FOOD FIGHT: A VICTORY IN THE ONGOING BATTLE AGAINST SEEDBORNE BACTERIAL DISEASE

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I. INTRODUCTION

"Agricultural science is largely a race between the emergence of new pests and the emergence of new techniques for their control."[1] The battle against microbial plant pathogens is perpetual because bacteria genetically modify to survive changing environmental conditions by developing resistance to antibiotics, chemicals, and hosts' defense mechanisms. The fight to provide an abundant, safe, and inexpensive food supply has escalated, primarily due to plant pathogens' ability to adapt to a host "plant's genetic defenses within five to fifteen years."[2]

Watermelon Fruit Blotch ("WFB") is a disease caused by the bacterium *Acidovorax avenae* subsp. c*itrulli*.[3] Symptoms first appear on melon surfaces as small, dark-green, greasy looking lesions which expand and coalesce; the blotch soon destroys fruit marketability.[4] As lesions age, the melon rind cracks and fruit decay ensues, frequently during handling and shipping.[5] Most consumers have never seen WFB-infected watermelons in grocery stores because "market managers wouldn't put them on the shelf . . . ."[6] The disease is not pathogenic to humans, but is infectious to sown or volunteer watermelon, muskmelon, and wild cucurbits,[7] and can be spread by several vectors.[8]

Sales involving agricultural products classified as 'goods' under the Uniform Commercial Code ("UCC") are subject to contract provisions, including express and implied warranties.[9] Farmers frequently encounter these provisions when they

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1. ALDO LEOPOLD, A SAND COUNTY ALMANAC, AND SKETCHES HERE AND THERE 217 (Spec. Commemorative ed., 1989).

2. June Starr & Kenneth C. Hardy, Comment, *Not By Seeds Alone: The Biodiversity Treaty and the Role for Native Agriculture*, 12 STAN. ENVTL. L.J. 85, 98 (1993). S*ee also* NORMAN MYERS, A WEALTH OF WILD SPECIES 33 (Westview Press, Inc. 1983) (citations omitted).

3. *See* A. Willems et al., *Transfer of Several Phytopathogenic* Pseudomonas *Species to* Acidovorax as Acidovorax avenae *subsp.* avenae *subsp. nov., comb. nov.,* Acidovorax avenae subsp. citrulli, Acidovorax avenae *subsp*. cattleyae, *and* Acidovorax konjaci. 42 INT'L J. SYSTEMATIC BACTERIOLOGY 107, 107-108 (1992).

4. *See* D.L. Hopkins et al., *Resistance of Watermelon Seedlings and Fruit to the Fruit Blotch Bacterium,* HORTSCIENCE 28(2), Feb. 1993, at 122.

5. *See id.*

6. *Watermelons Hit with a Mysterious Disease* (CNN Science and Technology Week television broadcast, Aug. 1, 1992).

7. *See* R.X. Latin & D.L. Hopkins, *Bacterial Fruit Blotch of Watermelon: The Hypothetical Exam Question Becomes Reality*, PLANT DISEASE, Aug. 1995, at 761.

8. *See* Don Hopkins et al., *Guidelines for Control of Bacterial Fruit Blotch of Watermelon* (NAT'L WATERMELON ASS'N, INC.) (Aug. 1996).

9. *See* U.C.C. § 2-313 (1994).

purchase seed produced by commercial companies and sold through retailers.[10] Today, virtually all seed dealers disclaim and limit their liability to the purchase price of the seed,[11] maintaining that limitation of their implied warranties has been exempted under "usage of the trade."[12] The Official Comment to UCC section 1-205 suggests that, so long as they are reasonable, trade usages are recognized.[13] Many farmers and seed buyers, however, are not aware of this concept. In its decision for one seed dealer, an Indiana appellate court held that if such usage is so widespread as to create an expectation that both parties should be aware of its existence, "it is not necessary for both parties to be consciously aware of trade usage."[14]

Scientists have concluded that WFB was first introduced into the United States through contaminated watermelon seed produced in China.[15] The first clear description of the disease, caused by a bacterium named *Pseudomonas pseudoalcaligenes* subsp. *citrulli (*"*Ppc*"*),* was published in 1969.[16] The common name "fruit blotch" first appeared in a 1978 Australian plant disease handbook.[17] In 1987, WFB attributed to *Ppc* was also reported in Guam and Tinian.[18] Later studies differentiated the *Ppc* bacterium from 'true' WFB (*Acidovorax avenae* subsp. *citrulli*) based on tobacco hypersensitivity, biochemical characteristics, and fatty acid profile analysis.[19]

The disease initially occurred in the United States in 1989 in commercial watermelon fields in Florida, Indiana, and South Carolina, causing losses of up to

10. *See* MONT. CODE ANN. § 30-2-316(3)(e) (1998) (amending U.C.C. § 2-316 (1994) by adding new subsection (e) regarding implied warranties: "in sales of any seed for planting (including both botanical and vegetative types of seed, whether certified or not), there are no implied warranties, as defined in this chapter, that the seeds are free from disease, virus, or any kind of pathogenic organisms").

11. *See, e.g.*, OTIS S. TWILLEY SEED CO., IMPORTANT NOTICE, WAIVER AND RELEASE AGREEMENT CONCERNING ALL MELON SEED PURCHASED FROM OTIS S. TWILLEY SEED COMPANY, INC. (1998) (on file with author).

12. U.C.C. § 1-205 (1995).

13. *See id.* cmt. 6.

14. Martin Rispens & Son v. Hall Farms, Inc., 601 N.E.2d 429, 438 (Ind. Ct. App. 1992) (quoting WHITE & SUMMERS, HANDBOOK OF THE LAW UNDER THE UNIFORM COMMERCIAL CODE, § 3-3, at 122 (3d ed. 1988)).

15. *See* Karen K. Rane & Richard X. Latin, *Bacterial Fruit Blotch of Watermelon: Association of the Pathogen with Seed*, PLANT DISEASE, May 1992 at 509, 512. *See also Martin Rispens & Son*, 621 N.E.2d 1078, 1081 (Ind. 1993).

16. *See* Latin & Hopkins, *supra* note 7, at 761-62 (citing J.M. Crall & N.C. Schenk, *Bacterial Fruit Rot of Watermelon in Florida*, 53 PLANT DISEASE REP. 74, 74-75 (1969)).

17. *See id*. at 761, 762-63 (citing 1 N.T. Vock, *A Handbook of Plant Diseases in Colour*, FRUIT & VEGETABLES (Queens Department of Primary Industries, eds. 1978)).

18. *See* W. Giles Frankle et al., *Ingress of the Watermelon Fruit Blotch Bacterium into Fruit*, PLANT DISEASE, Nov. 1993, at 1090 (citing G.C. Wall & V.M. Santos, *A New Bacterial Disease of Watermelon in the Mariana Islands* (abstr.) PHYTOPATHOLOGY, Dec. 1988 at 1605).

19. *See* G. Cameron Somodi et al., *Occurrence of a Bacterial Watermelon Fruit Blotch in Florida*, PLANT DISEASE, Oct. 1991, at 1053, 1054.

eighty percent of the total marketable fruit.[20] Outbreaks in 1994 were also severe, causing devastating crop losses in thousands of acres.[21] Since 1997, the disease has occurred in fifteen watermelon-growing states.[22] Plant pathologists report that outbreaks occurring early in the growing season "can result in total loss of fruit at harvest."[23] One plaintiff-grower asserted damages for 583 acres of unsaleable melons totaling more than $1.6 million.[24] The jury awarded only $800,000—less than fifty percent—for the damage.[25] Some verdicts have been reduced on appeal, while other lawsuits have been summarily dismissed.

This Note describes the interaction of agricultural law with commercial watermelon seed producers and dealers, watermelon transplant growers, farmers, and plant pathologists in an ongoing food fight. Their efforts in concert have successfully controlled a relatively new plant disease, WFB. An examination of legal causation theories and damage issues is included to provide a survey of the recourse available to potential litigants. Current industry guidelines, and scientists' recommendations, are described to disseminate the best currently available technology in the campaign against WFB. "We all know American agriculture is changing and it is doing so at a pace unprecedented . . . . There will be new disease infestations, changing farm practices, and other environmental concerns."[26]

II. WATERMELON BOTANY

The plant *(Citrullus lanatus* (*Thunb.) Matsum, & Nakai)*[27] is a member of the *Cucurbitaceae* family, which includes gourds, cantaloupes, squashes, cucumbers and pumpkins.[28] It is a "trailing vine native to tropical Africa but is widely cultivated, [especially] in warm climates."[29] Watermelons require at least 120 warm or hot days

20. *See* D.L. Hopkins, *Bacterial Fruit Blotch of Watermelon,* Dec. 1992 (on file with author).

21. *See* Susan O'Reilly, *Watermelon Industry Campaign Helps Make Watermelon Fruit Blotch a Manageable Disease*, CITRUS & VEGETABLE MAG., Research Update: Bacterial Fruit Blotch on Watermelon, 1998 at 7, 7.

22. *See Introduction,* CITRUS & VEGETABLE MAG., Research Update: Bacterial Fruit Blotch of Watermelon, Feb. 1997, at W2, W2 [hereinafter *1997 Research Update Introduction*].

23. *See* Latin & Hopkins, *supra* note 7, at 761, 761.

24. *See* Brief for Appellees and Cross-Appellants at 51, Elliott v. Petoseed Co., No. 95-2462 (11th Cir. 1997), *dismissing appeal from* consolidated Dist. Ct. Nos. 90-139, 93-355 (Aug. 14, 1998) [hereinafter *Elliot* Brief for Appellees].

25. *See id.*

26. *Agricultural Extension Programs: Hearings on S. 1150 Before the Subcomm. on Resource Conservation, Research, and Forestry of the House Comm. on Agriculture*, 104th Cong. 347, 350 (1996) (statement of Dean Urmston, Executive Vice President, Am. Seed Trade Ass'n) [hereinafter *Agricultural Extension Programs Hearings—Dean Urmston*].

27. *See* Karen K. Rane & Richard X. Latin, *Bacterial Fruit Blotch of Watermelon: Association of the Pathogen with Seed*, PLANT DISEASE, May 1992, at 509, 509.

28. *See* NEW LEXICON WEBSTER'S DICTIONARY OF THE ENGLISH LANGUAGE 1112 (Bernard S. Cayne & Doris E. Lechner eds., 1988).

