HISTORY OF EDAMAME, GREEN VEGETABLE SOYBEANS, AND VEGETABLE-TYPE SOYBEANS (1275 - 2009):

EXTENSIVELY ANNOTATED BIBLIOGRAPHY AND SOURCEBOOK

Including Young Soybean Leaves and Seedlings Used as Food

Compiled

by

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2009

and tegalan (dry land), 1979-1981. (6) Export and import of soybean, 1969-1982 (Indonesia was a small exporter until 1977 when exports stopped; imports over 100,000 tonnes began in 1976, and by 1982 had risen to 476,000 tonnes). (7) The estimated demand for soybean and production target, 1983-1988 (Source: Directorate General of Food Crops). (8) The important insects of soybean. (9) Improved soybean varieties. (10) Packages of technology in the intensification and areal [area] expansion programs.

Graphs: (1) Demand, production, and import of soybeans, 1978-1982. (2) Target of soybean area, 1983-1988 (tegalan field area is expected to rise rapidly; sawah field area will stabilize starting in 1985). A map of Indonesia (p. 31) shows seven research institutes under the Central Research Institute for Food Crops (CRIFC). They are located in Bogor, Sukamandi, and Lemband (W. Java), Sukarami (W. Sumatra), Banjarmasin (S. Kalimantan), Maros (S. Sulawesi), and Malang (E. Java). Address: Central Research Inst. of Food Crops, JL Merdeka 99, Bogor, Indonesia.

1150. Suzuki, Steven. 1984. Pacific Rim potential for edible soybeans. In: Ontario Soya-Bean Growers' Marketing Board. ed. 1984. Ontario Soybean Symposium. Chatham, Ontario, Canada: OSGMB. 319 p. See p. 224-41.
• ***Summary:*** Soybeans were first exported from Canada about 12 years ago when a Japanese house approached the Ontario Soybean Grower's Marketing Board for a trial shipment to Japan. The trial worked out very well and in a short time Ontario's soybean exports became a multi-million dollar business. Ontario soybeans are very clean, the quality is comparable to Japanese and Chinese soybeans, and the supply is consistent. However the price is high in relation to Chinese and U.S. soybeans. As a result, Ontario soybeans are sold in high-priced markets, as for making premium quality miso or soyamilk. The supply of Chinese soybeans is irregular. Address: Manager, Grain Trading Section, Okura & Co. America Ltd., New York, NY.

1151. Cusumano, Camille. 1984. Tofu, tempeh, & other soy delights: Enjoying traditional Oriental soyfoods in American-style cuisine. Emmaus, Pennsylvania: Rodale Press. x + 261 p. Illust. Index. April. 23 x 20 cm.
• ***Summary:*** Each chapter on a specific food describes (with illustrations and nutritional information) how to prepare that food at home, followed by many recipes. Contents: 1. The coming age of soyfoods cuisine. 2. Tofu 3. Tempeh. 4. Soymilk. 5. Japanese soyfoods. 6. Whole dry soybeans. 7. Fresh green soybeans. 8. Soy sprouts. 9. Soy flour and soy grits. 10. Soy sauces. 11. The soyfoods pantry.

Scattered throughout the books are 1-page descriptions of various American soyfoods companies, each accompanied by a black-and-white photo. Photos show: Greg Weaver and two other workers at The Lotus Cafe, Rochester, New York (p. 83). Sharon Rose of Brightsong Light Foods, Petaluma, California (p. 142). Steve and Sara Yurman of The Soy Shop, Atlanta, Georgia (p. 169). A craftsman cutting tofu at Tomsun Foods, Greenfield, Massachusetts (p. 195). Toby Alves of Blair Island Natural Foods Restaurant, Eugene, Oregon. A worker making brown rice and tofu sandwiches at Wildwood Natural Foods, Fairfax, California (p. 235). The company is owned by Bill Bramblett, Paul Orbuch, and Frank Rosenmayer.

Note: As of Sept. 1989 some 25,688 copies of this book had been sold by Rodale Press. It was sold out and will not be reprinted. Address: Rodale Press, Emmaus, Pennsylvania.

