

SEPTEMBER 15, 2014 • VOLUME 3, ISSUE 9

Whatcom *Ag* Monthly

Bringing Scientific Information to the Farming Community

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JOHNE'S DISEASE: DON'T BRING HOME MORE THAN YOU BARGAINED FOR

Dr. Susan Kerr, WSU Regional Livestock and Dairy Extension Specialist
Washington State University (WSU), Mount Vernon Research and Extension Center

Johne's (YO-neeZ) Disease is a contagious, untreatable and fatal disease of ruminants. It is estimated that 68% of the nation's dairy herd and 8% of the beef herd has at least one positive animal; prevalence in sheep and goat herds is unknown. If you don't have it, you don't want it. If you do have it, it is well worth your time and effort to control because it is silently eating you out of house and home and your livestock out of their health.

The Disease Agent

This wasting disease is caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP), a bacterium that needs to live inside ruminant macrophages (infection-fighting cells of the immune system) to reproduce. The organism is quite resistant to drying, heat and cold, so it can survive in feed, soil and water for up to a year. It can't reproduce outside its host.

The Infection Process

Here is a typical infection scenario: a baby ruminant is infected in utero or ingests an infective dose of MAP within a few months of birth through milk, feed or water contaminated with MAP-infected feces. MAP invades the neonate's ileum (last part of the small intestine) and eventually initiates an inflammatory response by macrophages. Macrophages are unable to clear the infection, so more inflammatory cells are called to the scene; MAP keeps multiplying within the macrophages, resulting in more MAP and more inflammation. The bacteria eventually spread to regional lymph nodes and throughout the body to all tissues.

The disease process continues slowly but continually in affected animals for months to years before any signs of illness are observed. As you can imagine, the chronically-inflamed intestine

is thickened and irritated and becomes less able to digest and absorb nutrients. Even sub-clinically affected animals require more nutrients just for maintenance and they are performing sub-optimally in the areas of fiber, milk and meat production and reproduction.

Sadly, clinically affected and test-positive individuals are usually the tip of the iceberg when it comes to the prevalence of Johne's Disease in a herd. Infected animals shed MAP into the environment and serve as sources of infection for other animals for months if not years, even while appearing healthy. Infected animals shed MAP into milk, colostrum and feces and can even transmit to fetuses across the placenta. Clinically ill animals are usually very heavy shedders.

Signs of Illness

Clinical signs of Johne's Disease are often precipitated by a stressor such as birthing or transportation. In cattle, the main signs of clinical infection are weight loss and profuse diarrhea. In goats and sheep, the usual sign is significant weight loss despite a good appetite; diarrhea is not as common in goats as in cattle. If you have a ruminant that is at least 18 months old, is thin and doesn't respond to better nutrition and deworming, you may have just met Johne's Disease.

Diagnosis

If you have a thin animal in your herd unresponsive to treatment and it dies, is culled or euthanized, have a veterinarian perform a necropsy on it. Samples can be taken from the ileum and regional lymph nodes to check for the Johne's Disease organism. This is often how a producer first learns the disease is present in a herd. Certainly other diseases can be responsible for

weight loss in ruminants with or without diarrhea. Dental disease, cancer, malnutrition, toxins, scrapie, B.V.D., C.L., C.A.E. and other infectious diseases could be to blame. After a thorough examination of a clinically ill animal, a veterinarian will recommend specific laboratory tests to rule in or out other diseases.

Testing for Johne's Disease involves looking for the organism in manure, tissues, milk, soil, water, feed, etc. or animal antibodies produced in response to the disease. Culturing (growing) MAP from fecal, tissue or environmental samples can be a very slow process and often misses early cases of the disease; however, using pooled or targeted cultures is economical and often used initially to detect the presence of MAP in a herd or the effectiveness of eradication efforts. DNA probe tests are another way to find the organism. This test looks for MAP DNA in samples, so it is much quicker than culturing the organism. Antibody tests include the ELISA and AGID options. All tests can be negative in early stages of the disease, so retesting is a crucial aspect of diagnosing, controlling and managing this disease. The type of test to use will depend on the likelihood of your herd's infection status, your goals and your veterinarian's recommendations. Be aware that if a female tests positive, it is likely her dam, maternal siblings and offspring are or will become positive, too.

