The Cucurbit Genetics Cooperative (CGC) was organized in 1977 to develop and advance the genetics of economically important cucurbits. Membership to CGC is voluntary and open to individuals who have an interest in cucurbit genetics and breeding. CGC membership is on a biennial basis. For more information on CGC and its membership rates, visit our website (http://cuke.hort.ncsu.edu/cgc) or contact Tim Ng, (301)405-1321, cucurbit.genetics.cooperative@gmail.com, or Angela Davis, (580)889-7395, angela.davis@lane-ag.org).

CGC Reports are issued on an annual basis. The Reports include articles submitted by CGC members for the use of CGC members. None of the information in the annual report may be used in publications without the consent of the respective authors for a period of five years.

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Contents

NEWS & COMMENT

v Comments from 34th CGC Business Meeting (2010)
v Comments from the CGC Coordinating Committee
v Cucurbit Genetics Cooperative Report Call for Papers
v Comments from CGC Gene List Committee
vi 2010 Watermelon Research and Development Working Group – 30th Annual Meeting
vii 2011 Watermelon Research and Development Working Group – 31st Annual Meeting
viii Comment from the U.S. Cucurbit Crop Germplasm Committee Chair
ix Upcoming Meetings of Interest to Cucurbit Researchers
xiv In Memoriam

RESEARCH REPORTS

Cucumber (Cucumis sativus)

1 The Cucumis of Antiquity: A Case of Mistaken Identity
   Harry S. Paris and Jules Janick
3 Origin and Characterization of the ‘Lemon’ Cucumber
   R.W. Robinson
5 Yield of Spring-Planted Cucumber Using Row Covers, Polyethylene Mulch, and Chilling Resistant Cultivars
   Todd C. Wehner, Gabriele Gusmini and Katharine B. Perry
13 Genetic Control of Downy Mildew Resistance in Cucumber – A Review
   Adam D. Criswell, Adam D. Call and Todd C. Wehner
17 Antagonistic Actinomycete XN-1 from Phyllosphere Microorganisms of Cucumber to Control Corynespora cassiicola
   Minggang Wang and Qing Ma

Melon (Cucumis melo)

22 Powdery Mildew Resistance of Cucurbits at Different Locations
   R.W. Robinson
24 Podosphaera xanthii but not Golovinomyces cichoracearum Infects Cucurbits in a Greenhouse at Salinas, California
   Cosme Bojorques Ramos, Karunakaran Maruthachalam, James D. McCreight and Raymundo S. Garcia Estrada
29 Melon Trait and Germplasm Resources Survey 2011
   James D. McCreight
32 Variability and Correlation among Morphological, Vegetative, Fruit and Yield Parameters of Snake Melon (Cucumis melo Var. Flexuosus)
   Mohamed T. Yousif, Tamadur M. Elamin, Al Fadil M. Baraka, Ali A. El Jack and Elamin A. Ahmed

Watermelon (Citrullus lanatus)

36 L-Citrulline Levels in Watermelon Cultivars from Three Locations
   Angela R. Davis, Wayne Fish, Amnon Levi, Stephen King, Todd Wehner and Penelope Perkins-Veazie
40 Breeding for Yield in Watermelon – A Review
   Rakesh Kumar and Todd C. Wehner
42 Natural Outcrossing in Watermelon – A Review
   Rakesh Kumar and Todd C. Wehner
44 Characterization of M1 Generation of Polyploids in Watermelon Variety ‘Sugar Baby’
   T. Pradeepkumar

Cucurbita spp.

47 A “Hull-less” Seed Trait of Cucurbita maxima Duch. in Accession BGH 7653
   José Raulindo Gardingo, Derly José Henriques da Silva, Vincente Wagner Dias Casali, Izaias da Silva Lima Neto and Roseli Aparecida Ferrari
51 Pollination of Squash Before and After the Day of Anthesis
   R.W. Robinson
53 Regeneration in Selected Cucurbita spp. Germplasm
   C. Gisbert, B. Picó and F. Nuez
55 “Exploding” Fruits not Unique to Watermelon: Fruit Cracking in Cucurbita moschata
   Linda Wessel-Beaver
Other Genera and Species

57 Occurrence and Preliminary Characterization of Gynoecious Ridge Gourd [*Luffa acutangula* (L.) Roxb.] in a Natural Population
A.D. Munshi, T.K. Behera, A.K. Sureja and Ravinder Kumar

60 Use of Silver Thiosulfate and Gibberellic Acid for Induction of Hermaphrodite Flower in Gynoecious Lines of Bitter Gourd (*Momordica charantia* L.)
T.K. Behera, Smaranika Mishra and Anand Pal

62 Phenotypic Diversity Analysis in Pointed Gourd (*Trichosanthes dioica* Roxb.)
L.K. Bharathi and Vishalnath

65 Performance of Gynoecious x Monoecious Hybrids of Bitter Gourd (*Momordica charantia* L.)
Swati Khan and T.K. Behera

67 The Distribution and Application of Bitter Gourd in China
Chun-mei Duan, Zhen Liu and Hong-wen Cui

GENE LISTS

69 Gene List 2010 for Cucumber
Adam D. Call and Todd Wehner

104 Gene List 2011 for Melon
Catherine Dogimont

MEMBER DIRECTORIES

134 2010-2011 CGC Membership Directory

139 2010-2011 CGC Membership by Country

141 2010-2011 United States CGC Membership by State

142 Covenant & By-Laws for the Cucurbit Genetics Cooperative

144 Gene Nomenclature for the Cucurbitaceae
News & Comments

34th CGC Business Meeting (2010)
Todd C. Wehner, Department of Horticultural Science, North Carolina State University, Raleigh, NC 27695-7609 USA

The Cucurbit Genetics Cooperative met with the Cucurbitaceae 2010 conference in Charleston, South Carolina at 6:30 pm on November 15. Editors were elected to replace those who were retiring.

