

Edited by Joe J. Hanan

**Bulletin 433**  
**July 1986**

Published by the Colorado Greenhouse Growers' Assoc.,  
Inc. in cooperation with Colorado State University

# research bulletin

## INDEX TO BULLETINS 381 (1982) to 433 (1986)

Aurelio Agut and Joe J. Hanan<sup>1</sup>

- AIR FLOW** (Horizontal) 385
- ALSTROEMERIA**  
Culture 393  
Cultivar Trials 414  
Planting density 415  
Observations 414
- ALTERNATE CROPS** 391
- BEDDING PLANTS**  
Chemical Phytotoxicity 405  
Enhancement of growth by a biological agent 431
- BUSINESS**  
Dutch hold strengthens 416  
Educational system in the U.S. 416  
Labor intensive agriculture 405  
Loss of talent 411  
Mismatch of jobs and seekers 422  
So we think we have problems 397  
Why managers are technologically illiterate 414
- CALIFORNIA**  
(A visit) 388
- CARNATION**  
Control of branching and flower production 394  
Diseases  
    A brief work sheet 405  
    Control of Pythium root rot, I 425  
    Control of Pythium root rot, II 428  
    Enhancement of growth by Trichoderma 431  
    Modern views on Fairy ring spot 429  
Fungicides  
    Effect of soil fungicides 412  
    Soil fungicides to increase production 398  
Keeping life under infrared and hot-air heating 429  
Lighting  
    Effect of — 412  
    Review on Lighting 392 (Supplement)  
Long time storage of carnation buds 406  
Pinching reviewed 386  
Timing  
    A review of CSU work 392 (Supplement)  
    Effect of Lighting 412
- CHRYSANTHEMUMS**  
Effect of plastic film covers 403
- CLIMATOLOGICAL GREENHOUSE SUMMARIES FOR FORT COLLINS**  
Sept 29 through Oct 27, 1985 426  
Nov 3 through Nov 24, 1985 427  
Dec 1 through Dec 22, 1985 428  
Dec 29 through Jan 19, 1986 429  
Jan 26 through Feb 23, 1986 430  
Mar 2 through Mar 23, 1986 431  
Mar 30 through Apr 27, 1986 432  
May 4 through May 25, 1986 433
- COLOMBIA**  
More than a decade later 427
- COVERS ON GREENHOUSES**  
Effects of plastic films on rose growth 426  
Energy conservation, covers and climate 381  
Environmental conditions under plastic films 404  
Light transmission and photosynthesis 422  
Mesh covers outside 429  
Plant responses to plastic covers 419  
Problems with yellowing from sulfur 406  
Response of Poinsettia to plastic covers 400  
Shading fabrics 416  
Solar radiation in Europe 406  
Toxicity from construction materials 400
- CUT FLOWERS**  
Growth regulation and cut flower keeping 418  
Marketing, Part I 421  
Marketing, Part II 423
- CYCLAMEN**  
Early flowering 392
- ENERGY CONSERVATION**  
Covers versus atmospheric conditions 381  
Energy saving in Holland 400  
Evaluating the options 393  
Field adjustments to the Wadsworth Step 50A 392  
Influence of double layer plastic 389  
Infrared heating  
    Progress Report I 407  
    Progress Report II 408  
    Progress Report III 409  
Major research project underway 399  
Notes on the Dutch heating experience 419  
Third International Energy Symposium 404  
What are the options? 393

<sup>1</sup>Visiting Scientist and Professor

This bulletin is published in cooperation with Colorado State University Experiment Station and Cooperative Extension Service. The information given here is supplied with the understanding that no product discrimination is intended and that no endorsement of a product is implied.