1152. Fehr, W.R.; Bahrenfus, J.B.; Walker, A.K. 1984. Registration of Vinton 81 soybean. *Crop Science* 24(2):384. March/April. [2 ref]
• ***Summary:*** Registration no. 170. The soybean variety Vinton 81 was developed by the Iowa Agriculture and Home Economics Experiment Station, the Puerto Rico Agricultural Experiment Station, and the Ohio Agricultural Research and Development Center. It is a large-seeded variety similar to Vinton, except that it has resistance to races t-3 and 6-9 of phytophthora rot (caused by *Phytophthora megasperma)*–to which Vinton is susceptible. Vinton 81 is also more sensitive to injury from the herbicide metribuzin. Vinton is a "specialty cultivar" which contains about 45% protein; 100 seeds weigh 22 gm. The line originated from the cross Harosoy x Higan made by the USDA's Agricultural Research Service (ARS) and the Illinois Agricultural Experiment Station. Seed color: Dull yellow with a yellow hilum. Maturity: Group I. Best adapted to approximately 42-44º N Latitude.

"Breeder seed of Vinton 81 was distributed to the foundation seed organization in Iowa for planting in 1981. Breeder seed will be maintained by the Iowa Agriculture and Home Economics Experiment Station, Ames." Address: 1. Prof. and research associate II, Dep. of Agronomy, Iowa State Univ., Ames, IA 50011.

1153. Leviton, Richard. 1984. Japanese soyfoods. In: Camille Cusumano. 1984. Tofu, Tempeh, & Other Soy Delights. Emmaus, Pennsylvania: Rodale Press. x + 261 p. See p. 144-49.
• ***Summary:*** Contents: Brief biography of Leviton and introduction. Deep-fried and grilled tofu treats: age, atsuage, ganmo, yaki-dofu, doufu-gan. Tofu haute cuisine (at 280-year-old Sasa-no-Yuki in Tokyo, dried-frozen tofu, wine-fermented tofu). Delights of soymilk and yuba (incl. Yuba Han). Natto, miso, and savory soy condiments (incl. Hamanatto or "savory soy nuggets," thua nao from Thailand, and natto miso). And still more: Cooked soybeans with wakame, "soy sprouts packed in a sausagelike clear tube, green soybeans in the pods, *kinako* powder (a flour

considerations. Address: Food Ingredients (Minnesota) Inc., 2121 Toledo Ave. North, Golden Valley, Minnesota 55422.

1269. Kraft, Raymond C. 1989. Remembrances of Dr. Harry Miller and his work with soyfoods (Interview). *SoyaScan Notes.* Oct. 24. Conducted by William Shurtleff of Soyfoods Center.
• ***Summary:*** On 22 April 1990 the Mount Vernon Academy, the Seventh-day Adventist high school that both he and Dr. Miller attended at different times, will celebrate the 50th anniversary of Dr. Miller's return to Mt. Vernon, Ohio, in the fall of 1939, to start the International Nutrition Laboratory, his soymilk plant, with a memorial to Dr. Miller. It may be a bust and/or a plaque, with exhibits. In the fall of 1939 Dr. Kraft was a senior at that school; now a physician who will be age 67 in April (2 generations behind Dr. Miller), he worked for Harry Miller at his Mt. Vernon soyfoods plant from January to September 1941. Dr. Miller bought 140 acres on which to build his plant and house, and to grow soybeans. He grew his own soybeans there from the first spring. In 1940 Dr. Miller's son, Clarence, had just finished college. He went to Mt. Vernon from Takoma Park to get the bookkeeping records for Dr. Miller's business in order.

Dr. Kraft has several strong recollections. "First, when he fired me on the first of September, I asked him if there was anything wrong with my work. He said 'No, not a thing. It's time for you to go back to school.' Second, he was a man who never knew the meaning of the word 'menial.' He would come out to the factory at 3:30 or 4:00 in the morning to do whatever needed to be done; sweeping the floor, grinding beans, cleaning out the spray drier, shoveling coal into the boiler, digging ditches. Then he worked at his medical profession (surgery and hospital) during the day and at 7:00 or 8:00 P.M. he'd be back in the factory again until 10:00 or even midnight. He had an inexhaustible supply of energy. He was a quiet, self-effacing man. He was not a public speaker, and didn't relish publicity–quite like General George C. Marshall."

