http://ipm.osu.edu/fruit/index.html

The Ohio State University Newsletter Extension

Fruit ICM News

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Calendar

February 7-9: Pre-Conference Tours for the Ohio Fruit & Vegetable Growers Congress in conjunction with the North American Farmer's Direct Marketing Conference and Ohio Roadside Marketing Conference, Cincinnati, OH. Tour begins at 7 a.m. at the Regal Cincinnati Hotel. For information contact Mike Pullins at (614) 249-2424.

February 10-12: 2000 Ohio Fruit & Vegetable Growers Congress & North American Farmers' Direct Marketing Conference in conjunction with Ohio Roadside Marketing Conference, Cincinnati Convention Center, Cincinnati, OH. Convenient lodging at Regal Cincinnati Hotel (513) 352-2100. In addition to our Ohio State specialists, we will have experts from University of Kentucky, Purdue University, and the state of Washington.

February 29: Video Conference for Plum Pox Virus Virtual Seminar, OARDC, Wooster, 1:00 p.m. Building location to be announced.

March 16: Paul Wright, Attorney at Law, will be in Northeast Ohio to explain business organizational forms (partnership, corporation, limited liability corporation, etc.) This subject applies to horticultural, farm, and non-farm businesses. Location will be announced. Please contact Jim Polson at

(330) 263-3831 for information.

Updated Bramble Production Bulletin

The newly updated Bulletin 782, "Brambles - Production Management and Marketing Extension" , is now available at Extension offices in Ohio. This high quality publication includes many color illustrations and the newest weed control recommendations. Also included are extensive listings for cultivars of raspberries and blackberries. The bulletin is available on the web at http://ohioline.ag.ohio-state.edu/b782/index.html

Other berry resources for cultivars are: the Cornell Small Fruit Nursery Guide, 1999 http://www.fvs.cornell.edu/ExtnServ/MPP/Nurseryfile.html & the National Clonal GermplasmRepository http://www.ars-grin.gov/ars/PacWest/Corvallis/ncgr/ncgr.html

(Thanks to Sonia Schloemann, January 2000 Massachusetts Berry Notes.)

The Tayberry

Source: http://www.cahe.nmsu.edu/pubs/_h/h-326.html

The Bramble bulletin mentions the "tayberry". Released in 1979 by the Scottish Horticultural Research Institute, the tayberry is a cross between a loganberry (Aughinbaugh' blackberry X red raspberry) and a black raspberry. The tayberry has a growth habit and fruit similar to the loganberry, which in turn is similar to the blackberry.

Fruit of the tayberry are borne on short, strong laterals on prickly canes 6 to 7 feet long. Tayberry fruit, like that of the raspberry and blackberry, is an aggregate fruit consisting of a collection of druplets. Plants are very vigorous and require a sturdy trellis for support.

Commercial yields can be heavy -- up to 12 tons per acre. The juicy fruit are cone-shaped, deep purple, and up to 1-1/2 inches long. Like a blackberry, the core remains in the berry when picked. Fruit are somewhat less acid than the loganberry with a strong, slightly tart flavor. Fruit can be eaten fresh or processed as jams or jellies.

Training and other cultural requirements are similar to those for trailing blackberries. Plants will need protection below -15 F. Tayberries make an excellent crop to grow under windows as a home security barrier because the canes are so prickly.

E. coli Primer

Source: http://ohioline.ag.ohio-state.edu/hyg-*fact/5000/5561.html* (OSU Fact Sheet, Human Nutrition)

There are a variety of *Escherichia coli* bacteria present in nature. They are usually found in the intestines of healthy humans and healthy animals. Normally, these bacteria are beneficial, suppressing the growth of harmful bacteria and producing vitamins. Very few cause disease in humans. However, there are those variations, or strains, that are pathogenic (have the ability to cause disease). *E. coli* O157:H7 is one of those disease-causing strains classified as a food-borne pathogen. *E. coli* organisms have the ability to attach to the intestinal wall and produce toxins. Symptoms such as bloody diarrhea and abdominal cramps may be observed or no such symptoms may appear. The O157 pathogen has become very significant among food-borne pathogens because of its low infectious dose and the severity of the infection that affects all age groups. The elderly and children under five years old are highly susceptible to Hemolytic Uremic Syndrome, a disease in which red blood cells are destroyed and kidneys fail.