## ENVIRONMENTAL CONTROL

- CO<sub>2</sub>, units for concentration 421
- Computer control, a progress report 396
- Controlling with a computer, Progress Report I 407
- Humidity
  - Advances in humidity measurement 420
  - Controlling humidity in tight houses 383
- Precision climate control 430
- Technical progress in climate control 420
- Symposium on Greenhouse Climate and Control 422

## EUROPE

- Denmark 401
- Dutch hold strengthens 415
- Holland
  - A look at Dutch greenhouses 425
  - Freesia cultivar trials 419
  - The Dutch vegetable industry 403
  - The Dutch way of research 409
- Norway 401

## FERTILIZER

- Figuring nutrient solutions for injection 413
- Thirty years of nutrition studies 413

## GARDEN TRIALS (Annual flowering) 404

## GERANIUMS

- Avoiding ammonium nitrate 429

## GERBERA

- Use of rockwool as a potting mixture 395

## GLOSSARY

- Technical terms for the industry 403, 398

## GROWING MEDIA

- Behavior of soil mixtures 399
- Calculating leaching requirements 402
- Experiments on salinity control 402
- Nutrient build-up with sub-irrigation 429
- Packing procedure for substrates 390
- Use of rockwool as a soil additive 395
- Vermiculite compared with rockwool 395

## HERBICIDES (Listing) 398

## HORIZONTAL AIR FLOW 398

## INFRARED HEATING

- Radiant heating 396
- Progress Report I 407
- Progress Report II 408
- Progress Report III 409

## INSTRUMENTATION

- Advances in humidity measurement 420
- Contributions to research 430
- Controlling with a computer 407
- Field adjustments of the Wadsworth Step 50A 392
- New instrumentation in agriculture 411
- Precision climate control 430

## IRRIGATION

- Trickle tube flow regulation 422

## KEEPING QUALITY

- Anthurium 423
- Carnation keeping life of White Sim 388
- Cut flowers, use of growth regulators 418
- Flowering pot plant keeping life 382

## MARKETING

- Cut flowers
  - Desires of flower customers, I 421
  - Greatest benefit of supermarkets, II 423
- Import changes 388
- Penetrating America 423
- Selling what to whom? 388

## MICROCOMPUTER

- A system to maximize profit 389
- Computer control of the greenhouse 396
- Controlling a greenhouse with a computer 407
- Data base services and electronic libraries 412
- Data bases for greenhouses 417
- Folding the perfect corner (linear programming) 415
- New control system for greenhouses 387
- Precision climate control 430
- Technical progress in climate control 420

## PEST AND DISEASE CONTROL

- Biological control
  - Fifth column in the greenhouse 392
  - Enhancement of growth by biological agents 431
  - Effects of peat-vermiculite with Trichoderma 432
- Botrytis 421
- Brief work sheet on carnation diseases 405
- Fairy ring spot of carnations 429
- Chemical volatilization 395
- Integrated control 416
- Phytotoxicity of chemicals 405

## PETUNIA

- Effect of supplemental irradiation 418

## PHOTOSYNTHESIS

- Transmission in greenhouses 422

## POINSETTIA

- Effect of four greenhouse covers 400
- Effect of low cycocel concentrations 424
- Observations and comments, 1982 390

## ROSES

- Covers
  - Effect of different plastic films 403
  - Effects of plastic glazings 426
  - Plant responses to plastic greenhouses 419
- Dwarf pot roses 397
- Rootstock evaluation 399
- Rose rooting 391
- Rose rooting and grafting 410
- Shoot removal from Sabrina 397
- Production of Royalty on four understock 406
- Weed control with Roundup 415

## SOILS

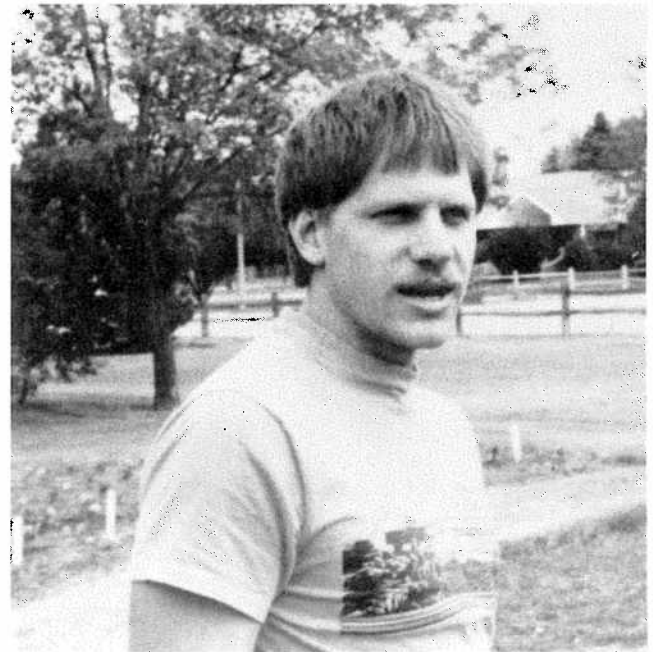
- Experiments in salinity control 402
- Calculating leaching requirements 402
- Minimizing salinity problems 384
- Rockwool as a soil additive 395
- Terminology in salinity control 383
- Thirty years of nutrition studies 413

