2,9	7,6	-1,1	90,8	7,3	12,9	2	18,3	3,1	10,1	-3,3	34,3	33	1,5
III	5,9	10,3	2,3	37,2	7,9	13,4	2,3	63,9	8,1	15,4	1,6	15,2	35	5,3
IV	10,3	16,7	3	31,7	13,5	21,2	7,7	30,7	10,8	18	2,7	39,6	42	10,7
V	17,6	23,8	10	55,1	14,6	20,3	8,8	209	16	22,1	9,2	103,9	71	15,3
VI	19,5	25	11,6	100,2	20,6	26,5	14,8	72,4	21,2	27,1	13,6	85	73	18,8
VII	23,7	30,9	14,4	7,7	23,2	29,9	14,7	11,3	22,6	29,8	14,6	74,2	59	20,8
VIII	22,7	30,2	14,8	106,7	22,9	29,8	14,4	40,5	23,4	31,1	14,1	9	73,5	20,2
IX	18,8	25,8	12,2	80,4	17,7	26,2	9,1	5,1	18,4	26,8	9,7	26,5	34	16,4
X	11,2	16,1	7,2	73,9	10,7	16,7	5,4	40,0	11,3	20,3	4,3	103,6	37	10,6
XI	9,3	16,9	3,2	89,1	5,9	12,4	0,8	12,4	7,3	12,1	2,9	37,5	45	5,8
XII	3,9	11,3	-1,4	89,3	-0,2	6,8	-5,9	6,8	3,9	9,2	0,4	37,4	41	1,8

In terms of climate data elements for research over three years showed some abnormalities in the region of Kazanlak, Bulgaria. In the first year the temperatures are close to the values of the multi-annual period (Table 1). Precipitation in phenophase budding in higher amounts which, in combination with normal temperatures during this period helps wagering more flower buds in rose bushes. In the flowering period, rainfall amounts were lower than the norm for perennial period but in sufficient quantity. In meteorological terms, the first year is favorable for the development of pink plants.

Table 1. Climatic data for the period of the experiment, in the region of Kazanlak, 2015-2017

In the second year they registered rainfall, significantly higher than the rate in May (71 mm). Exceedance is recorded in the phenological stage of flowering. The amount of precipitation measured in May is 209 mm.

Despite the reported temperatures close to normal, greater rainfall adversely affects the quality indicators of rose oil. Third year in agro-meteorological terms is characterized by higher temperatures than the norm throughout the growing season.

Typical for this year are higher amounts of measured rainfall. Lower values were recorded only in March (15,2 mm), at a rate of 35 mm and of in August (9 mm) at a rate of 73,5 mm. During the period of bloom again measured higher than normal rainfall amounted to 103.9.

During the study period, the occurrence of phenophases was within normal times of culture. The treatment with the liquid manure is carried out vegetatively, twice with a period between importation 20 days in methodology.

Table 2

Biometric indicators of pink flower, 2015-2017, in the region of Kazanlak

Variant	2015				2016				2017				Average			
	Mass	%	dm	%	Mass	%	dm	%	Mass	%	dm	%	Mass	%	dm	%
Non-irigation																
150 ml/da	2,4	109,1	6,2	110,7	2,4	104,3	6,3	111,0	2,4	104,3	6,3	111,0	2,4	105,9	6,3	110,9
250 ml/da	2,4	109,1	6,2	110,7	2,4	104,3	6,2	109,7	2,4	104,3	6,2	109,7	2,4	105,9	6,2	110,0
350 ml/da	2,4	109,1	6,1	108,9	2,4	104,3	6,7	118,0	2,4	104,3	6,7	118,0	2,4	105,9	6,5	115,0
Control	2,2	100,0	5,6	100,0	2,3	100,0	5,7	100,0	2,3	100,0	5,7	100,0	2,3	100,0	5,7	100,0
Irrigation																
150 ml/da	2,4	109,1	6,6	117,9	2,5	104,2	6,1	104,0	2,5	104,2	6,1	104,0	2,5	105,8	6,2	108,6
250 ml/da	2,6	118,2	6,4	114,3	2,5	104,2	6,0	103,0	2,5	104,2	6,0	103,0	2,5	108,9	6,1	106,8
350 ml/da	2,9	131,8	6,3	112,5	2,8	116,7	6,4	110,0	2,8	116,7	6,4	110,0	2,8	121,7	6,4	110,8
Control	2,2	100,1	5,6	100,0	2,4	100,0	5,8	100,0	2,4	100,0	5,8	100,0	2,3	100,0	5,7	100,0

Biometric identifiers in the three years of the field study are presented in Table 2. The data show how in all variants treated with organic fertilizer increased the mass and diameter of the color of oil rose. In terms of mass, variation in crop irrigation was found (2.5-2.8). Under

non-irrigation conditions, the treatment with different doses affects equally. Average for the period without irrigation excess in the diameter of the colors in relation to the control variation is 8.78%, measured at the introduction of 250 ml/da to 14.04%, as reported by treatment with 350 ml/da. In terms of irrigation increase is within the 7.02% to 12.28%.

