AgriNorthwest
Anderson Geographics
Blue Mountain Potato Grower
City of Hermiston
Crop Protection Services
Dexter Fortson Associates, Inc
Dupont
Elmer's Irrigation & Supply, Inc
Frederickson Farming
G2 Farming
Industrial Ventilation, Inc.
Inland Plumbing
Irrigation Specialists
IRZ Consulting
Morrow County
Nelson Irrigation
Northwest Farm Credit Services
Oregon Potato Commission
Oregon Wheat Commission
Portland General Electric
R.D. Offutt Company
RDO Equipment Co
River Point Farms
Ross-Brandt Electric, Inc
Syngenta Crop Protection
Three Mile Canyons
Umatilla County
Umatilla Electric Cooperative
Washington Potato Commission
Zimmatic / Lindsay Corp

THANK YOU!

Crop Production Services

For supporting our

Wheat Field Day

at OSU-HAREC

June 15, 2017

Oregon State University

Hermiston Agricultural Research & Extension Center
Oregon State University, 2121 South 1st Street, Hermiston, OR 97838
T 541-567-6337 | F 541-567-2240 | http//oregonstate.edu/dept/hermiston

HAREC WHEAT FIELD DAY
June 15, 2017

2:30 pm	Registration, Cookies and Drinks
3:00 pm	Phil Hamm, Director, OSU HAREC, "Welcome and Introductions"
3:10 pm	Ruijun Qin, OSU HAREC, "Introduction of OSU-HAREC Cereal Crops Program"
3:20 pm	Mike Flowers, OSU, "Update of Wheat Variety Selection"
3:50 pm	Joshua Adkins, Syngenta, "Role of SDHI Fungicides in Disease Management. Plus - Talinor, New Broadleaf Herbicide"
4:20 pm	Ken Frost, OSU HAREC, "The 2017 Wheat Soilborne Mosaic Update"
4:50 pm	Hannah C. Kammeyer, OSU, "OSU Wheat Varieties"
5:10 pm	Robert S. Zemetra, OSU, "Developing Varieties for Oregon Wheat Producer"
5:40 pm	Mat Kolding, OSU-HAREC, "Cereals as Forage"
6:00 pm	Adjourn

A special thanks to Crop Production Services for sponsoring field day!

Hermiston Agricultural Research and Extension Center

Oregon State University

Introduction of OSU-HAREC Cereal Crops Program

Ruijun (Ray) Qin

Assistant Professor and Agronomist

Oregon State University – Hermiston Agricultural Research and Extension Center

Phone 541 567 8321

Cell   509 820 9298

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Email: ruijun.qin@oregonstate.edu

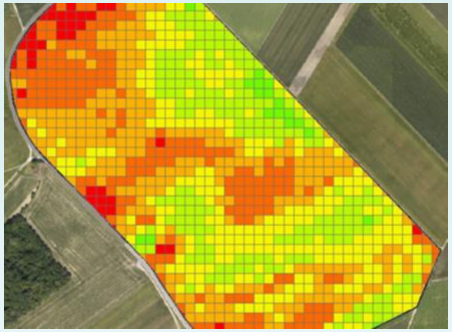
06/15/2017

Important issues for cereal crops

- Crop productivities and quality improvement.
- Irrigation/nitrogen management and nutrient/water use efficiency.
- Fertilization and pest control related environmental concerns (water quality, air quality).
- Weather (i.e., drought, heat) and soil constraints (i.e., low/high pH, unbalanced soil nutrients, soil degradation).
- Low profitability of farming on cereal crops.

On-going/potential projects

- **Updating nutrient guidelines:**
  - Evaluate growth, production and quality of crops, especially new varieties.
  - Understand nutrient availability in soils.
  - Develop good practices in improving nutrient/water use efficiency, crop productivities and grain quality.
  - Use 4R strategy and comprehensive approach.
  - Site-specific management:



On-going/potential projects

- **Sustaining soil quality/health:**
  - Intensive application of chemical fertilization results in soil degradation and environmental issues (NH_3 emissions, green house gas emissions, nitrate leaching).
  - Application of organic materials (manure or biochar), cover crop, green manure:
    - Sustaining soil quality and crop productivity.
    - Alleviating environmental concerns.
    - Improving nutrient use efficiency.

