



ISSN 1313 - 8820
Volume 2, Number 3
September 2010

AGRICULTURAL SCIENCE AND TECHNOLOGY

2010

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

Editor-in-Chief

Tsanko Yablanski
Faculty of Agriculture
Trakia University, Stara Zagora
Bulgaria

Co-Editor-in-Chief

Radoslav Slavov
Faculty of Agriculture
Trakia University, Stara Zagora
Bulgaria

Editors and Sections**Genetics and Breeding**

Atanas Atanasov (Bulgaria)
Ihsan Soysal (Turkey)
Max Rothschild (USA)
Stoitcho Metodiev (Bulgaria)

Nutrition and Physiology

Nikolai Todorov (Bulgaria)
Peter Surai (UK)
Zervas Georgios (Greece)

Production Systems

Dimitar Pavlov (Bulgaria)
Dimitar Panaiotov (Bulgaria)
Jordan Staikov (Bulgaria)
Yuliana Yarkova (Bulgaria)

Agriculture and Environment

Georgi Petkov (Bulgaria)
Ramesh Kanwar (USA)

Product Quality and Safety

Marin Kabakchiev (Bulgaria)
Stefan Denev (Bulgaria)

English Editor

Yanka Ivanova (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 an 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 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

All rights reserved. No part of this publications may be translated into other languages, reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying or any information storage and retrieval system without permission in writing from the publisher.

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 3
September 2010



AGRICULTURAL SCIENCE AND TECHNOLOGY

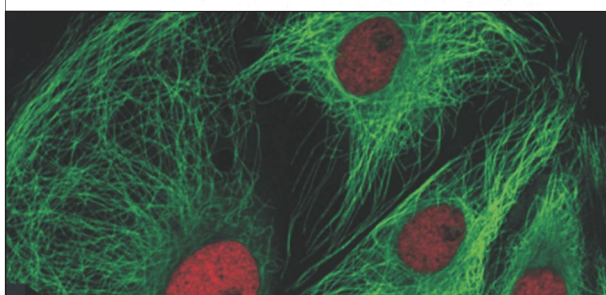
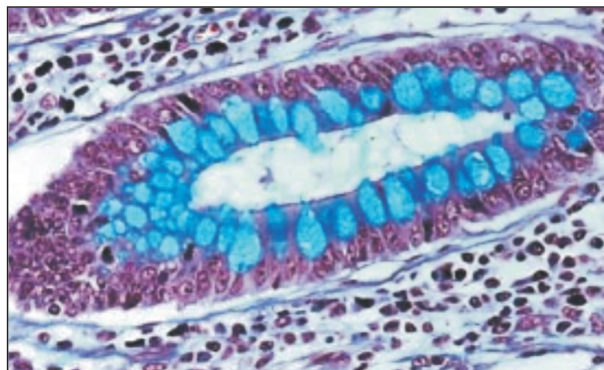
2010

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

OLYMPUS

Your Vision, Our Future

Като лидер на пазара за оптично-цифрови технологии и доставчик на една от най-широките гами микроскопи, Olympus приема предизвикателството и ускорява разработването на интелигентни и рентабилни системни решения. Olympus предлага цялостна гама продукти, покриваща всички възможни приложения: от учебни и рутинни микроскопи до най-висококачествени образни системи, приложими както в биологичните науки, така и в индустрията.



Olympus, as a market leader in optical digital technologies and supplier of one of the widest microscopy ranges, accepts the challenge and accelerates the development of intelligent and beneficial system solutions. Olympus offers a complete product range covering every possible application: from training and routine microscopes to image systems of highest quality applicable both in life science and in material science.

