ISSN 1313 - 8820
Volume 2, Number 2
June 2010

AGRICULTURAL SCIENCE AND TECHNOLOGY

2010

An International Journal Published by Faculty of Agriculture,
Trakia University, Stara Zagora, Bulgaria

Scope and policy of the journal

Agricultural Science and Technology /AST/ – an International Scientific Journal of Agricultural and Technology Sciences is published in English in one volume of 4 issues per year, as a printed journal and in electronic form. The policy of the journal is to publish original papers, reviews and short communications covering the aspects of agriculture related with life sciences and modern technologies. It will offer opportunities to address the global needs relating to food and environment, health, exploit the technology to provide innovative products and sustainable development. Papers will be considered in aspects of both fundamental and applied science in the areas of Genetics and Breeding, Nutrition and Physiology, Production Systems, Agriculture and Environment and Product Quality and Safety. Other categories closely related to the above topics could be considered by the editors. The detailed information of the journal is available at the website. Proceedings of scientific meetings and conference reports will be considered for special issues.

Submission of Manuscripts

All manuscript written in English should be submitted as MS-Word file attachments via e-mail to ascitech@uni-sz.bg. Manuscripts must be prepared strictly in accordance with the detailed instructions for authors at the website
http://www.uni-sz.bg/ascitech/index.html
and the instructions on the last page of the journal. For each manuscript the signatures of all authors are needed confirming their consent to publish it and to nominate on author for correspondence. They have to be presented by a submission letter signed by all authors. The form of the submission letter is available upon from request from the Technical Assistance or could be downloaded from the website of the journal. All manuscripts are subject to editorial review and the editors reserve the right to improve style and return the paper for rewriting to the authors, if necessary. The editorial board reserves rights to reject manuscripts based on priorities and space availability in the journal.

Subscriptions

Agricultural Science and Technology is published four times a year. The subscription price for institutions is 80 € and for personal subscription 30 € which include electronic access and delivery. Subscription run for full calendar year. Orders, which must be accompanied by payment may be sent direct to the publisher:

Trakia University
Faculty of Agriculture, Bank account:
UniCredit Bulbank,
Sofia BIC: UNCRBGSF

IBAN: BG29UNCR76303100117681
With UniCredit Bulbank Stara Zagora

Internet Access

This journal is included in the Trakia University Journals online Service which can be found at www.uni-sz.bg.

Copyright

Address of Editorial office:
Agricultural Science and Technology
Faculty of Agriculture, Trakia University
Student's campus, 6000 Stara Zagora
Bulgaria
Telephone.: +359 42 699330
+359 42 699446
http://www.uni-sz.bg/ascitech/index.html

Technical Assistance:
Nely Tzvetanova
Telephone.: +359 42 699446
E-mail: ascitech@uni-sz.bg

ISSN 1313 - 8820

Volume 2, Number 2
June 2010

AGRICULTURAL SCIENCE AND TECHNOLOGY

2010

An International Journal Published by Faculty of Agriculture,
Trakia University, Stara Zagora, Bulgaria

PRODUCTION OF FRESH
SAUSAGES AND OTHER MEAT PRODUCTS

Ken...
Everywhere
you go

KEN LTD
6000 Stara Zagora
www.ken.bg
for contacts:
+359 42 64 11 28
60 24 92
fax: +359 42 60 11 46

AGRICULTURAL SCIENCE AND TECHNOLOGY, VOL. 2, No 2, pp 71 - 74, 2010

Production Systems

Daily dynamics of the essential oils of *Rosa damascena* Mill. and *Rosa alba* L.

A. Dobreva*, N. Kovacheva

Institute of roses and aromatic plants, Osvobozhdenie 49, 6100 Kazanlak, Bulgaria

Abstract. *The dynamics of the essential oils of Rosa damascena Mill. and Rosa alba L. within a day period has been measured. It has been found that the two genotypes have the same rhythm in the release of volatile emissions. In the context of meteorological conditions the maximum of oil of the pink rose was reached at 8 o'clock (0.275 %), and that of the white rose – at 12 o'clock (0.216%). The quality and quantity changes in oil run parallel. The white rose has the potential to synthesize a high percentage of terpene alcohols – up to 43.97% (compared to 42.48% for the pink rose), but is more unstable in this potential.*

