Plant Protection Programs University of Missouri

Integrated Pest & Crop Management

Missouri Winter Weather Summary

By Pat Guinan

Preliminary numbers are indicating the current winter in Missouri will rank as one of the coldest winters nearly 30 years. Since the winter of 1979-80, only three winters have had much below normal temperatures for the December through February period and this is the first time since the winter of 1981-82 that all three months reported below normal temperatures for the state.

An unusually persistent weather pattern contributed toward many below normal temperature days. One of the strongest cold snaps in more than a decade occurred during the first 10 days of January and the most recent current cold period had a grip on the Show Me state for much of February with temperatures averaging 5-7 degrees below normal.

As February came to an end, the preliminary average statewide temperature for winter in Missouri was 28.1 degrees F, which is similar to the cold winters of 1981-82 (27.6°F) and 2000-01 (28.3°F). This winter will rank as the 13th coldest winter for the state over the past 116 years.

Its not only been a cold winter, but a wet one as well. Winter precipitation was above normal across northern and central sections and has set the stage set for potential spring flooding. There has been little moisture loss since the cold and very wet October we witnessed last year. The state averaged nearly 10 inches of rain that month and it ranked as the second wettest October on record.

Evaporation rates were minimal with the unusually cold winter temperatures and soils remained frozen for extended periods of time, contributing to continued surplus soil moisture conditions statewide. River and streamflow levels are running higher than normal and lakes, livestock ponds and lagoons are at capacity. Below normal temperatures are expected to persist through March and will mitigate drying opportunities.

The St. Louis weather forecast office is forecasting a greater than 50% chance of significant flooding in their region over the next 90 days. Flood potential will be monitored closely over the next several weeks since snowpack over a large part of the upper Missouri and Mississippi River basins will likely translate to runoff as spring temperatures rise. Climatologically, spring is also Missouri's wettest season.

Another aspect of this winter has been snowfall. The cold temperatures provided numerous opportunities for snowfall across the state with portions of far northwestern Missouri reporting nearly 50 inches of snow. Some communities in northwestern Missouri reported a continuous blanket of snow on the ground for three months! A weather observer located near Gallatin, MO, in Daviess county, reported 50.1 inches of snow so far this winter. Other reports from Nodaway county were approaching 50 inches. Generally, statewide snowfall totals ranged from 20-40 inches across the northwestern half of the state with 10-20 inches more common across the rest of Missouri.

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Table of Contents

Virus Diseases May Begin to Show Up in Missouri Wheat Fields

By Laura Sweets

According to the Missouri Agricultural Statistics Service, fall seedings for the 2010 winter wheat crop totaled 240,000 acres, down 46 percent from the 2009 seed acreage and 66 percent below the level of 2 years ago. This is the lowest winter wheat seeding on record, mainly because wet conditions led to an extremely late harvest for row crops. Many of the planted acres were planted later than usual because of the wet conditions and late harvest. Now that temperatures have finally begun to warm up, it may be possible to access stands for winter survival, uniformity and the presence of wheat virus diseases.

Green-up is the time of the year when symptoms of wheat spindle streak mosaic, wheat soilborne mosaic and barley yellow dwarf may become evident in winter wheat fields. Both wheat spindle streak mosaic and wheat soilborne mosaic tend to be more severe when wet conditions occur after planting in the fall or in the late winter/early spring months. Cool spring temperatures also enhance symptom development of both wheat spindle streak mosaic and wheat soilborne mosaic. Most of the state was wet last fall and this spring has been unusually wet and cool for much of the state. So it is possible that wheat spindle streak and wheat soilborne might be more prevalent this season than they have been the last few years. Although there are no rescue treatments for wheat virus diseases, it is still a good idea to scout fields for plants showing virus symptoms and to send in samples to identify the virus or combination of viruses that are present so that proper preventative management measures can be used the next time wheat is planted in that field.

Descriptions of the wheat virus diseases most likely to occur on winter wheat in Missouri are given in the following paragraphs.

Symptoms of wheat spindle streak mosaic appear in early spring as yellow-green streaks or dashes on the dark green background of the leaves. These lesions usually run parallel to the leaf veins and tend to be tapered at the ends giving the lesions a spindle shaped appearance. Foliage symptoms are most obvious when air temperatures are about 50°F. As temperatures warm-up, foliage symptoms of wheat spindle streak mosaic tend to fade. Plants may be slightly stunted and have fewer tillers than normal. Wheat spindle streak mosaic tends to be more prevalent in lower, wetter areas of a field. The virus which causes this disease is soilborne and is spread by the soil fungus Polymyxa graminis. Wet falls tend to favor outbreaks of wheat spindle streak mosaic the following spring.