In sheep and goats, antibodies from C.L. (contagious abscesses) can cross-react with some Johne's Disease ELISA tests and give false-positive readings, so your veterinarian might recommend other tests be used in herds with C.L. or C.L. vaccination programs.

Prevention and Control

A Johne's Disease vaccine is available for use in the U.S. but it does not have widespread use or support. It is only licensed for use in calves less than a month old. It does not lower infection rates, but it does reduce the number of animals that show clinical signs of illness. Instead of relying on a vaccine, producers should rely on the following management practices to prevent or

eliminate this scourge from their herds:

Here's a list of what you can do to reduce the entry or spread of MAP in your herd:

- Do not feed animals on the ground
- Only feed colostrum and milk from negative animals (or milk replacer or pasteurized milk); do not pool colostrum from animals with unknown MAP status
- Remove newborns from positive dams immediately and hand raise at a MAP-free location
- Test all animals over 18 months old; separate positive and negative animals and their feed and water sources; have MAP-positive and -negative dams give birth in separate areas
- Re-test negative animals at least annually
- Wean youngstock early to minimize length of contact with adults' manure
- Rotate pastures to prevent overgrazing and minimize animals' contact with manure
- Rest pastures as long as possible before re-entry
- Do not graze on known contaminated pastures or fields where MAP-infected manure has been spread
- Till contaminated pastures and expose to sun and as many freezing/drying cycles at possible before re-use
- Assess individuals' body condition scores often and investigate cases of weight loss
- Do not co-house ruminants with other ruminants of unknown MAP status
- Do not use milk or colostrum of unknown MAP status to feed youngstock
- Do not share or allow or access to water downstream from an MAP-positive farm
- Remove manure from housing ASAP and prevent runoff into water sources
- Do not have too many animals for available acreage or facilities
- Provide adequate amounts of a balanced diet
- Consider all manure infective and act accordingly
- Clean and sanitize the environment continually, including udders
- Wash tools and equipment with soap and

water and disinfect with a tuberculocidal product

This can't be stated strongly enough: only add animals to your herd that have tested negative and are from negative herds.

For Johne's Disease, a herd's status is even more important than an individual's status; a negative animal from a herd with positive animals may be harboring the disease and convert to positive in the future. Quarantine all herd additions for at least three months and re-test before letting them join the herd. Don't consider livestock sale yards to be a good source of disease-free animals—they are very high risk sources.

MAP is spread through fecal-oral routes, so manure management is key to controlling and preventing Johne's Disease. Your goal is to minimize and delay the dose of MAP ingested by youngstock. Work with your veterinarian to develop a risk assessment and Johne's management plan for your herd. As a nice bonus, those who have had to develop a Johne's Management Plan often observe a reduction in other sanitation-related diseases such as coccidiosis and mastitis; feed bills are often significantly reduced as well.

The Bottom Line

Do not take the "ostrich approach" to Johne's Disease and decide not to test because you don't want to know the answer. If you want to stay in the livestock business, eventually you will HAVE to test and the delay in diagnosis will cost you many more animals' lives and a lot more money and effort. To control Johne's Disease in a nutshell:

- Check your herd for MAP
- Identify and remove positive animals
- Target farm sanitation, especially manure management
- Keep excellent records for decision making
- Do not bring ruminants of unknown disease status into your herd

For More Information

www.johnes.org

www.johnesdisease.org

For Johne's Disease prevention and control: Feed milk replacer, or pasteurize **milk** at 145° F for 30 minutes stirring continually or 162° F for 15 seconds stirring continually. Feed **colostrum** from known negative animals.

Fastest elimination will come from testing all animals over 18 months old and culling all positive animals and their most recent offspring.



Fig. Emaciated Jersey cow with Johne's Disease. Source: The University of Wisconsin-Madison School of Veterinary Medicine, www.johnes.org.

WHAT'S GOING ON WITH THE NEW SMALL FRUIT HORTICULTURE (SFH) PROGRAM?

Lisa Wasko DeVetter, Assistant Professor of Berry Crops
Washington State University (WSU), Mount Vernon Research and Extension Center

My first day on the job was March 3rd, 2014. I had just arrived in Washington. The stereotypical gray skies and drizzle of the Pacific Northwest was a welcome relative to the frigid winter weather I was coming from in the Midwest. That very first day seems like it was ages ago. In fact, only six months have elapsed since that day. Although this spring and summer seemed to sprint past in a hurry, much was accomplished in the new small fruit horticulture (SFH) program and I wanted to take the opportunity to introduce you to some of the projects and people that have begun to take root.