Keywords: *Rosa damascena* Mill., *Rosa alba* L., essential oil, dynamics

Introduction

Rosa damascena Mill. (pink) and *Rosa alba* L. (white) are the main genotypes in our rose production. The first one is the raw material for the production of the famous Bulgarian rose oil. The second type has been provoking increasingly greater interest in recent years – globally, its essential oil has been defined as "original, exclusively fine, only suitable for the highest perfumery" (Degraff, 2002). Rose oil is mainly localized on the surface in the epidermis layer, and less in the blossom parenchyma (Mihailova et al., 1977), and from there it easily evaporates into the atmosphere. It has been proven that the fragrance emissions of the essential-oil plants take place according to a definite pattern which depends on the abiotic factors and endogenous physiological mechanisms and the tissue where the oil is deposited (Jakobsen and Olsen, 1994; Sangwan et al., 2001). This model is of theoretical and commercial interest. Thorough understanding of the biological and physiological properties of the rose is an important prerequisite for the successful work with this plant. On the other hand, the dynamics of oil in the blossom is a factor, which determines the quantity and quality of the resulting essential oil. The changes in the release of volatile components in the essential-oil crops are connected with the time of activity of the pollinating insects (Jakobsen and Olsen, 1994), temperature (Sagae et al., 2008), light (Dundareva et al., 2004), phase of blossom development (Shalit et al., 2003), mechanism of evaporation (Sagae et al., 2008), the general meteorological data for the day (Staykov and Zolotovitch, 1956) and the general physiological state of the plant (Jakobsen and Olsen, 1994; Sangwan et al., 2001).

References contain data about the optimum moment for picking *Rosa damascena* Mill. and *Rosa gallica* L., but only refer to the content of oil in the blossom, while the quality is determined according to indirect indices (Staykov and Zolotovitch, 1956, Nazarenko, 1978). For *Rosa alba* L. such information is not available. Having in mind the types of differences in roses, the specifics in their biochemistry and physiology (Bugorskiy and Beznishenko, 1984), such a study is necessary and timely.

* e-mail: anadobreva@abv.bg

Material and methods

The experiment was conducted at the time of mass blossoming in 2009 at the Institute of roses and essential oil plants, Kazanlak. The raw material used was fresh blossoms of pink (*R. damascena* Mill.) and white (*R. alba* L.) oil-bearing roses, in their IV-V stage of development. The plantations were in the experimental field of the Institute. The roses were picked in the most typical moments of the day: at 6 a.m, 8 a.m, 10 a.m, 12 noon and 4 p.m. and distillation was performed immediately after that. Other data was recorded for the same hours: air temperature, air humidity, clouds and wind the values for which were taken from the Meteorological station in Kazanlak, which is positioned on the grounds of the Institute. The moisture of the raw material was measured according to the weight method.

The content of essential oil in the raw material was determined by distillation, done in a Clevenger apparatus, with the following parameters: quantity of the sample - 200 g, hydromodule 1:4, speed 3-4 ml/min, duration 2,5 h. The essential oil was measured in ml and after eliminating the moisture of the raw material factor, it was calculated again in percentage of the absolute dry matter (ADM).

The chemical analysis was performed through gas chromatography on a PYE UNICAM apparatus by means of a flame ionization detector in the following conditions: capillary column ECONO-CAPTMECTM (30m n 0.32 mm; film thickness 0.20 μm); temperature program: from 70°C-230°C, with a speed increment of 8°C; temperature of injector: 300°C. Injected volume 0.1 μl. Carrier gas & hydrogen, flow rate 1.3 ml/min. The components were identified during the period of retention and authentic substances (references) were used for the sake of accuracy. They were calculated quantitatively on the basis of the peak areas without any correction factor.

Results and discussion

The survey was carried out after a period of sudden dry spell

Table 1: Quantity changes of the essential oil in the blossom of *R. alba* L. and *R. damascena* Mill at different points of the day

Picking time h	Temperature °C	Relative air humidity, %	Clouds force, Wind, speed	Wind, speed (m/s) and direction	Essential oil content ,%	
					R. alba L.	*R. damascena Mill.*
6 h	12.2	68	5	3. E	0.088 ± 0.029	0.147 ± 0.000
8 h	16.8	66	5	3. E	0.167 ± 0.016	0.275 ± 0.017
10 h	20	60	5	3. E	0.162 ± 0.014	0.226 ± 0.044
12 h	19.8	58	7	6. NW	0.216 ± 0.016	0.216 ± 0.044
16 h	18	70	7	Quiet	0.118 ± 0.000	*