The 4 main soy products that Dr. Kraft remembers the company selling when he began work there were Soyalac (the principal one, sold mostly for allergenic babies), probably Soyagen for general usage, (both liquid and spray dried; but he is not positive that they were making Soyagen), Soybean Sandwich Spread (made from the mash left over after making soymilk; he does not remember if the product contained additional soybeans), and Canned Green Soybeans.

All this was only 2 years after Dr. Miller started the farm in Mt. Vernon. "He was the first to produce soybeans in Knox County, Ohio, for food use. He had to go out and almost brow-beat the farmers into growing the soybeans for him. They would do it only on the condition that he contracted the entire crop." Address: 500 Cohasset Square, Suite 23, Chico, California 95926. Phone: 916-345-9500.

1270. Levey, Robert. 1989. Japanese restaurant better than ever. *Boston Globe.* Nov. 2. p. 4.
• ***Summary:*** A review of the Japanese restaurant Roka on Massachusetts Ave. near Harvard Square. "You may meander around on the appetizer menu with some satisfying results. Under the 'offbeat category,' consider the edamame, a bowl of Japanese green soy beans blanched in salted water and served cool. You pick up the whole pod, squeeze out the round soy beans and munch them like a party snack."

A salmon entree with teriyaki sauce was also served, as was grilled eel seasoned with a "traditional slightly sweet, thickened soy sauce..." Address: Globe staff.

1271. Agriculture Canada Research Station, Horrow. 1989. Description of variety: Harovinton. Harrow, Ontario, Canada. 2 p. Nov. 9. Unpublished typescript.
• ***Summary:*** Harovinton is a "Large-seeded tofu-type soybean. Registration date: May 24, 1989. Registration No.: 3118... Harovinton, tested as OX733, was developed by the Agriculture Canada Research Station, Harrow. This variety was derived from the cross Vinton x Vinton 81, made in 1982." Vinton is susceptible to Phytophthora (a fungus) and tolerant of metribuzin (an herbicide) applied at recommended rates. Growth habit: indeterminate.

"Seed characteristics: Shape: spherical flattened. Size: large; 23 grams per 100 seeds. Seed coat: dull yellow. Hilum colour: yellow. Oil content: lower than Corsoy (18.6% vs. 20.1%). Protein content: higher than Corsoy 79 (44.9% vs. 40.9%). Seed coat peroxidase activity: high.

Maturity: 3100 heat units (Ontario). Performance and adaptation: In yield trials conducted in 1986, 1987 and 1988 at Harrow, Malden and Woodslee, Harovinton yielded about 6% less than Corsoy 79. Harovinton is shorter, more lodging tolerant, and earlier maturing than Corsoy 79... The yield of soymilk and tofu per kilogram of Harovinton beans was 4% and 11% greater, respectively, than for Corsoy 79." Maintenance of breeder seed: Agriculture Canada, Research Station, Harrow, Ontario. Canadian distributor: Canada Packers.

Note 1. This is the earliest document seen (June 2009) that mentions the soybean variety Harovinton.

Note 2. The letterhead reads: "Agriculture Canada, Food Production and Inspection Branch, Seed Division." No address is given. Address: Harrow, Ontario, Canada.

1272. Harovinton: New Canadian domestic soybean variety. Large-seeded and/or vegetable-type soybean. 1989. Seed color: Yellow (dull), hilum yellow.
• ***Summary:*** Sources: Agriculture Canada Research Station, Harrow. 1989. "Description of variety: Harovinton." Harrow, Ontario, Canada. 2 p. Unpublished typescript. Nov.