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An Elegant Matrix

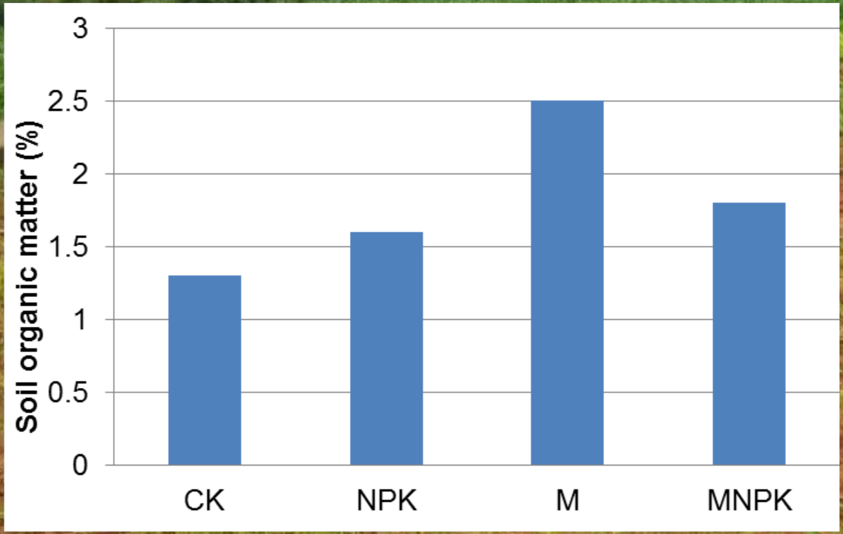
Woody waste finds new markets in biochar

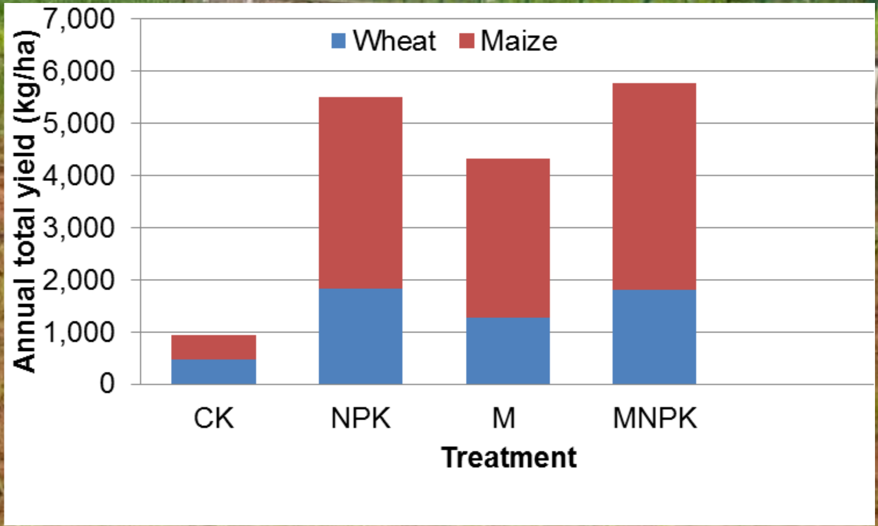
By Lee Sherman | Posted on October 10th, 2013

This story begins with an entrepreneur – a citizen scientist living in the timber town of Philomath, an outdoorsman, fisherman and organic farmer of Dutch and Blackfeet ancestry who's hell-bent on healing an ailing Earth. A few years ago, his longtime quest for planetary remedies began to take form as a towering furnace built with castoff parts and a gasifier once owned by a Y2K doomsday cult. The 20-foot-tall furnace looks more like a tinker's collection of rusty metal than an invention for the future of the planet. But in this

- **Long-term fertilization with organic material and/or NPK**
  (Example of field trial in subtropical region)