* - no available data, E – east, NW- north-west

had set in, and a rise in the morning temperatures (1-st and 2-nd June). The day of the survey was a mild day, fairly cloudy, without the typical morning dew (3-rd June). The quantitative changes of the essential oil in the context of meteorological conditions are given in Table 1. The data shows that in both types the morning content of oil was still very low. As the day grew and air temperatures increased, the relative humidity decreased, but the clouds and the light wind remained almost the same. Thus the oil content increased abruptly and at 8 a.m. the recorded quantities were double. This is the peak time for the pink rose. The increased rate was 1.9 times. For the white rose the increase continued until noon, and the peak was 2.9 times as high as the minimum. At 4 p.m. the temperature was within the morning values, and the relative humidity had reached levels which were favourable for the roses. The oil content, however, was lower than in the morning samples, and this can be explained by the 24-hour endogenous mechanism of blossoming, which is a proven fact for *R.damascena* Mill. (Staykov and Zolotovich, 1956; Nazarenko, 1978; Picone et al., 2004), and which involves a mass blossoming in the morning hours of the day and an afternoon decrease in the content due to evaporation loss.

Parallel with the quantitative changes run the quality changes. With time the content of terpene alcohols (TA) in the blossom increased to a certain maximum, and then it fell to the initial levels (Table 2). With both types geraniol is at its highest, but with *R. alba* L it is 3 times as much as the citronelol+nerol. With the white rose the increase for citronelol+nerol reaches double the value of the minimum (from 6.9-11.9%, while with *R. damascena* Mill the variation is within a narrow range (from 13.7-19.9%).

The components of stearopten retain their relative stability, probably due to the weak evaporation. If we trace the values for the terpene alcohols/hydrocarbons ratio (TA/HC) as a quality criterion, we will see that the most favourable ones are those at 8 a.m. and 10 a.m. (Figure 1). The white rose demonstrates better behaviour in this respect – the maximum value for TA/HC reaches 2.64 (2.00 for the pink rose). At the same time the damascene demonstrates greater stability – the variation amplitude is very narrow (1.21-2.00), while with the Alba the difference between the highest and lowest value is a sign of instability. (1.07-2.64).

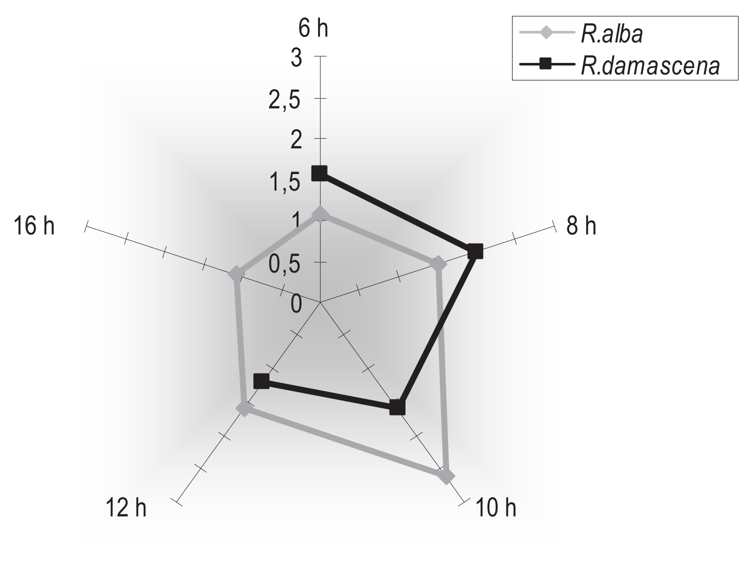

Figure 1. TA/HC ratio values in the essential oil of *R. alba* L. and *R. damascena* Mill. at different times of the day

Table 1: Chemical composition of the essential oil of *R. alba* L. and *R. damascena* Mill at different times of the day

Genotype	Picking time, h	Typical ingredients of the rose oil, %																
		Ethanol	Linalol	Cis rose oxide	Trans rose oxide	Phenylethyl alcohol	Citonelol+ nerol	Geraniol	Geranial	Damascenone	Cariophylle	Geranilaceta	Eugenol	Heptadekan, C_{17}	Nonadekan, C_{19}	Eykozan, C_{20}	Heneikozan, C_{21}	Trykozan C_{23}
Rosa alba L.	6	0.01	1.13	0.01	*	0.07	6.89	19.89	0.25	0.08	4.33	0.64	0.02	0.21	9.19	22.87	15.68	4.85
	8	0.02	1.27	*	*	0.09	7.37	23.67	0.17	0.09	3.41	0.49	0.09	0.42	8.74	2.58	11.33	2.82
	10	0.03	1.61	0.01	*	0.14	11.91	32.06	0.27	0.07	3.62	0.49	0.15	0.41	7.23	1.63	9.01	2.75
	12	0.03	0.91	0.01	*	0.09	9.14	21.23	0.28	0.04	2.7	0.31	0.20	0.37	7.79	2.30	11.03	3.18
	16	*	0.85	0.02	0.01	0.06	8.11	17.57	0.25	0.03	1.4	0.85	0.17	0.36	7.46	2.41	16.01	5.35
Rosa damascena Mill.	6	0.03	1.28	0.21	0.10	0.30	18.81	19.41	0.94	0.06	1.63	1.78	0.31	3.59	11.78	1.77	9.06	3.465
	8	0.02	1.56	0.13	0.07	0.25	19.90	22.58	1.18	0.09	1.93	1.12	0.31	4.51	10.32	1.96	6.41	1.87
	10	0.06	1.75	0.13	0.07	0.27	17.24	23.06	1.66	0.14	2.27	1.28	0.35	4.82	12.32	2.07	7.98	2.10
	12	0.02	1.35	0.13	0.07	0.21	13.70	19.04	1.07	0.19	2.09	1.08	0.38	4.22	13.59	2.10	9.36	3.13

