CURRICULUM VITAE

Joongmin Shin, Ph.D.
Industrial Technology and Packaging
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Education

- Ph.D. 2007 Packaging Science, Michigan State University
- M.S. 2003 Packaging Science, Michigan State University
- B.S. 1997 Food Science, Woosuk University, South Korea

Dissertation

- Evaluation of the effect of chlorine dioxide and allyl-isothiocyanate on the growth of Salmonella Typhimurium and Listeria monocytogenes on fresh chicken breast and the effect of chlorine dioxide exposure on the physical properties of plastic films. July 2007, Drs. Susan Selke & Bruce Harte

Fields of Interests

- Modified atmosphere packaging system
- Antimicrobial packaging material (encapsulation and polymer grafting technologies)
- Electrospinning fiber system to control odor
- Food product/package compatibility and interaction
- Material applications in packaging and properties of packaging

Employment

- Professor (Sep 2023-Current), Industrial Technology and Packaging, Orfalea College of Business, Cal Poly State University
- Associate Professor (Sep 2017- Aug 2023), Industrial Technology and Packaging, Orfalea College of Business, Cal Poly State University
- Associate Professor (Aug 2015- Aug 2017), Engineering and Technology, College of Engineering, Technology & Mathematics, University of Wisconsin-Stout
- Assistant Professor (Aug 2010- Jun 2015), Engineering and Technology, College of Engineering, Technology & Mathematics, University of Wisconsin-Stout
- Pilot plant manager (Sep 2008- Aug 2010), Food Science, Louisiana State University
- Post-doctor research associate (July 2007- Aug 2008), School of Packaging, Michigan State University
- Associate Researcher (May. 2003-Jan. 2008), E.Saeng, Ltd., Seoul, South Korea
- Research Assistant (Aug. 2004 – Dec. 2006), School of Packaging, Michigan State University

Refereed Publication or Other Creative Achievement

1. Journal Publication

1) Lee, T.H., Lee, Y.E., **Shin, J.M.**, Chang, Y.H., 2023, Physicochemical and prebiotic properties of waxy rice flour modified by pullulanase, Food Biotechnology, 89-105. (IF:1.564)

2) Kathuria, A., Lee, Y.S., **Shin, J.M**., Kivy, M., 2022, Crystalline γ-cyclodextrin metal organic framework nano-containers for encapsulation of benzaldehyde and their host–guest interactions, Journal of Inclusion Phenomena and Macrocyclic Chemistry, https://doi.org/10.1007/s10847-022-01158-x (IF:1.925)

3) Park, J.Y, Kim, M.S, **Shin, J.M.,** Chang, Y.H, 2022, Microencapsulation of de-glycosylated mulberry (Morus alba L.) fruit extract through double-layered multiple emulsions of pectic polysaccharide extracted from Ulmus davidiana and soy protein isolate, Journal of Food Processing and Preservation, DOI: 10.1111/jfpp.16833 (IF:1.700)

4) Singh, A.K., Itkor, P., Lee, M. **Shin, J.M**., Lee, Y.S, 2022, Promoting sustainable packaging applications in the circular economy by exploring and advancing molded pulp materials for food products: a review, Critical Reviews in Food Science and Nutrition, DOI: 10.1080/10408398.2022.2088686. (IF: 11.176)

5) Gaikwad, K.K, Singh, S., **Shin, J.M**., Lee, Y.S., 2020, Novel polyisoprene based UV-activated oxygen scavenging films and their applications in packaging of beef jerky, LWT-Food Science and Technology, 117, 108643. (IF: 4.006)

6) Kathuria, A., Buntinx, M., **Shin, J.M.,** Harding, T., 2019, Inclusion of ethanol in a nano-porous, bio-based metal-organic framework, Journal of Inclusion Phenomena and macrocyclic Chemistry, 95, 91-98. (IF:1.560)

7) **Shin, J.M.**, Kathuria, A., Lee, Y.S., 2019, Effect of hydrophilic and hydrophobic cyclodextrins on the release of encapsulated allyl isothiocyanate (AITC) and their potential application for plastic film extrusion, Journal of Applied Polymer, 136, 48137. (IF:: 2.520)

8) **Shin, J.M**., Solval, K.M., Xiang, B., 2019, Combined effects of calcium ascorbate treatment and modified atmosphere packaging to improve quality retention of fresh-cut cantaloupes, Journal of Applied Packaging Science, 11, 70-87. (IF: 0.105)