The O157 *E. coli* pathogen was recognized in 1982 after the investigation of two outbreaks of a bloody diarrhea syndrome. The outbreaks were traced to undercooked hamburgers served from a fast food chain. Since then, food-borne outbreaks have been associated with various meats and fresh produce. In the fall of 1996, there were four outbreaks of food-borne illness related to contaminated unpasteurized fresh apple cider, including the *E.coli* O157:H7 outbreak which resulted in the death of a 16-month-old girl. This was in addition to earlier outbreaks from unpasteurized apple cider in 1991 and 1993. The actual source of contamination of apple cider in these outbreaks was not determined, but various potential contamination sources and events before and after harvest have been suggested. This bacterium was found in the feces of healthy birds, domestic animals, and feral animals, such as deer.

The Centers for Disease Control and Prevention (CDC) approximates that 10,000 to 20,000 people in the United States are annually affected, including 500 deaths. The most frequently known outbreaks of *E. coli* 0157:H7 are associated with fecal contaminated meats in slaughterhouses. However, it can also be associated with:

- water
- raw milk
- unpasteurized apple juice/cider
- sandwiches
- lettuce
- dry cured salami
- produce from manure-fertilized gardens
- handling potatoes
- radish sprouts, alfalfa sprouts
- yogurt
- undercooked beef, poultry, venison, lamb

New food safety guidelines are being implemented to decrease the incidence of contamination occurring during processing. However, this alone is not enough. Consumers need to take more responsibility. As a researcher has said, "preparation and sanitation methods are key to preventing food-borne illness in the home as in other areas of food handling.

U.S. Apple recently advised us of the Food and Drug Administration's (FDA) proposed change to its 5-log policy on fresh juices. The FDA had reopened, until January 24, 2000, the comment period for the proposed application of the HACCP principles to the processing of fruit and vegetable juices and juice products.

Following are some articles provided to explain the deferment of the final apple cider rules.

Use of Hazard Analysis Critical Control Point and Alternative Treatments in the Production of Apple Cider

Source: http://www.foodprotection.org/ (Click on Publications, then to Table of Contents and Abstracts)
Journal of Food Protection: Vol. 62, No. 7

The purpose of this study was to evaluate the practices of Maryland cider producers and determine whether implementing hazard analysis critical control point (HACCP) would reduce the microbial contamination of cider. Cider producers (n=11) were surveyed to determine existing manufacturing practices and sanitation. A training program was then conducted to inform operators of safety issues, including contamination with *Escherichia coli* O157:H7, and teach HACCP concepts and principles, sanitation procedures, and good manufacturing practice (GMP). Although all operators used a control strategy from one of the model HACCP plans provided, only one developed a written HACCP plan. None developed specific GMP, sanitation standard operating procedures, or sanitation monitoring records. Six operators changed or added production controls, including the exclusion of windfall apples, sanitizing apples chemically and by hot dip, and cider treatment with UV light or pasteurization. Facility inspections indicated improved sanitation and hazard control but identified ongoing problems. Microbiological evaluation of bottled cider before and after training, in-line apples, pomace, cider, and inoculated apples was conducted. *E. coli* O157:H7, *Salmonella*, or Staphylococcus aureus were not found in samples of in-line apple, pomace, and cider, or bottled cider. Generic *E. coli* was not isolated on in-coming apples but was found in 4 of 32 (13%) in-line samples and 3 of 17 (18%) bottled fresh cider samples, suggesting that *E. coli* was introduced during in-plant processing. To produce pathogen-free cider, operators must strictly conform to GMP and sanitation procedures in addition to HACCP controls. Controls aimed at preventing or eliminating pathogens on source apples are critical but alone may not be sufficient for product safety.