Projects. There are several projects that I have either initiated as the lead investigator or am collaborating with expert scientists on. One project that I would like to introduce focuses on methods to improve soilborne disease and pest management through the removal of root inoculum in continuous red raspberry production systems. I have several great academic and grower collab-



Fig. Raspberry root removal with a Lundeby Plant Lifter.

orators for this project, which has been funded in part by the Northwest Center for Small Fruits Research. Those academic collaborators include I. Zasada, M. Mazzola, J. Weiland, T. Walters, and C. Benedict.

Click Video to Play

Managing Soilborne Diseases and Pests through Raspberry Root Removal



Dr. Lisa Wasko DeVetter
WSU Small Fruit Horticulturist



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The first part of this project is an evaluation of the effectiveness of root removal in improving plant health, productivity, and longevity in sites with high disease and pest pressure. Addressing this entails a replicated field trial whereby we will be comparing the establishment and productivity of spring-planted 'Meeker' raspberry in plots with the following treatments: 1) roots removed and fumigated, 2) roots removed and not fumigated, 3) no root removal and fumigated, and 4) no root removal nor fumigation. Roots have been removed at our experimental site in Whatcom County with a Lundebly plant lifter and fumigated plots will be treated with metam sodium this fall (applied at normal rates). Aside of plant establishment and productivity, we will also be monitoring nematode populations and the development of soilborne diseases. This project will also consider the effectiveness and costs of different root removal systems (e.g, plant lifter, potato digger, and beachcomber) and whether removed roots can be economically converted into a safe, value-added product, such as compost. A separate experiment related to root removal, led by my graduate student, Rachel Rudolph, will monitor how soil microbial populations change. Specifically, Rachel will be eval-



Fig. Honeybee pollinating a 'Duke' flower cluster.



Fig. Raspberry root removal with a beachcomber.

uating how populations change in plots where roots have been removed and treated with the following this fall: 1) fumigated at recommended rates, 2) fumigated at half the recommended rate, 3) brassica seed meal, broadcasted and applied at 1.5 tons/acre, and 4) non-root removed and fumigated control (specific fumigant still being selected). Plant establishment and productivity of tissue-cultured 'Meeker' plants will also be evaluated. The main goals of these projects is to develop improved and economical ways to sustainably manage soilborne diseases and pests for red raspberry growers. Furthermore, these projects will provided needed information on soil microbial ecology as it relates to disease and pest management, as well as plant productivity.

Much of my attention in blueberry has been directed on methods to improve pollination and fruit set, which necessitates an improved understanding of the environmental and physiological variables influencing these events. Blueberry production in the coastal areas of the Pacific Northwest is characterized as having low fruit set and yields, which means growers are not meeting their full yield potential. Low fruit set and yields can be attributed to many factors, such as inadequate mineral nutrition, poor pollination, and carbohydrate imbalances (to name a few). I have undertaken several projects with the support of the Washington Blueberry Commission



Fig. Evaluating the effects of biodegradable mulches on yield and fruit quality in day-neutral strawberry production.

that seeks to improve our current understanding of factors influencing fruit set and yield.

One such project will evaluate the impact of fall- and spring-applied boron on fruit set and yields of established 'Duke' plants. Foliar applications of boron in several perennial fruit cropping systems has demonstrated that this micronutrient may be insufficient in floral tissues and result in poor fruit set, regardless of foliar tissue test results indicating sufficiency. This has yet to be studied in blueberry in western Washington, let alone the Pacific Northwest, where boron deficiency can sometimes occur. Beyond studying the effects of boron in blueberry, I am also evaluating the activity and effectiveness of honeybees in western and eastern Washington. Honeybees are important pollinators for many horticultural crops, yet their activity and resulting effectiveness in blueberry has been questionable, particularly amid growing concerns for Colony Collapse Disorder. The goal of this project is to assess the current status of honeybee activity in Washington and relate activity to landscape and grower management practices. Results from this foundational study will provided needed infor-

mation on the role honeybees and other pollinators have in highbush blueberry production, as well as potential methods to enhance pollination in the landscape.