29. *Id.*

to mature, and are reasonably drought-resistant.[30] Seeds can be planted directly into the soil or started in commercial greenhouses, for locations having colder climates or shorter growing seasons.[31] Three to four weeks after germination, the seedling "sets" are "transplanted to fields after the danger of frost has passed."[32] Mature fruit emerges in eighty to ninety-five days depending on the variety.[33]

A. *History of Watermelon Cultivation*

"People have eaten watermelon for more than 5000 years."[34] Hieroglyphics indicate ancient Egyptians first cultivated watermelons; early explorers used them as canteens.[35] The fruit's popularity spread from Egypt, throughout the Mediterranean, and into China by the thirteenth century.[36] "David Livingstone—of 'Dr. Livingstone, I presume' fame—is credited with discovering the botanical origins of watermelon in the Kalahari Desert in the 1850s."[37] The plant has been grown in the United States as early as 1629 in New England.[38] Mark Twain described watermelon as "chief of the world's luxuries, king by the grace of God over all the fruits of the earth. When one has tasted it, he knows what the angels eat."[39]

B. *Annual Revenue from U. S. Watermelon Sales*

In 1997 the USDA reported that more than $309 million in revenue was generated from sales of watermelon grown in the U.S.[40] California, Florida, Georgia, and Texas were the nation's four largest watermelon producing states.[41] Congress employs two methods to authorize research and promotion of agricultural products: the 1937 Agricultural Marketing Agreement Act ("AMAA"),[42] and a series of individual legislation orders knows as Marketing Acts.[43] The AMAA authorizes

30. *See* 21 GARY W. ELMSTROM, WORLD BOOK ENCYCLOPEDIA 146 (1995 ed.).
31. *See id.*
32. *Id.*
33. *See id.*
34. Ramsey Campbell, *Watermelon is a Sweet Treat But Not Easy*, ORLANDO SENTINEL, Apr. 15, 1998, at 4.
35. *See id.*
36. *See id.*
37. *Id.*
38. *See* ELMSTROM, *supra* note 30, at 146.
39. Campbell, *supra* note 34, at 4.
40. *See* NATIONAL AGRICULTURAL STATISTICS SERVICE, USDA, AGRICULTURAL STATISTICS 1998 IX-22 (1998).
41. *See id.* at IV-40.
42. *See* Agricultural Marketing Agreement Act (AMAA), 7 U.S.C. § 671 (1937) (enacting legislation to establish and maintain orderly marketing conditions and fair prices for agricultural commodities). *See also* Glickman v. Wileman Bros. & Elliott, Inc., 521 U.S. 457, 459 (1997).
43. *See* H.R. REP. NO. 99-430, at 2 (1996), *reprinted in* 1986 U.S.C.C.A.N. 6241, 6241.

Congress to fund research and promotion programs to remedy economically ailing commodities.[44]

C. *Marketing Acts and Advertising Campaigns*

Federally funded Marketing Acts establish "marketing boards" to create an increased demand for specific agricultural products.[45] Marketing board advertising campaigns have created memorable slogans including: "Milk. Where's Your Mustache?;"[46] "The Incredible, Edible Egg;"[47] and (pork) "The Other White (Meat) Sale."[48] Congress created the 1985 Watermelon Research And Promotion Act ("WRPA")[49] in response to USDA reports that per capita consumption of watermelon in the United States had declined steadily since the 1950's.[50] The downward trend had continued for decades; per capita consumption of watermelon "declined from 15.9 pounds in 1963 to 13.6 pounds in 1977, and to 12.3 pounds in 1981."[51] Citing concern over decreasing domestic watermelon consumption levels, the House Committee approved the WRPA "to strengthen the watermelon's competitive position in the marketplace, and establish, maintain, and expand domestic and foreign markets for watermelons."[52]

The National Watermelon Promotion Board ("NWPB") was also created in 1985 to stimulate sales.[53] Currently financed by the watermelon industry,[54] the

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44. *See* Ann Smith, *The ABCs of Perishables*, PROGRESSIVE GROCER, Sept. 1997, at 87.

45 *See id. See, e.g.*, 7 U.S.C. §§ 2106(a), 2617(a), 2707(a), 2904(1), 3405(a), 4306(1), 4606(c), 4808(a), 4906(b), 6005(b), 6104(b), 6204(b), 6304(b), 6407(b) (1988 & Supp. II 1990) (stating section names respectively as: Cotton Board, National Potato Promotion Board, Egg Board, Cattlemen's Beef Promotion and Research Board, Wheat Industry Council, Floraboard, Honey board, National Pork Board, National Watermelon Promotion Board, Pecan Marketing Board, Mushroom Council, Lime Board, United Soybean Board, National [fluid milk] Processor Advertising and Promotion Board).

46. *See* George Hostetter, *Moove Over, Coke; Producers Launches Snazzy New Products to Compete in the Mobile Market*, FRESNO BEE, Nov. 1, 1998, at C1 (quoting the National Fluid Milk Processor Promotion Board's 2-year-old "Milk. Where's Your Mustache?" campaign).

47. *See Old Corner Deli*, RESTAURANT BUS. MAG., July 1, 1998, at 76, 78 (citing the AMERICAN EGG BOARD FOODSERVICE GUIDE, Pamphlet, "*The Incredible Edible Egg: A Natural for Any Foodservice Operation*").

48. *See* Jerry Perkins, *A White (Meat) Sale*, DES MOINES REG., Sept. 27, 1998, at FC-1 (describing the "recently launched special promotion by the National Pork Producers Council and the National Pork Board is part of its All-Out Pork Surplus Initiative to move a historically large supply of pork . . . caused by overproduction [that] has been dragging down hog prices for 10 months . . . using national and local newspaper, television and radio advertisements to promote 'The Other White (Meat) Sale' through the end of 1998.").

49. Watermelon Research and Promotion Act of 1985, Pub. L. No. 99-198, 99 Stat. 1354, 1622-1630 (codified as amended in scattered sections of 7 U.S.C.).

50. *See* Watermelon Research and Promotion Act, 7 U.S.C. § 4901(a)(1) (1994).

51. Watermelon Research and Promotion Act, H.R. Rep. No. 99-271(I) at 192 (1985).

52. Watermelon Research and Promotion Act, 7 U.S.C. § 4901(b) (1994).

53. *See id*. § 4902(8).

NWPB mission is to enhance "retail and foodservice marketing and promotional campaigns, consumer public relations, production, consumer and retail research."[55] The resultant advertising campaigns and promotional efforts have been successful. Production peaked at record levels in 1996[56] and Americans' per capita consumption of watermelon rose to 17.4 pounds.[57]

1. *Hybrid Watermelon Seed Production Techniques*

Biotechnology involves the application of scientific techniques to create "new varieties of plants, animals, and microorganisms."[58] Humans have developed and improved plant varieties throughout history[59] using simple techniques such as culling, or planting only seed saved from the most vigorous crops. The laws of heredity (foundation of the science of genetics) were established in 1865 by Gregor Johann Mendel, an Austrian monk and botanist.[60] Today, plant breeders use Mendel's cross-fertilization techniques to create new plant varieties called "cultivars"[61] having desirable characteristics such as higher yield, and resistance to disease and drought.[62] Commercial seed companies have developed most of today's popular watermelon varieties to improve traits such as quality and yield.[63]

WFB's emergence coincided with growers' increased use of hybrid seeds developed by commercial seed companies through expensive hand pollination techniques. Male and female flowers grow on the same watermelon plant, a botanical condition known as "incomplete" flowering.[64] Fertilization typically occurs when pollen produced by the anthers of the male flower is transported on the bodies

54. *See id.* § 4906(G) (stating the funds received from the industry are used to fund the NWPB).

55. Smith, *supra* note 44, at 100.

56. *See* NATIONAL AGRICULTURAL STATISTICS SERVICE, USDA, AGRICULTURAL STATISTICS IV-40 (1998).

57. *See* Campbell, *supra* note 34, at 4.

58. Klaus Bosselmann, *Plants and Politics: The International Legal Regime Concerning Biotechnology and Biodiversity*, 7 COLO. J. INT'L ENVTL. L. & POL'Y 111, 114 (1996) (citing *Industrial Property Protection of Biotechnological Inventions*, 4-5, World Intelligence Property Organization, Publication Biot/CE/1/2 (1984)).

59. *See* J. Benjamin Bai, Note, *Protecting Plant Varieties Under TRIPS and NAFTA: Should Utility Patents be Available for Plants?*, 32 TEX. INT'L L.J. 139, 140 (1997).

60. *See* Natalie M. Derzko, *Plant Breeders' Rights in Canada and Abroad: What are These Rights and How Much Must Society Pay for Them?*, 39 MCGILL L.J. 144, 148 (1994).

61. *See id*. at 147.

62. *See* Sara M. Dunn, *From Flav'r Sav'r to Environmental Saver? Biotechnology and the Future of Agriculture, International Trade, and the Environment*, 9 COLO. J. INT'L ENVTL. L. & POL'Y 145, 148 (1998) (citing Monsanto Backgrounder: Plant Biotechnology at Monsanto (visited Feb. 28, 1997) <http://www.monsanto.com/monsanto/mediacenter/background/96nov__PlantBiotech.html>).

63. *See* Ormund Powers, *Prince Watermelon Reigns in Farm Kingdom*, ORLANDO SENTINEL, May 21, 1997, at 3.

64. *See* WEBSTER'S NEW INTERNATIONAL DICTIONARY 1144 (3d ed. 1981).

of honey bees, or other visiting insects, to the stigma and ovary of female flowers.[65] Germination occurs when the ovary develops into the fruit of the watermelon and ovules later become seeds.[66]

Seed breeders counter crop diseases by identifying genes in a plant which confer resistance against a particular pathogen, and breed these identified genes into the crop.[67] The battle is a continuous one because insects and plant pathogens "generally adapt to the plant's genetic defenses within five to fifteen years."[68] "New genes must continually be found to combat the renewed attacks of insects and disease."[69]

2. *Why Commercial Watermelon Seed Costs $85.40 per Pound*

For watermelon growers, the first step in cultivation is to choose a variety that is best adapted to their climatic region. All traits, for example: shape, exterior coloration, and pulp sugar, are inherited from the parent plants' chromosomal makeup.[70] Plant breeders combine pollen from two different varieties to create new cultivars which will have both parents' combined characteristics.[71]

Scientists may also treat the male or female parts of the flower (or both) with growth-stimulating chemicals prior to fertilization to create new, improved plant varieties. Hybrid watermelon seed is typically produced by planting the male parent in one field, the female parent in a separate, isolated field to prevent pollination by wind and insects.[72] Pollen from desired male flowers is carefully harvested, monitored to ensure against contamination by pollen from other flowers, and " transported in a vial to the field where the female parent is located."[73]

In the breeding fields, "all of the blossoms except one are removed [by hand] from each plant;"[74] male flowers are removed from the plant by hand.[75] Hybrids are created by individually placing the desired pollen from variety 'A' onto the female flower of variety 'B'.[76] The seed which develop will be variety 'AB'.[77] This tedious work is performed in the field when female flowers are mature.[78] The remaining blossoms are hand pollinated, individually covered with plastic bags and tied shut, to