Initial 6 years

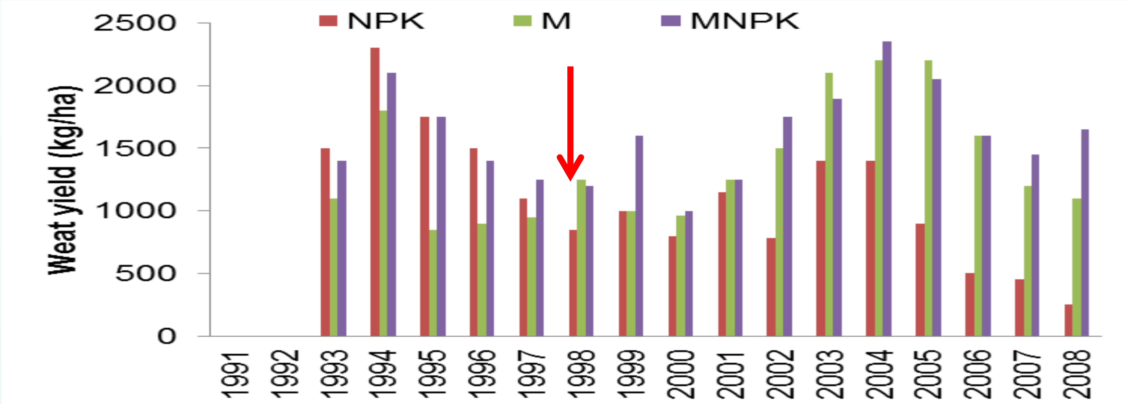


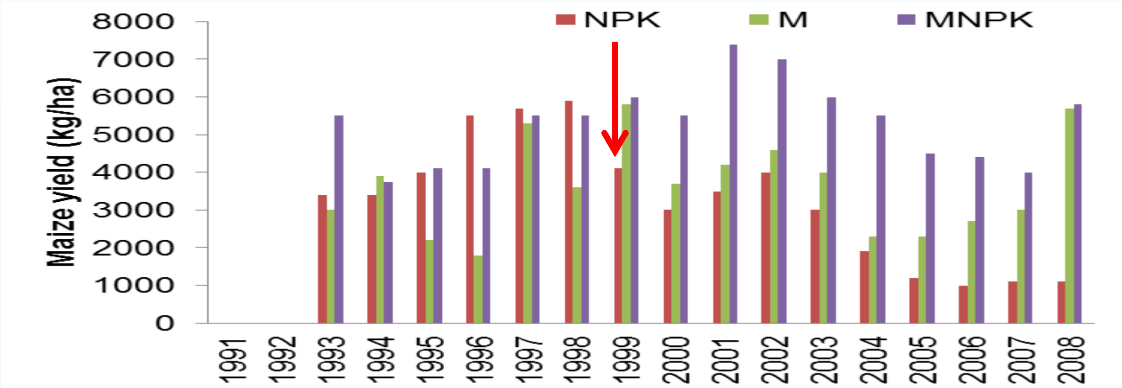


Soil organic matter:
M > MNPK > NPK > CK

Crop yields:
MNPK = NPK>M>CK

- **Long-term fertilization with organic material and/or NPK** ***(Example of field trial in subtropical region)***