There are several other projects that my program has been or will become involved in. More information about some of those projects can be found at my website, described below. Current and upcoming projects include: evaluating mechanical harvest-aid systems for fresh market blueberry, determining blueberry cold hardiness in Washington, evaluating alternative labor-saving pruning practices and effects on yield and productivity in blueberry, mitigating green fruit drop in 'Draper' blueberry, groundcover management in blueberry, screening alternative pre-plant soil treatments in greenhouse grown raspberry, the role of humic acids in establishing red raspberry, improved irrigation techniques in raspberry, alternative and labor saving production techniques in raspberry, effects of primocane burning on total nonstructural carbohydrates and productivity in raspberry, and chemical migration of biodegradable mulches in day-neutral strawberry production. Manure management and soil health in berry crop production is also an interest of mine and I anticipate research and extension activity related to this theme. I am also serving in an extension capacity for the recently funded RosBREED project, which seeks to learn more about combining disease resistance and high fruit quality into successful cultivars of Rosaceous plants. In a similar fashion, I'm helping the berry industry connect with bioinformatic-related research, which stands to provide great benefits to future breeding efforts for our berry crops. More projects are in the cauldron and I look forward to the continued development of a program that positively impacts berry production in Washington!

People. Although the new SFH program is still small and growing, I wanted to introduce two important people. First is the technician for the SFH program, Sean Watkinson. Sean is no



mission, Washington Strawberry Commission, WSU Extension, WSU Mount Vernon Research and Extension Center (and the other RECs in the state), WSU Department of Horticulture, WSU College of Agriculture, Human, and Natural Resource Sciences, Whatcom Farmers Co-op, British Columbia Blueberry Council, Oregon State University, Peerbolt Crop Management, Fall Creek, and more! There are many more unnamed individuals that I had the pleasure to meet this season and I look forward to working with you into the future.

Fig. Blueberry field in Whatcom County.

stranger to berry crop production and has been involved in research with WSU for almost ten years. Next is Rachel Rudolph, a doctoral candidate in horticulture. Rachel is arriving from New Mexico, which is where she received her Master's degree. Before that, she came from "a little bit of everywhere" – Paraguay, Kentucky, Nebraska, Hawaii, etc.

Website. Lastly, I wanted to introduce my website, which can be accessed at <http://smallfruits.cahnrs.wsu.edu/>. This website is a resource containing credible information pertaining to berry crop production, with an emphasis on raspberry, blueberry, and strawberry. The website also has a calendar listing important events and a page dedicated to research project updates. While the website is in its infancy, I encourage you to bookmark and visit it, as well as provide me feedback about its contents.

Acknowledgements. This year has been a tremendously positive experience and I wanted to acknowledge the following groups for their support and assistance: Washington Red Raspberry Commission, Washington Blueberry Com-

WSU WINTER WHEAT VARIETY TESTING WSU MT. VERNON

Steve Jones and Steve Lyons

Washington State University (WSU), Mount Vernon Research and Extension Center

2014 WSU Variety Testing Hard Winter Wheat Trial, WSU-Mount Vernon

Variety	Mkt class	Yield	Test Wt.	Protein	Heading date	Plant Ht (in)	Lodging (%)
LCS Colonia	HRW	212.4	56.8	11.6	19-May	41	20
W9*	HRW	183.7	54.8	9.6	27-May	36	0
Norwest 553	HRW	183.1	59.2	10.4	19-May	39	7
W10*	HRW	179.4	51.2	10.6	27-May	35	0
NSA10-7208	HRW	176.7	57.8	10.9	13-May	37	0
SAS W7	HRF	168.5	57.6	10.6	19-May	48	27
SAS13-69*	HRF	168.0	52.8	10.3	20-May	39	0
BAL 6-4*	HRW	167.5	57.2	11.3	19-May	44	20
W15*	HRW	165.7	49.4	10.2	28-May	35	0
LCS Evina	HRW	163.9	59.2	11.1	22-May	46	7
Pactole	HRW	162.5	59.3	11.9	19-May	45	63
W14*	HRW	162.1	52.1	9.9	30-May	36	0
Estica	HRW	160.0	55.4	9.7	28-May	45	0
Barok	SRW	154.9	53.2	11.0	19-May	37	65
4J110002	HRW	153.6	59.1	11.5	19-May	46	37
LCS Allezy	HRW	151.8	56.5	9.3	20-May	40	0
4J110008	HRW	151.2	56.6	10.7	18-May	42	27
4J110009	HRW	147.7	57	10.5	18-May	44	7
OR2100061H	HWW	147.2	56.8	10.0	18-May	41	40
SAS W4	HRF	143.6	51.8	10.8	20-May	46	58
OR2080236H	HWW	142.6	58.1	10.8	27-May	45	78
LCS-Azimut	HRW	139	53.6	11.5	11-May	31	0
SAS 4B	HRF	136.2	51.2	10.9	19-May	43	52
WA 8209	HRW	135.5	57.4	12.0	21-May	41	63
WB-Arrowhead	HRW	134.1	57.5	10.5	13-May	41	33
WA 8186	HRW	133.4	57.5	10.4	27-May	41	63
4J110031	HRW	132.6	58.6	9.8	19-May	48	58
OR2080156H	HWW	132.5	58.3	10.4	18-May	44	38
Genesis	HRW	128.8	57.0	11.5	11-May	36	37
OR2100081H	HWW	116.7	56.3	10.8	17-May	41	27