Wheat soilborne mosaic causes light green to yellow green to bright yellow mosaic patterns in leaf tissues. Symptoms are most evident on early spring growth, and warmer temperatures later in the season slow disease development. Symptoms of wheat soilborne mosaic are not always particularly distinctive and might occur as a more general yellowing similar to that caused by nitrogen deficiency. Infected plants may be stunted. This disease may be more severe in low lying, wet areas of a field. The soilborne wheat mosaic virus survives in the soil and is spread by the soil fungus Polymyxa graminis. Again, wet falls tend to favor outbreaks of wheat soilborne mosaic the following spring.

Barley yellow dwarf is an extremely widespread virus disease of cereals. Symptoms include leaf discoloration ranging from a light green or yellowing of leaf tissue to a red or purple discoloration of leaf tissue. Discoloration tends to be from the leaf tip down and the leaf margin in towards the center of the leaf. Plants may be stunted or may have a rigid, upright growth form. Symptoms are most pronounced when temperatures are in the range of 50-65°F. The barley yellow dwarf virus persists in small grains, corn and perennial and annual weed grasses. More than twenty species of aphids can transmit the barley yellow dwarf virus. Symptoms may be more severe and yield losses higher if plants are infected in the fall or early in the spring. Infections developing in late spring or summer may cause discoloration of upper leaves but little stunting of plants or yield loss.

The other virus disease likely to occur on winter wheat in Missouri is wheat streak mosaic, but symptoms of this disease are not usually evident until later in the season when air temperatures increase. Wheat streak mosaic causes a light green to yellow green mottling and streaking of leaves. Symptoms may vary with variety, virus strain, stage of wheat growth when plants are infected and environmental conditions. Plants may be stunted. As temperatures increase later in the spring, yellowing of leaf tissue and stunting of plants may become more obvious. The wheat streak mosaic virus is spread by the wheat curl mite. Symptoms are frequently found along the edges of fields where the mite vector first entered the field. Both the wheat streak mosaic virus and the wheat curl mite survive in susceptible crop and weed hosts. Thus, the destruction of volunteer wheat and weed control are important management options for wheat streak mosaic.

A management program for virus diseases of wheat should include the following steps.

- Plant good quality seed of resistant varieties.
- Avoid planting too early in the fall to minimize opportunity for insect vectors to transmit viruses to young plants.
- Destroy volunteer wheat and control weed grasses.
- Maintain good plant vigor with adequate fertility.

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Streaky Nitrogen Applications: Why They Happen and What You Can Do About Them

By Peter Scharf

Nearly every year, excessive rainfall causes loss of soil and fertilizer nitrogen to the extent that visual deficiency symptoms are seen in corn somewhere in Missouri. During the past two growing seasons, nearly all of Missouri and large swaths of the midwest have been affected in this way, causing about a billion bushels in lost yield potential by my estimation (see article in the last issue of Insect, Pest and Crop Management).

Every year I take aerial photographs of areas where the corn is experiencing N deficiency (figure 1). In these photographs, at least half of the fields show the deficiency occurring in streaks. When I georeference the photos and measure the distances between the streaks, they always correspond to common swath widths of fertilizer applicators.

Figure 1.

I believe that we have a serious, and increasing, problem with uneven distribution of N fertilizer. This problem sticks out like a sore thumb when nitrogen loss occurs, because the areas receiving low N rates have a light-green or yellow-green color that is very visible. But the uneven applications are still happening in years with low N loss, and potentially are causing yield loss in those years as well.

Uneven application of granular N sources

Granular N sources (urea and ammonium nitrate) are increasingly susceptible to uneven application. This is because more and more of our supply of granular N is imported. Urea imports more than doubled from 1997 to 2007.