9) **Shin, J.M**., Lee, E.J., Ahn, Dong, 2018, Electrospinning of Tri-acetyl Cyclodextrin (TACD) Functionalized Low-Density Polyethylene Nanofibers to Minimize Off-Odor Volatile Compounds from irradiated meat, Food Packaging and Shelf Life, 18, 107-114. (IF: 4.244)

10) **Shin, J.M**., Xiaojing L., Chikthimmah, N., Lee, Y.S., 2016, Polymer Surface Modification Using UV treatment for Attachment of Natamycin and the Potential Applications for Conventional Food Cling Wrap (LDPE), Applied Surface Science, 386, 276-284. (IF:6.707)

11) Shin, Y.J., **Shin, J.M**., Lee, Y.S, 2011, Preparation and characterization of multilayer film incorporating oxygen scavenger, Macromolecular Research, 19(9), 869-875 (IF: 2.227)

12) **Shin, J.M**., Lee, Y.S., Harte, B., Selke, S., 2011, The effect of controlled chlorine dioxide (ClO2) release system in combination with modified atmosphere packaging (MAP) to control the growth of pathogens, Journal of food quality, 34(3), 220-228. (IF: 2.450)

13) Vazquez, H.O., **Shin, J.M**., Soto-Valdez, H., Auras, R., 2011, Release of Butylated Hydroxytoluene (BHT) from Poly(lactic acid) films, Polymer Testing, 30(5), 463-471. (IF: 4.282)

14) **Shin, J.M.,** Harte, B., Harte, J., Kirk, D., 2011, The effect of low-dose X-ray irradiation on the quality of fresh-cut asparagus in microwaveable vacuum skin packs, HortScience, 46 (1), 1-6. (IF: 1.455)

15) Lee, YS, Chung, D.S, Harte, B., **Shin, J.M.,** 2010, Effect of 1-Methylcycloperopene (1-MCP) treatment on the quality characteristics and pigmentation of tomato fruit (Lycopersicon Esculentum Mill.), Korean Journal of Horticulture Science & Technology, 28(4), 600-608. (IF: 0.869)

16) **Shin, J.M**., Harte, B, Ryser, E, and Selke, S, 2010, Active Packaging of Fresh Chicken Breast, with Allyl Isothiocyanate (AITC) in Combination with Modified Atmosphere Packaging (MAP) to Control the Growth of Pathogens, Journal of Food Science, 75(2), M65-M71. (IF: 3.167)

17) Shin YJ, **Shin J.M**., Lee Y.S., 2009, Effect of oxygen scavenging package on the quality changes of processed meatball product, Food science, and biotechnology, 18(1), 73-78. (IF: 2.391)

18) Choi, S.G., **Shin, J.M**., 2006, the analysis of cushioning properties of corrugated cushion, Journal of Korea Society of Packaging Science and Technology 12:1 35-40.

2. Books

1) **Shin, J.M**., Selke, S., 2014, Food packaging, In Food processing principles and applications 2nd edition, Clark et al. (Editor), Wiley-Blackwell Blackwell Publishing, Ames, IA, p 249-273.
2) Lee, M.H., and al. (**Shin, J.M**), 2003, Korean packaging science of technology encyclopedia, Korea Society of Packaging Science & Technology, Seoul, Korea.