Изключителен дистрибутор на медицински
продукти на фирма Olympus в България
Инфомед ЕООД
Бизнес Център Сердика,
Сграда 1, ет. 3, Бул. Акад. Иван Гешов 2Е
Тел: 02 / 489 1700 , Факс: 02 / 491 8818
e-mail: office@infomed.bg
web: www.infomed.bg

Infomed
Medical Visual Systems

Distributor of Olympus Medical
Equipment in Bulgaria
Infomed Ltd.
Business Center Serdika, Building 1, Floor 3 ,
2E, Akad. Ivan Geshov Blvd.
Tel: + 359 2 489 1700 , Fax: + 359 2 491 8818
e-mail: office@infomed.bg
web: www.infomed.bg

Genetics and Breeding

Grouping of determinate local tomato varieties on the basis of cluster analysis

L. Krasteva^{1*}, I. Ivanova², N. Velcheva¹

¹Institute of Plant Genetic Resources, 2 Drouzba, 4122 Sadovo, Bulgaria

²Agricultural University, 12 Mendeleev, 4000 Plovdiv, Bulgaria

Abstract. The purpose of this paper is to classify the genetic proximity of a collection of 49 local determinant tomato accessions based on 18 quantitative indicators evaluated. By hierarchical cluster analysis they are grouped into 5 clusters. The classifications will increase the objectivity in the evaluation of accessions and the opportunity for application of different directions in the selection of tomatoes.

Keywords: cluster analysis, accession, determinate tomato

Introduction

Due to their quality indicators tomato are considered the most profitable vegetable crop, either fresh or processed. Tomato is very easily adapted to growing conditions therefore they are widely distributed. In Bulgaria there are great agrobiological opportunities for their cultivation and their production is very profitable. The introduction of foreign varieties does not always result in high profit and high quality yield due to the specific climate and soils in the country. In this respect the significance of the research and investigation of local plant genetic resources and Bulgarian tomato varieties increases. The selection aims at creation of varieties of determinant tomatoes having high biological value, which may adapt to the climate in the country (Krasteva, 1995).

The purpose of the present paper is to explain the genetic proximity of a collection of 49 determinant local accessions and tomato varieties by means of hierarchical cluster analysis based on 18 studied quantitative indicators.

Material and methods

The study of 49 accessions (28 local and 21 Bulgarian varieties) was conducted at the experimental field of IPGR-Sadovo, between 1999-2009 according to the International Classifiers for vegetable crops evaluation methodology.

Vegetative development of 10 plant accessions was evaluated. Phenological observations for phenophase initialization were conducted: germination, blossoming, fruit formation, technological and botanical maturity. Biometric measurements of all accessions were performed – the fruit form, length and width ratio, as well as the mass. 10 fruits of each accession were tested. Sugar content was determined by the method of Shoorl and vitamin C content was determined by the method of Mury. Dry matter content was determined by means of weighing method and refractometer.

A regular plant protection program related to development and distribution of economically significant tomato diseases was applied

during crop vegetation. As a preventive measure the plants were treated with suitable pesticides in compliance with the tomato development stage and surrounding climatic conditions. For that reason no disease or pest attacks were reported.

Hierarchical cluster analysis was performed (Duran and Odelle, 1977; Ward, 1963). Euclidean distance between groups is used as a unit of measurement of genetic proximity. To avoid the variation in the dimensions of the studied indicators, the data are standardized in advance. Clusterization results are presented graphically by means of dendrograms showing unification sequence of objects and clusters.

The genetic proximity evaluation of determinant tomatoes accessions is performed by means of their complex comparison on the grounds of the following 18 indicators: vegetation period „germination - blossoming” (days); vegetation period „germination – fruit formation” (days); vegetation period „germination - technological maturity” (days); stem height (cm); leaf length (cm); leaf width (cm); blossoms in the racemes (number); size of raceme (cm); fruit form (cm); mass of 1 fruit (g); loculi (number); seeds in fruit (number); average mass of 10 fruits (g); biochemical composition (% sugar); vitamin C content (mg); apple acid content (%); dry substance content (weighing, %); dry substance content (refractometric).

Results and discussion

Five clusters were formed from the tested collection upon the performed cluster analysis (Ganeva et al., 2006). The accessions within these clusters were characterized by high degree of similarity related to the studied quantitative indicators.

The first cluster includes 12 accessions (Figure 1). Upon comparison of Euclidean distance between them it was obvious that practically there was no difference between 12 and 49, 10 and 46, 3 and 39, 11 and 47, 1 and 37, 7 and 43. Determinant tomatoes included in this cluster were characterized by high content of vitamin C (17.34-25.24 mg) and % dry substance content within the range

* e-mail: krasteva_ipgr@abv.bg

4.7 - 5.7, which made them similar according to these indicators while the differences were insignificant. The accessions of this group were very suitable as genetic carriers for creation of varieties directed to industrial processing and as a raw material for the food and beverage industry.