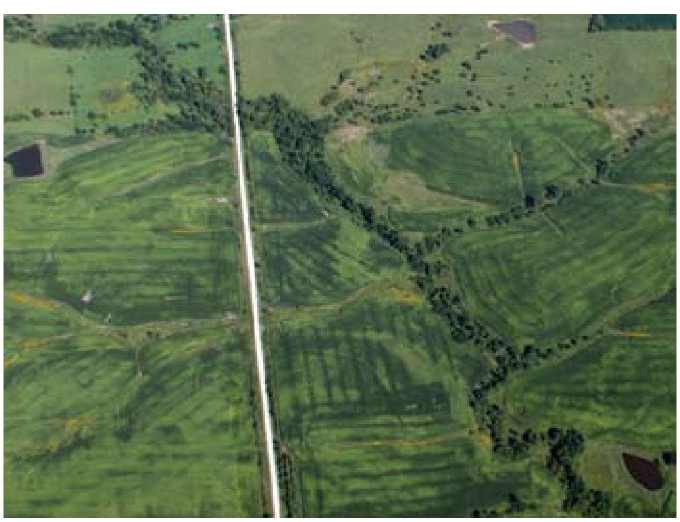

Figure 2.

Why is imported granular N more susceptible to uneven application? It's due to the increased handling that these materials go through. Every time granular N is handled, especially when it goes through an auger, forces on the granules tend to break them into smaller pieces. My observation in the urea and ammonium nitrate that I have handled is that the proportion of fine particles has increased over the past 15 years.

Most granular N applications are made using spinner spreaders to throw the fertilizer. Unfortunately, you can't throw dust very far. When spreading material with a lot of fine particles, the rate immediately behind the spreader will be much higher than the rate at the edge of the pattern. This results in streaks of high and low N availability which can be seen in aerial photographs of corn fields that have experienced N loss (figure 2). The corn in the N-deficient streaks will have lower yields due to this deficiency.

Spreading granular N evenly

There are several potential solutions to the problem of uneven application of granular N. One is the use of air-boom spreaders. Fine particles can be blown down the boom tubes on a stream of air to produce a relatively even application. This is a pretty good solution, except that I've heard from operators that the fine materials will collect at the places where the boom folds, clogging it up. My understanding is that these places are difficult to access and clean. Maintenance costs and operator fatigue are also issues with air-boom spreaders, and I've heard several people who have these applicators say that they intend to go back to using spinner spreaders in the future.

From the producer point of view, one option is to inspect the fertilizer material before agreeing to purchase it. This requires

Continued on page 28

Streaky Nitrogen Applications: Why They Happen and What You Can Do About Them

continued from page 27

time and hassle, along with a backup plan of how to proceed if the fertilizer material is not up to par.

Another possibility is to screen out the fine particles and only apply the larger particles. I'm not aware of anyone doing this. It would require a plan for how to still get value out of the fine particles, and how to charge enough extra to cover the labor and management costs of implementing this solution. Part of my aim in writing this article is to convince producers (and therefore retail outlets) that they can afford to pay more for quality materials. Or, from the other direction, that they can't afford to continue having streaky N applications.

The last option is to 'double-spread' which can either be done by spreading in narrower swaths than the machine is designed for, or by spreading a half-rate in one direction and then spreading the other half crosswise to the first. This practice certainly helps to even out applications, but it's potentially very expensive because it cuts the applicator's total acreage by as much as half. It makes it harder to pay for the applicator and cuts into precious field time. Especially in a year like this one, when very little fertilizer (ammonia, phosphate, potash) got applied in the fall, applicators will be going full bore this spring when conditions are right (and even when they aren't) to catch up. I predict that very little double-spreading of granular N will happen this spring.

Figure 3.

In the long run, we need to re-granulate the dry N that we import. This will take advantage of low natural gas prices (and therefore fertilizer production costs) elsewhere in the world while still delivering a quality product that can be spread evenly on our crops. Until producers are willing to pay a premium for this product, and someone invests in the infrastructure to make it happen, we'll have to get by with the solutions above.

Uneven application of anhydrous ammonia

Streaks associated with uneven applications of anhydrous ammonia are narrower than those associated with granular N, and may also be less common. I've seen them both parallel to the row and at an angle to the row (figure 3).

Spreading anhydrous ammonia evenly

I hear a wide range of opinions about how to get even N applications from anhydrous ammonia. Work done by Gerry Gogan, formerly of Farmland, showed clearly that the main problem with uneven distribution of anhydrous ammonia was poor splitting at the manifold. Progress has been made in manifold design over the past 15 years, but I am not familiar enough with these products to know which one to recommend. Manifolds with interior structures that are designed to swirl the ammonia around the manifold chamber apparently improve distribution, as do vertical dam manifolds. At the high end, pumping/metering systems provide the most thorough solution but can be very expensive.