3. Conference Proceedings

1) Dudely, A., Kassama, L., Jackson-Davis, Am. **Shin, J.M.**, Electrospinning of Northern Alabama Grown Hemp Extract in PVA to Develop an Active Packaging Film, American Society of Agricultural and Biological Engineers (ASABE) Annual International, Omaha, Nebraska, July 9-12, 2023.
2) **Shin, J.M.**, Singh, J. Environmental Analysis of Single-use and Multiple-use Pallet Systems for Air Shipments, International Association of Packaging Research Institute (IAPRI) world packaging conference, Bangkok, Thailand, June 12-16, 2022.
3) Ochieng, E., **Shin, J.M**., Kassama, L., Optimization of Electrospinning Parameters and Impact on the Physical Properties of the Electrospun Chitosan-Curcumin Film, American Society of Agricultural and Biological Engineers (ASABE) Annual International Meeting, Huston, Texas, July 17-20, 2022.
4) Ochieng, E., Kassama, L., Davis, A.K, **Shin, J.M.,** Development of Electrospun Chitosan Nanofibers for Antimicrobial Food Packaging, International Association of Packaging Research Institute (IAPRI) world packaging conference, Bangkok, Thailand, June 12-16, 2022.
5) **Shin, J.M.,** Yeung, M., Immobilization of bioactive agents on packaging film for enhancing microbial safety and extending the shelf life of food, International Association of Packaging Research Institute (IAPRI) world packaging conference, Virtual, June 15-17, 2021.
6) Caralyn Wong, Stephanie Jung, Ajay Kathuria, **Shin, J.M**, Development of peach pit waste-filled polyolefin biocomposite with maleic anhydride coupling agent, International Association of Packaging Research Institute (IAPRI) world packaging conference, , Mexico(Virtual), June 15-19, 2020.
7) Caralyn Wong, Stephanie Jung, Ajay Kathuria, **Shin, J.M**, Potential of peach waste addition in the production of packaging biocomposites, International Food Technologist (IFT) annual conferment, Chicago (Virtual), July 12-15, 2020
8) Penafiel, J.R., Padilla, B., **Shin, J.M**., Yeung, M, The antifungal effects of chitosan and natamycin, CSU Biotechnology Symposium, Garden Grove, CA, Jan 3-5, 2020.
9) Pauwels, A.K., Buntinx, M., Harding, T., **Shin, J.M**., Kathuria, A., Encapsulation of ethanol in cyclodextrin and bio-based cyclodextrin metal-organic framework for active packaging, IAPRI world packaging conference, Netherland, June 11-14, 2019.
10) **Shin, J.M**., Eun Joo Lee, Dong Ahn, Development, Optimization, and Characterization of Electrospun Lo-Density Polyethylene (LDPE) Nano Fibers Containing Triacetyl-β-cyclodextrin (TACD), Institute of Food Technologists (IFT) annual conference, Las Vegas, NV, July 25 - 28, 2017.
11) **Shin, J.M**., Anne Wesptal, Allyl isothiocyanate (AITC) by Triacetylene β-cyclodextrin (TACD) and Its Potential Application in Polymer Extrusion Process for the Food Packaging, Institute of Food Technologists (IFT) annual conference, Chicago, IL, July 16 - 19, 2016.
12) Lee, Eun, **Shin, J.M**., Ann, Dong Uk, Reduction of sulfur compounds using tri-acetyl β-cyclodextrin (TACD)-impregnated packaging materials, Institute of Food Technologists (IFT) annual conference, Chicago, IL, July 16 - 19, 2016.