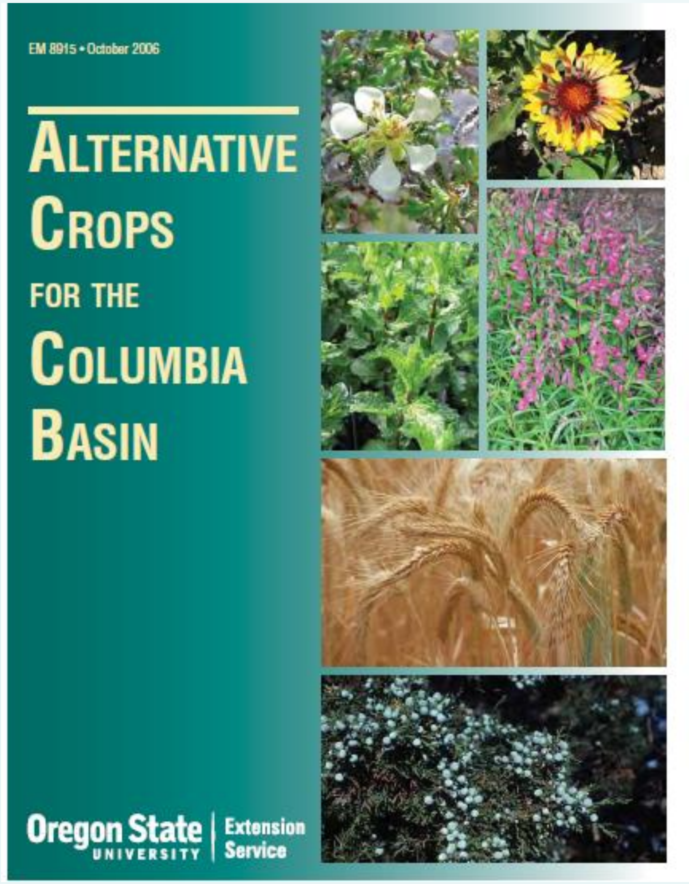


The changes of crop yield over time

22 years later…

On-going/potential projects

- **Variety selection and alternative Crops:**
  - More cereal types and varieties
  - Rotational crops (Adzuki bean, sorghum, quinoa, oat, etc.)



The 2017 Wheat Soil-borne Mosaic Update

Ken Frost
OSU Hermiston Agricultural Research and Extension Center, Hermiston, OR

There is an on-going epidemic of wheat soil-borne mosaic, caused by *Soil-borne wheat mosaic virus* (SBWMV) in PNW wheat. SBWMV was first reported in irrigated crop fields in the Columbia Basin of Oregon in 2005, confirmed in Walla Walla County, 2008. In 2017, the known distribution expanded and now includes a 25 mile stretch of the Walla Walla Valley from North of Dixie, WA to East of Milton-Freewater, OR. This range also seems to be increasing in the lower Columbia Basin of Oregon.

SBWMV can cause severe stunting and mosaic in susceptible wheat, barley and rye crops. In moderate to severely infested fields, harvesting the crop may not be economically worthwhile, but this typically cannot be determined until mid-spring after fertilizer, herbicide, and fungicide applications have been made. In dryland wheat, if infection is too severe to warrant harvest, there are limited options, including leaving the field fallow until fall planting, re-seeding the field with spring wheat, or spraying out and re-seeding with a spring crops (e.g., peas, garbanzo beans). For irrigated wheat, water and fertility management can mitigate losses caused by SBWMV.

When and where to look for the disease (Figure 1):

- SBWM primarily affects Fall-sown small grains.
- Typically first observed in the spring, after the crop begins to green up, but can sometimes be observed in fall or early winter in warmer areas.
- Look for symptoms in low-lying, wet areas of the field – it tends to be more severe in those areas, but is not limited those areas.
- In wet regions or irrigated fields symptomatic patches may occur anywhere.
- Check areas where machinery might first enter a field.
- Disease symptoms typically become less severe and may disappear as the weather warms up.

Figure 1. SBWMV patches in winter-sown wheat. Look for irregularly shaped chlorotic patches that may occur in low-lying or wet area of the field (Photos: Hagerty and APS image database).

Figure 2. Healthy (left) and SBWMV-infected wheat (right) (Photos: Bag).

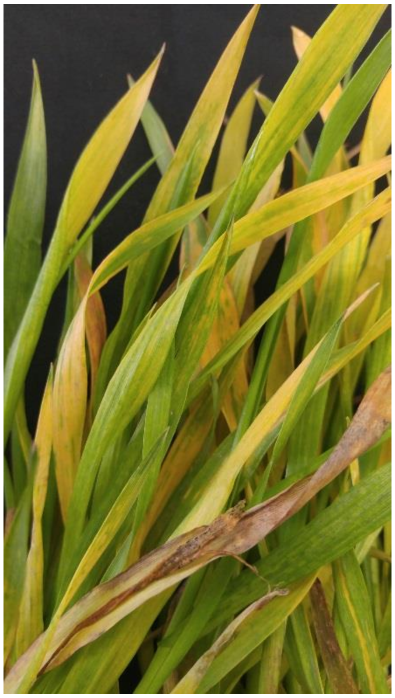


Figure 3. Close up of SBWMV-infected wheat. Note mosaic pattern on leaves (Photos: Bag).