Contamination of Intact Apples after Immersion in an Aqueous Environment Containing *E. coli* O157:H7

Source: http:/www.foodprotection.org/ (Click on Publications, then to Table of Contents and Abstracts)
Journal of Food Protection, Vol 62, No. 5

The extent and location of *Escherichia coli* O157:H7 contamination after intact apples were immersed in cold (2 C) 1% peptone water containing approximately 3 x 107CFU/ml was assessed using four apple varieties, Golden Delicious, McIntosh, Red Delicious, and Braeburn. Room temperature and refrigerated apples were used to determine the effect of temperature differential on *E. coli* infiltration. The highest levels of *E. coli* were associated with the outer core region of the apple, followed by the skin. Apples were subsequently treated by immersing them for 1 minute in 2,000 mg/liter sodium hypochlorite, followed by a 1-minute tapwater rinse. This treatment reduced pathogen levels by 1- to 3-log cycles, but did not eliminate the microorganism, particularly from the outer core region. While *E. coli* was not detected in the inner core of most apples, warm fruit immersed in cold peptone water occasionally internalized the pathogen. The frequency and extent of internalization of the pathogen was less when cold apples were immersed in cold peptone water. Subsequent dye uptake studies with Golden Delicious apples indicated that approximately 6% of warm apples immersed into a cold dye solution accumulated dye via open channels leading from the blossom end into the core region. However, dye uptake did not occur when the dye solution was warmer than the apple.

Prevalence of *Escherichia coli* in Apple Cider Manufactured in Connecticut

Source: http://www.foodprotection.org/ (Click on Publications, then to Table of Contents and Abstracts) *Journal of Food Protection: Vol. 62, No. 6*

Cider samples obtained from 11 cider mills operating in Connecticut during the 1997 to 1998 production season were tested for the presence of *Escherichia coli*. Cider production began in mid August and continued through March, with peak production in September and October. Of 314 cider samples tested, 11 (4%) were found to contain *E. coli*. Of the 11 mills, 6 (55%) tested positive for *E. coli* in the cider at least once during the production year. E. coli was first observed in cider samples produced in mid to late October and was not detected in samples made after January. A trend was observed for cider to decrease in acidity and increase in øBrix (soluble sugars) throughout the production season. No correlation between pH and soluble sugars of cider and the presence of *E. coli* was detected. Eight mills used both dropped apples and tree-picked apples, whereas three mills used tree-picked apples only. The use of dropped apples in cider production began 5 weeks before the first detection of *E. coli* in cider. *E. coli* was isolated from cider samples produced using dropped apples and from samples produced using only tree-picked apples. No direct correlation between the use of dropped apples or tree-picked apples and the presence of *E. coli* in the cider was observed. An association between the time of apple harvest and the appearance of *E. coli* in cider was noted. For mills providing adequate records, all contaminated cider was produced from apples harvested between mid October and mid November.

Fate of *Escherichia coli* O157:H7 on Fresh-Cut Apple Tissue and Its Potential for Transmission by Fruit Flies

*Source:*http://aem.asm.org/cgi/reprint/65/1/1 *Applied and Environmental Microbiology, Jan. 1999*

Pathogenic *E. coli* O157:H7, as well as nonpathogenic strains, grew exponentially in wounds on Golden Delicious apple fruit. The exponential growth occurred over a longer time period on fruit inoculated with a lower concentration of the bacterium than on fruit inoculated with a higher concentration. The bacterium reached the maximum population supported in the wounds regardless of the initial inoculum concentrations. Populations of *E. coli* O157:H7 in various concentrations of sterilized apple juice and unsterilized cider declined over time and declined more quickly in diluted juice and cider. The decline was greater in the unsterilized cider than in juice, which may have resulted from the interaction of *E. coli* with natural populations of yeasts that increased with time. Experiments on the transmission of *E. coli* by fruit flies, collected from a compost pile of decaying apples and peaches, were conducted with a nonpathogenic strain of *E. coli*. Fruit flies were easily contaminated externally and internally with this nonpathogenic *E. coli* after contact with the bacterium source. The flies transmitted this bacterium to uncontaminated apple wounds, resulting in a high incidence of contaminated wounds. Populations of the bacterium in apple wounds increased significantly during the first 48 hours after transmission. Further studies under commercial conditions are necessary to confirm these findings.