* - unidentified component

Conclusion

The content of the essential oil for *R. alba* L. follows a pattern of variation in a 24-hour period, parallel with that of *R. damascena* Mill. The highest percentage is typical of the morning hours after 6 a.m. In moderate temperatures it is retained until noon, and then it starts to fall to as low as 50% of the maximum values.

The quality and quantity changes run parallel, i.e. picking the blossoms within optimum ranges guarantees good-quality oil. The white rose has the potential to synthesize a high percentage of terpene alcohols – up to 43,97% (with 42.48% for the pink rose), but its potential is less stable.

References

Bugorskii P and Beznishenko E, 1984. Peculiarities of the oil formation process in some sorts of roses, VNIIEMK, Simferopol, VII, 3-7, (Ru).

Degraff K, 2002. Roses beyond the beginnings of time, Bulletin of the Bulgarian National Association of essential oil perfumery and cosmetics, 4/5, 75, (Bg).

Dudareva N, Pyrchesky E.and Gershenzon J, 2004. Biochemistry of plant volatiles. Plant Physiology, 135, 1893 – 1902.

Jakobsen H and Olsen C, 1994. Influence of climatic factors on emission of flower volatiles in situ. Planta, 192 (3), 365 – 371.

Mihailova Y, Decheva R and Koseva D, 1977. Microscopic and biochemical investigations of starch and ethereal oil localisation in petals of the Kazanlak oil-bearing rose. Plant science. XIV, 2, 34 – 40, (Bg).

Nazarenko L, 1978. Essential oil roses, Naukova dumka, Ucraine, (Ru).

Picone J, Clery R, Watanabe N, Mac Tavish H and Turnbull C, 2004. Rhythmic emission of floral volatiles from *Rosa damascena* semperflorens cv."Quatre Saisons". Planta, 219, 468 – 478.

Sagae M, Oyama – Okibo N, Ando T, Marchesi E and Nakayama M, 2008. Effect of Temperature on the Floral Scent Emission and Endogenous Volatile Profile of *Petunia axillaris.* Bioscience, Biotechnology, Biochemistry, 72 (1), 110 – 115.

Sangwan N, Farooqi A, Shabih F and Sangwan R, 2001. Regulation of essential oil production in plants. Plant Growth Regulation, 34 (1), 3 – 21.

Shalit M, Guterman I, Volpin H, Bar E, Tamari T, Menda N, Adam Z, Zamir D, Vainstein A, Weis D, Pichersky E and Lewinsohn E, 2003. Volatile ester formation in Roses. Identification on an Acetyl-Coenzyme A. Geraniol/Citronellol Acetyltransferase in Developing Rose Petals. Plant Physiology, 131, 1 – 9.

Staykov V and Zolotovich G, 1956. Dynamics of the essential oil in the blossoms of the Kazanlak oil-bearing rose (*R.damascena* Mill.). Research on plant growing of the institutes of MA, v. X, 155 – 170, (Bg).

Instruction for authors

Preparation of papers

Papers shall be submitted at the editorial office typed on standard typing pages (A4, 30 lines per page, 62 characters per line). The editors recommend up to 15 pages for full research paper (including abstract references, tables, figures and other appendices)

The manuscript should be structured as follows: Title, Names of authors and affiliation address, Abstract, List of keywords, Introduction, Material and methods, Results, Discussion, Conclusion, Acknowledgements (if any), References, Tables, Figures.

The title needs to be as concise and informative about the nature of research. It should be written with small letter /bold, 14/ without any abbreviations.