Japan, where for 18 months he did extensive research on edamamé at about the same time that his student, John Konovsky, was studying the same crop at Iwate University. Of the many Japanese-language citations in their bibliography on edamamé (most previously uncited in English), John "discovered" about two-thirds and Tom about one-third. Tom ran his program at WSU from Japan and returned to Washington every 3 months to plant crops, check details, etc. Tom is collecting documents on edamamé, and has 60 from China. He has translated the titles of all of them and has translated ten entire documents. In addition he has about 150 Japanese journal articles on edamamé from 1920 to the present; many of the more recent ones have an English abstract. Some translators work with him. These documents are part of a growing library on East Asian crops, housed within Tom's program. He is in the process of finishing a book on edamamé in cooperation with Dr. Sundar Shanmugasundaram and another scientist at AVRDC, which plans to publish it. The book should be ready in about 6 months. It will probably be titled *Edamamé: The vegetable soybean,* and will contain a very lengthy and original bibliography–one of the hallmarks of Tom's work. Tom is also working on a book on the azuki (adzuki) bean, which will be published by CAB in the UK; soybeans are mentioned throughout this book. He is also very interested in wasabi. Tom prefers the term "edamamé" but AVRDC likes "vegetable soybeans." This summer a woman named Hu Jia, who is a librarian at the Chinese Academy of Agricultural Sciences in Beijing, is coming to work on his project for about 1 year. Tom has been very close to her family for 12 years. She collects literature in China for him on all of the basic crops he is working on. He has known her father well for a long time. During the Cultural Revolution, she was sent out to be a barefoot doctor for 10 years. She is age 40, has a degree in library science, and speaks good English, in part because her father, a native Chinese, earned a PhD from a university in Minnesota, and is now a chairman emeritus in the Chinese in the Chinese Academy of Agricultural Sciences. Her father will be sending documents on Chinese crops to Tom's program. She will be in the USA for at least a year, in part to learn more about computers, and in part to help on Tom's project.

Edamamé are now being grown in Washington state. In 1990 two farmers grew 20 acres and in 1991 3-4 farmers are expected to grow about 100 acres. D&K Foods in Walla Walla, Washington, is shelling, freezing and packing the beans. Tom has never met a person who did not like them. The Japanese think they are the best they have ever tasted, probably because they are frozen so quickly after harvest. The seeds are a bit smaller than their Japanese counterparts. Dunn International in Waterloo, Iowa, is also growing edamamé.

One of Tom's graduate students, named John Konovsky, is doing his thesis on edamamé, focusing and breeding and agronomy. They are working with D&K in Walla Walla, Washington on developing mechanical harvesting for edamamé.

Tom presented a paper at the INTSOY soybean conference in China last summer. The focus of the conference was utilization. It was excellent. Address: Head, East Asian Crop Development Program, Dep. of Crops and Soil Sciences, Washington State Univ., Pullman, WA 99164-6420. Phone: 509-335-2726.

1303. Soffranko, Andrew. 1991. Indigenous people in Rwanda eat lots of soybean leaves (Interview). *SoyaScan Notes.* April 8. Conducted by William Shurtleff of Soyfoods Center.

• ***Summary:*** The green soybean leaves give them a source of food during the lean season as the plant is coming to maturity. Then they eat the green vegetable soybeans. They also eat the leaves of other bean plants. Address: Prof. of Agricultural Economics, Univ. of Illinois. Phone: 217-352-3964.

1304. Buzzell, R.I.; Anderson, T.R.; Hamill, A.S.; Welacky, T.W. 1991. Harovinton soybean. *Canadian J. of Plant Science* 71:525-26. April. [4 ref. Eng; fre]

• ***Summary:*** "Harovinton is a large-seeded soybean cultivar with a greater protein content than oilseed cultivars and is suitable for tofu production... Production will be on a contract basis with Canada Packers, Inc."

"Registration number 3118 was issued for Harovinton as a tofu-type soybean, by the Variety of Registration Office, Seed Division, Food Production and Inspection Branch of Agriculture Canada." Address: Research Station, Agriculture Canada, Harrow, Ontario, N0R 1G0, Canada.

1305. Orf, J.H.; Lambert, J.W.; Kennedy, B.W. 1991. Registration of Proto soybean. *Crop Science* 31(2):486. March/April. [5 ref]

• ***Summary:*** The Proto soybean (Registration no. CV-275, PI 542,769) was developed at the Minnesota Agricultural Experiment Station. It was released on 15 Feb. 1989 as a "special purpose high-protein cultivar for use in the production of tofu and other products requiring very high protein content." Proto is of maturity Group 0, about 2 days earlier than Evans. The seeds are dull yellow with buff hila. Proto contains 45.6% protein and 16.5% oil. Breeder seed will be maintained by the Minnesota Agric. Exp. Station.

Work supported in part by grants from the Minnesota Soybean Research and Promotion Council, and the Minnesota Seed Producers and Promotion Assoc.

Note: This is the earliest document seen (Aug. 1999) that mentions the soybeans variety Proto. Address: 1-2.