Linda Wessel-Beaver presented an overview of CGC membership. The membership list has been updated. Conference attendees were permitted to register for CGC membership on-site.

Angela Davis presented summary statistics and cost analyses on the annual CGC Reports. A paper edition will continue to be made available, this time in a smaller format.

The CGC website has been updated and expanded. All back issues have been put onto the world wide web, along with all issues of the Vegetable Improvement Newsletter. Help is needed to review past CGC articles and report any corrections needed or typographical errors found.

Announcements were made on the upcoming EU-CARPIA Cucurbit meeting in Antalya, Turkey in 2012, as well as plans for Cucurbitaceae 2014.

Comments from the CGC Coordinating Committee

The Call for Papers for the 2011 Report (CGC Report No. 34) has been sent out. Papers should be submitted to the respective Coordinating Committee members for publication in the volume. As always, we are eager to hear from CGC members regarding our current activities and the future direction of CGC.

- Todd C. Wehner, chair and website editor
- Angela Davis, associate chair and print editor
- Linda Wessel-Beaver, associate chair and membership coordinator
- Tim Ng, associate chair and treasurer
- Rebecca Grumet, assistant editor (cucumber)
- Kevin Crosby, assistant editor (melon)
- Tusar Behera, assistant editor (other genera)
- James Myers, assistant editor (Cucurbita spp.)
- Stephen R. King, assistant editor (watermelon)

Cucurbit Genetics Cooperative Report Call for Papers

The call for papers for CGC 35 (2012) is open, and we are accepting papers for the volume now. Send manuscripts to the appropriate crop editor. (http://cuke.hort.ncsu.edu/cgc) If you do not receive your copy, contact Linda Wessel-Beaver: lindawessel.beaver@upr.edu.

Comments from CGC Gene List Committee

Lists of known genes for the Cucurbitaceae have been published previously in Hortscience and in reports of the Cucurbit Genetics Cooperative. CGC is currently publishing complete lists of known genes for cucumber (Cucumis sativus), melon (Cucumis melo), watermelon (Citrus lanatus), Cucurbita spp., and other cumber genera and species on a rotating basis.

It is hoped that scientists will consult these lists as well as the rules of gene nomenclature for the Cucurbitaceae before choosing a gene name and symbol. Thus, inadvertent duplication of gene names and symbols will be prevented. The rules of gene nomenclature were adopted in order to provide guidelines for the naming and symbolizing of genes previously reported and those which will be reported in the future. Scientists are urged to contact members of the Gene List Committee regarding questions in interpreting the nomenclature rules and in naming and symbolizing new genes.

- Cucumber: Yiqun Weng (curator) and Todd C. Wehner (assistant)
- Melon: Catherine Dogimont (curator) Michael Pitrat (assistant curator) and James D. McCreight (assistant curator)
- Other Genera: Mark G. Hutton (curator) and Thomas Andres (assistant curator)
- Cucurbita spp.: Harry Paris (curator) and Les Padley (assistant curator)
- Watermelon: Todd C. Wehner (curator) and Stephen R. King (assistant curator)

Comments from CGC Gene Curators

Lists of known genes for the Cucurbitaceae have been published in reports of the Cucurbit Genetics Cooperative. CGC is currently publishing complete lists of known genes for cucumber (Cucumis sativus), melon (Cucumis melo), watermelon (Citrus lanatus), Cucurbita spp., and other genera on a 5-year rotation.

We hope that scientists will consult these lists as well as the rules of gene nomenclature for the Cucurbitaceae before choosing a gene name and symbol. In this way, we hope to avoid inadvertent duplication of gene names and symbols. The rules of gene nomenclature were adopted in order to provide guidelines for the naming and symbolizing of genes previously reported and those which will be reported in the future. Scientists are urged to contact members of the Gene List Committee regarding questions in interpreting the nomenclature
rules and in naming and symbolizing new genes.

CGC has appointed Curators for the major cultivated groups: cucumber, melon, other genera, *Cucurbita* spp., and watermelon.

Curators are responsible for collecting, maintaining and distributing upon request stocks of the known marker genes. CGC members are requested to forward samples of currently held gene stocks to the respective Curator.