Keldin	HRW	115.1	56.6	9.2	19-May	42	39
DAS 2	HRW	114.6	58.1	13.1	12-May	39	88
SAS W3	HRF	113.8	49.0	10.6	19-May	46	63
SAS 08-44*	HRF	111.9	57.3	11.7	28-May	42	0
DAS 1	HRW	101.7	56.6	12.1	12-May	40	93
Whetstone	HRW	101.4	54.9	11.1	17-May	42	53
JC1101	HWW	94.5	50.7	11.3	17-May	36	98
WA 8189	HRF	93.2	59.2	11.8	18-May	43	86
WA 8210	HRW	87.8	51.1	12.9	22-May	40	99
WA 8184	HWW	86.5	54.9	11.6	18-May	44	66
Boundary	HRW	86.2	54.8	11.2	21-May	41	79
WA 8211	HRF	85.7	59.7	12.4	20-May	45	46
AP503 CL2	HRW	78.8	53.9	9.9	12-May	40	99
JC1103	HRW	78.2	52.4	13.6	18-May	41	99
Sprinter (WA 8118)	HRW	67.4	54.4	12.2	11-May	43	98
Farnum	HRW	65.3	53.5	11.9	28-May	52	98
Eltan	SWW	51.4	44.2	10.8	29-May	41	90
WB-Rimrock	HRW	46.9	45.9	10.9	18-May	41	99
Bauermeister	HRW	40.2	43.8	13.0	22-May	43	98
Finley	HRW	28.1	44	13.9	19-May	53	98
Mean		125.7	54.7	10.9			
CV		16.2	3.3				
LSD		33	2.9				
Max		212.4	59.7				
Min		28.1	43.8				

Mount Vernon Hard Winter Wheat

1. Grain yield in the WSU-Mount Vernon hard winter wheat trial averaged 125.7 bushels/acre.
2. This nursery was seeded on 5 October, 2013 following summer fallow. Seed was placed at a 100#/acre seeding rate (those marked with * planted at 60#/acre) using a double disc drill on 6-inch spacing. No fertilizer was applied in the fall. Diuron herbicide was applied pre-emergence at 1 lb/ac. A total of 231 #N/ac was applied over the course of the growing season based on soil nutrient tests. Herbicides were applied to control weeds, but no fungicides were applied for stripe rust control.
3. Yields ranged from 28.1 to 212.4 bushels/acre, test weights 43.8 to 59.7 lbs/bu and proteins from 9.3 to 13.9 %. Yield and test weight values within the 10% LSD range of the highest are shown in bold.
4. Heading date is when 50% of the heads are 50% emerged.
5. Final lodging scores were taken on 29 July following a two day rain event of nearly 1.5 inches the previous week.