65. *See* PETER B. KAUFMAN ET AL., PRACTICAL BOTANY 17-18 (1983).
66. *See* MICHAEL PROCTOR ET AL., THE NATURAL HISTORY OF POLLINATION 32-34 (1996).
67. *See* Starr & Hardy, *supra* note 2, at 97-98.
68. *Id.* at 97 (quoting NORMAN MYERS, A WEALTH OF WILD SPECIES 33 (1983)).
69. *Id*. at 98 (quoting *Just Say No*, THE ECONOMIST, Mar. 9, 1991, at 84).
70. *See, e.g.*, KAUFFMAN, *supra* note 65 at 18.
71. *See id.* at 17-18.
72. *See Elliot* Brief for Appellees, *supra* note 24, at 9.
73. *Id.*
74. *Id*. at 10.
75. *See id.* at 9.
76. *See* KAUFFMAN, *supra* note 65, at 17.
77. *See id.*.
78. *See Elliot* Brief for Appellees, *supra* note 24, at 9-10.

prevent fertilization by undesirable pollen.[79] Seed from the mature hybrid watermelons is harvested and commercial seed companies process and sell the hybrid seed in the United States and foreign countries.[80]

3. *The China Connection: Sprouting Litigation*

"[S]eeds are the foundation of agriculture and account for a significant portion of agriculture's contribution to economies here and abroad."[81] In 1997, the world's leading watermelon producers were Turkey and China.[82] The Petoseed Company, Inc. contracted with the China National Seed Company to produce 450 kilograms of Prince Charles (then known for its high yield and disease resistance)[83] hybrid watermelon seed in 1986.[84] The breeding fields were located near the Kai Feng and Yanshi villages in the Henan province.[85] China National Seed Company's production records revealed that a number of watermelons which constituted Prince Charles lot #1018 cracked near harvest time and only 300 kilograms were produced.[86] By 1994, WFB was introduced into the United States from several other commercial seed sources, including seed produced in Thailand[87] and Mexico.[88]

4. *Impact of WFB on Watermelon - Producing States*

Mature watermelon fruit with large, dark green, water-soaked lesions were reported in Florida (then the nation's top watermelon producing state), Indiana, North and South Carolina, Delaware, and Maryland in 1989.[89] Within three years, farms in Georgia, Alabama, and Texas also suffered severe economic and crop losses from WFB. By 1994, WFB had caused partial-to-total losses in thousands of acres in ten states.[90] Since 1997, the disease has occurred in fifteen watermelon-growing states: Alabama, Arkansas, California, Delaware, Florida, Georgia, Indiana, Iowa,

79. *See id.* at 10.
80. *See id.*
81. *Agricultural Extension Programs Hearings—Dean Urmston*, *supra* note 26, at 350.
82. *See* GARY W. ELMSTROM, WORLD BOOK ENCYCLOPEDIA 146 (1995 ed.).
83. *See* Martin Rispens & Son v. Hall Farms, Inc., 621 N.E.2d 1078, 1080 (Ind. 1993).
84. *See Elliot* Brief for Appellees, *supra* note 24, at 10.
85. *See id.*
86. *See id.*
87. Telephone Interview with John E. Parker, Plaintiff's Attorney, Law Offices of Peters, Murdaugh, Parker, Eltzrock & Detrick (Sept. 8, 1998) (on file with author) (stating by 1994, other commercial sources of WFB included Harris Moran Co.'s "Millionaire" variety watermelon seed tested from Thailand, Asgrow Seed Co's. "Starbright" variety from direct-seeded fields, and "Tri-5"—which had not been tested for WFB—purchased by Clemson University scientists from China's Great Western Seed Co.).
88. *See Martin Rispens & Son*, 621 N.E.2d at 1081.
89. *See* O'Reilly, *supra* note 21, at 7; *1997 Research Update Introduction*, *supra* note 22, at W2.
90. *See 1997 Research Update Introduction*, *supra* note 22, at W2.

Maryland, Mississippi, Missouri, Oklahoma, North Carolina, South Carolina, and Texas.[91]

III. WFB SYMPTOMS

WFB symptoms first manifest as water-soaked, brown lesions on the leaves that may be bordered by leaf veins or yellow tissue.[92] Leaf lesions occur on the underside of the leaves near the midrib (vein) and can be a source of infection for lesions appearing on other parts of the fruit.[93] Fruit lesions start as small, greasy-looking, water-soaked spots on the sunny side of the melon.[94] The spots enlarge rapidly until much of the melon surface is covered with a greasy blotch; the rind cracks as lesions age.[95] "A white ooze can be seen on the fruit and decay soon follows."[96] Marketability of watermelons exhibiting WFB symptoms is ruined; the melons are unusable.[97] Affected melons are left in the field, where the fruit eventually sours and rots.[98]

A. *"Exploding" Watermelons: The Juicy Rumor*

Plant pathologists attributed the abnormally high amount of media coverage to WFB's newness, "the gruesome appearance of infected fruit, and the severe losses sustained in affected fields . . . ."[99] Several newspaper articles reported erroneous descriptions of "exploding watermelons" caused by WFB:

> [T]he disease first appears as a small, blurry spot on a melon, and as the size of the blotch increases, bacteria penetrate the rind into the meat of the melon and begin to eat it. As the melon is hollowed out, a gas is produced. If there are holes in the rind, the gas will escape through them. If not, the melon will crack or even explode with a loud report.[100]

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91. *See id.*
92. *See* Latin & Hopkins, *supra* note 7, at 761-762.
93. *See id.* at 764.
94. *See id.*
95. *See id.* at 762.
96. Kenny Bailey, *Bacterial Fruit Blotch of Watermelon*, COMMERCIAL PRODUCE (North Carolina Cooperative Extension Service, Fayetteville, N.C., eds.) July 1995.
97. *See, e.g.*, *Watermelon Blight Sours Crop Prospects*, CINN. ENQUIRER, May 29, 1994, at A26.
98. *See* Bailey, *supra* note 96.
99. Latin & Hopkins, *supra* note 7, at 764.
100. Jack Warner, *Disease Attacking Watermelon Crops: Gas from Bacteria Sometimes Causes Fruit to Explode*, ATLANTA J. & CONST., Aug. 22, 1992, at B2 (quoting University of Georgia phytopathologist Dr. Danny Gay). S*ee also* Elliott Minor, *Watch is on for Watermelon Blotch*, ST. PETERSBURG TIMES, May 10, 1994, at 4B (stating [WFB] "rots the inside of the fruit, causing a buildup of pressure that makes the melons pop open and spew a foul-smelling ooze"). S*ee* Dick Tracy, *Salt in the Garden?*, SACRAMENTO BEE, Dec. 31 1994, at CL3 (stating "watermelons that explode and spew

Most plant pathologists decry the juicy "exploding watermelon" rumor, insisting that it is not a part of WFB syndrome.[101]

B. *Watermelon Varieties Affected*

The National Watermelon Promotion Board in Orlando, Florida, lists 39 principal varieties.[102] WFB-susceptible varieties include: Prince Charles, Charleston Gray, Royal Jubilee, Jubilee, Starbright, Millionaire, and Regency.[103] "The most resistant varieties are the uniformly dark green rind types, such as Sugar Baby. More tolerant varieties include the dark green and light green striped varieties, such as Crimson Sweet."[104]

IV. CASE HISTORY: WFB FROM CONTAMINATED SEED

The first outbreak of WFB began at Hall Farms, Inc., a small family farm corporation which had purchased forty pounds of Prince Charles watermelon seeds for $85.40 per pound.[105] The seeds were produced by the Petoseed Company, Inc., and sold through a local retailer, Martin Rispens & Son.[106] In early April, 1989, Hall Farms germinated the seeds in two of its greenhouses, intending to plant the seedling "sets" over 261 acres of rented land.[107] Mark Hall noticed on April 15 that several seedlings had small, yellow-spotted lesions; however, plant growth was not affected.[108] Asymptomatic seedlings were transplanted to the fields the next month.[109]

On July 5th or 6th, Hall found a watermelon in his field which had a small purple blotch; he described the same blotch one week later as "spreading like wildfire."[110] "By harvest time ten days later, a significant portion of the watermelon

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rancid liquid are very real," and quoting ORGANIC GARDENING MAG., Dec. 1994: "[S]hould this happen in your garden, we suggest you wear a moon suit or very old clothes while harvesting any surviving melons.").

101. *See* Latin & Hopkins, *supra* note 7, at 764. *See also* Kate Santich, *Anyway You Slice it Melons Aren't Exploding*, ORLANDO SENTINEL, June 5, 1994, at 4 (quoting Dr. Tom Kucharek, University of Florida plant pathologist: "I've seen fruit in the field where the rind has cracked a little under pressure, but I have never once seen a watermelon explode" and quoting William Watson, Executive Director of the National Watermelon Promotion Board: "[T]he only way you're going to see a watermelon explode is if somebody shoots it with a gun.").

102. *See* Tom Longshaw, *Watermelon Lovers, Take Note: Passion Could Be Costly this Summer*, HERALD, May 3, 1995, at 1A.

103. *Id.*

104. *Id.*

105. *See* Martin Rispens & Son v. Hall Farms, Inc., 621 N.E.2d 1078, 1080 (Ind. 1993).

106. *See id.* at 1081.

107. *See id. See also* Martin Rispens & Son v. Hall Farms, Inc., 601 N.E.2d 429, 431 (Ind. Ct. App. 1992).

108. *See Martin Rispens & Son*, 621 N.E.2d at 1081.

109. *See id.*

110. *Martin Rispens & Son*, 601 N.E.2d at 432 (citing trial record at 662).

crop had been ruined" and most of the blotched fruit had to be left in the fields and plowed under.[111]

V. LAWSUITS AGAINST THE SEED PRODUCER AND RETAILER

In Hall's original lawsuit against Rispens & Son, Inc., the Indiana Court of Appeals addressed the issue of whether the defendant's purchase order, which stated the seeds were "strictly high grade seeds," and "properly fitted for seeding purposes," constituted an express warranty.[112] The court granted summary judgment in favor of the seed dealer, with respect to its warranty of "high grade seeds," because the buyers failed to provide evidence of a grading system in the watermelon seed industry.[113] The Indiana Supreme Court upheld the lower court's denial of summary judgment for the seed dealer on the issue of the express warranty claim, finding that "properly fitted for seeding purposes was susceptible to more than one meaning."[114]

VI. IDENTIFYING THE CAUSATIVE AGENT: TRACKING THE WFB CULPRIT

Koch's postulates are classical laboratory methods used to verify that a pathogenic organism is the causative agent of a specific disease.[115] To fulfill the postulates, the suspect organism:

(1) must be present and recoverable from a diseased plant or animal host;
(2) must occur in all instances of the disease;
(3) should be recoverable in pure culture; and
(4) must cause the same disease when the purified culture is inoculated into a healthy, susceptible host.[116]

A Purdue University plant pathologist, Dr. Rick Latin, was able to obtain an unopened can of Prince Charles watermelon seed and isolate a bacterium suspected to be the causative agent of WFB.[117] After conducting biochemical tests, a pure culture of the bacterium was inoculated onto healthy watermelon seedlings, stems,

111. *Martin Rispens & Son*, 621 N.E.2d at 1081.
112. *Id.* at 1083.
113. *See Martin Rispens & Son*, 601 N.E.2d at 436.
114. *Martin Rispens & Son*, 621 N.E.2d at 1083.
115. *See* PAUL SINGLETON & DANA SAINSBURY, DICTIONARY OF MICROBIOLOGY 479 (2d ed. 1997).
116. *See id*.
117. *See* K.K. Rane & R.X. Latin, Abstract, *Investigation of Bacterial Fruit Blotch of Watermelon in Indiana*, 80 PHYTOPATHOLOGY 1070 (1990).

and cotyledons.[118] Several days later, the inoculated seedlings expressed symptoms identical to those observed on WFB-infected watermelon seedlings Dr. Latin observed in the field.[119] The bacterium was recovered from the diseased seedlings and purified.[120] After the re-isolated cultures underwent the same biochemical tests (fulfilling Koch's postulates), the results confirmed that the original source of the WFB bacterium was from the contaminated watermelon seed.[121]

VII. TORT REMEDIES: MERE PLACEBO OR VIABLE REDRESS?

Strict liability in tort is liability imposed without regard to one's fault, for damage caused by certain activities.[122] "When a defective product fails and causes personal injury or property damage, the seller is generally held liable for the damages proximately caused by the defect."[123] Strict liability is subject to certain limitations not found in a warranty action; the buyer must prove that the product is unreasonably dangerous in its defective condition,[124] but, according to author interpretation, does not have to make this proof in a breach of warranty action.