- Cucumber: Yiqun Weng (curator) and Todd C. Wehner (assistant curator)
- Melon: Catherine Dogimont (curator) and James D. McCreight (assistant curator)
- Other Genera: Mark G. Hutton (curator) and Thomas Andres (assistant curator)
- *Cucurbita* spp.: Harry Paris (curator) and Richard W. Robinson (assistant curator)
- Watermelon: Todd C. Wehner (curator) and Stephen R. King (assistant curator)

### 2010 Watermelon Research and Development Working Group – 30th Annual Meeting

Submitted by Jonathan R. Schultheis

The Annual Meeting of the Watermelon Research & Development Working Group was held Sunday, February 7, 2010 at the Wyndham Orlando Resort in Orlando, FL, from 8:00 a.m. to 4:00 p.m. The meeting was held in conjunction with The Southern Association of Agricultural Scientists and the Southern Region American Society for Horticultural Science (SR-ASHS). A welcome from Elisabetta Vivoda, chair of the Watermelon Research & Development Working Group (WRDWG), was given to all in attendance which totaled near 30 people. Judy Thies, chair of the upcoming international Cucurbitaceae meeting, reminded and invited everyone to be held in Charleston, SC, November 14-18, 2010.

An update in watermelon cultivar development was then provided from the following seed companies: Harris Moran (Brenda Lanini), Syngenta (James Brusca), and Zeraim Gedera (Woody Spiers).

Watermelon trial reports were then given by Jonathan Schultheis: Red flesh watermelon and mini-watermelon trials, 2009; and Brad Thompson: Yellow orange flesh watermelon trial, 2008. After their presentations, there was a lengthy discussion regarding watermelon quality attributes with particular interest in hollow heart.

After the watermelon cultivar trial results the following research reports were presented the remainder of the morning and after lunch:

- **Lagenaria and Cucurbita rootstocks prevent infection of watermelon scions by *Fusarium oxysporum f. sp. niveum*.** A. P. Keinath*, V. B. DuBose, and R. L. Hassell. Clemson University, Coastal REC, Charleston, SC.
- **Tolerance to the herbicide clomazone in watermelon plant introductions.** H. Harrison, C.S. Kousik* and A. Levi. U.S. Vegetable Laboratory, USDA ARS, Charleston, SC.
- **Phylogenetic Relationships Among Cucurbit Species Used as Rootstocks for Grafting Watermelon.** A. Levi*1, J.A. Thies3, K. Ling1, A. Simmons1, C.S. Kousik1, W.P. Wechter4, and R. Hassell2. 1USDA-ARS, U.S. Vegetable Laboratory, and 2Clemson University, Costal Research and Education Center, 2700 Savannah Highway, Charleston, SC 29414, USA 2700 Savannah Highway, Charleston, SC.
Resistance of wild watermelon (*Citrullus lanatus* var. *citroides*) rootstocks to southern root-knot nematode. Judy A. Thies*(1), Jennifer J. Ariss (1), Amnon Levi (1), Chandrasekar S. Kousik (1), and Richard L. Hassell (2). (1) U.S. Vegetable Laboratory, USDA, ARS, Charleston, SC; (2) Clemson Coastal Research & Education Center, Charleston, SC.

Evaluation of instrumental texture measurements of watermelon cultivars. Jennifer W. Shiu*, University of California Davis, Davis, CA; David C. Slaughter, University of California Davis, Davis, CA; Laurie Boyden, Syngenta Seeds, Naples, FL; Diane M. Barrett, University of California Davis, Davis, CA.

*Denotes who made presentation.

Following the more formal presentations, Shaker Kousik led a good discussion session aimed at answering some of the following questions: How many watermelon varieties are grown in the US? Can the name Hollow Heart be changed to Sweet heart since most watermelons with hollow heart are generally sweeter?

Elisabetta Vivoda presided over the WRDWG meeting as this was the first year of a two year term as chair of the group. She did a wonderful job in organizing the meeting.

Jonathan Schultheis served the first year of a two year term as vice-chair.

Todd Wehner was re-elected secretary.

The WRDWG thanks Syngenta for providing refreshments at the meeting.

2011 Watermelon Research and Development Working Group – 31st Annual Meeting

Submitted by Jonathan R. Schultheis and Richard Hassell

Prior to the 31st Annual Meeting of the Watermelon Research & Development Working Group (WRDWG), a session was held for the WRDWG at the Cucurbitaceae 2010 meeting held in Charleston, South Carolina in November 2010. About 60 people attended the WRDWG session at Cucurbitaceae 2010. One of the focuses of the session was to gain perspectives on watermelon production practices and challenges across various international geographic regions. This provided the opportunity for the group to gain some international perspectives rather than only a national perspective. Several watermelon breeders familiar with various production regions within Europe and Asia willingly shared their knowledge with the group. Additionally, there was discussion as to whether to have the WRDWG meeting in Corpus Christi. Although many who attended Cucurbitaceae could not or chose not to attend the meeting in Corpus Christi, there was a critical mass with several excellent presentations such that the 31st meeting did take place.

The Annual Meeting of the Watermelon Research & Development Working Group (WRDWG) was held Sunday, February 6, 2010 at Corpus Christi, Texas, from 8:00 a.m. to 12:00 noon. The meeting was held in conjunction with The Southern Association of Agricultural Scientists and the Southern Region American Society for Horticultural Sciences (SR-ASHS). A welcome from Richard Hassell, substituting as chair of the WRDWG, was given to all in attendance which totaled near 25 people. The weather, in addition to the close proximity of the recent cucurbit meeting in Charleston, South Carolina resulted in a lower attendance.