Potential for Infiltration, Survival, and Growth of Human Pathogens within Fruits and Vegetables

Source: http://vm.cfsan.fda.gov/~comm/juicback.html *U.S. Food and Drug Administration Center for Food Safety and Applied Nutrition Nov. 1999*

Published and unpublished information relevant to the subject of microbial infiltration and survival in produce has demonstrated that, under certain conditions, microorganisms can become internalized into fruits and vegetables, including citrus fruits, and can survive in that environment. Water, insects, or birds, all of which may carry human pathogens, may serve as vectors resulting in the contamination of damaged or decayed sites on the rind. Microorganisms subsequently may infiltrate the produce through these damaged sites. In addition, fruit can become contaminated if warm fruit is submerged into cold, contaminated water or if vulnerable external points of fruit are immersed in contaminated water. Under certain conditions, equipment also has been shown to cross contaminate both fresh apple and orange juice during processing.

Survival of pathogens, both plant and human, has been demonstrated in both produce and juice. In laboratory studies, human pathogens have been found in or on tomatoes, cantaloupe, watermelon, honeydew melon, and apples. There appears to be no published information on human pathogens in citrus fruits; however, the presence of other bacteria internalized in citrus was noted. Numerous studies have shown that human pathogens can survive in both apple and orange juice, despite their natural acidity.

Additional Reading on *E. coli*

Source: http://www.foodprotection.org/ Click on Publications, then to Table of Contents and Abstracts)
Journal of Food Protection, Vol. 62, No. 7, pp. 793-796

Inactivation of *Escherichia coli* O157:H7 and *Escherichia coli* 8739 in Apple Juice by Pulsed Electric Fields

The effect of high voltage pulsed electric field (PEF) treatment on *Escherichia coli* O157:H7 and generic *E. coli* 8739 in apple juice was investigated. Fresh apple juice samples inoculated with *E. coli* O157:H7 and *E. coli* 8739 were treated by PEF with selected parameters, including electric field strength, treatment time, and treatment temperature. Samples were exposed to bipolar pulses with electric field strengths of 30, 26, 22, and 18 kV/cm and total treatment times of 172, 144, 115, and 86 s. A 5-log reduction in both cultures was determined by a standard nonselective medium spread plate laboratory procedure. Treatment temperature was kept below 35 C.

Results showed no difference in the sensitivities of *E. coli* O157:H7 and *E. coli* 8739 against PEF treatment. PEF is a promising technology for the inactivation of *E. coli* O157:H7 and *E. coli* 8739 in apple juice.

Apple Cider Food Safety Control Workshop

Source: http://vm.cfsan.fda.gov/~comm/cidw-toc.html

The FDA held a workshop on July 15-16, 1999 to present information regarding food safety controls for the apple cider industry. The workshop addressed issues regarding pathogen reduction interventions that research studies suggest can e effective for apple cider production, and methods that can be used to measure and validate such interventions. Results of research presented at this workshop are available at this website. Of particular interest may be the slide set titled "Comparison of Tree Picked and Dropped Fruit on Microflora" by D. Bob Merker, FDA. Individual slides are available for viewing . Slide 6 asks the question "Are dropped apples more likely to be contaminated?" Slides 14 and 15 give general conclusions. One conclusion is the detection of patulin alone would be sufficient reason for avoiding use of dropped apples from more susceptible varieties. Patulin and yeast and mold levels in dropped apples are higher than those for tree picked apples. What is patulin?

Patulin in Apple Juice

Patulin is a mycotoxin produced by certain strains of the mold *Penicillium expansum*, which grow naturally in and on fruits such as apples, peaches, pears, and some vegetables. It is particularly associated with molds such as brown rot in apples. It will always be present to some extent, since these foods are not produced and stored under sterile conditions.

Patulin has been shown to cause a variety of adverse effects in toxicological studies. Although the levels found to date in apple juice are unlikely to give rise to intakes which are of toxicological concern, it has been recommended that levels of patulin in food should be reduced to the lowest that are technologically achievable by industry to minimize the possible risk of adverse effects for humans.

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