Symposium: Program abstracts. See p. 70. Held 2-5 Oct. 1994 at New Orleans, Louisiana.
• ***Summary:*** "Soybean harvested and used green between the R6 and R7 growth stages is termed vegetable-type soybean." Note: This is an unusual definition. We would substitute the term "green vegetable soybeans" for "vegetable-type soybean." The latter term means something else. Address: Virginia State Univ., Petersburg, Virginia 23806.

1410. Shurtleff, William. 1994. Report on soybean and soyfoods research trip to Ontario, Canada: 17-19 October. Soyfoods Center, P.O. Box 234, Lafayette, CA 94549 USA. 21 p. Unpublished manuscript.
• ***Summary:*** Contents: 3-page program titled "Incoming Soybean Technical Mission." Oct. 17. Talk with Fred Brandenburg, executive director of OSGMB about food-grade Ontario soybeans exported to Asia. Canada is working to increase its sale of food-grade soybeans to Asia. Even though these soybeans are more expensive, they are of better quality and thus preferred. They are also very clean, since soyfoods makers want soybeans with little or no foreign matter. Most are not sold identity preserved, but they are large seeded, white hilum beans. Fred speaks of "crusher beans" and "food beans."

Oct. 18. Visit to Harrow Research Station, run by the Canadian federal government. (1) Talk by Michael Loh: Canada has 72% of the Singapore soybean market, 52% of the Hong Kong market, and 14% of the Malaysia market for soybeans imported for all purposes. Ontario's goal is to double exports by the year 2000. Their strategy is selling value-added products to niche markets. Food-grade soybeans now being developed in Japan include Enrei, Toyo Suzu, Toyo Masari, Otsura, and Kita Musume. (2) Talk by William Shurtleff on "Breeding Soybeans for Food Uses." (3) Presentation by Doug Jessop of the Food Processing Lab. at Harrow. He has been making and studying tofu there since 1983, and on a regular basis since 1984. He shows us his process, using lab equipment that cost about $15,000 not including the Instron system that measures texture. (4) Talk with transparencies by Dr. Dick Buzzell on breeding soybeans to make tofu. Harovinton gives the best tofu yield of all the varieties developed in Canada. A soyfoods maker can either contract with farmers in advance to have soybeans grown for them, or buy the soybeans from traders after they are harvested. To take optimum advantage of a soybean for making tofu, you must know the protein content then add the appropriate amount of water. The more protein in the bean, the more water you must add to get the highest yield. Identity preservation (IP) costs more. The yields will be lower and you must contract for it in advance; a problem is how to deliver the beans year-round to the end user. (4) Talk by Dr. Ma of Central Food and Animal Research. His specialty is vegetable protein. He is collaborating with ProSoya to make soy protein isolates from soymilk since Russia wants to make its own isolates. The soybeans with the highest protein content (on a dry weight basis) are BARC-6 53.4%, Harovinton 45.5%, Enrei 45.0%. One Japanese mutant soybean has none of the three types of lipoxygenase. Lines that lack A-4 protein give firmer tofu. In isolines, everything is the same except for one trait.

Oct. 19. (1) Visit to OSGMB with Fred Brandenburg to hear presentation, see facilities and collect documents. It takes more solar energy to lay down oil in a soybean than protein. Thus after a hot, dry summer, Canadian soybeans contain more oil. Soybeans in hot, tropical countries near the equator also generally contain more oil. In 1985 Canada became a net exporter of soybeans. The cost of producing soybeans in Canada is about the same as in the USA, but the U.S. often ships full vessels of soybeans and is near oceans, whereas Ontario often ships containers (20 or 40 tons), either out the St. Lawrence Seaway or down the Mississippi River. Some agrochemicals that are legal in America are not legal in Canada. All agrochemicals must be licensed, as must some farmers. Mr. Goh says that Chinese believe white hilum soybeans contain more protein than other soybeans. (2) Visit to Canadian Grain Commission to learn how Canada inspects and exports soybeans. The closest that a full seagoing vessel can get to Ontario is Montreal (Quebec)–the last deep-water port up the St. Lawrence Seaway. In Canada, dockage (both big and tiny foreign matter) is removed from soybeans before foreign material is calculated. This makes Canadian soybean much cleaner than those from the USA. Address: Lafayette, California. Phone: 510-283-2991.