2014 WSU Variety Testing Soft Winter Wheat Trial, WSU-Mount Vernon

Variety	Mkt class	Yield	Test Wt.	Protein	Heading date	Plant Ht (in)	Lodging (%)
Rosalyn	SWW	175.5	52.4	8.0	19-May	38	0
Bobtail	SWW	161.7	54.3	7.9	19-May	38	0
LCS-Biancor	SWW	160.6	56.7	7.9	13-May	36	0
LWW12-7105	SWW	152.3	55.6	7.8	11-May	35	0
AP700 CL	SWW	149.0	56.1	8.3	19-May	42	0
IDN-02-29001A	SWW	148.7	56.4	8.1	18-May	43	0
Skiles	SWW	146.8	57.3	8.9	18-May	40	13
JC1108	SWW	141.7	54.9	8.6	22-May	47	0
WA 8187	SWWI	140.8	56.4	8.6	19-May	40	0
WA 8173	SWW	140.5	56.5	8.6	22-May	46	0
WA 8176	SWW	140.2	57.2	8.0	27-May	50	0
ARS-Crescent	WC	138.7	55.4	8.2	29-May	44	7
WA 8169	SWW	138.1	55.9	8.2	21-May	44	0
IDN-01-10704A	SWW	138.1	54.8	8.0	19-May	44	0
OR2090473	SWW	136.8	53.1	7.6	19-May	40	0
WA 8212	SWW	135.2	55.8	9.4	19-May	40	3
OR2080641	SWW	133.0	55.2	8.0	19-May	43	0
LWW-04-4009	SWW	132.8	55.9	8.6	27-May	37	55
WA 8203	SWW	132.1	54.7	7.5	26-May	46	0
WA 8177	SWWI	131.6	55.3	10.1	19-May	39	0
Cara	WC	129.0	55.2	8.9	22-May	42	20
ARS010729-1L	SWW	128.7	56.4	9.2	20-May	43	45
Ladd	SWW	128.4	55.2	9.2	20-May	39	0
Kaseberg	SWW	127.3	53.5	8.2	17-May	41	0
Legion	SWW	126.5	55.1	9.5	19-May	41	33
WA 8188	SWWI	126.1	56.2	8.7	19-May	43	0
WB-1070CL	SWWI	126.0	58.4	8.7	16-May	37	0
Bruneau	SWW	122.7	55.8	8.2	19-May	41	25
Puma	SWW	122.6	53.1	9.3	21-May	49	33
ARS-Amber	SWW	122.4	55.3	8.1	21-May	46	13
ARS-Selbu	SWW	121.9	58.7	7.9	21-May	41	0
IDN-03-29902A	SWW	121.6	56.0	8.0	21-May	43	0

Madsen	SWW	121.5	56.3	8.9	22-May	44	0
Trifecta	SWW	119.3	56.1	8.2	17-May	42	0
WA 8206	SWW	118.6	57.0	8.3	19-May	44	3
LCS-Artdeco	SWW	117.9	52.2	8.0	11-May	35	0
WB 523	SWW	117.9	57.5	8.1	19-May	42	0
Otto	SWW	115.7	55.2	7.8	30-May	48	63
WA 8204	SWW	115.6	56.1	8.4	21-May	46	17
WA 8205	SWW	115.1	56.6	8.3	27-May	39	0
Masami	SWW	113.6	55.0	8.4	21-May	41	45
SY Ovation	SWW	112.0	55.4	8.2	19-May	42	43
IDN-02-08806A	SWW	111.5	54.1	8.3	20-May	37	0
ARS010780-3C	WC	109.8	55.3	8.1	28-May	42	17
IDN-04-00405B	SWW	109.5	51.3	9.2	19-May	39	0
Bruehl	WC	109.4	52.1	7.8	28-May	45	13
Stephens	SWW	108.4	53.9	9.0	18-May	42	33
Coda	WC	107.9	56.3	9.2	21-May	46	48
WB 456	SWW	106.7	57.1	9.2	17-May	39	25
WB-528	SWW	95.3	55.7	8.6	19-May	40	7
Mary	SWW	94.3	53.0	8.5	17-May	43	0
ARS-Chrysal	WC	90.7	52.6	8.7	22-May	50	23
ORCF-102	SWWI	90.0	52.7	9.1	21-May	41	0
WB-Junction	SWW	89.3	52.9	8.2	17-May	40	32
SY 107	SWW	74.1	52.6	9.4	21-May	39	98
Tubbs 06	SWW	73.0	51.6	9.2	20-May	43	0
Xerpha	SWW	64.3	51.0	10.0	21-May	38	96
ARS010262-1C	WC	59.2	55.7	9.7	20-May	45	30
ORCF-103	SWWI	58.0	51.8	9.5	27-May	40	99
Eltan	SWW	51.5	48.9	10.6	28-May	39	96
Variety		Yield	Test Wt.	Protein			
Average		120.2	54.9	8.6			
CV		16.0	3.3				
LSD		30.8	3.0				
Max		175.5	58.7	10.6			
Min		51.5	48.9	7.5			

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3. Yields ranged from 51.5 to 175.5 bushels/acre, test weights 48.9 to 58.7 lbs/bu and proteins from 9.3 to 13.9 %. Yield and test weight values within the 10% LSD range of the highest are shown in bold.
4. Heading date is when 50% of the heads are 50% emerged.
5. Final lodging scores were taken on 29 July following a two day rain event of nearly 1.5 inches the previous week.