An update in watermelon cultivar development was then provided from the following seed companies: Syngenta and Zeraim Gedera. The following reports were given:

**Irrigation Levels Affect Fruit Yield and Quality of Watermelon.** Juan C. Díaz-Pérez, Dan MacLean, Pingsheng, Department of Horticulture, Tifton Campus, University of Georgia 31793 (jcdiaz@uga.edu)

**Tolerance to Phytophthora Fruit Rot in Watermelon Plant Introductions.** C.S. Kousik, U.S. Vegetable Laboratory, USDA, ARS, 2700 Savannah Highway, Charleston, SC 29414 (shaker.kousik@ars.usda.gov)

**Results of 2010 Fungicide Trials to Manage Phytophthora Fruit Rot of Watermelon in South Carolina.** C.S. Kousik, H.F. Harrison and J.A. Thies, U.S. Vegetable Laboratory, USDA, ARS, 2700 Savannah Highway, Charleston, SC 29414 (shaker.kousik @ars.usda.gov)

**Performance of grafted watermelon in root-knot nematode infested soils.** Judy A. Thies, U.S. Vegetable Laboratory, USDA, ARS, Charleston, SC, 29414 (Judy.Thies@ars.usda.gov) Richard L. Hassell, Clemson University CREC, 2700 Savannah Highway, Charleston, SC 29414 Jennifer J. Ariss, and Amnon Levi, U.S. Vegetable Laboratory, USDA, ARS, Charleston, SC 29414

**Field Survey of Pollenizer Flowering, Triploid Fruit Set, and Pollinator Activity in Delaware Watermelons.** Gordon C. Johnson, University of Delaware Carvel REC, 16483 County Seat Highway, Georgetown, DE 19947 (gcjohn@udel.edu)

**QTL Mapping of Important Horticultural Traits in Watermelon.** Cecilia E. McGregor. Department of Horticulture, University of Georgia, Athens, GA 30602 (cmcgre1@uga.edu)

**Watermelon Fruit Quality Study 2010.** Richard L. Hassell, Clemson University CREC, 2700 Savannah Highway, Charleston, SC. 29414 (rhassel@clemson.edu),
Comment from the U.S. Cucurbit Crop Germplasm Committee Chair
J.D. McCreight, USDA-ARS, Salinas, California USA.

The Cucurbit Crop Germplasm Committee (CCGC) operates under the auspices of the USDA-ARS National Plant Germplasm System (NPGS), is composed of ARS, university and industry scientists, and provides guidance to NPGS on matters relating to cucurbit crop and wild related species. CCGC membership and species-specific crop reports are accessible through the NPGS website: (http://www.ars-grin.gov/npgs/). The CCGC receives, reviews, and recommends germplasm evaluation proposals annually for funding by NPGS, and also reviews and recommends proposals for germplasm collections and exchange. Contact James D. McCreight (james.mccreight@ars.usda.gov) for more information.

In 2010, the CCGC met with the Cucurbitaceae 2010 conference in Charleston, South Carolina at 6:00 p.m. on November 16. Reports were provided by NPGS on recent germplasm exploration activities and imminent release of GRIN Global software. Curator reports were presented. Proposed descriptors for Buffalo gourd (Cucurbita foetidissima) were submitted by the curator for review by the CCGC.

Upcoming Meetings of Interest to Cucurbit Researchers

Cucurbitaceae 2012
October 15-18, 2012, Antalya, Turkey

Dear Colleagues,

On behalf of the EUCARPIA Vegetable section, the conference organizing committee is pleased to welcome you to Antalya, Turkey, for the Xth EUCARPIA Meeting on Genetics and Breeding of Cucurbitaceae 2012.

The meeting will take place in Antalya. The city has always been a popular destination due to charming geography, history, and culture.

The EUCARPIA meetings on Cucurbitaceae are held every 4 years. Cucurbitaceae 2012 aims to bring together all researchers working on cucurbit genetics and breeding.

Cucurbitaceae 2012 will focus on all aspects of:
* Genetic resources
* Genetics and breeding
* Genomics and biotechnology

The scientific program includes oral and poster presentations submitted to the scientific committee. The language of the meeting will be English. The meeting will include a one-day technical excursion. Submission of posters and oral communications will be accepted August 01, 2011 - March 15, 2012. Online registration opens August 01, 2011. Deadline for reduced registration fee is April 15, 2012. Final registration (regular fee) August 15, 2012.

With Warm Regards,
The Organizing Committee and the Organizing President Prof. Dr. Nebahat SARI;
nesari@cu.edu.tr