Symptoms:

- Symptoms are variable and often confused with nutrient deficiencies or stress.
- From a distance, affected areas may appear light green or yellow.
- Affected plants will be clustered together in a field sometimes resulting in irregularly shaped patches, shapes typical of soil-borne diseases.
- Typical symptoms of SBWM are stunting, chlorosis, mosaic or irregular mottling, and streaking on leaves but there are multiple strains that can vary in virulence and symptomatology. Some SBWMV strains are known to cause resetting with plant growth that is bunchy or compact.
- Symptoms are not expressed on leaves that emerge after the average temperature rises above 68 °F and diseased patches often disappear in late spring.

Economic significance:

- Virus infection results in reduced kernel weight, tiller number, and test weight.
- More generally, yield losses due to SBWMV are poorly understood and likely underestimated because of misdiagnosis of disease.

Host Range:

- SBWMV causes mosaic diseases in winter wheat and barley. The severity of symptoms varies depending on variety, strain of virus, and weather.
- Experimentally, the host range of U.S. strains is limited to several *Triticum* (wheat) species, *Hordeum vulgare* (barley), *Secale cereale* (rye), *Bromus commutatus*, *B. tectorum* and some *Chenopodium* species.

SBWMV transmission:

- The complete infection process of plants by *P. graminis* and SBWMV is still not well defined.
- SBWMV is transmitted by the soil-borne fungus-like organism *Polymyxa graminis*. It is an endoparasitic slime mold (Plasmodiophoromycota).
- This organism harbors SBWMV RNA in the “resting” spores it produces - resting spores can remain dormant for 30 years.
- Virus-containing zoospores will then germinate when next susceptible host is planted and environmental conditions are conducive for transmission, soil water is critical for *P. graminis*. On the host root, *P. graminis* zoospore will produces a structure that penetrates the plant cell wall and membrane, “injecting” SBWMV into the host plant.
- Optimal temperatures for SBWMV transmission by *P. graminis* varies but is generally greater than 44 °F with appropriate soil moisture conditions. This suggests the virus is not transmitted during winter (i.e. transmission occurs in fall or spring).
- Given the period of time required for SBWMV systemic movement and symptom expression, spring infections by *P. graminis* are not likely to contribute to observed symptoms.
- There is some evidence that SBWMV moves systemically via xylem and virus can be detected in roots and leaves of infected plants.
- **SBWMV is not thought to be seed-transmitted** although some recent research suggests transmission through seed may occur.

Management

Host resistance

- Host resistance to the virus is the most practical disease control strategy. Cultivar resistance has yet to be fully characterized and may occur through multiple mechanisms (i.e. prevents infection, replication or virus movement).
- Resistance to the vector, *P. graminis* may also exist.

Varietal mixtures

- It has been reported that mixtures of susceptible with resistant varieties had less disease than would be predicted based on pure stand comparisons.
- Would be an interesting area for additional research.

Chemical

- Soil fumigants are effective but not economically feasible.

Rotation

- Continuous wheat increases *P. graminis* inoculum and planting virus-susceptible cultivars will increase the proportion of viruliferous P. graminis.
- Crop rotation is not effective because of the resting spores of P. graminis

Sanitation

- Clean machinery or equipment that may move soil field-to-field.

Studies that are getting underway:
Seeking funding to develop new information about 1) the current distribution of SBWMV, 2) factors that influence SBWMV infection and severity, and 3) factors that correlate with geographic movement (i.e. spread) of SBWMV in the PNW.

- Cultivar resistance is considered the best way to **mitigate yield losses due to SBWMV**
- Sanitation and exclusion are the only successful tactics that can be used to **reduce the spread of SBWMV**.

If we know where the pathogen is, we can use appropriate cultivars and sanitize equipment prior to movement.

We are also seeking to better understand environmental drivers of disease development (e.g., rainfall amount, planting dates) to help reduce initial infection.

SBWMV-resistant cultivars can be planted in “high risk” areas or be used if early seeding is necessary for growers managing a large number of acres.

Soft White Winter Wheat Elite Trial

The Soft White Winter Wheat Elite Trial is a new nursery in the program that allows for evaluation of more lines from the breeding program's various breeding sub-projects (groups) across the state. There are four groups in the nursery this year that are comprised of advanced lines and selected check cultivars. The lines in each group are together in the first replication and then randomized in the other replications.