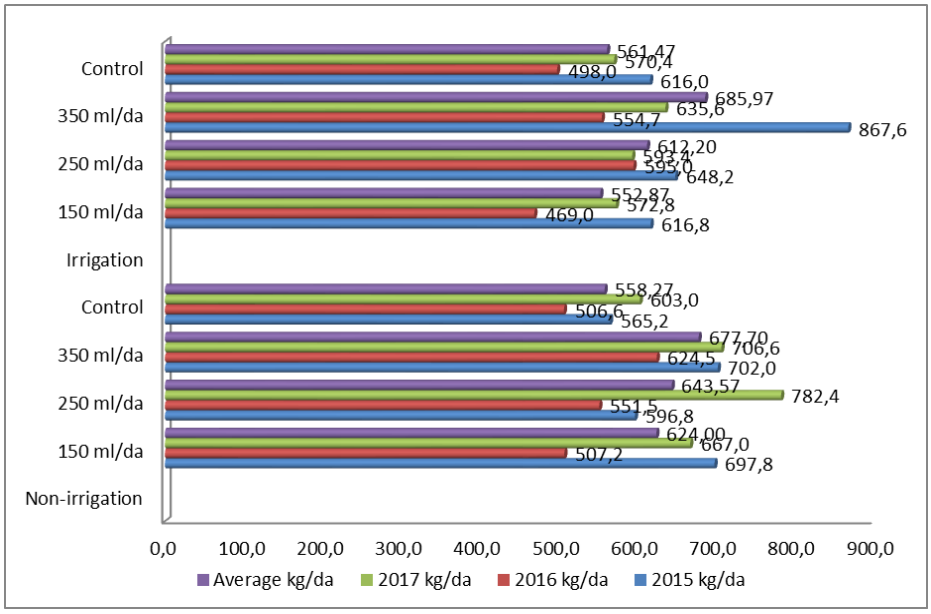

Figure 1. Yield of pink flower from damask rose (Rosa damascena Mill.)

The results of the analysis to yield a pink color are represented graphically (Figure 1). The length of flowering period is determined in part by weather conditions. In the first year flowering period lasts 24 days (18.may to 10 June). In 2016 the length of flowering period is 29 days. It starts on May 9th and lasts until June 8th. For the last year of the study is registered flowering period lasts 23 days. The period begins on May 22 and ends on June 13.

The yield of pink is increased by treatment with the biotor under study. For non-irrigation variants, the increase is in the range of 11.4% - 21.57% over the non-irrigation control. A maximum yield of 677.70kg/da was reported after administration of the vegetatively introduced biotor at a dose of 350 ml/da. The irrigation conditions of the control variant accounted for 561.47 kg/da. Under the influence of the additional treatment, yields of 552.87 to 685.97 kg/da were recorded, averaging over the study period. Again maximum yield was obtained after administration of the product at a dose of 350 ml/da. For the whole period of study the highest scores were recorded in 2015 - 867.6 350 ml/da, after introduction of the fertilizer fertilizer Siapton at a dose of 350 ml/da, under irrigation.

The same trend was observed in the production of rose oil. The higher the results obtained under irrigated conditions (Figure 2). Average for the three year period, they are in the 0.087 to 0.097, in the monitoring 0,075 ml. With the highest scores stand variant with the highest dose studied fertilizer.

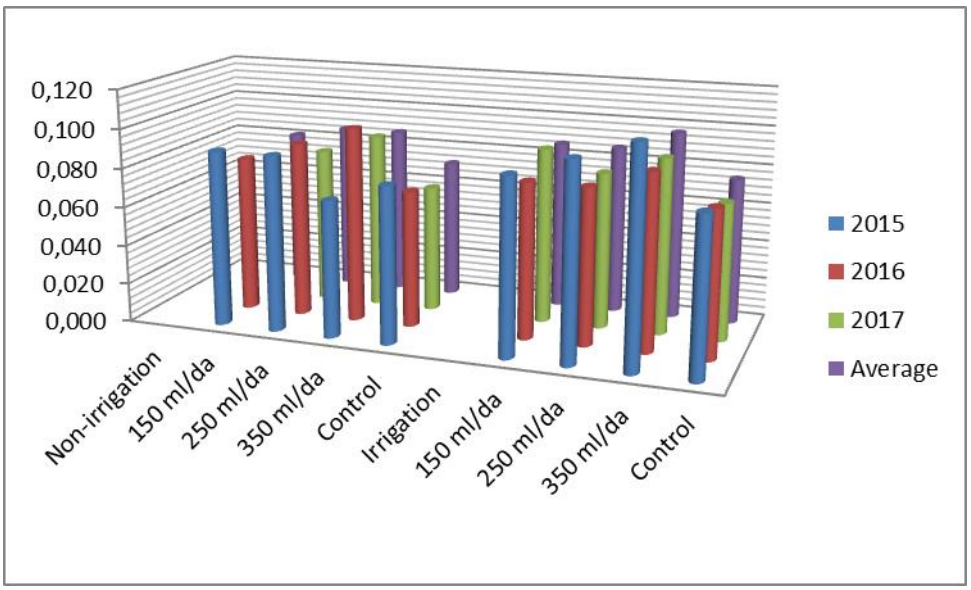

Figure 2. Yield of damask rose, for the period 2015-2017

With natural humidity, the results are highest when treated with biota at a dose of 250-350 ml / da, averaged over the period. In the first year under irrigation and treatment with 350 ml/da registered the highest yields rose oil - 0,110 ml. Importation of fertilizer helps increase the production of rose oil to 28.7% on average for the period under irrigation. In case of non-irrigation, the increase is up to 23,00%.

CONCLUSIONS

Conducted by field study can be drawn the following conclusions:

Applying fertilizer Siapton leads to an increase in the mass and diameter of the color of oil rose.

After treatment with the organic fertilizer Siapton yield of the pink color of the oil rose (Rosa damascena Mill) increases. Treatment at a dose of 350 ml/da under irrigated conditions ensures an increase to 21.57%, while under irrigation - 21.20%.

With natural moisture supply, the highest yields of rose oil were obtained by treatment with biotor at a dose of 250-350 ml/da. At irrigation, the yields were 28.7% higher after treatment with 350 ml/da.

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