http://www.cucurbitaceae2012.org/invitation.html
<table>
<thead>
<tr>
<th>Organization/Meeting</th>
<th>Dates</th>
<th>Location</th>
<th>Contact</th>
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</table>
| 32nd Annual Meeting of the Watermelon Research & Development Group | February 2012 8:00 am - 5:00 pm  
October, 2012 | In conjunction with the 72nd Annual Meeting of the Southern Region - American Society for Horticultural Science, Birmingham, AL, USA  
In conjunction with Cucurbitaceae 2012, Antalya, Turkey. | Jonathan Schultheis  
jonathan_schultheis@ncsu.edu |
| ISHS V International Symposium on Cucurbits               | May 14-16, 2013 | Giza, Egypt                                                               | Ahmed Glala, Horticultural  
aaa_glala@yahoo.com |
| Cucurbit Crop Germplasm Committee Meeting                 | TBA                           | In conjunction with Cucurbitaceae 2014, USA.                             | Jim McCreight  
jmccreight@pw.ars.usda.gov |
| Cucurbit Genetics Cooperative Business Meeting            | September 2011  
July-August 2012  
October 2012 | In conjunction with American Society for Horticultural Science, Waikoloa, Hawaii  
In conjunction with American Society for Horticultural Science, InterContinental Miami Hotel, Miami, Florida  
In conjunction with Cucurbitaceae 2012, Antalya, Turkey. | Todd Wehner  
todd_wehner@ncsu.edu |
| Pickle Packers International                             | October 26-28, 2011  
April 10-12, 2012 | Venetian Hotel, Las Vegas, Nevada.  
Hyatt Regency, Milwaukee, WI | 202-331-2456  
http://www.ilovepickles.org |
| Cucurbitaceae 2014                                       | TBA                           | TBA                                                                       | Rebecca Grumet  
grumet@msu.edu  
Mike Havey  
michael.havey@ars.usda.gov |
| X EUCARPIA International Meeting on Cucurbitaceae         | October 2012 | Rixos Downtown Antalya Hotel, Antalya, Turkey                            | Nebahat Sari  
nesari@cu.edu.tr |
| Melon Breeders Group                                      | TBA                           | In conjunction with Cucurbitaceae 2014, USA.                             | Jim McCreight  
Jim.McCreight@ars.usda.gov |
| National Watermelon Association                          | February 22-26, 2012  
February 20-24, 2013 | Ritz Carlton Resort & Spa, Amelia Island, Florida  
Westin La Cantera Resort & Spa, San Antonio, Texas | Telephone: 863-619-7575  
Fax: 863-619-7577  
nwa@tampabay.rr.com  
http://www.nationalwatermelonassociation.com |
| Squash Research Group                                     | October 2012 | In conjunction with Cucurbitaceae 2012, Antalya, Turkey.                | TBA |
| Pickling Cucumber Improvement Committee                   | October 28, 2011 | In conjunction with Pickle Packers International (PPI) Annual Meeting & Product Showcase, Venetian Hotel, Las Vegas, Nevada. | Yiqun Weng  
weng4@wisc.edu |
Cucurbit Genetics Cooperative

Style Guide

The following guidelines are for use in the preparation of reports. It is recognized that CGC members may not be able to meet one or more of the guidelines.

Authors are encouraged to contribute reports even though some of the guidelines cannot be met.

Our objective is to facilitate the interchange of information, but we ask authors to help reduce unnecessary editing.

Refer to the latest Cucurbit Genetics Cooperative Report regarding questions of style not mentioned.

I. Reports will be assigned to one of the following:

A. Research Notes - short reports dealing with current genetics, breeding and closely related matters that are of possible interest to members.

B. Germplasm Exchange - a listing of seed stocks that are available or desired. Brief descriptions and gene symbols, if applicable, are useful.

II. General Guidelines

A. Reports should normally not exceed two (2) single-spaced, typewritten or word-processed pages.

B. Authors are requested to submit electronic copy of their reports by email. The report should be submitted as a word processing file. A follow up email should be sent to see if it was properly received.

C. Tables and Figures (e.g., *.TIFF, *.PCX, *.GIF, *.JPG, *.WPG) should be included as separate files on the disk even if they are also embedded in the body of the text.

D. If you are unable to submit your report by email or disk, send a typed copy. CGC will look after re-entering your submission.

III. Title

A. The title should be a precise and concise description of the work.

B. Avoid the use of meaningless words such as “influence of,” “effects of,” “results of,” “studies on,” “evaluation of,” “factors involved in,” and “tests on.”

C. Begin at left-hand margin. (See Examples I, II and III)

D. Capitalize first letter of all words except for articles such as “a” and “the,” prepositions such as “of,” “in,” “on,” “during,” and “between,” and conjunctions such as “and” and “with” that are not the first word.

E. DOUBLE SPACE between Title and By-line.

IV. By-line

A. Author(s) name(s) (first name or initial followed by middle initial and last name). (See Example I)

1. Names of two or more authors at the same institution are on the same line. (See Example II)

2. Names of authors in separate institutions are on different lines. (See Example III)

B. Concise mailing address is on the line below the author(s) name(s). (See Examples I, II and III)

C. TRIPLE SPACE between By-line and Body of Report. (See Example I)
V. Body of Report (See Example I)

A. Follow conventional format and include a brief Introduction, essential Materials & Methods, and concise Results and Discussion.

B. DO NOT indent the first word of a paragraph.

C. Use numbers enclosed in parentheses for literature citations.

D. DOUBLE SPACE between paragraphs and between body of report and Literature Cited.

VI. Taxonomy and Genetic Nomenclature (See Example I)

A. **Taxonomy** (See Example I)

1. Give the full scientific names of plants, disease organisms, and insects, along with their authority (and if important, the cultivar name).

2. **Italicize** scientific names.