Soft White Winter Wheat Elite Group – These are lines that are in the Statewide Extension trial, lines that needed a 3rd year of evaluation and lines that did not fit in the Statewide Extension trial. The check cultivars for this group are Stephens, SY Ovation, Jasper, SY Assure, Bobtail, Kaseberg, Rosalyn, Skiles, Norwest Duet and Norwest Tandem.

Soft White Winter Wheat soil-borne Wheat Mosaic Virus (sbWMV) Resistance Group – sbWMV is a viral disease that is increasing in occurrence in Eastern Oregon. Once the disease is in the field it will always be present so the only method of control is by disease resistance. This is the first set of advanced lines from a breeding sub-program to develop resistant cultivars. Besides being evaluated in this trial the lines are being evaluated under disease pressure in Eastern Oregon. The check cultivars for this group are SY Ovation (resistant) and Ladd (resistant).

Soft White Winter Wheat 2-Gene Herbicide Resistance Group – The need for herbicide resistant wheat as a tool for grassy weed management has led to the development of herbicide resistant cultivars such as ORCF-101 and ORCF-102 that carried one gene for resistance to the herbicide Beyond. To give the wheat more protection from the action of the herbicide and allow for a 'hotter' herbicide mix, wheat cultivars carrying two genes for resistance have been developed. The advanced lines in this trial are in their second year of mandatory efficacy testing. They are not only herbicide resistant but have shown good resistance to stripe rust and crown/root diseases. They also may have a level of Septoria resistance that would be of use in the Willamette Valley. The check cultivars for this group are ORCF-101 (1-gene), ORCF-102 (1-gene), Curiosity CL+ (2-gene) and UI Magic CL+ (2-gene).

Soft White Winter Wheat Plant Pathology Group – Dr. Chris Mundt has been working on a Foote x Madsen population to study stripe rust and Septoria resistance. The three lines in this group had the best stripe rust resistance and Septoria leaf blotch resistance in the population. These lines plus the new 2-gene resistance lines are being used as parents in a new breeding sub-program specifically targeting resistance to Septoria leaf blotch.

Soft White Winter Wheat Elite Yield Trial - 2017

range											
10	Fill	Fill	Jasper	OR2090473	11-163-1C	OR2130485	ORI2150061	11-163-17C	ORCF 102	Skiles	MxF RIL 3
9	Bobtail	OR2121252	11-163-16C	NW Duet	SY Ovation	UI-Magic	OR2130579	ORCF 101	11-163-14C	OR2101043	SY Assure
8	OR2121086	Curiosity CL+	MxF RIL 2	Rosalyn	ORI2150031	MxF RIL 1	Ladd	Kaseberg	OR2121285	OR2130081	11-225-2C
7	ORI2150031	SY Ovation	Rosalyn	11-163-14C	OR2101043	Kaseberg	Stephens	ORI2150033	NW Tandem	11-163-5C	OR2121284
6	Jasper	ORCF 102	OR2130081	OR2121285	Stephens	NW Duet	SY Assure	ORCF 101	OR2130579	11-163-5C	MxF RIL 2
5	Ladd	11-225-2C	MxF RIL 3	OR2121252	OR2130485	Curiosity CL+	OR2090473	Bobtail	ORI2150061	11-163-16C	ORI2150033
4	NW Tandem	11-163-17C	OR2121284	Skiles	UI-Magic	MxF RIL 1	11-163-1C	OR2121086	MxF RIL 3	MxF RIL 2	MxF RIL 1
3	11-163-14C	11-163-16C	11-163-17C	11-225-2C	ORCF 101	ORCF 102	Curiosity	UI Magic	ORI2150031	ORI2150033	ORI2150061
2	11-163-5C	11-163-1C	Ladd	OR2130579	OR2130081	OR2121284	OR2090473	OR2130485	OR2121285	OR2121086	OR2121252
1	Stephens	Sy Ovation	Jasper	SY Assure	Bobtail	Kaseberg	Rosalyn	Skiles	NW Duet	NW Tandem	OR2101043