13) **Shin, J.M**., Liu, X., Chikthimmah, N., 2015, Development of Natamycin Attached Functional LDPE Polymers and Efficacy Against Penicillium and Saccharomyces Microbial Genera, Institute of Food Technologists (IFT) annual conference, Chicago, IL, July 12-5, 2015.
14) D. Pokhrel, N. Chikthimmah, K. Chinnadurai, C. Rohrer, **Shin, J.M**., 2014, Effect of Mustard Powder on the Survival of Salmonella enterica and Penicillium chrysogenum in Shredded Mozzarella Cheese, Institute of Food Technologists (IFT) annual conference, Chicago, IL, June 21-24, 2014.
15) Drager, K, Karunanithy, C., **Shin, J.M**., Lee, E.J., 2014, Shelf life evaluation of a new packaging container for breakfast cereal, Institute of Food Technologists (IFT) annual conference, Chicago, IL, June 21-24, 2014.
16) **Shin, J.M**., Chikthimmah, N., 2013, Polymer surface modification for the attachment of antimicrobial compounds (Natamycin) using UV treatment, Institute of Food Technologists (IFT) annual conference, Chicago, IL, July 20-23, 2013.
17) **Shin, J.M**., Mokwena, K., 2012, The potential of tri-acetyl- β-cyclodextrin and its inclusion complex with AITC for LDPE film extrusion, IAPRI world packaging conference, St. Louis Obispo, CA, June 18-22.
18) **Shin, J.M.,** Dao Yang, Kereilemang Mokwena, 2011, Encapsulation of Allyl-isothiocyanate (AITC) into LDPE film using β-cyclodextrin and its potential application in food packaging, IFT Annual Conference, New Orleans, LA, June 11-15, 2011.
19) **Shin, J.M**., Kevin Mis Solval, Bob Xiang, 2011, The use of vitamin and mineral mixture treatment and modified atmosphere packaging to improve quality retention of fresh-cut cantaloupes, IFT Annual Conference, New Orleans, LA, June 11-15, 2011.
20) S. Sathivel, B. Xiang, **Shin, J.M**, D. Skonberg, 2009, Evaluation of freezing rate and quality of channel catfish (Ictalurus punctatus) fillets using cryogenic and blast freezers, IFT Annual Conference, Anaheim, CA, June 6-9, 2009.
21) S.Sathivel, J. Pu, Y. Wan, L. Cook, H. Yin, B. Xiang, **Shin, J.M**, D. Skonberg, 2009, Glazing frozen shrimp with an emulsion containing astaxanthin, IFT Annual Conference, Anaheim, CA, June 6-9, 2009.
22) **Shin, J.M**., Savage, J., Harte, J., Dolan, K., Harte, B., Performance Comparison of Modified Atmosphere Packaging (MAP) and Vacuum Skin Packaging (VSP) in maintaining the quality of fresh Michigan green asparagus, IAPRI world conference on packaging, Bankok, Thailand, June 8-12, 2008.
23) **Shin, J.M**., Harte, J., Dolan, K., Harte, B., The effect of x-ray irradiation on the quality of fresh-cut asparagus, IAPRI world conference on packaging, Bankok, Thailand, June 8-12, 2008.
24) Bhisanbut, A., **Shin, J.M**., Harte, J., Fulbright, D., Dolan, K., Harte, B., The extension of chestnut product quality using Modified Atmosphere Packaging and Vacuum Skin Packaging, IAPRI world conference on packaging, Bankok, Thailand, June 8-12, 2008.
25) **Shin, J.M**., Harte, B., Selke, S., Ryser, E., Evaluation of the microbial inhibition performance of gas type antimicrobials (chlorine dioxide and allyl-isothiocyanate) with Modified Atmosphere Packaging (MAP), IAPRI world conference on packaging, Tokyo, Japan, October 3-6, 2006.
26) **Shin, J.M**., Harte, B., Selke, S., Ryser, E., The effect of chlorine dioxide exposure on the physical properties of plastic films, NSF Barrier Development Center Meeting, Kalamazoo, MI, October 12-14, 2006.

27) Shin, Y.J, Selke, S., Harte, B., **Shin, J.M**., Development of active packaging; application of oxygen scavenger, Korean Society of Food Science & Technology Annual Meeting, Korea, June 24-26, 2004.

Presentations at Professional Meetings

1) **Shin, J.M**., Applications of electrospun nanofibers in food packaging, Korean Food Nutritional International Conference, Korea, Oct 23-25, 2019.

Works in Progress

Manuscripts in Submission

1) Loong, Y.H, Samsudin, H., **Shin, J.M**., Development and characterization of polylactic acid/ porous corn starch – inclusion complex blend film containing thymol, Journal of Food Science, submitted in Aug 21. 2022 (Impact Factor: 3.693)