## WATER QUALITY

- CSU water quality 426
- Terminology 383
- Minimizing salinity problems 384
- Salinity progress report 394
- Water problems 386

## WEED CONTROL

- Oxalis, biology and control 424
- Quackgrass, a serious weed problem 429
- Weed control on roses with Roundup 415



## FACES AT PERC

At the upper left, Linda Keil is working on temperature effects on Alstroemeria. Linda is an outstanding student sent to us by one of our former undergraduates, Terry Gilbertson-Ferris, at the University of Wisconsin, River Falls. During her days at CSU, Terry was partially supported by a scientist award from CGGA, and now teaches floriculture. Linda is our second such student from River Falls to earn an M.S. degree at CSU. Frank Coker (upper right) is conducting his thesis on roses in the heat houses, coming from Texas. Frank has shown himself to be one of our hardest workers at Lake Street. With him, on the same crop and in the same houses, is Crecencio Elenes-Fonseca — "Chenco" to all and sundry — . Chenco is supported by the Mexican government on the M.S. degree, and funds for the work of these two have been supplied by CGGA, Roses, Inc., and the Gloeckner Foundation. Last, but not least (lower right), is the third Lehman (Dan) to obtain a B.S. degree in Horticulture at CSU. Maybe that says something about the program. Dan is hourly labor at PERC, working mostly with roses and such other things as Hanan may find for him to do. With the reduced student numbers in agriculture the last few years, students of the caliber photographed here are hard to come by. We are pleased to have them. CGGA's support of the research program allows us to find them and encourage them to make a career in the field.

FORT COLLINS GREENHOUSE CLIMATOLOGICAL SUMMARY FOR FIVE WEEKS, BEGINNING APRIL 27, 1986

	Week beginning									
	April 27		May 4		May 11		May 18 <sup>1</sup>		May 25	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Average outside temperature (°F)	61	50	59	48	58	49	56	50	62	51
Maximum outside temperature (°F)	81	68	87	64	79	70	82	60	79	61
Minimum outside temperature (°F)	44	35	40	37	32	39	48	40	49	43
Degree-days of heating	14	53	21	60	25	56	0	53	12	49
Average hours in the period	11	13	12	12	14	14	14	10	14	13
Accumulated total solar radiation (MJ/sq.m.)	130	1	155	1	101	1	170	1	154	1
Average relative humidity (%)	39	55	41	60	52	70	33	70	49	62
Maximum relative humidity (%)	73	83	94	100	100	100	74	88	93	81
Minimum relative humidity (%)	15	30	8	21	-	13	16	40	25	47
Average absolute vapor pressure (mb)	7	7	7	7	8	8	16	9	9	7
Average wind speed (mph)	4	2	4	3	3	1	2	0	3	1
Maximum wind speed (mph)	32	23	30	47		26	38	7	21	5
Average CO <sub>2</sub> concentration (Pascal)	19	—	19	—	19	—	19	—	19	—
Maximum CO <sub>2</sub> concentration (Pascal)	24	—	47	—	23	—	23	—	23	—
Accumulated gas consumption (cu.ft./sq.ft.)	5	22	13	22	17	22	3	14	6	3

<sup>1</sup>Lost one day's data

COLORADO GREENHOUSE  
GROWERS ASSOCIATION, INC.



Dick Kingman, Executive Vice President  
2785 N. Speer Blvd., Suite 230  
Denver, Colorado 80211  
Bulletin 433

NONPROFIT  
ORGANIZATION  
U.S. POSTAGE  
PAID  
Fort Collins, Colorado 80523  
Permit Number 19

Direct inquiries to:  
Office of the Editor  
Horticulture Department  
Colorado State University  
Fort Collins, Colorado 80523