118. *See* Rane & Latin, *supra* note 27, at 509-10.

119. *See id.* at 512.

120. *See id.*

121. *See id*.

122. *See* RESTATEMENT (SECOND) OF TORTS § 402A(1) (1965).

> One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property, is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if (a) the seller is engaged in the business of selling such a product, and (b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold. (2) The rule stated in Subsection (1) applies although (a) the seller has exercised all possible care in the preparation and sale of his product, and (b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.

Id. See also RESTATEMENT (SECOND) OF TORTS § 402A cmt. m (1965).

> [T]he model rule is not based on contract or subject to the limitations found in the law of warranty as developed as part of the law of sales. There is nothing in this Section which would prevent any court from treating the rule stated as a matter of 'warranty' to the user or consumer. But if this is done, it should be recognized and understood that the 'warranty' is a very different kind of warranty from those usually found in the sale of goods, and that it is not subject to the various contract rules which have grown up to surround such sales.

Id.

123. JAMES A. HENDERSON, JR. & AARON D. TWERSKI, PRODUCTS LIABILITY: PROBLEMS AND PROCESS 220 (3d ed. 1997).

124. *See, e.g.*, Bowler v. Stewart-Warner Corp., 563 A.2d 344, 348 (D.C. App. 1989) (holding that the trial incorrectly used two different jury instructions to decide a strict liability and warranty action). The jury found no strict liability because the chair casters at issue were not unreasonably dangerous; however, they were unfit for their purpose because they were defective and caused injury. *See id*.

The Economic Loss Rule ("ELR") is a doctrine that "bars tort claims and limits a plaintiff's recovery to those contractual remedies provided by the Uniform Commercial Code where the suit arises out of a commercial transaction and the loss incurred is only to the product itself."[125] A majority of jurisdictions have adopted the ELR doctrine.[126] Under the ELR, a plaintiff who has incurred only economic loss from a defective product generally cannot recover, regardless of whether privity exists between the plaintiff and defendant.[127]

The Florida Supreme Court reiterated, explaining that in such cases, "contract principles [are] more appropriate than tort principles for recovering economic loss . . . ."[128] Thus, the ELR limits a plaintiff's use of tort remedies when no property damage or physical injury is shown. Recent cases involving crops and livestock hold that "damage . . . is compensable in strict liability—as property damage—if the damage is sudden and major."[129]

In the appeals case of *Martin Rispens & Son v. Hall Farms, Inc*., the farmer's strict liability claim was dismissed because the WFB infection was "slow growing."[130] The negligence claim was dismissed because the only loss alleged was economic loss.[131] An argument can be made, however, that because WFB symptoms appeared approximately two weeks after seedling emergence, and mature fruit emerge only eleven to thirteen weeks later, the infection is not slow-growing, in terms of the plant's useful life as marketable produce, or "goods" as defined by UCC § 2-105.[132] In a separate opinion, concurring Justice Dickson dissented, stating the

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125. Myrtle Beach Pipeline Corp. v. Emerson Elec. Co., 843 F. Supp. 1027, 1049 (D.S.C. 1993).

126. *See, e.g.*, W. Dudley McCarter, *The Economic Loss Doctrine in Construction Litigation*, CONSTRUCTION LAWYER, July 1998, at 21, 21. *See also* Casa Clara Condominium Ass'n v. Charley Toppino & Sons, Inc., 620 So.2d 1244, 1246-48 (Fla. 1993).

127. *See, e.g.*, Seely v. White Motor Co., 403 P.2d 145, 151 (Cal. 1965) (holding a claim for economic losses is barred in a tort action, absent physical injury to property); Spectron Dev. Lab v. American Hollow Boring Co., 936 P.2d 852, 857 (N.M. 1997) (reaffirming the holding in Utah Int'l v. Caterpillar Tractor Co. 775 P.2d 741, 744 (Utah 1989). "[I]n commercial transactions between parties with comparable bargaining power any damage to the product itself, including economic loss resulting from that damage, should be governed by contract law, not tort law." *Id. See, e.g.*, Alloway v. Gen. Marine Indus., 695 A.2d 264, 267-68 (N.J. 1997) (stating "tort principles are better suited to resolve claims for personal injuries or damage to other property . . . . Contract principles more readily respond to claims for economic loss caused by damage to the product itself").

128. *Casa Clara Condominium Ass'n*, 620 So. 2d at 1247 (quoting Florida Power & Light Co. v. Westinghouse Elec. Corp., 510 So. 2d 899, 902 (Fla. 1987)).

129. Alan J. Lazarus et al., *Recent Developments in Products, General Liability, and Consumer Law*, 30 TORT & INS. L.J. 523, 525 (1995).

130. *See* Martin Rispens & Son v. Hall Farms, Inc., 621 N.E.2d 1078, 1089 (Ind. 1993).

131. *See id.* at 1088-89 (holding "bacteria affect[ing] the watermelon crop over a period of months, first appearing in the greenhouse and progressing over time to the melons . . . is not the type of sudden, major damage to property contemplated in the [Indiana Strict Product Liability] Act").

132. *See* U.C.C. § 2-105 (1994). " 'Goods' means all things (including specially manufactured goods) which are movable at the time of identification to the contract for sale other than the money in which the price is to be paid, investment securities (Article 8) and things in action." § 2-

issue of the crop's gradual or sudden damage depended on a variety of factors, and presented substantial questions of fact that should have been left to the fact finder at trial (e.g., whether all or only some of the seeds were infected when they were purchased, and whether the damaged watermelon crop grew exclusively from the infected seed sold to the plaintiff).[133]

VIII. CONTRACT REMEDIES

A. *Breach of Express Warranty*

With regard to a plaintiff's negligence claims:

> [T]he economic loss rule has not eliminated causes of action based on torts independent of the contractual breach even though there exists a breach of contract action. Where a contract exists, a tort action will lie for either intentional or negligent acts considered to be independent from the acts that breached the contract.[134]

Therefore, because strict liability in tort will not lie in claims of damage to the product itself, the Supreme Court of Indiana held the farmer/grower's proper remedies were warranty.[135]

Commercial seed producers may use express warranty provisions to defend against actions for breach of contract.[136] An express warranty is "[a]ny affirmation of fact or promise made by the seller to the buyer which relates to the goods and becomes part of the basis of the bargain creates an express warranty that the goods shall conform to the affirmation or promise."[137] Hall Farms sued the seed dealer and the commercial seed producer, alleging they sold him defective watermelon seeds; the complaint sought damages for: breach of express and implied warranty, strict liability, and negligence.[138] The seed producer argued that the label on its seed cans

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105(1) (1994). " 'Goods' also includes the unborn young animals and growing crops and other identified things attached to realty as described in the section on goods to be severed from realty (Section 2-107)." *Id.*

133. *See Martin Rispens & Son*, 621 N.E.2d at 1091 (Dickson, J., dissenting in part and concurring in part). "[T]he determination of whether damage is 'sudden' will necessarily depend on the unique facts of each controversy, and will ordinarily be resolved by the trier of fact." *Id.*

134. HTP, Ltd. v. Lineas Aeras Costarricenses, S.A., 685 So.2d 1238, 1239 (Fla. 1996).

135. The *Martin* Court states "[r]elegating the purchaser to warranty remedies prevents a manufacturer from being held liable for damages of unknown and unlimited scope." *Martin Rispens & Son*, 621 N.E.2d at 1091 (relying on previous footnote to Prairie Prod., Inc. v. Agchem Div.-Pennwalt Corp., 514 N.E.2d 1299, 1304-05 (Ind. App. 1987)).

136. *See* Henry D. Gabriel et al., *General Provisions and Sales*, 49 BUS. LAW. 1919, 1928 (1994).

137. U.C.C. § 2-313(1)(a) (1994).

138. *See* Martin Rispens & Son v. Hall Farms, Inc., 601 N.E.2d 429, 433-39 (Ind. App. 1992) (hearing arguments as the defendants' interlocutory appeal challenging the trial court's refusal to

clearly stated "as its sole express warranty, that the seeds it sells will conform to only those descriptions of said seed that are required to be on the label . . . ."[139] Hall Farms countered arguing that the label constituted an express warranty because it described the seeds as "top quality seeds with high vitality, vigor and germination."[140] After considering whether the various writings on seed cans constituted express warranties, the court held that no breach of any warranty was created by the writings because the seeds sprouted, grew, and developed fruit.[141] The court also held the "top quality" label contained no degree of specificity, and was "mere puffery and did not create an express warranty."[142]

Farmers wishing to purchase seed are usually required to sign purchase orders which contain boilerplate release provisions.[143] Despite commercial seed companies' efforts to test sample batches of seed for the presence of the [WFB] bacterium, they cannot guarantee that all the seed they sell are disease-free. For this reason, suppliers have buyers sign a form releasing the company from any liability in the event the disease occurs.[144] The UCC does not define "unconscionable."[145] However, Comment 1 to UCC §2-302 describes the underlying principle as the "prevention of oppression and unfair surprise . . . and not of disturbance of allocation of risks because of superior bargaining power."[146]

Hall Farms also claimed that the limitation of liability provisions in paragraphs 10 and 11 of Rispens' invoice were "substantively unconscionable because farmers will be denied a minimum adequate remedy while giving seed manufacturers and distributors effective immunity from liability in a situation where the defect in the seed was latent."[147] 'Substantive unconscionability' refers to oppressively one-sided or harsh terms of a contract, and generally involves cases where courts have determined the price to be unduly excessive, or where the terms of

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grant summary judgment, and noting damages claimed for the watermelon crop, growing equipment, and lost profits were approximately $180,000).

