Integrated Pest Management
University of Missouri

DEC 2015

Integrated Pest & Crop Management

Plant Diagnostic Clinic End of Year Summary for Agronomic Crops — *by Patricia K. Hosack*

As of November 30th, the Plant Diagnostic Clinic (PDC) had a total of 400 samples submitted in 2015. Most samples were submitted for disease diagnosis, though some were for insect or plant/weed identification (Figure 1). Despite the excessive rain and the many acres of production fields that were not planted, agronomic crops were the most frequently submitted for disease diagnosis. Soybean samples were the most numerous, however corn, wheat, alfalfa and lespedeza were also submitted (Figure 2).

Due to the rainy spring and early summer, it is no surprise that Pythium diseases were the most numerous. Pythium is an oomycete, or a water mold, meaning it loves water and takes advantage of it by producing a motile spore called a zoospore that can 'swim' from root to root or plant to plant. Eleven corn and eleven soybean samples were diagnosed with Pythiumdiseases such as root rot and seedling damping off. An additional sorghum sample was also positive for Pythium root rot. Diagnosis of Pythium diseases is based on the observation of oospores (non-swimming spores) in plant tissues or via a serological assay. There are many species of Pythium that can be pathogenic, with each having a range of preferred temperatures for growth and infection.

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Figure 1.

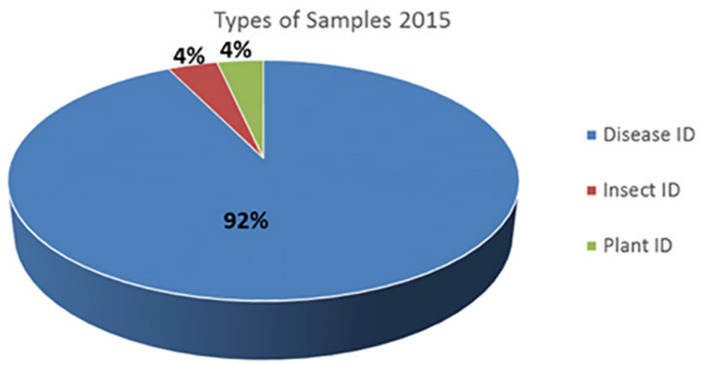
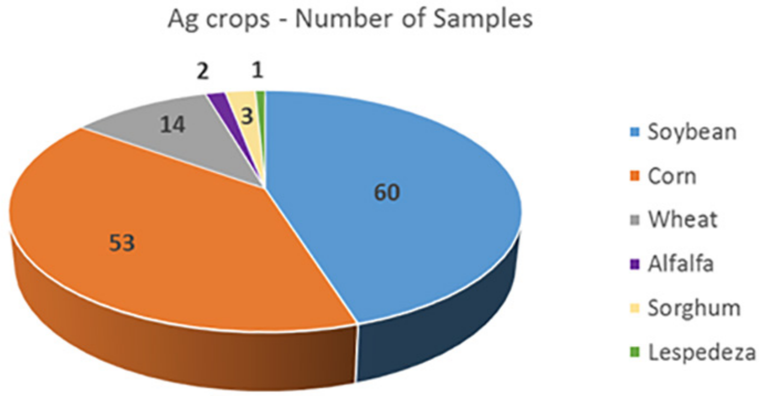


Figure 2.



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Other confirmed soybean diseases in 2015 included:

- Phytophthorastem rot (Phytophthora spp.) 4 samples
- Charcoal rot (Macrophomina phaseolina) 2 samples
- Cercosporaleaf bligh2t (Cercospora spp.) 2 samples
- Sudden death syndrome (Fusarium virguliforme) 2 samples
- Soybean stem borer (Dectes texanus) 2 samples
- Frogeye leaf spot (Cercospora sojina) 1 sample
- Phyllostictaleaf spot (Phyllosticta spp.) 1 sample
- Anthracnose (Colletotrichum truncatum) 1 sample
- Brown stem rot (Cadophora gregata) 1 sample
- Rhizoctonia crown and stem rot (Rhizoctonia spp.) 1 sample

Other confirmed corn diseases in 2015 included:

- Gray leaf spot (Cercospora zeae-maydis) 7 samples
- Northern corn leaf blight (Exserohilum turcicum) 4 samples
- Diplodiaear rot (Diplodia maydis) 2 samples
- Anthracnose (Colletotrichum graminicola) 1 sample
- Blue mold rot (Penicillium spp.) 1 sample
- Physodermabrown spot (Physoderma maydis) 1 sample
- Southern corn rust (Puccinia polysora)1 sample
- Thrips damage (unidentified thrips) 1 sample

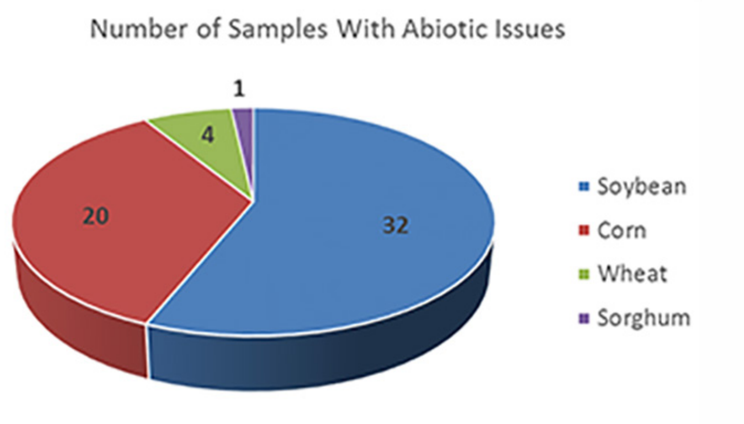
Confirmed wheat diseases in 2015 included:

- Bacterial leaf streak (Xanthamonas spp.) 4 samples
- Loose smut (Ustilago tritici) 1 sample
- Scab (Fusarium spp.) 1 sample
- Wheat soil-borne mosaic (Wheat soil-borne mosaic virus) 1 sample
- Glume blotch (Septoria tritici) 1 sample
- Sharp eyespot (Rhizoctonia cerealis) 1 sample
- Stripe rust (Puccinia striiformis f.sp. poae) 1 sample

Forage crop issues included a sample of lespedeza with tar spot, and two alfalfa samples, one with a root and crown rot complex and the other with with suspected insect damage from the Clover root curculio (Sitona hispidulus). The most diagnosed issues were abiotic, including chemical injuries and environmental issues such as soil compaction or drought stress (Figure 3).

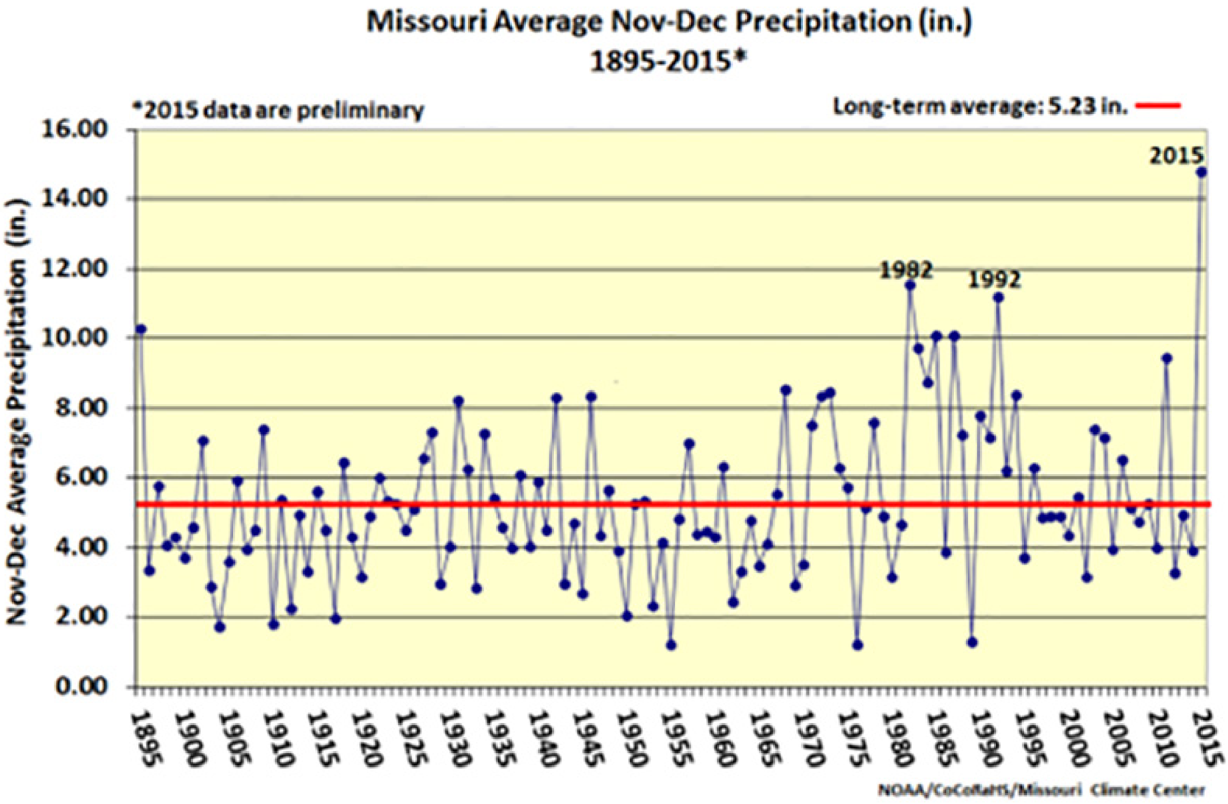
The PDC is open year round for sample submission. The typical turn around is 48 hours, depending on the day of the week the sample is submitted. If special testing is required, such as an ELISA or culture plating, turn around time varies. A general diagnosis is $15, additional services are $10 each. For agronomic crops, additional services may include culture plating, wheat virus ELISA assays, Goss's wilt serological testing, Pythium spp. serological testing, Phytophthora spp. serological testing or other miscellaneous molecular testing methods. Please see the PDC website http://plantclinic.missouri.edu/ or call (573-882-3019) for more information.