The second cluster included 4 accessions while 9 and 45, 8 and 44 could not be practically differentiated (Figure. 1). Later this cluster joined the first one. The accessions included in the cluster were similar in regards of sugar content in % and in average mass for 10 fruits in grams. They were valuable genetic resource in regards to the fresh consumption.

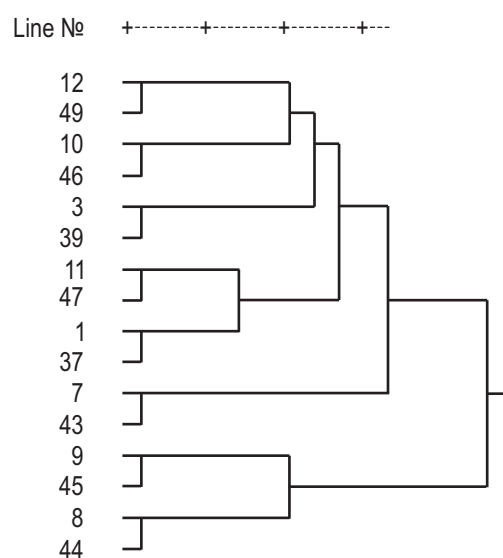


Figure 1. Dendrogram of I and II cluster

The third cluster included 7 tomato accessions (Figure 2), while 5 and 41, 2 and 38, 4, 40 and 48 had very similar dry substance content and fruit form. The dry substance content /weighing%/ varied from 5.5 to 5.7. The fruit form was within the range 0.87 - 0.92. Due to these indicators they were considered transport enduring and resistant to fruit physiological cracking.

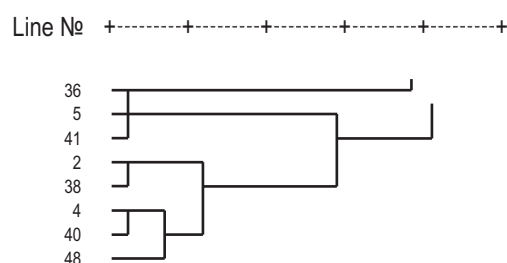


Figure 2. Dendrogram of III cluster

The fourth cluster included 12 accessions (Figure 3) – these were Nos. 23, 31, 25, 30, 26, 28, 29, 24, 32, 33, 27 and 35. They were homogenous in relation to the following indicators: vitamin C content (24.3-25.4) and apple acid content /0.678-0.691/. This group included direct Bulgarian varieties such as Topaz, Iskar, Pioneer, which were characterized by high biological indicators.

The fifth cluster included 10 accessions (Figure 3) having numbers 17, 19, 20, 13, 18, 15, 16, 14, 21 and 22. All of them were

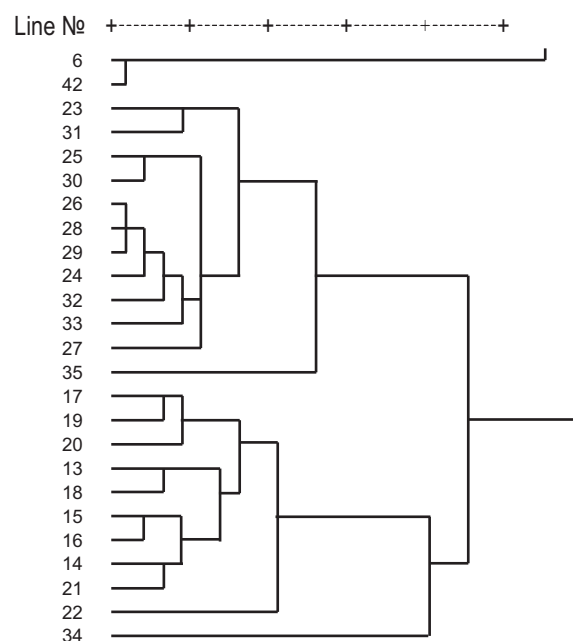


Figure 3. Dendrogram of IV and V cluster

characterized by high vitamin C and sugar content. The following economically important direct varieties such as Trapezitsa, Milyana, Vihren, Merkuriy, Lira and Bononiya were also included here. This group of varieties had the highest biological value of fruits and met the contemporary requirements of manufacturers at the largest extent. (Krasteva et al., 2009)