139. *Id.* at 434.

140. *Id. See also* U.C.C. § 2-313(1)(a) (1994) (stating promises or affirmations of fact create express warranties if they become part of the basis of the bargain).

141. *See Martin Rispens & Son*, 601 N.E.2d at 435.

142. *Id.* (holding that the farming corporation failed to meet its burden of proof to establish that seed retailer breached an express warranty arising from a phrase appearing on a purchase order, no evidence was presented concerning the meaning of "strictly high grade seeds").

143. *See* Latin & Hopkins, *supra* note 7, at 764.

144. Ruth Coxeter, *Watermelons of Wrath*, BUS. WK., Dec. 19, 1994, at 6 (stating watermelon "[s]eed suppliers are shipping [seed] again, after agreeing to beef up testing for [WFB] . . . . Customers must agree not to sue").

145. *See* Clark A. Remington, *Llewellyn, Antiformalism and the Fear of Transcendental Nonsense: Codifying the Variability Rule in the Law of Sales*, 44 WAYNE L. REV. 29, 58 (1998). *See also* Arthur Allen Leff, *Unconscionability and the Code—The Emperor's New Clause*, 115 U. PA. L. REV. 485, 487-88 (1967).

146. U.C.C. § 2-302 cmt. 1 (1994).

147. Martin Rispens & Son v. Hall Farms, Inc., 621 N.E. 2d 1078, 1086 (Ind. 1993).

a contract unduly limit a buyer's remedies.[148] Clearly, a court can set aside a contract where unconscionability was based upon unfair surprise, duress, or unfairness in a party's relative bargaining power, as it is "one technique for controlling the quality of a transaction when free market control is considered ineffective."[149]

B. *Breach of Implied Warranty; Usage of Trade*

The seed dealer, Rispens, provided various affidavits in support of its position, claiming that "virtually all seed manufacturers, wholesalers, and distributors disclaim and limit their liability to the purchase price of the seed," and that such limitation is the usage of the trade.[150] Hall Farms maintained it was not aware of any such usage of the trade.[151] The court acknowledged that "implied warranties may be disclaimed or modified through usage of trade,"[152] and held that it was unnecessary for both parties to have actual knowledge of trade usage if such usage is such "as to justify an expectation" that both parties should be aware of its existence.[153] On appeal, the Indiana Supreme court decided that because "Rispens is in the business of selling seeds while Hall Farms is in the business of planting seeds and producing crops," the parties were not involved in the same trade.[154] "Rispens submitted purchase orders used by another seed company with whom Hall Farms had dealt in the past which also disclaimed the implied warranty of merchantability. In response, Hall Farms submitted testimony of Mark Hall . . . that he had never read such disclaimers on the purchase orders."[155] Citing the conflicting testimony, the court remanded the issue, "whether the implied warranty of merchantability was disclaimed by usage of trade is a question of fact which must be resolved at trial."[156]

In a later WFB case involving a different plaintiff, exclusion of consequential damages, even for latent defects in seed, was not unconscionable if both parties were aware of the risk.[157] The seed dealer was found to have disclaimed its implied warranties by trade usage.

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148. *See* Weaver v. American Oil Co., 276 N.E.2d 144, 146 (Ind. 1972) (stating an unconscionable contract is one "no sensible man . . . would make, and . . . no honest and fair man would accept.").

149. Arthur Allen Leff, *Unconscionability and the Crowd—Consumers and the Common Law Tradition*, 31 U. PITT. L. REV. 349, 350 (1970).

150. Martin Rispens & Son v. Hall Farms, Inc., 601 N.E.2d 429, 437 (Ind. Ct. App. 1992).

151. *Id.*

152. *Id.* (citing IND. CODE ANN. § 26-1-2-316(3)(c) (Michie 1992)). *See also* U.C.C. § 2-316(3)(c) (1994).

153. *See Martin Rispens & Son*, 601 N.E.2d at 438 (quoting JAMES J. WHITE & ROBERT S. SUMMERS, UNIFORM COMMERCIAL CODE § 3-3, at 122 (3d ed. 1988)).

154. Martin Rispens & Son v. Hall Farms, Inc., 621 N.E.2d 1078, 1084 (Ind. 1993).

155. *Id.* at 1085.

156. *Id.*

157. *See Elliot* Brief for Appellees, *supra* note 24, at 42-43.

C. *Disclaimers and Unconscionability*

The Restatement of the Law of Contracts Second[158] and the UCC[159] provide that an unconscionable contract is not enforceable. The UCC has governed sales of goods in every state except Louisiana since 1967.[160] Although the UCC uses the word "clause," and the Restatement refers to "term" in describing the provisions of a contract, the import is substantially the same. Courts examine the facts of each case and have discretion to excise some, or all, contract clauses to arrive at a fair compact.[161]

> If the court as a matter of law finds the contract or any clause of the contract to have been unconscionable at the time it was made the court may refuse to enforce the contract, or it may enforce the remainder of the contract without the unconscionable clause, or it may so limit the application of any unconscionable clause as to avoid any unconscionable result.[162]

A warranty disclaimer is a means of controlling the seller's liability "by reducing the number of situations in which a seller can be in breach of contract terms."[163] Attempts to disclaim or limit liability for implied warranties are generally successful if the disclaimer or limitation fully complies with UCC section 2-316,[164] which requires that a disclaimer must be conspicuous and mention merchantability,[165]

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158. *See* RESTATEMENT (SECOND) OF CONTRACTS §208 (1981).

159. *See* U.C.C. § 2-302 (1994).

160. *See* Fred H. Miller, *Realism Not Idealism in Uniform Laws—Observations from the Revision of the UCC*, 39 S. TEX. L. REV. 707, 710 & n.10 (1998).

161. *See* U.C.C. § 2-302(1) (1994).

162. U.C.C. § 2-302 (1) (1994) (stating the purpose of enabling courts to make such conclusions of law is to "police explicitly against the contracts or clauses which they find to be unconscionable").

163. Collins Radio Co. v. Bell, 623 P.2d 1039, 1049 (Okla. Ct. App. 1980) (defining a remedy limitations clause as one which "simply restricts the remedies available to the seller, buyer, or both *once a breach is established*.") (emphasis added).

164. *See, e.g.*, Desert Seed Co. v. Drew Farmers Supply, Inc., 454 S.W.2d 307, 309 (Ark. 1970) (reviewing a tomato grower's suit for damages against a seed grower (third-party defendant) and seed distributor (third-party defendant)). *See id.* at 308. The tomato seeds were not the variety ordered. *See id.* The court held that: (1) the seed distributor's fine print "limitation of liability" on a tag attached to a bag of tomato seeds the retailer ordered by telephone was not the basis of the bargain between the seed distributor and the retailer, and (2) the grower should not be allowed to shield itself, by a disclaimer on a tag, from liability for its negligence (shipping the wrong seed type) would contravene public policy. *See id*. at 309-11

165. *See* U.C.C. § 2-314(2)(f) (1994). Merchantable goods must "conform to the promises or affirmations of fact made on the container or label if any." *Id. See also* H. Ward Classen, *Fundamentals of Software Licensing*, 37 IDEA 1, 14 (1996). The U.C.C. "requires that any warranty disclaimers related to merchantability must mention the word merchantability in writing and must be conspicuous." U.C.C. § 2-316(2) (1994).

if it is to be effective as to the implied warranty of merchantability. Disclaimers for a "warranty of fitness for a particular purpose must be in writing and conspicuous."[166]

"[C]ourts have begun to recognize that experienced but legally unsophisticated businessmen may be unfairly surprised by unconscionable contract terms . . . and that even large business entities may have *relatively* little bargaining power . . . ."[167] In one produce company's dispute with a farm equipment manufacturer, the contract's consequential damages exclusion and warranty disclaimer were struck down as procedurally unconscionable, even though they met the requirements of UCC section 2-316(2)[168] The manufacturer's standard form contract imposed non-negotiable terms on small customers.[169] The plaintiff, "a relatively small but experienced farming company" successfully challenged FMC, "an enormous diversified corporation."[170] The court found there was "ample evidence of unequal bargaining power . . . moreover, the evidence establishes that A & M had no previous experience with [the defendant's product] and was forced to rely on [the defendant's] expertise in recommending the necessary equipment."[171] The court affirmed the trial court's finding that the plaintiff's inferior bargaining position gave him no choice but to take or leave the contract terms, and the contract was held unconscionable and unenforceable.[172]

Clauses limiting the seller's liability have also been held unconscionable in instances "where there was absence of evidence that the provision was commercially reasonable or should reasonably have been anticipated."[173] For example, a seed seller's implied warranty of merchantability was breached where cabbage seeds sold to farmers carried "black leg" (*Phoma lingam*, a seedborne fungal disease) which destroyed a large portion of their cabbage crops and was the actual cause of the farmers' injury.[174] The court applied a two-part test, analyzing (1) the parties' relative economic strength, bargaining power, and available alternate supply sources,

166. U.C.C. § 2-316(2) (1999).

167. A & M Produce Co. v. FMC Corp., 186 Cal. Rptr. 114, 124 (Cal. Ct. App. 1982) (emphasis in original).

168. *See id*.

169. *See id.* at 126.

170. *Id* at 124. *Accord* Martin v. Joseph Harris Co., 767 F.2d 296, 298-302 (6th Cir. 1985) (holding where the seed distributor and purchasers were small independent farmers, and the seller was a large national producer, the disclaimer in the seller's standard form contract was unconscionable even though it was in compliance with UCC § 2-316).

171. A & M Produce Co., 186 Cal. Rptr. at 126 (stating "[w]hen non-negotiable terms on preprinted form agreements combine with disparate bargaining power, resulting in the allocation of commercial risks in a socially or economically unreasonable manner, the concept of unconscionability as codified in [UCC] §§ 2-302 and 2-719 . . . furnishes legal justification for refusing enforcement of the offensive result.").

172. *See id.* at 129.

173. J. W. Looney, *Warranties in Livestock, Feed, Seed, and Pesticide Transactions*, 25 U. MEM. L. REV. 1123, 1144 (1995).