1411. *Bluebook Update (Bar Harbor, Maine).*1994. SunRich sells Sweet Beans. 1(4):1, 4. Oct/Dec.
• ***Summary:*** MWCG Export Co. (Minnesota Waxy), a marketing company in Hope, Minnesota, plans to begin marketing frozen green vegetable soybeans as SunRich Sweet Beans. The first market will be retail stores in the Minneapolis-St. Paul area.

Talk with Raquel Supalla of SunRich Inc. (formerly MWCG Export Co.). 1995. March 7. This product was first sold retail in Jan. 1995 in the Minneapolis/St. Paul area, where it is being test marketed.

1412. Morinaga Nutritional Foods, Inc. 1994. The word is out: Tofu is in (Ad). *Vegetarian Times.* Nov. p. 79.
• ***Summary:*** This full-page color ad shows: (1) A carton of Mori-Nu Silken Tofu (Firm) on a wooden cutting board surrounded by cubes of white tofu, green vegetable soybeans, and whole dry soybeans; (2) Cartons of the five types of Mori-Nu Tofu; (3) A tofu-chocolate creme pie topped with sliced bananas.

Five paragraphs compare the conventional wisdom about tofu with the "Word on the street," which is about

Broccoli Blend. It is slated to contain one-third Sweet Beans (green vegetable soybeans) and two-thirds broccoli. Address: New York City.

1454. Zibart, Eve. 1996. The very fertile vegan field. *Washington Post.* Jan. 26. p. N24. Weekend section.
• ***Summary:*** The article begins: "It's not unusual anymore for non-vegetarians to eat at such green hot spots as the Health Zone, Food for Thought or Planet X (which is turning into the caterer-of-choice for veggie and vegan alternative rock types). Likewise, its easier and easier for vegetarians to find foods they like at new nutrition-conscious restaurants such as Felix, Greenwood, etc.–as well as at mainstream spots.

Today, more and more restaurants are offering vegan dishes, which contain no animal products whatsoever. A vegan diet precludes not only meat, poultry and seafood, but dairy products, eggs, butter, lard and other animal fats, cream sauces, cheese, etc. Yet that still leaves plenty of room for fine dining.

Most Asian cuisines (except Korean and Filipino) limit the use of dairy products and eggs. Malik, a downtown Thai restaurant, has a dozen vegetarian / vegan entrees, "including several featuring that heart-healthy favorite tofu" in various sauces such as red curry, black bean sauce, and peanut curry.

The Vegetable Garden in Rockville is the only wholly vegan Chinese restaurant in the area, although most Chinese eating place have a good variety of choices. The key words are "mock" and "Buddha." Mock chicken and mock pork are nicknames for tofu and other soy-based meat alternatives. The word "pork" sometimes refers to seasoned tempeh dishes. Since Buddhists are also vegans, correctly labeled "Buddhist delights" contain no animal products.

Most Japanese restaurants offer hot or cold tofu and "lightly salted soybean pods called edamame."

Ends with a directory of ten restaurants in the Washington, DC, area that offer a good selection of vegetarian or vegan dishes.

1455. Ma, C.Y.; Buzzell, R.I.; Jessop, D.B.; Buttery, B.R. 1996. Evaluation of soybeans for tofu processing. *Canadian Soybean Technical Bulletin (OSGMB, Chatham, Ontario, Canada)* 1(1):1-2. Jan.
• ***Summary:*** Contents: Introduction. Tofu yields and texture. Flow properties of soymilk. 11S / 7S globulin ratio. Correlation among soymilk and tofu variables. Conclusions.

In this study, eight Ontario, five USA, and two Japanese soybean cultivars covering a wide range of protein content were evaluated for their tofu processing properties, using glucono delta lactone as a coagulant. Table 1, titled "Characteristics of soymilk and tofu prepared from 15 soybean varieties," lists the following varieties (in descending order of soymilk protein; a water to dry matter ratio of 7 was used in making soymilk and tofu): BARC-6, AC Proteus, Proto, Harovinton, Raiden, Enrei, HP202, Secord, TK-89, Kanrich, RCAT Calico, Maple Arrow, RCAT Angora, Grande. This table contains the following vertical columns: Soybean protein (highest was BARC-6 at 53.4% on moisture-free basis), soymilk protein (highest was 6.1% from AC Proteus), soymilk yield (highest was 5.7 kg/kg from Maple Arrow), tofu yield (highest was 4.6 kg/kg from Harovinton and Raiden), tofu firmness (highest was 0.42 N/mm from Enrei), tofu rigidity (highest was 1680 G', Pa from Maple Arrow), soymilk viscosity (highest was 7.73 from BARC-6), and soymilk 11S/7S (highest was 5.44 from Secord; It has been reported that soybeans with a high 11S/7S ratio will produce firmer tofu).

