2008 Public Sector Cucumber Research Priority Survey

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The mission of the Cucumber Improvement Program in the Vegetable Crops Research Unit (VCRU) of USDA-ARS, Madison is to conduct researches to serve the needs of the cucumber industry and consumers. For researchers in a public institution, it is useful to survey their clientele and prioritize their research to address major problems. In December 2008, a national wide survey was conducted to identify priorities for cucumber research in the public sector (see Appendix for the survey design). The questions in the survey were in four categories: diseases, insects, abiotic stresses and other issues. In each category, the respondent was asked to identify and rank in the order of importance of current problems in cucumber production. Write-in space was provided in case the respondents had additional important issues.

The survey was sent to cucumber-related researchers in public institutions (mainly university research and extension faculty), seed companies (cucumber breeders), as well as people working in the cucumber industry. Twenty-one feedbacks were received, of which seven, five, and nine respondents were from the public, private sectors, and the industry, respectively. The results were compiled by inverting the ranks by each respondent where a rank of 1 (top priority) was assigned a value of 5, and a rank of 2 was assigned a value of 4 and so on. Therefore, a surveyed question with the highest value had the highest priority in this category. The results from the public and private sectors, as well as the industry were compiled separately to reflect their different responses to certain questions.

The survey results are summarized in Table 1. The issues in each category were arranged according to the overall ranking of their importance among all respondents. For cucumber diseases, it is clear that downy mildew had the highest priority. Phytophthora fruit rot, angular leaf spot (ALS), cucumber mosaic virus (CMV) and root knot nematode (RKN) are other four with major concerns. Respondents from seed companies also indicated the importance to work with anthracnose and belly rot. Among the major insects, cucumber beetles were ranked the top priority, followed by aphids, pickleworm and thrips. For abiotic stresses, herbicide damage, cold germination, and drought/heat stresses were some important issues. For other cucumber research-related issues (category 4), higher yield was the top priority among public and industry respondents. Improving pre- and post-harvest fruit qualities was also emphasized. Meanwhile, respondents of seed companies ranked 'broadening cucumber genetic diversity' and 'Use molecular markers in marker-assisted selection' as the top priorities. In addition, seed company respondents also emphasized improving fruit nutrition and developing cucumber genomics resources.

In addition to questions asked in the four categories, other issues raised by the respondents during this survey included hybrids for the small cucumber 1A, 1B size market and developing machine harvest system to accommodate this fruit; improve seed vigor; increase fruit per plant; development of parthenocarpic varieties, and finally controlling Length/Diameter ratios with water/fertilizer applications.

To summarize, although rigorous statistical methods were not applied to the survey data, this survey provided very useful information for public sector researchers to prioritize their research to address needs of the cucumber industry in the U. S.

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Table 1. Results of Public Sector Research Priority Survey

Categories	Industry		Private		Public		All	
	Weights	Rank	Weights	Rank	Weights	Rank	Weights	Rank
1. Diseases								
Downy mildew (DM)	39	**1**	20	**1**	33	**1**	92	**1**
Phytophthora fruit rot	23	**2**	13	**3**	21	**2**	57	**2**
Angular leaf spot (ALS)	18	**3**	11	**4**	6	**5**	35	**3**
Cucumber mosaic virus (CMV)	9		8	**5**	9	**4**	26	**4**
Root knot nematode (RKN)	6		14	**2**	4		24	**5**
Bacterial wilt (BW)	6		1		11	**3**	18	**6**
Powdery mildew (PM)	9		2		5		16	**7**
Anthracnose	13	**4**	0		2		15	**8**
Belly rot	15	**5**	0		0		15	**9**
Gummy stem blight (GSB)	8		3		2		13	**10**
Watermelon mosaic virus (WMV)	3		4		4		11	**11**
Zucchini yellow mosaic virus (ZYMV)	1		5		5		11	**12**
Cucurbit Yellow Stunting Disorder Virus	2		6		3		11	**13**
Fusarium wilt (FW)	6		3		1		10	**14**
Watermelon strain of papaya ringspot virus	2		0		3		5	**15**
Scab	3		0		0		3	**16**
2. Insect pests								
Cucumber beetles	25	**1**	23	**1**	29	**1**	77	**1**
Aphids	24	**2**	13	**2**	16	**2**	53	**2**
Pickleworm	22	**3**	13	**2**	10	**3**	45	**3**
Thrips	18	**5**	11	**3**	10	**3**	39	**4**
Whiteflies	20	**4**	11	**3**	7	**4**	38	**5**
Spider mites	6		3	**4**	5	**5**	14	**6**
Leaf miners	5		0		5	**5**	10	**7**
Others.	5						5	**8**
3. Abiotic stresses								
Herbicide damage	26	**1**	17	**1**	20	**2**	63	**1**
Drought stress	21	**3**	17	**1**	17	**4**	55	**2**
Cold germination	14	**4**	7	**4**	24	**1**	45	**3**
Heat damage	25	**2**	7	**4**	4	**5**	36	**4**
Chilling damage	7	**5**	13	**2**	14	**3**	34	**5**
Saline stress (salt tolerance)	2		11	**3**	1		14	**6**
4. Other issues								
Higher fruit yield	32	**1**	14	**2**	16	**1**	62	**1**
Improve pre-harvest fruit quality	24	**2**	3	**5**	16	**1**	43	**2**
Broaden cucumber genetic diversity	12	**4**	22	**1**	7	**5**	41	**3**
Use of molecular marker-assisted selection	12	**4**	22	**1**	5		39	**4**
Improve post-harvest fruit quality	15	**3**	0		14	**2**	29	**5**
Improved fruit nutrition	7		11	**3**	7	**5**	25	**6**
Develop cucumber genomic resources	4		9	**4**	11	**3**	24	**7**
Develop GMOs	9	**5**	0		8	**4**	17	**8**