Figure 3.



Unprecedented Rainfall, Flooding and Impact on Wheat and Cover Crops—*by Gregory A. Luce*

There have been many questions concerning winter wheat and cover crops that have been subjected to the adverse effects of flooding. With the unprecedented rainfall in the last two months across Missouri (see chart below from Pat Guinan), many winter wheat and cover crop fields have been flooded or saturated for varying periods in portions of the state. The impact that flooding, waterlogging and potential ice sheeting may have on the winter crops could be significant. As with most weather related events, the level of impact will need to be judged on a field by field basis yet there are some important factors to keep in mind.



Crop injury from waterlogging and ice sheeting is primarily caused by the lack of oxygen. A main concern of the flooding is the impact on the growing point of wheat which is below ground until after tillering. The growing point is subject to water saturation or ice cover and the amount of oxygen available to plant tissues below the surface of the soil decreases as plants and microorganisms use up what is available. The depletion of oxygen in saturated soil is dependent on a number of factors, but temperature is a very important factor.

At higher temperatures the rate of oxygen depletion is greater. For instance, during summer conditions, the oxygen level in flooded/saturated soil reaches the point that is harmful to plant growth after 48 to 96 hours. Water-logging also leads to accumulations of CO2, which can actually be harmful to plants in high concentrations. Research and observations suggest that most crop plants submerged for more than five to seven days, when temperatures are greater than 65 degrees, will die and that yield can be impacted by flooding after as few as 48 hours. Under cooler temperatures, the negative effects of flooding take longer to impact plant tissues, so we can reasonably expect winter wheat to tolerate flooding for a longer time than described above for midsummer conditions.

Dormancy of wheat, or cover crops like cereal rye, greatly reduces the requirement for oxygen but does not eliminate it. With the warm December, the winter crops were not dormant when the wet weather began. Considering the extreme conditions, it seems reasonable that some stand loss is expected in the areas where water saturation or ice sheeting remains for long periods. However, before writing off a winter wheat crop that