Conclusion: "Results show that Canadian tofu varieties such as Harovinton have excellent tofu processing properties (yields, textures, etc.) comparable to or exceeding those of Enrei, a Japanese tofu variety." Address: 1. Centre for Food & Animal Research, Agriculture & Agri-Food Canada, Ottawa, Ontario, Canada; 2-4. Harrow Research Centre, Agriculture & Agri-Food Canada, Harrow, Ontario.

1456. McCord, Holly. 1996. Savor the new white-hot superfood. Way, way beyond the usual tofu: 7 easy, tasty ways to get "soying." *Prevention (Emmaus, Pennsylvania).* Jan. p. 79-83.
• ***Summary:*** The article begins: "Finally, soy's so hot it's smokin'! After years of neglect, mounting studies now suggest that soy foods help us dodge the big ones–heart disease and breast and prostate cancer. Maybe even osteoporosis... But in the United States, where we grow half the world's soybeans and then feed 'em mostly to chickens, the idea of soy for dinner somehow doesn't cut it. Fear of tofu–a white, spongy, soybean curd that most of us don't have a clue how to cook with–runs deep.

"If this describes you, relax! We've discovered seven surprisingly gentle ways to get you started with soy. They're all delicious and supereasy–foods even soybean sissies can relate to." 1. Pour soy milk on your cereal. 2. Whip up tofu blender smoothies (using Mori-Nu Silken Lite Firm Tofu–aseptic pack). 3. Make chocolate pudding no one can resist (using Mori-Nu Silken Lite Extra Firm Tofu). 4. Add "Sweet Beans" [green vegetable soybeans] to your repertoire. 5. Indulge in healthy Sloppy Joes (add TVP to a can of Sloppy Joe sauce and serve on a bun). 6. Go Nutlettes! The only ready to eat soy breakfast cereal made from a TVP you don't rehydrate. Order by phone from Dixie USA, Inc. 1-800-347-3494. 7. Drink soy protein beverages (such as Take Care. Order by phone from Nutritious Foods, Inc., 1-800-445-3350).

A sidebar discusses why soy is white-hot: Soy protein lowers high cholesterol. Soy isoflavones may beat breast and prostate cancer. Because soy protein causes less calcium excretion from the body than does animal protein, it may

Lambert, Lancaster, LN90-4524, Lyon, Macon, Magellan, Marcus 95, Maverick, Maxcy, Mercury, Micron, Mustang, Nemaha, ODell, Ohio FG1, Ohio FG2, Pace, Parker, Pearl, Piatt, Probst, Saline, Sandusky, Saturn, Stressland, Thorne, TNS, Toyopro, Traill, Vernal, Vertex, Wicomico, Yale. Address: Research Geneticist / Assoc. Prof., USDA-ARS, North Carolina State Univ., Raleigh, NC.

1495. DuPont Quality Grains. 1997. Optimum quality grains (Leaflets). Des Moines, Iowa. 2 p.
• ***Summary:*** One leaflet describes A231QT Optimum yellow hilum soybean varieties "designed specifically for the soyfood market. It is large seeded, high protein, yellow hilum, and lipoxygenase 2, null" [i.e. lacking the undesirable L2 lipoxygenase enzyme which causes beany flavor]. Soyfood evaluations conducted by the Illinois Crop Improvement Association show that soymilk yields, tofu yields, tofu strength, and protein content meet and exceed Soyfood standards. Quality specifications on a dry matter basis: Seeds/lb: 2100. Protein: 46.3%. Oil: 20.6%. Tofu yield 332.6. White index of tofu: 51.6%. Tofu strength: 22.7 gm/sq. cm. Soymilk yield: 4.8 ml/gDS. Solids content of soymilk 11.7%. Protein content of soymilk: 50.3%. Sold in 50 lb bags and bulk.