174. *See Martin*, 767 F.2d at 298 (noting the disease "causes affected plants to rot before maturing").

and (2) the substantive reasonableness of challenged contract term.[175] Although the disclaimer apparently complied with UCC section 2-316, it was held unconscionable because the plaintiff/buyers were small, independent farmers and the defendant/seller was a large national producer and seed distributor.[176]

The South Dakota Supreme Court has applied the UCC section 2-302 unconscionability test for implied warranty limitations and disclaimers involving allegedly defective seed.[177] In *Schmaltz v. Nissen*,[178] a seed dealer's contract provisions were held unconscionable because the farmer was unable to test the sorghum seeds prior to planting, and was precluded from bargaining for more favorable terms. Legal scholars note these "cases suggest that, in merchant-to-consumer cases, courts are applying unconscionability principles to excise disclaimers that appear to comply with UCC section 2-316."[179]

Consequential damages may also be limited or excluded under UCC section 2-719(3), unless the limitation or exclusion is unconscionable.[180] In one seed purchaser's warranty action against "one of the largest seed companies in the world . . . the seller escaped liability for the buyer's damages."[181] The court held that the contract's terms limited the grower's remedy to only a refund of the purchase price, regardless of obvious breaches of the implied fitness warranty and express warranty that it had complied with all statutory labeling requirements.[182] The Appellate Court affirmed, stating that unconscionability is an issue of fact, and not of law.[183]

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175. *See id.* at 300.

176. *See id.* at 300-01 (stating "where goods and services can only be obtained from one source (or several sources on non-competitive terms) the [purchasers'] choices . . . are limited to acceptance of the terms offered or doing without." Allen v. Michigan Bell Tel. Co., 171 N.W.2d 689, 692 (Mich. Ct. App. 1969)).

177. *See, e.g.*, Schmaltz v. Nissen, 431 N.W.2d 657, 657-58 (S.D. 1988) (holding that: (1) applicable state and federal seed laws did not preempt warranty claims under the UCC; (2) sellers' descriptions and affirmations concerning seed did not constitute express warranties; (3) manufacturer's disclaimer of warranty and limitation of consequential damages was unconscionable; (4) buyers had established the existence of a defect in the seed; and (5) damages awarded for lost crop yields were established with reasonable certainty).

178. *See id.* at 661 (holding that no express warranty was created when the seed seller told the plaintiff-buyer that the allegedly defective seed was "good seed"). *But see* Cricket Alley Corp. v. Data Terminal Sys., 732 P.2d 719, 722 (Kan. 1987) *and* Williams v. Beechnut Nutrition Corp., 229 Cal. Rptr. 605, 608 (Cal. Ct. App. 1986) (holding that advertising created an express warranty).

179. Edith Resnick Warkentine, *Article 2 Revisions: An Opportunity to Protect Consumers and "Merchant/Consumers" Through Default Provisions*, 30 J. MARSHALL L. REV. 39, 66 (1996).

180. *See* Ralph James Mooney, *The New Conceptualism in Contract Law*, 74 OR. L. REV. 1131, 1203 (1995).

181. *Id.* at 1203. *See* Nunes Turfgrass, Inc. v. Vaughan-Jacklin Seed Co., 246 Cal. Rptr. 823, 825 (Cal. Ct. App. 1988).

182. *See Nunes Turfgrass, Inc*., 246 Cal. Rptr. at 826-27.

183. *See id.* at 837.

D. *Warranty of Fitness for a Particular Purpose*

Warranties of fitness for a particular purpose relate to the quality of goods. UCC section 2-315 provides that:

> [W]here the seller at the time of contracting has reason to know any particular purpose for which the goods are required and that the buyer is relying on the seller's skill or judgment to select or furnish suitable goods, there is . . . an implied warranty that the goods shall be fit for such purpose.[184]

In an early seed purity case involving the implied warranty of a particular kind of seeds, a plaintiff intended to purchase a particular seed variety, orange sorghum seed, specifically used to produce molasses.[185] The seed sold was a mixture, indistinguishable from sorghum—broom corn, kaffir corn, and milo maize seed, with perhaps a mixture of sorghum of some kind.[186] Because the mixture could not be used in molasses production, the court applied "the warranty of fitness for [a] particular purpose and indicated that the proper measure of damages was the difference in the value of the crop raised from the seed sold and the value of a crop which would have been raised from the proper variety."[187]

Three farmers, who suffered economic damages from WFB-contaminated watermelon seeds, filed separate lawsuits against the seed producer.[188] They submitted interrogatories, requesting "a description of all tests that [the seed producer] had performed on the seeds to determine the nature of the disease."[189] In response, the producer claimed that "its tests were negative for the existence of the bacteria that caused [WFB] disease."[190] The farmers settled their claims in reliance upon that response, were compensated for their losses, and released the producer from further liability.[191] The farmers later learned that the producer had withheld material information during discovery; specifically it "failed to disclose test results of a small sample of seeds that were positive for the [WFB] bacteria."[192] Following the defendant seed producer's successful motion for removal to District Court, the farmers joined their lawsuits and brought two new claims: compensatory contempt of court (for failure to disclose the watermelon seed tests as ordered by the state court) and misrepresentation of the test results (which fraudulently induced the

184. U.C.C. § 2-315 (1994).
185. *See* Kefauver v. Price, 206 S.W. 664, 665 (Ark. 1918).
186. *See id.* at 664.
187. J.L. Looney, *Bad Seeds Make Bad Law: Is the Seed Arbitration Act an Obstacle to Recovery in Defective Seed Cases in Arkansas*?, 1994 ARK. L. NOTES 53, 55 (1994).
188. *See* Gray v. Petoseed Co., No. 96-1864, *available in* 1997 WL 716454, at *1 (4th Cir. Nov. 18, 1997).
189. *Id.*
190. *Id.*
191. *See id.*
187. *See id.*

parties to settle their claims).[193] The compensatory contempt claims were remanded to state (South Carolina) court "under principles of comity and respect for the state court."[194] In a subsequent bench trial, the seed producer was held liable for civil compensatory contempt.[195]

The fraud claims, however, were dismissed because the plaintiffs had not complied with a state law which required them to first "return the settlement amounts . . . in order to maintain their fraud claims."[196] Two of the farmers appealed the fraud dismissal, claiming that "[h]ad they known of the test results . . . they would not have settled their case for $70,000."[197] The appeals court acknowledged that "[t]he touchstone of civil compensatory contempt decisions is the return of the aggrieved party to the status quo."[198] But because "no expenses or out-of-pocket costs ha[d] been alleged," the court denied the farmers' additional recovery for damages and granted the seed producer's motion to dismiss.[199] The court rejected the farmers' claim stating that "[b]y attempting to recover the difference between the amount of settlement made without knowledge of the non-disclosed information and the amount of settlement had the information been disclosed, [the farmers sought] an improved post-contempt position based on expectation instead of harm."[200] The rationale was to avoid jeopardizing "the indemnification policies promoted by compensatory contempt sanctions . . . . [Otherwise,] [b]inding settlements would be subject to attack in circumvention of the accepted principles for setting them aside."[201]

Settlements for damages caused by WFB have been reached in many instances; an attorney who handled sixty to seventy cases on farmers' behalf reported that most settled for the value of the crop amount, as if it had been harvested.[202] The advantage of this approach is that it enables farmers to recoup more than the price they initially paid for seed.

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193. *See id*.

194. *Id*. The court stated "[i]t would be a serious interference with the orderly administration of justice for the district court to decide when a state court order has been violated and how it should be remedied." *Id*.

195. *See* Jarrell v. Petoseed Co., 500 S.E.2d 793, 794 (S.C. Ct. App. 1998).

196. *See Gray*, No. 96-1864, 1997 *available in* 716454, at *1.

197. *Jarrell*, 500 S.E.2d at 794.

198. *Id.* at 795-96.

199. *Id.* at 796.

200. *Id.* at 795.

201. *Id.* at 795-96. *See also* Taylor v. Palmetto State Life Ins. Co., 12 S.E.2d 708, 710 (S.C. 1940).

202. Telephone Interview with John E. Parker, Plaintiff's Attorney, Law Offices of Peters, Murdaugh, Parker, Eltzrock & Detrick (Sept. 8, 1998) (notes on file with the author).

IX. QUALITY CONTROL AND CORPORATE RESPONSIBILITY

"[I]t is the seed—the foundation of agriculture that enables American farmers to provide the food and fiber necessary to sustain life and a standard of living envied by many."[203] Unless commercial seed companies, and their independent contractors, maintain good quality control procedures to ensure the seeds they sell are disease-free, American farmers may be left with only a field of dreams.

A. *Commercial Seed Producers' Solutions: A United Front*

1. *Form Alliances*

In 1996, a representative of the American Seed Trade Association ("ASTA") stated, "the [USDA] calculates current U.S. seed exports at $665 million annually."[204] Seed industries frequently form alliances when necessary to combat plant disease problems such as those raised by WFB.[205] The National Watermelon Association ("NWA") in Morven, GA, works with commercial seed and plant companies on WFB, food safety, and environmental issues. NWA has served the watermelon industry, issuing control guidelines and guarding plant health nationwide, since 1914.[206]

2. *Suspend Seed Sales Until the Source is Detected*

Private seed companies have dramatically increased their annual research expenditures "from about $28 million in 1960 to $470 million in 1994. By comparison, the public sector spent $1.1 billion on all crop research in 1994."[207] In the fall of 1994, several commercial watermelon seed producers suspended seed sales until better methods of detecting the disease prior to marketing could be developed.[208] This "threaten[ed] the very existence of the watermelon industry in 1995,"[209] and prompted one warning that "[w]atermelons could be rare as chicken lips since some seed companies withdrew their seed and aren't supplying replacement seed."[210]

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203. *Agricultural Extension Programs Hearings-Dean Urmstom*, *supra* note 26, at 347.
204. *Id.*
205. *See id.* (testifying that "ASTA has teamed up with the USDA, academic institutions, land grant colleges and others to look ahead to future needs, demands, and challenges [because] . . . success is dependent on sustained partnerships and thoughtful vision and cooperation").
206. *See* NATIONAL WATERMELON ASSOCIATION, INC., 1996 GUIDELINES FOR CONTROL OF BACTERIAL FRUIT BLOTCH OF WATERMELON (Aug. 1996).
207. *Agricultural Extension Programs Hearings—Dean Urmstom*, *supra* note 26, at 347.
208. *See* Longshaw, *supra* note 102.
209. Latin & Hopkins, *supra* note 7, at 764.
210. Longshaw, *supra* note 102.

By 1994, one commercial seed producer had lost a $350,000 judgment and faced a dozen more pending suits.[211] Fearing litigation, some retailers also stopped selling watermelon seed;[212] one seed salesman explained, "[w]e don't want to take on the liability."[213]

3. *Conduct 10,000 and 50,000 Seed Grow-Out Tests.*

The National Watermelon Association's Watermelon Disease Research Sub-Committee ("WDRS") provides detailed guidelines to members of the watermelon industry to effectively manage and control WFB.[214] Commercial seed companies are advised to "grow-out" a minimum of 10,000 seedlings for each seed lot, as a pre-market quality control screening measure.[215] Some 10,000 seeds from each seed lot are planted in research greenhouses maintained at carefully controlled environmental conditions. Emerging seedlings are inspected daily for WFB symptoms, and data monitored to detect WFB-contaminated seed prior to distribution. Seed lots that are determined to be infected with the WFB bacterium are withdrawn before entering the market. This pre-market regimen has considerably diminished seedborne incidences of the disease.[216]

Dr. John Cross, plant pathologist and chairman of the WDRS, described the screening method's wide acceptance: "Today, leading seed companies are growing out up to 50,000 seedlings per lot, and transplant producers are requiring this . . . test."[217] However, because outbreaks of WFB have been documented from pre-screened seed, the grow-out approach is not 100% reliable.[218]

Today, commercial watermelon seed packages include information "that the seed lot tested negative for the [WFB bacterium], but that absence of the pathogen cannot be guaranteed."[219] Some seed companies' release and waiver agreements

211. *See* Coxeter, *supra* note 144, at 6.