Names and affiliation of authors

The names of the authors should be presented from the initials of first names followed by the family names. The complete address and name of the institution should be stated next. The affiliation of authors are designated by different signs. For the author who is going to be corresponding by the editorial board and readers, an E-mail address and telephone number should be presented as footnote on the first page. Corresponding author is indicated with *.

Abstract should be not more than 350 words. It should be clearly stated what new findings have been made in the course of research. Abbreviations and references to authors are inadmissible in the summary. It should be understandable without having read the paper and should be in one paragraph.

Keywords: Up to maximum of 5 keywords should be selected not repeating the title but giving the essence of study.

The introduction must answer the following questions: What is known and what is new on the studied issue? What necessitated the research problem, described in the paper? What is your hypothesis and goal ?

Material and methods: The objects of research, organization of experiments, chemical analyses, statistical and other methods and conditions applied for the experiments should be described in detail. A criterion of sufficient information is to be possible for others to repeat the experiment in order to verify results.

Results are presented in understandable tables and figures, accompanied by the statistical parameters needed for the evaluation. Data from tables and figures should not be repeated in the text.

Tables should be as simple and as few as possible. Each table should have its own explanatory title and to be typed on a separate page. They should be outside the main body of the text and an indication should be given where it should be inserted.

Figures should be sharp with good contrast and rendition. Graphic materials should be preferred. Photographs to be appropriate for printing. Illustrations are supplied in colour as an exception after special agreement with the editorial board and possible payment of extra costs. The figures are to be each in a single file and their location should be given within the text.

Discussion: The objective of this section is to indicate the scientific significance of the study. By comparing the results and conclusions of other scientists the contribution of the study for expanding or modifying existing knowledge is pointed out clearly and convincingly to the reader.

Conclusion: The most important consequences for the science and practice resulting from the conducted research should be summarized in a few sentences. The conclusions shouldn't be numbered and no new paragraphs be used. Contributions are the core of conclusions.

References:

In the text, references should be cited as follows: single author: Sandberg (2002); two authors: Andersson and Georges (2004); more than two authors: Andersson et al.(2003). When several references are cited simultaneously, they should be ranked by chronological order e.g.: (Sandberg, 2002; Andersson et al., 2003; Andersson and Georges, 2004). References are arranged alphabetically by the name of the first author. If an author is cited more than once, first his individual publications are given ranked by year, then come publications with one co-author, two co-authors, etc. The names of authors, article and journal titles in the Cyrillic or alphabet different from Latin, should be transliterated into Latin and article titles should be translated into English. The original language of articles and books translated into English is indicated in parenthesis after the bibliographic reference (Bulgarian = Bg, Russian = Ru, Serbian = Sr, if in the Cyrillic, Mongolian = Mo, Greek = Gr, Georgian = Geor., Japanese = Ja, Chinese = Ch, Arabic = Ar, etc.)

The following order in the reference list is recommended:

Journal articles: Author(s) surname and initials, year. Title. Full title of the journal, volume, pages. Example:

Simm G, Lewis RM, Grundy B and Dingwall WS, 2002. Responses to selection for lean growth in sheep. Animal Science, 74, 39-50

Books: Author(s) surname and initials, year. Title. Edition, name of publisher, place of publication. Example:

Oldenbroek JK, 1999. Genebanks and the conservation of farm animal genetic resources, Second edition. DLO Institute for Animal Science and Health, Netherlands.

Book chapter or conference proceedings: Author(s) surname and initials, year. Title. In: Title of the book or of the proceedings followed by the editor(s), volume, pages. Name of publisher, place of publication. Example:

Mauff G, Pulverer G, Operkuch W, Hummel K and Hidden C, 1995. C3-variants and diverse phenotypes of unconverted and converted C3. In: Provides of the Biological Fluids (ed. H. Peters), vol. 22, 143-165, Pergamon Press. Oxford, UK.

Todorov N and Mitev J, 1995. Effect of level of feeding during dry period, and body condition score on reproductive performance in dairy cows, IX th International Conference on Production Diseases in Farm Animals, Sept.11 – 14, Berlin, Germany, p. 302 (Abstr.).

Thesis:

Penkov D, 2008. Estimation of metabolic energy and true digestibility of amino acids of some feeds in experiments with muscus duck (Carina moshata, L). Thesis for DSc. Agrarian University, Plovdiv, 314 pp.

The Editorial Board of the Journal is not responsible for incorrect quotes of reference sources and the relevant violations of copyrights.

AGRICULTURAL SCIENCE AND TECHNOLOGY

Volume 2, Number 2
June 2010

CONTENTS

Journal web site:
www.uni-sz.bg/ascitech/index.html

Алфамаркет®
Publisher:
www.alfamarket.biz