3. Use common names whenever possible.

4. Cultivar names can be preceded by the abbreviation for the word cultivar (e.g., cv. Calypso), or can be set off with single quotes (e.g., 'Calypso').

B. **Genetic Nomenclature** (See Example I)


2. Refer to the rules of nomenclature before assigning a name and symbol to a newly described gene in a published report regardless of where it is published.

3. If necessary, consult the CGC Gene List Committee regarding questions of gene names and symbols. Members of the Gene List Committee are listed in the latest CGC Report.

4. **Italicize** gene names and symbols.

VII. Literature Cited (See Example I)

A. List citations in alphabetical order, but numbered consecutively with Arabic numerals followed by a period.

B. Authors are listed after the number; senior author (last name first, by initials), then additional authors (initials first).

C. DO NOT substitute the underline for the author’s name when an author is cited more than once, repeat the author’s name for each citation.

D. DO NOT indent the second and any subsequent lines of citations, but begin directly below the first letter of the author’s last name.

E. DO NOT underline journal titles.

VIII. Tables (See Example IV)

A. Tables should document or clarify, but not duplicate, data already given in the text or figures.

B. Large tables can be reduced in size through photoreduction (or reduced font size) in order to fit within the prescribed margins. Photoreductions should be done by the author(s) if possible.
C. Table Anatomy

1. Headnote - contains “Table,” then number in Arabic, and a self-explanatory title.

2. Headrule - underscores the headnote; one line.

3. Stubhead - is the head of the first column. Capitalize only the first letter of the first word and any proper nouns.

4. Boxhead - contains the column heads of the rest of the table, and is centered between the stubhead and the right margin. Capitalize only the first letter of the first word and any proper nouns.

5. Boxhead rule - one line under the boxhead to separate it from the main body of the table.

6. Field - is all the information between the boxhead rule and the footrule -- the main body of the table.

7. Footrule - a single underscore to separate the field from the footnotes (if any).

8. Footnotes - are designated with superscript, lowercase letters in reverse alphabetical order (z, y, x, w, etc.), thus avoiding confusion with alphabetical letters used for statistical significance (a, b, A, B).

IX. Figures

A. Data presented in tables should not be duplicated in Figures.

B. Figures include graphs and line drawings in black on white paper or on white paper imprinted with light blue lines which will not appear when photographically reproduced, and black and white photographs.

C. Large figures can be reduced in size through photoreduction in order to fit within the prescribed margins. Photoreductions should be done by the author(s) if possible.

D. Captions should be clear, concise and complete.

E. If mailing reports, protect figures with stiff cardboard backing and mark envelope “Do Not Bend.”

Examples

Example I

Sources of Resistance to Viruses in Two Accessions of Cucumis sativus

R. Provvidenti

Department of Plant Pathology, New York Agricultural Experiment Station, Cornell University, Geneva, NY 14456

Recently we have determined that two accessions of Cucumis sativus L. cv. Surinam and cv. TMG-1 are valuable sources of resistance to the most common viruses affecting this species in the U. S.

‘Surinam’, a cultivar from the South American country of the same name, possesses a single gene (wmv-1-1), which confers resistance to watermelon mosaic virus 1 (WMV-1) (2). Following inoculation . . .

(body of report)

...breeders with sources of resistance to four viruses.
Literature Cited


Example II

Obtention of Embryos and Plants from In Vitro Culture of Unfertilized Ovules of *Cucurbita pepo*

D. Chambonnet and R. Dumas de Vaulx

Institut National de la Recherche Agronomique, 84140 Montfavet, France

Example III

Lack of Resistance to Zucchini Yellow Mosaic Virus in Accessions of *Cucurbita maxima*

R. Provvidenti

Department of Plant Pathology, New York Agricultural Experiment Station, Cornell University, Geneva, NY 14456

R. Alconero

U. S. Department of Agriculture, Agricultural Research Service, Regional Plant Introduction Station, Geneva, NY 14456

Example IV

Table 1. Petiole length (cm) of the first four true leaves of mutant and normal cucumber plants segregating for the short petiole (sp) gene.

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Leaf node</th>
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Warren S. Barham, Watermelon Breeder

Dr. Warren S. Barham worked in administration, research and teaching at Cornell University, North Carolina State University, and Texas A&M University. He worked many years in the seed industry at several seed companies before founding his own company, Barham Seeds, Inc. in 1986.

Dr. Barham was the first watermelon breeder at North Carolina State University. A major contribution to watermelon breeding at NC State was finding resistance to anthracnose (Colletotrichum lagenarium). He also studied physiological disorders in watermelon.

Warren Barham studied seed size in watermelon and developed the small (short) seed type, which was released in the cultivar ‘Sweet Princess’. He studied the inheritance of golden leaf and fruit (go) as a possible indicator of ripeness.

While in the seed industry, Dr. Barham and his staff developed over twenty seedless and seeded watermelon hybrids. A&C 5244 is one of the most popular seedless watermelons grown in North America. Along with watermelon breeding, he also bred onion, tomato, and cucumber.

Warren S. Barham, PhD, passed away on April 16, 2010. He was born February 15, 1919, in Prescott, Arkansas. He married Margaret Alice Kyle (deceased 1997) in 1940. Warren and Margaret had 4 children (Barbara, Juanita, Margaret Ann, and Robert; 11 grandchildren; and 11 great-grandchildren).