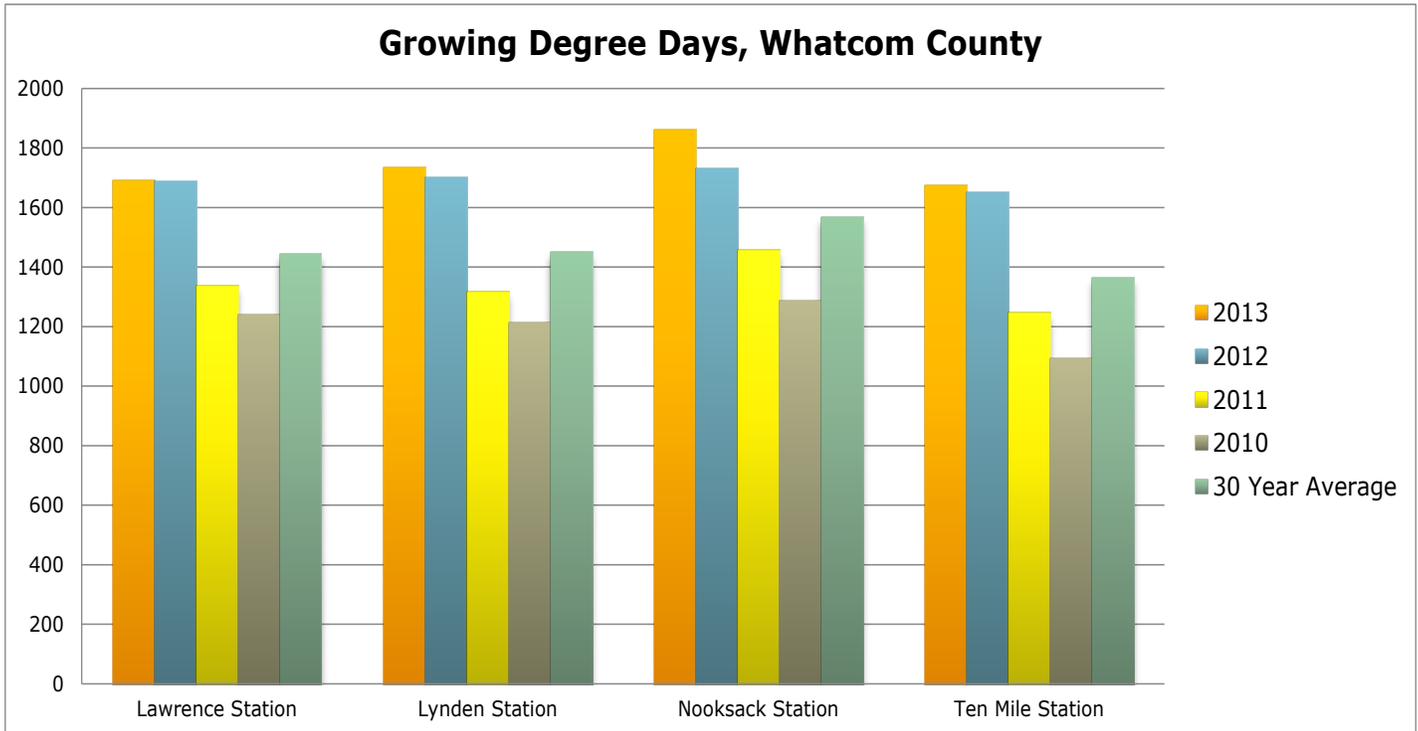
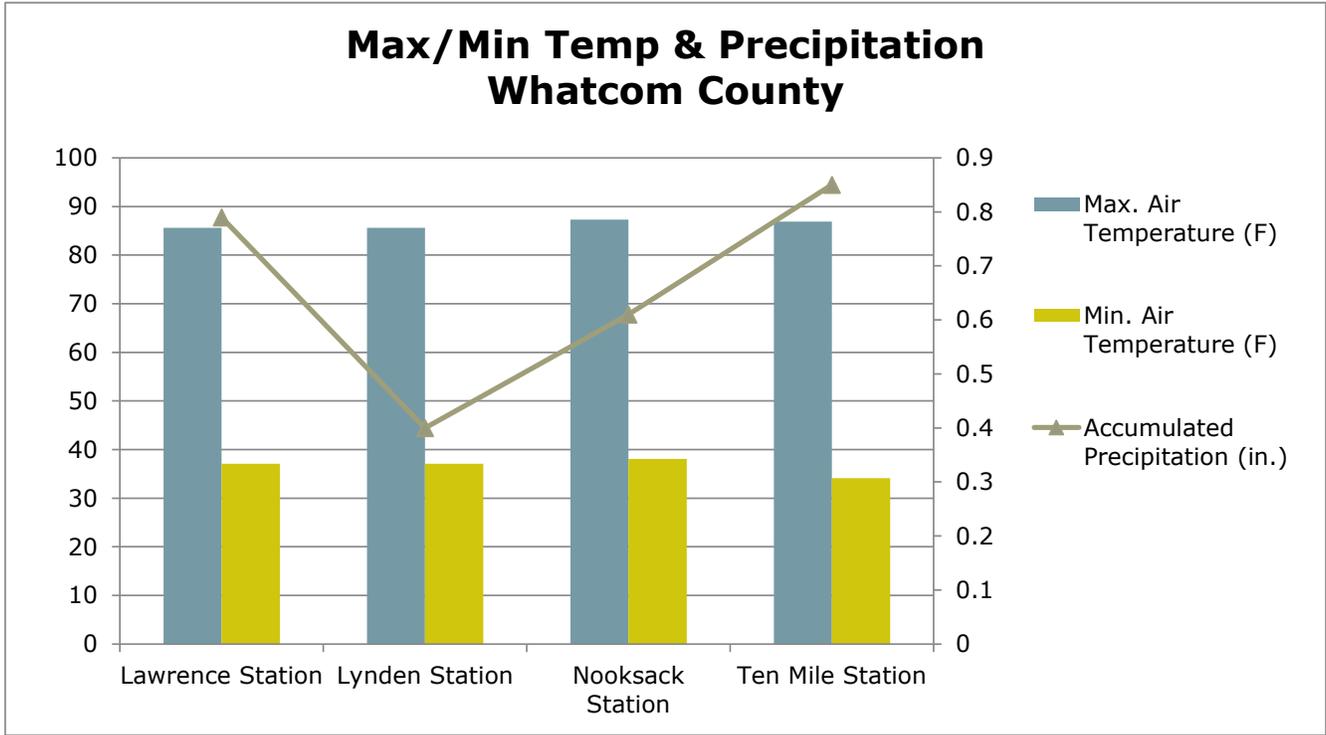
For more information on wheat testing in western Washington contact Steve Lyons: slyon@wsu.edu