Honors, Grants, and Fellowship

Funded Grants

1) Empowering Student Learning through Seaweed-Based Sustainable Packaging for Food and Pharmaceutical Applications: A Hands-On Approach, **Shin, J.M. (PI),** Teacher-Scholar Mini Grant Program, $14,400.
2) Sustainable Packaging Solutions for Food and Pharmaceutical Applications Using Seaweed-Based Materials, **Shin, J.M. (PI)**, Orfalea Mini Summer Grant, 2023, $5,000.
3) An Investigation of Root Cause of Quality Loss for Jolly Rancher Chews Estimated, Singh, J (PI), **Shin, J.M. (Co-PI)**, Kathuria, Kathuria (Co-PI), A, Patel, A. (Co-PI). 2021-2022, $39,000.
4) Environmental Impact Analysis of Single-use and Multiple-use Pallet Systems for Air Shipments, Singh, J. (PI), **Shin, J.M.(Co-PI)**, Orfalea Mini Summer Grant, 2022, $5,000.
5) The Effects of 1-Methylcyclopropene (1-MCP) and Itsfresh^{TM} on Shelf Life Extension and Quality of tomato, Saha, K. (PI), Kathuria, A. (Co-PI), **Shin, J.M.(Co-PI)**, The Cooperative Research Consortium Grant, 2020-2022, $55,000.
6) Digital Packaging Specs and Testing is the Future, Singh, J. (PI), **Shin, J.M (Co-PI)**, Kathuria, A. (Co-PI), The Cooperative Research Consortium Grant, 2020-2022, $40,000.
7) Immobilization of bioactive agents on packaging film for enhancing microbial safety and extending the shelf life of fresh cheese, Yeung, M. (P.I.), **Shin, JM. (Co-PI)**, 2020 COVID-19 Research Recovery Microgrant program, CSUPERB, $1500
8) Clamshell Containers: Corporate and Retail Sustainability Goals, Singh, J. (PI), **Shin, J.M (Co-PI)**, Kathuria, A. (Co-PI), The Cooperative Research Consortium Grant, 2019-2020, $55,000.
9) The Effects of 1-Methylcyclopropene (1-MCP) and Potassium Permanganate on Shelf Life Extension and Quality of Fresh Produce, **Shin, J.M (PI),** Saha, K.(Co-PI), Kathuria, A. (Co-PI), The Cooperative Research Consortium Grant, 2019-2020, $55,000.
10) Novel polyisoprene based UV-activated oxygen scavenging films and their applications in packaging of beef jerky, **Shin, J.M (PI)**, Orfalea Mini Summer Grant, 2019, $3,500

11) Immobilization of bioactive agents on packaging film for enhancing microbial safety and extending the shelf life of fresh cheese, **Shin, J.M (PI)**, Yeung, M. (Co-PI), Agricultural Research Institute (ARI) grant, 2019-2020, $23,442.
12) Develop Capacity in the Application of Nanotechnology in Active and Intelligent Food Packaging to Enhance Experiential Learning in Food Safety, Lamin S. Kassama (PI), Martha Verghese, Alak Bandyopadhyay, Florence Okafor, Linshu Liu, **Shin, J.M (CO-PI)**, USDA 1890 Institution Teaching, Research and Extension Capacity Building Grants (CBG), 2019-2023, $562,781.
13) Ally-isothiocyanate/ triacetyl-β-cyclodextrin inclusion complex for low-density polyethylene film extrusion, **Shin, J.M (PI)** and Kathuria, M. (PI), Orfalea Mini Summer Grant, 2018, $3,000.
14) Surface Modification and Antimicrobial Activity of Shrink-Wrap/Cling-Wrap Grafted with Natamycin and Chitosan for Cheese, **Shin, J.M (PI)**, Agricultural Research Institute (ARI) grant, 2018-2019, $18,341.
15) Development of High-Performance Paper-based Packaging Material Using Nano-fibrillated Cellulose Fibers, Research, Scholarship, and Creative Activity (RSCA) grant, **Shin, J.M. (PI)**, 2018-2019, $17,800.
16) Development of Non-Migratory Active Cling Wrap Packaging for Enhanced Food Safety and Quality, Wisconsin Joint Applied Research-WiSys Technology Advancement Grant, **Shin, J.M (PI**), Chikthimmah, N. (Co-PI), 2014-2015, $50,000.
17) Development of antimicrobial vacuum pouches using UV treatment, UW-Stout Research incubation fund, **Shin, J.M (PI)**, N. Chikthimmah (Co-PI), 2011-2012, $9,892.
18) Laboratory and Classroom Modernization Request fund, Shin, J.M (PI), 2011-2012, $39, 428.
19) Polymer surface modification for the attachment of antimicrobial compounds (Natamycin) using UV treatment, and its potential application for cheese products, UW system Wysis reassignment fund, **Shin, J.M (PI**), N. Chikthimma (Co-PI), 2011-2012, $3,500.
20) Development of safe, convenient, and frozen oyster products for the frozen ready-meal market segment, Louisiana Sea Grant, S. Sathivel (PI), B. Ge (Co-PI), D. Bankston (Co-PI), J. Supan, (Investigator), and **Shin, J.M** (Investigator), 2010-2012, $140,548.
21) Development of safe and ready-to-eat frozen oyster products, Louisiana Board of Regents (BOR), Industrial Ties Research Subprogram (ITRS), S. Sathivel and B. Ge (Co-PIs), J. King, J. Finley (Investigators), and **Shin, J.M** (Investigator), 2009-2011, $117,800.