The second leaflet describes A232QT Optimum high sucrose soybean varieties which "have been specifically selected and developed for their unique characteristics for use in the soyfoods industry and traditional food industries. High sucrose varieties have significantly increased sucrose content, reduced stachyose content [Note: Stachyose is an oligosaccharide that causes flatulence], and are lipoxygenase 2, null. Flours and powders from high sucrose varieties have a unique flavor profile offering opportunities for making improved beverages, bakery, pasta products, and other processed foods. Quality specifications Seeds/lb: 2900. Protein: 42.4%. Oil: 19.7%. Carbohydrate profile (dry weight basis): Sucrose: 8.4%. Raffinose: 0.03%. Stachyose: 0.40%. A color photo shows the soybeans with sliced white bread.

A cover letter from Kent Savage states that "These soybeans were developed through traditional plant breeding methods, and were produced in Iowa and Minnesota."

Note: 1997 July 11–There is no good source of bland soymilk base in the United States. Use of these lipoxygenase-null soybeans could be the answer to that problem. Address: 10700 Justin Dr., Des Moines, Iowa 50322. Phone: (515) 251-3056.

1496. Liu, KeShun. 1997. Biological and compositional changes during soybean maturation, storage, and germination. In: KeShun Liu. 1997. Soybeans: Chemistry, Technology, and Utilization. Florence, Kentucky: Chapman & Hall. xxvi + 532 p. See p. 114-36. Chap. 3. Index. [59 ref]
• ***Summary:*** Contents: Introduction. Changes during soybean maturation: Dry matter and proximate composition, fatty acid composition, vitamins, biologically active components, food values of immature soybeans [green vegetable soybeans]. Biological aging during soybean storage: Storage-induced protein changes, other changes, effects on quality of soy products, mechanisms of biological aging, prevention of storage-induced quality loss. Changes during soybean germination: Dry matter and proximate composition, fatty acid composition, amino acid composition, vitamins, biologically active components, food values of germinated soybeans, references.

Immature soybeans have some nutritional advantages over whole dry (mature) soybeans. These include higher contents of ascorbic acid and β-carotene, and lower contents of trypsin inhibitors, phytates, and oligosaccharides. They are also have a sweeter and better flavor, and a more tender texture. Address: PhD, Soyfood Lab., Hartz Seed, a Unit of Monsanto, P.O. Box 946, Stuttgart, Arkansas 72160-0946. Phone: 870-673-8565.

1497. Liu, KeShun. 1997. Nonfermented Oriental soyfoods. In: KeShun Liu. 1997. Soybeans: Chemistry, Technology, and Utilization. Florence, Kentucky: Chapman & Hall. xxvi + 532 p. See p. 137-217. Chap. 4. Index. [125 ref]
• ***Summary:*** Contents: Introduction. Soymilk: Traditional soymilk preparation methods, chemistry of beany flavors, modern soymilk preparation methods (Cornell method, Illinois method, rapid hydration hydrothermal cooking, methods using defatted soy material, deodorization techniques, commercial methods, novel approaches), basic steps and principles of soymilk preparation (starting material, water incorporation, grinding, soymilk extraction, heat treatment, formulation and fortification, final processing and packaging, additional processing), other constraints (objectionable aftertaste, chalkiness, yields), standardization of soymilk. Tofu: Tofu preparation methods (traditional methods, variations in tofu preparation methods), tofu varieties, quality and quantity attributes of tofu, factors affecting tofu making (soybean varieties and compositions, temperature of grinding soybeans, concentration of soymilk, heat processing of soymilk and tofu gelation mechanism, types of coagulants, concentration of coagulants, coagulation temperature, mode of adding coagulants, coagulation time, molding conditions, other factors, tofu made from full-fat soy flakes, novel treatments), microbiological safety. Yuba: Preparation, chemical composition, varieties, utilization, mechanism of film formation, conditions for film formation and their optimization. Other nonfermented soyfoods: Soybean sprouts, okara, roasted soybeans, soynuts, and soy flour, cooked whole soybeans, immature soybeans [green vegetable soybeans]. Address: PhD, Soyfood Lab., Hartz