212. *See id*.

213. Longshaw, *supra* note 102 (quoting Ansel Moody, Seed Salesman, Dillon Seed Co.).

214. *See* Susan O'Reilly, *National Watermelon Promotion Board Votes to Fund Production Research*, CITRUS & VEGETABLE MAG. Research Update: Bacterial Fruit Blotch on Watermelon, Feb. 1997, at W1, W7.

215. *See* Daniel J. LaFlamme & Darrell Maddox, *Clinical Application of the Polymerase Chain Reaction for the Detection of Seedborne AAC*, CITRUS & VEGETABLE MAG. Research Update: Bacterial Fruit Blotch on Watermelon 1998 at 2, 3.

216. Letter from Tom Isakeit, Extension Plant Pathologist, *Texas Agricultural Extension Service Texas A&M University*, to Nancy C. Hodge (Feb. 6, 1998) (on file with author).

217. O'Reilly, *supra* note 21, at 7.

218. *See* THOMAS ISAKET, THE TEXAS A&M UNIVERSITY SYSTEM, BACTERIAL FRUIT BLOTCH OF WATERMELON 1 (1998).

219. Latin & Hopkins, *supra* note 7, at 764.

include clauses requiring the grower, user, and/or transplant producer to agree to prescribed growth conditions.[220]

4. *Chemically Ferment Seeds*

In 1992, researchers at Purdue University reported that "recovery of the [WFB] pathogen from both seed coats and embryos of seeds from symptomatic fruit indicates that seeds are both internally and externally contaminated."[221] This led to a later discovery, a chemical method tailored for use by the seed industry, which greatly decreased infected seed contamination.[222] The study, funded in part by the American Seed Research Foundation, found that the most effective treatments for eliminating bacterial contamination of watermelon seeds were to ferment seeds "for 24 to 48 h[ours] followed by 1% HCl or 1% $CaOCl_2$ treatment for 15 min[utes] prior to washing and drying . . . ."[223]

5. *Utilize DNA Testing to Find the Needle in a Haystack*

In addition to less than 100% reliability, there are other disadvantages of grow-out tests: seeds that are grown out are destroyed; tests require a minimum of three weeks to complete;[224] and tests are costly and unwieldy.[225] To overcome these problems, researchers at the University of Florida, Dr. Robert E. Stall and Jerry V. Minsavage, adapted a sensitive DNA assay, the polymerase chain reaction ("PCR"), and developed a protocol to screen and detect the WFB bacterium in representative seed lot samples.[226] PCR is frequently used in crime laboratories to detect genetic material (deoxyribonucleic acid, or DNA) from a target sample such as bacteria, blood, hair, or saliva.[227]

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220. *See* OTIS S. TWILLEY SEED CO., *supra* note 11 (providing "[a]ny seed or plants purchased . . . will be produced or grown in accordance with Guidelines for Control of Bacterial Fruit Blotch in Watermelon, as published by the National Watermelon Association, Inc., August 1996, including any subsequent amendments."). *See also* Coxeter, *supra* note 140, at 6 (reporting some seed suppliers also require their customers to agree not to sue).

221. Rane & Latin, *supra* note 27, at 512.

222. *See* D.L. Hopkins et al., *Wet Seed Treatments for the Control of Bacterial Fruit Blotch of Watermelon*, PLANT DISEASE, May 1996, at 529, 529-32.

223. *See id.* at 529.

224. *See* LaFlamme & Maddox, *supra* note 215, at 2.

225. *See* Robert E. Stall, *Detection of* Acidovorax avenae subsp. *citrulli*, *the Causal Agent of Watermelon Fruit Blotch on Seeds by the Polymerase Chain Reaction (PCR)*, CITRUS & VEGETABLE MAG., Research Update: Bacterial Fruit Blotch of Watermelon, Feb. 1997, at W2, W2-W3.

226. *See id.* at W3.

227. *See* RICHARD SAFERSTEIN, CRIMINALISTICS: AN INTRODUCTION TO FORENSIC SCIENCE 416 (6th ed. 1998) (stating "PCR offers . . . increased sensitivity, as little as one-billionth of a gram of DNA is required for analysis").

PCR uses amplification techniques to make millions of copies from trace amounts of DNA.[228] Watermelon seeds are placed in a sterile wash solution containing free nucleotides, a thermostable enzyme (*Taq* polymerase)[229] which copies (amplifies) DNA, and primers. This enzyme is site-specific—it can only synthesize a particular sequence of amino acids in the WFB bacterium's DNA.[230] Amplification is conducted in a programmable thermal cycling machine, where the DNA is heated to about 94° C.[231] As the mixture undergoes thermal cycling, paired strands of DNA are divided by the heating process into two separate nucleotide chains.[232] During the cooling process the primers, which essentially bind to DNA and help to target a portion for copying, bind to the appropriate spots on the separate chains.[233] The DNA polymerase enzyme in the mixture then attaches free nucleotides end-to-end, starting at the primers, to copy the stretch of DNA.[234] As the thermal cycling is repeated, the number of copies increases exponentially.[235]

After millions of copies of the DNA sequence are produced *in vitro*, the sample's DNA can be compared to DNA from known WFB bacteria using many different methods of molecular biology.[236] The assay is extremely sensitive—"detection of the [WFB] pathogen can be obtained at levels of 1,000 bacteria in a milliliter of water."[237] This new PCR method, which enables scientists to "identify the [WFB bacterium's] DNA in a 'needle-in-a-haystack' fashion from all of the other DNA molecules present in a watermelon seed sample,"[238] has shown excellent correlation with grow-out tests.[239]

Several commercial seed companies and an independent seed testing laboratory are using this new procedure.[240] PCR offers several advantages over grow-out testing: destroying fewer seeds, taking only two to three days to complete an entire seed lot analysis, and requiring far less workspace to conduct testing.[241] Only those seed lots which test positive (by PCR) for the WFB pathogen would have to be subjected to confirmation testing by grow-outs.[242] Most importantly, if the PCR

228. *See id.* at 418.
229. *See* 3 DOUGLAS H. JONES, POLYMERASE CHAIN REACTION (PCR), ENCYCLOPEDIA OF MICROBIOLOGY 443, 444 (Joshua Lederberg, ed., 1992) (stating *Taq polymerase* is derived from the thermophilic (heat-tolerant) bacterium *Thermus aquaticus*).
230. *See* SAFERSTEIN, *supra* note 227, at 416.
231. *See id.* at 418.
232. *See id.*
233. *See id.*
234. *See id.*
235. *See id.*
236. *See id.* at 409.
237. Stall, *supra* note 225, at W2.
238. LaFlamme & Maddox, *supra* note 219, at 2.
239. *See id.*
240. *See* Stall, *supra* note 225, at W3.
241. *See* LaFlamme & Maddox, *supra* note 215, at 2.
242. *See* Stall, *supra* note 225, at W3.

method continues to prove successful it may be augmented to test for a variety of other diseases, because seed contamination by bacterial plant pathogens is a primary source of plant diseases.[243]

B. *Six Solutions for Watermelon Growers*

"For each farmer, regardless of their commodity or geographic location, their first planting decision involves the selection of seed . . . based on price, performance, and opportunity for profit."[244] Growers can prevent and control WFB by using a variety of relatively easy techniques:

(1) Plant only watermelon seeds that have tested negative for WFB using the minimum 10,000 seedling grow-outs per seed lot;[245]
(2) Use seedlings only from commercial transplant production facilities in which watermelon or other cucurbits (e.g., honeydew melon, pumpkin, citron) had no WFB symptoms;
(3) Maintain a good crop rotation schedule;[246]
(4) Inspect transplants prior to acceptance and planting, avoid planting transplants that show symptoms,[247] and inspect field-transplanted seedlings frequently, as WFB lesions are difficult to detect until fruit ripen;[248]
(5) Where symptomatic plants are present, avoid working in the field when the plants are wet, as the WFB bacterium can be introduced to a field by infested seed, infected transplants, volunteer watermelon or by spread from alternate hosts;[249]
(6) Forestall survival in alternate plant hosts,[250] an important control method, as WFB can also be spread from citron and other wild cucurbit-type weeds.[251]

"Overwintering" or "overseasoning" refer to an evolutionary survival mechanism, similar to hibernation.[252] Plants, animals, and bacteria have genetically adapted to survive harsh environmental conditions, including drought, fire, cold, and heat through evolution.[253] Because dormant bacteria that overwinter in seed can

243. *See id.*
244. *Agricultural Extension Programs Hearings-Dean Urmston*, *supra* note 26, at 348.
245. *See* LaFlamme & Maddox, *supra* note 215, at 2.
246. *See* Hopkins, *supra* note 8.
247. THOMAS ISAKEIT, TEXAS AGRICULTURAL EXTENSION SERVICE, BACTERIAL FRUIT BLOTCH OF WATERMELON 2 (1998).
248. *See* Ronald Smothers, *Tiny Invader Sows Fear in Watermelon Farms*, THE COMMERCIAL APPEAL, May 29, 1994, at A15.
249. *See* Hopkins, *supra* note 20.
250. *See Elliot* Brief for Appellees, *supra* note 24, at 10.
251. *See* H.S. Stevens, *Reasons to Choose Seedless Watermelons*, DALLAS MORNING NEWS, Apr. 18, 1997, at 4G.
252. *See* THOMAS A. SCOTT, CONCISE ENCYCLOPEDIA OF BIOLOGY 873 (1996).
253. *See id.*

germinate when more favorable growing conditions occur, eliminating volunteer watermelon seedlings and other cucurbits helps restrict the bacterium's survival and dispersal.[254]

Plant pathologists have concluded that the 1989 WFB outbreak in Indiana was seedborne.[255] Some scientists, however, say that later outbreaks may have been caused by the bacterium's dormancy, its ability to survive in alternate plant hosts until more watermelons were available, or dispersal by farm equipment, rain, or wind.[256] When present in the field, dispersal of the WFB bacterium can occur by wind-driven rain, handling, touching, or other mechanical methods.[257] The infectious bacteria can spread rapidly through greenhouses and planted fields; infected volunteer plants and dormant WFB bacteria could become inoculum for the next year's watermelon crop.[258] Scientists estimate that "80-90% of seedlings from seeds obtained from diseased fruit are infected."[259] Petoseed Co., Inc.'s expert witness, a plant pathologist, testified that "a small infection of WFB in a field could wipe out 100% of an entire crop."[260] Therefore, in locations where WFB has occurred, current disease management recommendations include "rotat[ing] fields out of watermelon or other cucurbit crops for at least a year."[261]