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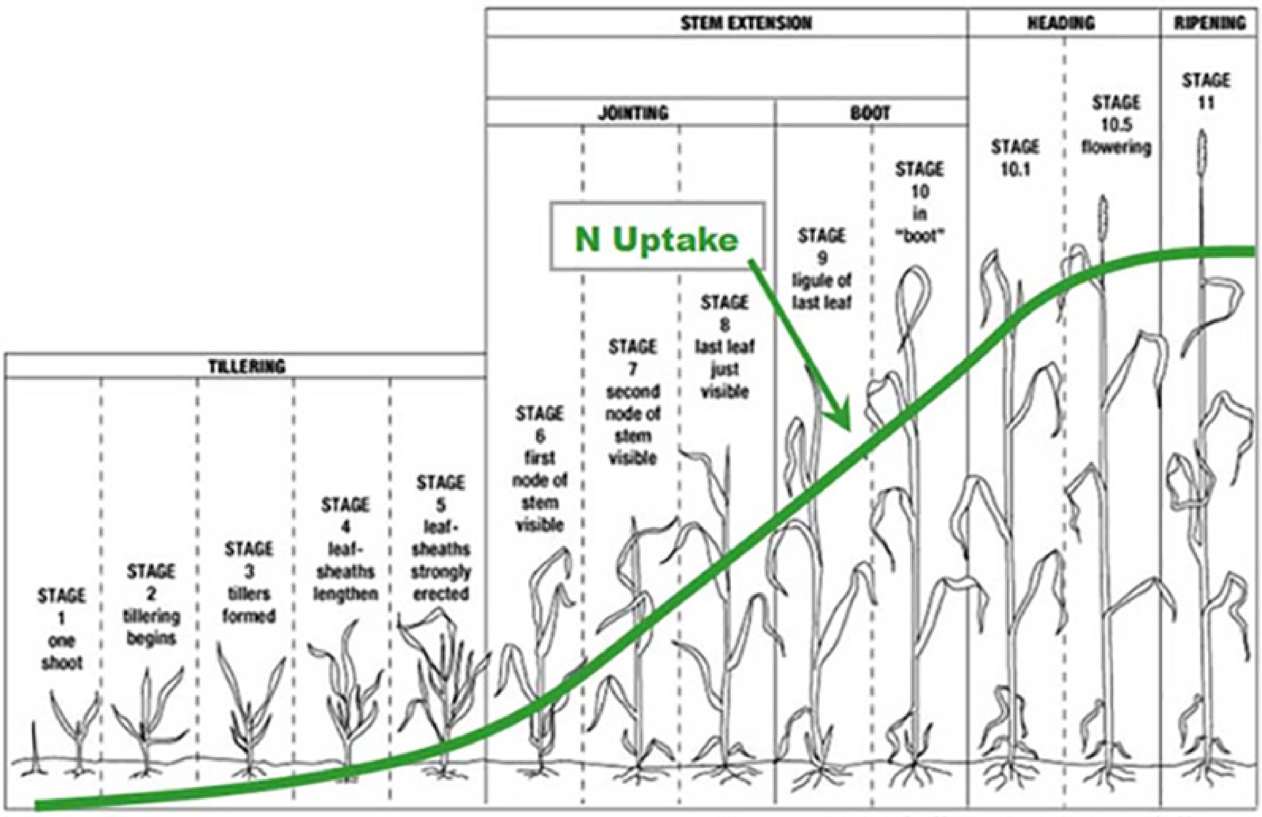
has been flooded, or ice covered, experience has taught me that wheat is very resilient. I would suggest that growers confirm wheat viability by bringing a sample inside a warm building and observing it for regrowth after a couple of days. This could be done later in the winter, prior to green-up. If, after exhibiting new leaf growth, the plants also sprout new white roots, a grower can be relatively assured that the sampled area holds some live plants. If the plant is in good condition, the crown will appear white and healthy, and new roots will be developing. At green-up, field scale decisions will need to be made. The critical threshold for a wheat grain field is an average of 12 to 15 live plants per square foot. Below that level replant is needed.

Wheat requires a chilling period called vernalization in order for wheat to move from tillering into the reproductive stages. After tillers have formed, and vernalization occurs through the winter period, wheat plants enter the "greening up" phase and begins erect growth, Feekes 4, and is closely followed by Feekes 5.

During green-up, Feekes growth stage 4-5, it is an optimal time to make spring topdress nitrogen applications and to apply post-emergence herbicides for weed control. Feekes growth stage 4-5 also is an important time to scout for soilborne virus diseases and early-season foliar diseases such as powdery mildew and leaf blotch.