Appendix

2008 Cucumber Research Priority Survey

1. I am a

_____ Grower
_____ Broker/Marketer
_____ Green shipper
_____ Private researcher
_____ Processor
_____ Salter
_____ Public researcher
_____ Others. Please specify _____

2. My work focuses primarily on

_____ Fresh market cucumber
_____ Processing cucumber
_____ Both

3. If Grower, please check:

_____ Less than 100 acres_____ 100 to 500 acres_____ > 500 acres

4. Areas where you operate (check all that apply):

_____ Southeast (AL, AR, FL, GA, LA, KY, MS, NC, SC, TN, VA, WV)
_____ Northeast (CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT)
_____ Southwest (AZ, NM, OK, TX)
_____ Midwest (IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI)
_____ West (AK, CA, CO, HI, ID, MT, NV, OR, UT, WA, WY)
_____ International. Please specify _____

For questions 5 to 8, please rank the top 5 topics that you think should be addressed by public-sector research (1 to 5 with 1 = top priority and 5 being lower priority).

5. Diseases

_____ Anthracnose (*Colletotrichum orbiculare*)
_____ Downy mildew (DM) (*Pseudoperonospora cubensis*)
_____ Fusarium wilt (*Fusarium oxysporum f. sp. cucumerinum*)
_____ Bacterial wilt (BW) (*Erwinia tracheiphila*)
_____ Gummy stem blight (*Didymella bryoniae*, *Phoma cucurbitacearum*)
_____ Powdery mildew (PM)(*Podosphaera xanthii*)
_____ Belly rot (*Rhizoctonia solani*)
_____ Phytophthora fruit rot (*Phytophthora* spp.)
_____ Scab (*Cladosporium cucumerinum*)
_____ Angular leaf spot (ALS) (*Pseudomonas syringae* pv. *lachrymans*)
_____ Root knot nematode (RKN) (*Meloidogyne incognita*; *M. javanica*; *M. arenaria*)
_____ Other nematodes. Please specify _____
_____ Cucumber mosaic virus (CMV)
_____ Watermelon mosaic virus (WMV)
_____ Zucchini yellow mosaic virus (ZYMV)
_____ Watermelon strain of papaya ringspot virus
_____ Cucurbit Yellow Stunting Disorder Virus
_____ Other diseases. Please specify_____

6. Insect pests

_____ Cucumber beetles
_____ Spider mites
_____ Pickleworm
_____ Aphids
_____ Whiteflies
_____ Leaf miners
_____ Thrips
_____ Others. Please specify _____

7. Abiotic factors affecting cucumber production

_____ Chilling damage
_____ Drought stress
_____ Saline stress (salt tolerance)
_____ Others. Please specify _____
_____ Cold germination
_____ Heat damage
_____ Herbicide damage

8. Other issues in cucumber improvement research

_____ Use of molecular marker-assisted selection for cucumber breeding
_____ Broaden cucumber genetic diversity through exploring other *Cucumis* resources
_____ Develop cucumber genomic resources (mapping populations, genetic/physical maps, genome sequencing, double haploid production, ETS ...)
_____ Improve post-harvest fruit quality (brining quality, shelf-life, ...)
_____ Develop GMOs (Genetically Modified Organisms)
_____ Improve pre-harvest fruit quality (shape, color, internal defects, ...)
_____ Improved fruit nutrition (carotenoids content, solid content, nutraceutical ...)
_____ Higher fruit yield
_____ Others. Please specify _____

9. Other problems not listed. Please specify.

10. Additional comments related to research needs.