Warren was a generous loving father, husband, grandpa, and friend with a wonderful sense of humor and compassion for all. He knew no stranger and had an amazing ability to keep in touch with friends and colleagues from his native Arkansas, to all corners of the world. He was a passionate horticulturist, educator and renowned plant breeder who never retired from his creative instincts to develop new fruits and vegetables. He had a strong, lasting influence on all who knew him.

Dr. Barham received his BS degree at the University of Arkansas, Fayetteville, in 1941 and his PhD in Plant Breeding, Vegetable Crops, and Plant Physiology at Cornell University, Ithaca, N.Y. in 1949. Dr. Barham served in the Army Air Corps during World War II from 1942 to 1945. Dr. Barham was Assistant Professor of Horticulture at North Carolina State University, Raleigh, where he taught Plant Breeding and Graduate Research until 1958. He then became Director of Raw Products Research for Basic Vegetables in Vacaville, California, until 1976, and was then Professor and Head of the Horticultural Sciences Department at Texas A&M University, College Station, until 1982.

Dr. Barham moved to California and formed Barham Seeds, Inc. in 1985 After “retiring” for two weeks, at 65, Warren Barham then went on to become a pioneer in the development of seedless watermelons.

Dr. Barham continued active research, consulting, and generating innovative ideas about vegetable breeding until the final day of his life. Dr. Barham’s research included identifying and developing solutions to long-standing issues for plant breeding in various crops including onions, tomatoes, watermelons, melons, and cucumbers.

Dr. Barham was committed to contributing to his community as well as to his profession. He served as a school board member in Vacaville for 10 years, as a Rotarian for over 50 years, served as a member of parks and recreation commission in Gilroy, and volunteered at the Garlic Festival. He backed up his time commitment to community service with generous donations to fighting cancer, supporting the arts, helping youth sports, scholarships, and public horticultural research – to name a few.

Significant was Dr. Barham’s commitment to the American Society for Horticultural Science (ASHS). He was always supportive and active in this preeminent scientific society. He was vice-president of Industry and then president of ASHS.

Warren Barham is an excellent example of that “great generation” that first saved the world for freedom then went on to enhance life for everyone through hard work and positive achievement.

In Memoriam

Henry Munger, Plant Breeder Extraordinaire

R. W. Robinson
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Henry M. Munger died on August 25, 2010 at the age of 94. He was a renowned breeder of many vegetable crops. He introduced more than 70 varieties and breeding lines of nine different vegetable crops.

Dr. Munger grew up on a vegetable farm in western New York and entered Cornell University at the young age of 16. After receiving his BS from Cornell in 1936 he obtained his MS from Ohio State University in 1937, and then returned to Cornell where he was...
awarded his PhD degree in 1941. After graduating he was a faculty member at the University of Wisconsin for two years, then returned again to Cornell University where he had joint appointments in the Dept. of Plant Breeding and the Dept. of Vegetable Crops.

Improved quality and disease resistance were of prime importance in his many breeding programs. He diligently tasted the fruit of hundreds of tomato breeding lines in a quest to breed for better flavor. The ‘Gardener’ and ‘VF Gardener’ varieties that he bred have exceptional flavor, and he bred three other tomato varieties as well. He bred onions for mild flavor and long storage life and, in cooperation with other breeders, developed the ‘Empire’, ‘Premier’, and ‘Sweet Sandwich’ varieties. He bred cabbage for yellows resistance and introduced the ‘Empire Danish’ variety. He bred the blight resistant celery varieties ‘Emerson Pascal’ and ‘Beacon’. He also bred spinach, beans, peas, and *Amaranthus*. The male sterile mutant of the Queen Anne’s Lace weed which he discovered while on vacation on Cape Cod is the basis for all hybrid carrot varieties and the important baby carrot industry.

Dr. Munger was an outstanding breeder of many vegetable crops but cucurbits were his favorite. Melon was the first crop he ever bred and at the end of his long and distinguished career he was still breeding melon, and cucumber and squash as well. His doctoral research, under famed plant breeder R. A. Emerson, was on Fusarium resistance for melon. This led to his development of ‘Iroquois’, the first Fusarium resistant variety of melon, and later to ‘Delicious 51’. He also bred melons for resistance to powdery mildew and cucumber mosaic virus. He developed an improved method for producing hybrid melon seed, and he bred monoecious melons with round fruit shape so that seedsmen could produce hybrid seed without having to emasculate bisexual flowers.

His accomplishments in cucumber breeding are legendary. His ‘Marketmore’ variety, the improvements he added to it by backcrossing, and varieties with ‘Marketmore’ in their pedigree that were bred by others represent most of the cucumber varieties grown in the US and many other countries today. He bred cucumber varieties with a higher level of CMV resistance than any before, with combined resistance to more diseases than any other variety, and with better and more uniform fruit color. Cucumber varieties he bred include ‘Yorkstate Pickling’ (1950), ‘Niagara’ (1951), ‘Tablegreen’ (1959), ‘Marketmore’ (1968). ‘Meridian’ (1971). ‘Marketmore 76’ (1976), ‘Poinsett 76’ (1976), ‘Spacemaster’ (1980), and ‘Comet’ (1983).