Honors

1. OCOB outstanding faculty award (2021)

Other Research and Other Creative Achievements

Patent

1) **Shin, J.M**., Antifungal Grafted Polyolefin, Reference No. T160012US (2/25/2016)

Governance and Other Professionally Related Service

1. Committee Service

1) University level Committee
    a. Fairness Committee (2018-Present)

   b. Sustainability advisory committee (2019-2021)
   c. Faculty Senate (2021-Present)
2) College-level committee
   a. Professional leave & research committee (2018-2019)
   b. OCOB Student Affairs committee (Fall, 2019-Present)
3) External reviewer (tenure credential reviewer) for Dr. Jonghoon Park on behalf of Graphic Communications Management, Toronto Metropolitan University (July 2022)
4) External reviewer (tenure credential reviewer) for Dr. Young Kim on behalf of Sustainable Biomaterials Department, Virginia Tech, VA (Oct 2019)
5) External Graduate Student thesis examiner at School of Industrial Technology, Universiti Sains Malaysia, Pulau Pinang, Malaysia (2020-Present)
6) Competition judge of Flexible Packaging Association Student Design Challenge Awards, Annapolis, MD (Nov 2017)

2. Professional Service

1) Journal referee/reviewer for 12 peer-reviewed journals
   - Food Packaging and Shelf Life
   - Comprehensive Reviews in Food Science and Food Safety
   - Journal of Food Science
   - International Journal of Food Science and Technology
   - LWT - Food Science and Technology
   - Journal of food engineering
   - Journal of plastic film and sheet
   - Packaging technology and science
   - Hortscience
   - Journal of Crystal Growth
   - Progress in Organic Coating
   - Journal of Applied Packaging Research
2) IFT Student poster competition referees 2013.
3) IFT annual conference technical session abstract reviewer 2010-Current.
4) UW-Stout representative in Flexible Packaging Association (FPA) 2010-Current.
5) UW-Stout representative in International Association of Packaging Research Institutes (IAPRI) 2011-2017.

3. Industry Consulting and Support

1) External 3rd party reviewer (Trayak LLC) from 2021 to present.

4. Other services

1) Graduate Marshall for 2018 Spring Calpoly Commencement (May 2018)
2) Associate Marshall for 2019 Spring Calpoly Commencement (May 2019)
3) Support coordination for FreshPackmoves 2019 conference at Pismo Beach (May 2019)
4) Support coordination for FreshPackmoves 2020 conference at Pismo Beach (Cancelled due to Covid 19)

5) MS Packaging Value Chain course development: I contributed to MS PVC course development (GSP 531 Packaging Materials) with two instructors. I co-authored Glass packaging material, Packaging sustainability, and several sets of quizzes.
6) Guest Lecture
    a. FSN 334 Food packaging (for food science student) May 8, 2018, 9:40-11:00 am
    b. FSN 334 Food packaging (for nonfood science student) May 15, 2018, 4:10-5:30 pm
    c. ASCI 484 Meat packaging Oct 22, 2020, 9:00-10:20 am

Memberships in Professional Societies

- Member, Sustainable Packaging Collision (SPC), 2018-current
- Professional Member, Institute of Food Technologists (IFT), 2003-2018
- Professional Member, Institute of Packaging Professionals (IOPP), 2006 – current.
- Member, International Association of Packaging Research Institute (IAPRI), 2011-current.
- Member, American Society for Horticultural Science (ASHS), 2009-2013

Other Teaching, Mentoring, and Curricular Achievements

Work highlighted in media

- CSU STEMP-NET, resusable antimicrobial face mask https://twitter.com/NetCsu/status/1249810885993852930
- Tom Karst, Jan 2019, resistance to plastic packaging grows in organics, https://www.producemarketguide.com/article/resistance-plastic-packaging-grows-organics
- Curran, Bridget, Sep 2014, WQOW News 18, Two UW-Stout professors invent cling wrap that prevents spoiled food http://www.wqow.com/story/26571795/2014/09/18/two-uw-stout-professors-change-elements-of-cling-wrap
- ASHS Press Release, Nov 2011, Asparagus Benefits from X-ray Treatment http://www2.ashs.org/pressrelease/index.php?option=com_content&view=article&id=1183:asparagus-benefits-from-x-ray-treatment&catid=1:hortscience&Itemid=3