C. *Controlling WFB in the Marketing and Distribution Chain*

Plant pathologists at Clemson University conducted a study in 1996 to characterize WFB's post-harvest behavior.[262] Early results led scientists to suggest that "the disease is not readily transmitted from diseased to healthy fruit in the marketing chain."[263] The study was repeated in 1997 and confirmed the accuracy of the earlier tests.[264] The authors prescribed several additional methods[265] for controlling the incidence of WFB from harvest to consumers' tables:

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254. *See* ISAKEIT, *supra* note 247, at 2.
255. *See* Rane & Latin, *supra* note 27, at 512.
256. See Smothers, *supra* note 248, at 14.
257. *See* Richard Latin et al., *Factors Affecting the Survival and Spread of Acidovorax avenae subsp. citrulli in Watermelon Transplant Production Facilities*, 85 PHYTOPATHOLOGY 1413, 1413 (1995).
258. *See* Latin & Hopkins, *supra* note 7, at 765.
259. Stall, *supra* note 225, at 2.
260. *Elliot* Brief for Appellant at 8; Elliott v. Petoseed Co., No. 95-2462 (11th Cir. 1997), *dismissing appeal from* consolidated Dist. Ct. Nos. 90-139, 93-354, 93-355 (Aug. 14, 1998).
261. ISAKEIT, *supra* note 247, at 2.
262. *See* James W. Rushing et al., *Controlling Watermelon Fruit Blotch in the Marketing Chain*, CITRUS & VEGETABLE MAG., Research Update: Bacterial Fruit Blotch on Watermelon, 1998 at 6.
263. *Id.*
264. *See id.*
265. *See id.*

(1) Field workers should examine all watermelons during harvest, and leave melons exhibiting WFB symptoms in the field;
(2) Packing station graders and handlers should cull all melons having WFB symptoms from batches to be shipped;
(3) An important post-harvest control treatment is to "pre-cool the fruit as soon as possible after harvest [to eliminate secondary disease problems] and maintain the cold chain [at 50-54º F] throughout the distribution system."[266]

Inspection and culling at harvest, and maintaining cold temperatures throughout the distribution chain, can prevent watermelon with WFB symptoms from reaching consumers.

D. *Plant Breeders' Solutions: Develop WFB - Resistant Varieties*

Thomas Jefferson wrote, "[t]he greatest service which can be rendered any country is to add a useful plant to its culture."[267] Today, our 'food fight' has escalated, primarily due to the ability of plant pathogens to adapt to a plant's genetic defenses within five to fifteen years.[268] Despite a wealth of technology and knowledge, scientists' struggle to breed seeds and plants for resistance after disease emergence is akin to playing perpetual sudden death overtime.[269] The research strategies of plant breeders must include a consideration of farmer demands for varieties that provide increased yield and tolerance to environmental stresses, as well as resistance to disease and plant pests.[270]

To combat plant disease, seed breeders develop crops by identifying resistant genes in plant chromosomes and breeding them into seeds. The acquired resistance is expressed in subsequent crop plantings. Breeders have determined that seedless watermelon varieties are more WFB-resistant than standard seeded varieties:[271] "[T]ests have also shown that varieties with dark-green rinds are more resistant than those with light-green rinds."[272]

Increasing the plantings of WFB-resistant varieties in lieu of susceptible cultivars may help decrease disease outbreaks. Research scientists also "recommend

266. *Id.*
267. Sara M. Dunn, *From Flav'r Sav'r to Environmental Saver? Biotechnology and the Future of Agriculture, International Trade, and the Environment*, 9 COLO. J. INT'L ENVT'L L. & Pol'y 145, 145 (1998) (quoting The GARDEN AND FARM BOOKS OF THOMAS JEFFERSON 509 (Robert C. Baron ed., 1987)).
268. *See* Starr & Hardy, *supra* note 2, at 98.
269. *See* NORMAN MYERS, A WEALTH OF WILD SPECIES 33 (1983).
270. *Agricultural Extension Programs Hearings-Dean Urmstrom*, *supra* note 26, at 347-50.
271. *See* Stevens, *supra* note 251 (reporting 'hybrid triploid,' or 'seedless' means that "[t]he fruit will not contain black, hard seeds that can be planted, but may contain a few small, white immature seeds that are edible").
272. *Id.*

not harvesting seeds from fruit in the vicinity of symptomatic fruit . . . [and] harvest seeds only from fields that had no blotch symptoms."[273]

E. *Commercial Greenhouse Managers' Solutions*

Preventing the bacterium from entry and establishment in the field is the best method for controlling WFB.[274] Greenhouse managers should purchase watermelon seed from reliable companies, and only from seed lots which have undergone seedling grow-out tests.[275] Diligent inspection for signs of WFB on all plants is essential to good greenhouse management.

Utilization of sub-irrigation (drip) systems is more effective than overhead watering systems[276] because WFB bacteria can spread up to twenty feet from an infected seedling under standard greenhouse growth conditions.[277] Testifying as an expert witness for the growers, Dr. Rick Latin, a plant pathologist at Purdue University, described how bacteria are spread by overhead watering systems:[278] "[WFB lesions on] a source plant . . . contain millions of bacteria. [As a] watering boom would pass . . . the water droplets that splash onto the plants would pick up some of the bacteria as they break up and go to neighboring plants." The defendant seed company's in-house plant pathologist testified similarly to the overhead irrigation dispersal of WFB.[279] Thus, overhead watering systems in commercial greenhouses should be monitored to minimize the risk of the disease spread.[280]

F. *Chemical Control Measures*

WFB can usually be prevented or controlled by weekly spray applications of a copper-containing bactericide, such as Kocide®, before the plants begin blooming.[281] Some fungicides are also effective; in 1997, Agtrol added the "control of WFB to its fungicide label for Champ Formula 2® (copper hydroxide)."[282] Extension plant pathologists recommend a prophylactic regimen, applying bi-weekly

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273. Hopkins, *supra* note 222, at 532.

274. *See* Bailey, *supra* note 94.

275. *See* Don Hopkins, *When and How to Apply Copper-Containing Fungicides for the Control of Bacterial Fruit Blotch of Watermelon in the Field*, CITRUS & VEGETABLE MAG., Research Update: Bacterial Fruit Blotch on Watermelon, 1998, at 4.

276. *See* Latin, *supra* note 257, at 1416 (reporting greenhouse sub-irrigation watering systems can decrease WFB by reducing the duration of leaf wetness).

277. *See* O'Reilly, *supra* note 21, at 7 (discussing research conducted by scientists at Purdue University).

278. *See Elliot* Brief for Appellees, *supra* note 24, at 9.

279. *See id.*

280. *See* ISAKEIT, *supra* note 254, at 2.

281. *See* Stevens, *supra* note 251.

282. *See Champ Formula 2 (copper hydroxide): Agtrol Fungicide Label Additions*, CHEMICAL BUS. NEWSBASE, Oct. 14, 1997, *available in* 1997 WL 13727754 (source on file with author).

sprays to non-symptomatic plants beginning at flowering and continuing until all fruit mature.[283]

Survival experiments show sanitation practices (culling and destroying symptomatic plants from fields and greenhouses, and eliminating alternate plant hosts, can markedly reduce the threat of WFB.[284] Watermelon transplant producers who reuse plastic trays can effectively eliminate WFB transmission with "common greenhouse disinfectants such as Physan and Green Shield."[285] Watermelon growers should check with their local extension agents to ascertain the optimum timing and rates of spray applications, and to obtain current information on the prevention and control of WFB.

X. CONCLUSION: FOOD FOR THOUGHT

Biotechnology is a powerful weapon in the effort to enhance agriculture by converting genetic information into new plants, plant products, and microorganisms.[286] However, because of agriculture's changing dynamics, many of yesterday's varieties are now obsolete. Scientists must continually identify and transfer new genes which confer disease resistance, in order to combat the ongoing, renewed attacks of disease and plant pests.

The mental image of devastated farmland acres covered by rotting melons is clearly food for thought. Despite losses and hardships caused by the WFB disease, one significant benefit has been realized: ground has been broken for PCR to become a widely applied analytical tool in testing seed for other bacterial pathogens that cause different diseases. "[WFB] is the harbinger in testing seeds for contamination by a plant pathogen by PCR."[287] Thus, future disease outbreaks may be discovered in commercial seed research laboratories prior to release, rather than *post hoc* in the field.

Today's U.S. biotechnology industry is booming. In 1991, total product sales were approximately $4 billion, a thirty-eight percent increase over 1990.[288] In 1996, "estimates for the U.S. [seed export] market value [were] $5-6 billion and [for the] world market . . . around $60 billion."[289] Biotechnology sales are expected to

283. *See* ISAKEIT, *supra* note 254, at 2.

284. *See* Latin & Hopkins, *supra* note 7, at 765.

285. R. Latin, *Survival and Spread of* Acidovorax avenae *subsp.* citrulli *in Watermelon Transplant Production Facilities*, CITRUS AND VEGETABLE MAG., Research Update: Bacterial Fruit Blotch of Watermelon, Feb. 1997, at W3, W4.

286. *See* Senator Al Gore, *Planning a New Biotechnology Policy*, 5 HARV. J.L. & TECH. 19, 19 (1991).

287. Stall, *supra* note 225, at W3.

288. *See* Bosselmann, *supra* note 58, at 115 (citing Gollins et al., BIOTECHNOLOGY PROSPECTING (1993)).

289. *Agricultural Extension Programs Hearings-Dean Urmstrom*, *supra* note 26, at 347.

increase tenfold, to approximately $50 billion annually, by the year 2000.[290] Congress should allocate more funding for plant disease education, prevention, and protection programs, and emphasize "the long-term effects and the benefits to the farmer as well as the taxpayer."[291] Our society, as well as the world's food supply, is too reliant upon agriculture to ignore the interdependencies of science, biotechnology, and the law.

The challenges we face, now and in the future, include constantly developing new plant varieties to express traits for drought and cold tolerance, disease resistance, and higher yields. With such an arsenal, agricultural producers will be better able to supply the world's ever-increasing demand for food without increasing land, pesticide, or fertilizer use. Confrontations with plant diseases illustrate that commercial industries, farmers, and scientific researchers must maintain a united front to address and conduct effective, continuous research programs. Cooperative, united efforts will enable those involved in all aspects of food production to advance more refined and effective attacks in agriculture's perpetual "food fight."

290. *See* Bosselmann, *supra* note 58, at 115 (citing Gollins et. al., BIOTECHNOLOGY PROSPECTING (1993)).

291. *Agricultural Extension Programs Hearings-Dean Urmstrom, supra* note 26, at 348.