Henry was the foremost proponent of the use of backcrossing in vegetable breeding. Other vegetable breeders have used the backcross method to incorporate single genes into varieties, but none so extensively as Dr. Munger. No one else to my knowledge has used the backcross method with traits of complex inheritance, but Dr. Munger accomplished this with CMV resistance for cucumber. It is difficult to identify cucumber plants with all possible CMV resistance genes when evaluating the selfs of each backcross generation, since plants lacking one of the genes may have nearly as high a level of CMV resistance as those homozygous for all of the resistance genes. Dr. Munger, however, determined that backcross plants not selfed, which are heterozygous for the resistance genes, have an intermediate level of resistance and plants with all of the resistance genes can be more easily distinguished.

Dr. Munger backcrossed resistance to the phenomenal number of nine diseases (CMV, ZYMV, WMV, PRSV, scab, powdery and downy mildew, bacterial wilt, and target leaf spot) into ‘Marketmore’ and other cucumber varieties he bred and also into ‘Wisconsin SMR 18’, and ‘Poinsett’. He also backcrossed genes for nonbitterness and cucumber beetle resistance, plant habit, and uniform fruit color. The germplasm that he developed by backcrossing has been very valuable in cucumber breeding. They provide breeders with parents for multiple disease resistance and other useful traits. ‘Marketmore 76’ and ‘Poinsett 76’, which he developed by backcrossing, have become important varieties. His gynoecious versions of ‘Marketmore’, ‘Tablegreen’, and ‘Poinsett’ have value as the female parent of hybrid varieties. His near isogenic lines make possible basic physiological research to investigate the effect of a gene of horticultural importance without its being affected by other genes.

Henry Munger bred ‘Butternut 77’, a winter squash variety of *Cucurbita moschata* with reduced vine size. He also bred *C. moschata* for disease resistance. Henry Munger was the first to breed disease resistant squash, and almost all of the disease resistant varieties of squash and pumpkin now being grown are derived from germplasm he bred.

It is time consuming to inoculate cucurbits by the method previously used to breed for virus resistance, by manually rubbing inoculum onto leaves of individual plants. This problem was overcome, however, when Dr. Munger developed an ingenious method of using a leaf blower to project inoculum with considerable force into many plants at the same time. This method has expedited the development of disease resistant squash and pumpkin varieties.

Previously, all attempts to find a useful source of disease resistance in any of the cultivated species of *Cucurbita* were unsuccessful. Henry therefore asked
Tom Whitaker if any of the compatible wild species could be used as a source of powdery mildew resistance, and he was advised to use C. okeechobeensis subsp. martinezii as a parent. Dr. Munger used this species to breed disease resistance into both winter and summer squash, and made this germplasm freely available to other breeders.

It was difficult for him to use martinezii as a parent since it does not flower in the field at Ithaca, NY until shortly before frost, but Henry succeeded in crossing it with ‘Butternut’. It is even more difficult to cross martinezii with summer squash due to severe sterility barriers with C. pepo but Dr. Munger and his graduate student, Max Contin, succeeded in crossing summer squash with the hybrid of moschata x martinezii. They thereby used moschata as a bridge in order to introgress disease resistance from martinezii to pepo.

He used martinezii to breed squash for powdery mildew resistance, and then his keen power of observation led him to discover that some of his breeding lines were also resistant to naturally occurring CMV. His finding that martinezii is resistant to CMV encouraged his colleague at Geneva NY, Rosario Provvidenti, to test other wild Cucurbita species and to find sources of resistance to many viruses. Based on this information, Henry then used C. ecuadorensis as a parent for resistance to ZYMV, WMV, and PRSV. When Dr. Provvidenti later discovered that Nigerian Local (C. moschata) is resistant to the same viruses, Henry used this more tractable parent for breeding summer squash with multiple virus resistance.

Dr. Munger received many well deserved honors and awards. He was profiled in a well written biography by Martha Mutschler in an issue of Plant Breeding Reviews dedicated to him. He served as President of the American Society for Horticultural Science. He was the first living recipient of the Horticultural Hall of Fame of the ASHS, which previously included only such eminent authorities as Liberty Hyde Bailey, Luther Burbank, and Gregor Mendel. ASHS also designated him as a Fellow of that society and honored him with the Norman F. Childers Award for distinguished graduate teaching. He was awarded the prestigious World Seed Prize. The University of Nebraska honored him with an honorary doctorate degree. Dr. Munger was given the Man of the Year award by the Vegetable Growers Association of America. His contributions to vegetable breeding were also honored by the New York Vegetable Growers Association and by the National Council of Plant Breeders. He was given the All America Selections award for outstanding achievements in horticulture. In 1989 the H. M. Munger Symposium on Breeding Vegetables for Virus Resistance was held at Cornell University, and many of his former students returned to Cornell to attend it and honor him.

He served as editor of the Proceedings of the American Society for Horticultural Science. He was the founder and the editor of the Vegetable Improvement Newsletter, the precursor of the Cucurbit Genetics Cooperative Reports. He served as Head of the Department of Vegetable Crops at Cornell University for 16 years.

I was privileged to have Henry as a teacher, a mentor, a colleague, and as a friend.