Questions have also been raised about nitrogen losses from the soil. Excessive water can cause denitrification and leaching of nitrate nitrogen beyond the rooting zone of the developing plant, particularly in lighter-textured soils. Soil temperatures below 50 F slow the nitrification and denitrification processes, so loss of nitrogen at this point may not be significant. Also, most nitrogen tends to be applied to wheat in the spring anyway. To maximize yield response in winter wheat, the majority of nitrogen fertilizer should be applied before jointing takes place. The chart above shows the rapid uptake of nitrogen from Feekes 6 to 10.

Right now it is good to understand the processes involved from flooding and ice covered conditions on the wheat crop. Be prepared to address the potential stand issues at green-up and determine if it is justified to keep a stand for grain, and if nitrogen or weed control is needed.



Source: S.A. Ebelhar, University of Illinois.

Weather Data for the Week Ending December 29, 2015

Station	County	Weekly Temperature (ºF)						Monthly Precipitation (in.)		Growing Degree Days‡	
Station	County	Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	December 1-29	Departure from long term avg.	Accumulated Since Apr 1	Departure from long term avg.
Corning	Atchison	36	25	49	14	31	+4	3.74	+2.69	3820	+369
St. Joseph	Buchanan	39	27	58	18	32	+4	2.32	+1.01	3723	+281
Brunswick	Carroll	43	31	65	24	37	+8	4.05	+2.41	3973	+480
Albany	Gentry	38	27	59	20	32	+6	2.52	+1.27	3449	+99
Auxvasse	Audrain	44	32	66	26	38	+9	6.77	+4.41	3815	+255
Vandalia	Audrain	44	33	64	26	38	+9	5.79	+3.40	3775	+280
Columbia-Bradford Research and Extension Center	Boone	44	32	65	25	38	+7	6.29	+4.03	3751	+85
Columbia-Capen Park	Boone	46	32	69	26	39	+8	6.08	+3.90	3755	-44
Columbia-Jefferson Farm and Gardens	Boone	*	*	*	*	*	*	*	*	*	*
Columbia-Sanborn Field	Boone	45	33	68	26	39	+8	5.97	+3.70	4101	+292
Columbia-South Farms	Boone	45	32	67	25	39	+8	6.23	+3.96	3852	+180
Williamsburg	Callaway	45	32	66	26	38	+8	6.31	+3.73	3801	+305
Novelty	Knox	41	31	64	25	36	+8	4.13	+2.25	3505	+89
Mosow Mills	Lincoln	47	34	64	28	41	+11	9.43	+6.99	*	*
Linneus	Linn	41	29	63	22	35	+7	2.74	+1.27	3612	+255
Monroe City	Monroe	43	32	64	26	38	+10	5.11	+2.92	3688	+211
Versailles	Morgan	46	32	68	25	39	+7	7.22	+4.83	4054	+274
Green Ridge	Pettis	44	30	65	23	38	+8	5.19	+3.05	3856	+319
Unionville	Putnam	39	29	61	23	33	+7	3.72	+1.79	*	*
Lamar	Barton	47	32	64	25	40	+7	8.32	+5.80	4070	+114
Butler	Bates	45	31	63	22	38	+7	4.93	+2.90	*	*
Cook Station	Crawford	53	35	66	26	44	+11	8.98	+5.92	3740	-20
Round Spring	Shannon	58	36	67	28	45	+13	10.23	+7.41	3630	+32
Mountain Grove	Wright	52	34	67	25	43	+12	8.67	+5.24	3642	+63
Delta	Cape Girardeau	59	43	67	35	50	+16	6.96	+2.92	4039	-137
Cardwell	Dunklin	63	46	74	38	54	+18	7.12	+2.57	4483	-83
Clarkton	Dunklin	62	45	70	37	52	+16	9.03	+5.11	4447	-45
Glennonville	Dunklin	62	44	73	36	52	+15	7.43	+3.67	4483	+26
Charleston	Mississippi	62	46	71	37	53	+19	6.88	+3.09	4435	+212
Hayward	Pemiscot	63	46	72	37	54	+18	8.11	+3.75	4608	+105
Portageville	Pemiscot	63	46	72	37	54	+18	6.15	+1.73	4702	+163
Steele	Pemiscot	64	46	75	38	54	+17	6.60	+1.86	4557	+6

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

Weather Data provided by Pat Guinan | GuinanP@missouri.edu | (573) 882-5908

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