Accessions 6 and 42 which were practically indistinguishable were extremely distant from others and were not included into the formed clusters. Similarly, lines 36 and 34 could not be included into the formed clusters. According to indicators, accession 36 was most similar to 1 of the first cluster, while the accession 34 – to 13 of the last, fifth cluster, but with rather large Euclidean distance. The large genetic distance was mainly due to the different origin centres and dynamic climate conditions in Bulgaria. (Krasteva, 2001)

Conclusion

By means of cluster analysis and on the grounds of 18 studied indicators the collection of determinant tomatoes was grouped into 5 clusters having various genetic proximity. The groups included accessions with similar agricultural properties which represented valuable genetic resources upon selection of varieties having high biological potential.

The performed classification will increase the objectiveness upon accession evaluation and the opportunity for variety selection usage for various production purposes, as well as their reproduction for long-term storage at the National Gene Bank at the IPGR – Sadovo and for exchange.

References

- Duran B and Odelle P, 1977. Cluster analysis. Moscow.
 Ganeva D, Ivanova I and Pevicharova G, 2006. Identification of F1 determinant tomato hybrids by means of cluster analysis. Collection

of reports "Ecological approaches to safe food production", Plovdiv, 205-210.

Krasteva L, 1995. Plant resources of determinant tomatoes and their use. Scientific work of the Agrarian University, Plovdiv, 40, 1, 13-16.

Krasteva L, 2001. Gene pool of tomatoes in collection *ex situ* - evaluation and identification. 80th Anniversary of the Agrarian University, Plovdiv. Scientific work of the Agrarian University, 46, 3, 151-156.

Krasteva L, Neykov S and Velcheva N, 2009. Evaluation and management of genetic resources of the family Solanaceae. Collection of reports of AGROEKO 2009, Agrarian University, Plovdiv, LIV, 19-24.

Ward JH, 1963. Hierarchical grouping to optimize an objective function. Journal of the American Statistical Association, 58, 236-244.

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, IXth 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 muscovy duck (*Carina moschata*, 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.



CONTENTS

Genetics and Breeding

- Grouping of determinate local tomato varieties on the basis of cluster analysis** 113
L. Krasteva, I. Ivanova, N. Velcheva

- Genetic diversity in Bulgarian Thoroughbred using microsatellite DNA markers** 116

G. Barzev, E. Zhelyazkov, V. Barzeva, D. Hristova, Zh. Sabev

- Evaluation of the stability and adaptability of the Bulgarian lavender (*Lavandula angustifolia* Mill.) sorts yield** 121

S. Stanev

Nutrition and Physiology

- Effect of dietary exogenous phytase supplementation in growing and fattening pigs** 124

A. Ilchev

Production Systems

- Designing lavender plantations in relation to the mechanized harvesting of lavender blossom** 131

K. Trendafilov, N. Delchev

- Economic evaluation of winter wheat leaf fertilization** 136

A. Stoyanova, I. Gospodinov, R. Petkova

- Effect of fertilization and predecessor on chemical composition and energy value of wintering oats grain** 139

M. Dimitrova – Doneva, R. Petkova

Agriculture and Environment

- Animal hygiene and ecological assessment of air pollution in a pig-farm** 143

G. Petkov, G. Kostadinova, R. Stefanova, T. Penev, P. Gercheva

- Variation in lipid abundance and composition in a fire affected hillside from Lyulin mountain, Bulgaria** 153

I. Atanassova, M. Teoharov

- Determination of minimum heat insulation thickness for an experimental methane fermentor** 160

R. Georgiev, K. Peychev, I. Simeonov, A. Alexandrov

- Theoretical study of absorption refrigeration system thermally activated by a vacuum pipe solar collector** 163

K. Peychev, R. Georgiev, D. Dimitrova