Further resources:

<http://plantbreeding.wsu.edu/index.html>

WEATHER UPDATE

All information here is derived from the four weather WSU AgWeatherNet stations (<http://weather.wsu.edu/awn.php>) in Whatcom County. Current weather conditions can be found at: <http://whatcom.wsu.edu/ag/currentdata.html>. Station information can be found [here](#).



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An aging fenceline.

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Upcoming Events

September

Livestock Advisor Training

Sept 15th
6:00 pm - 9:00 pm
Learn to raise your own beef, sheep, goats, poultry, swine and rabbits either traditionally or organically on your farm. Feeding, housing, breeding, fencing, pastures, weeds and more are all covered in this 10 week session. Several livestock farm tours are included to show best management practices of raising livestock.

Honey Bee Survival Workshop

Sept 16th
1:00 - 2:30 pm
WSU Mt. Vernon
Sue Cobey, World-renowned honey bee specialist will present a program about what is being done to insure that honey bee colonies survive and what role you can play.

NABC Fall Orchardng Workshop

Sept 19th
Mt. Vernon, WA
A dynamic one-day workshop featuring a team of experienced professionals led by expert Western Washington Orchardist/Pomologist Gary Moulton. Both Dr. Ines Hanrahan of the

Washington Tree Fruit Research Commission and Dr. Jay Pscheidt of Oregon State University will address the practical aspects of fall orcharding as well as current trends.