With old-style manifolds that put out uneven rates, randomizing the hoses can undo a lot of the damage. If one manifold port is putting out a low rate, the port next to it is likely to put out a low rate as well. If the hoses from these two ports go to adjacent knives, then both knives will be putting out low rates and the corn in between will not get as much N as intended. If one is putting out a low rate and the other a high rate, the corn will be much happier. Other practices, such as making all hoses the same length, inspecting knives for burs/blockage, and replacing knives regularly can all help to make applications more even, but are considerably less important than how evenly the material stream is split by the manifold.

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Have You Tested Your Soil? Soil Fertility Summary Trends in Missouri for 2009 Prompts That You Should!

By Manjula Nathan

Spring is the time when normally the labs get flooded with soil samples for testing. Even though fall sampling is ideal for farmers, as it gives the starting point to plan for next year's nutrient management plan, we have many who wait until spring to test their soils. Last year, the excess rainfall during the months of September and October delayed harvest and the cooler temperatures that followed made it nearly impossible for producers to sample their fields in fall. To add to the problem, the winter weather conditions that persisted until mid February prolonged frozen soil conditions, causing further delays in sampling in early spring.

The soil fertility summary provides a valuable index of the soil fertility status of Missouri farmland and identifies broad soil fertility trends in the state. The trends in soil fertility status summary in the state for 2009 emphasize the importance of soil testing (Table 1). Of the 18,615 field crops samples tested by the MU Soil Testing Labs in the state during 2009, about 30% tested very low to low in soil pHs (less than 5.3) indicating lime should be applied for economically viable crop production. Another 37% of the samples received tested medium in soil pHs (5.4 to 6.0), and is likely to need lime to avoid profit loss.

Table 1. Statewide Soil Fertility Status Summary in Missouri Based on Samples Received by the MU Soil Testing Labs in 2009

Test	Very Low	Low	Medium	High	Very High
---------------------------Percentage of samples---------------------------					
pHs	2	25	37	35	0
Bray P, lbs/ac	34	15	23	13	15
Soil K, lbs/ac	3	11	39	26	21
Soil OM, %	1	16	47	23	13

pHs: *Very low less than 4.5; low 4.5 to 5.3; medium 5.4 – 6.0; high 6.1 – 7.5; very high greater than 7.5*
P1: *Very low less than 14 lb/ac; low 14 – 22 lb/ac; medium 23 – 45 lb/ac; high 46-70 lb/ac; very high greater than 70 lb/ac*
K: *Very low less than 65 lb/ac; low 65 – 110 lb/ac; medium 111 – 220 lb/ac; high 221- 330 lb/ac; very* high greater than 330 lb/ac
OM: *very low less than 1; low 1-1.9:%; medium 2.0 % to 2.9%; high 3.0 – 4.0 %; very high greater than 4%*

For example, the desired soil pHs range for alfalfa and row crops is between 6.1- 6.5. The lower soil pH will hinder alfalfa establishment and nodulation. The statewide trend in soil P indicated 49% of the samples tested low to very low, and P fertilizer is essential to avoid profit loss by crops. Another 23% of the P tests were medium (23 to 45 lbs of P/ac), and indicate P fertilizer is required for economic crop production. The desired soil P levels for row crops, small grains, and alfalfa are 45 lbs/ac and for forages are 40 lbs/ac. The majority of soils (47%) in the state tested medium in soil K (111to 220 lbs/ac) and 17% tested low to very low (less than 110 lbs/ac) and indicate K fertilizer will be required to avoid profit loss by crops. In Missouri the soil organic matter (OM) tests are used to estimate N availability in soil. The N credit from soil OM varies depending on soil texture. A general rule of thumb is every 1% of soil OM in the soil will release about 20 lbs of N/ac for crop. The majority of the soils tested had medium levels of soil OM (2 to 2.9%).

If you are going to apply nutrients in spring you need to know how much to put on. Without soil testing, nutrient applications are a guess, and there is no room for guessing in today's atmosphere of narrow margins due to varying fertilizer prices, and public concern of the environmental pollution. Testing soils reduce the risks involved with misapplying nutrients. What kind of fertilizer do you need to achieve your yield goals? Well, a good place to start would be the MU Soil and Plant Testing Lab.

Soil testing is a farmer's best guide for the wise and efficient use of fertilizer and soil amendments. A soil test is like taking an inventory of the nutrients available to plants, which are too high, too low, or just right. While plant growth and prior yields may offer clues to nutrient availability, a farmer won't precisely know until they test their soil. Although soil-testing kits are available in garden centers, laboratory testing is more reliable, and the results from laboratories are accompanied with specific interpretations and recommendations.

Soil fertility fluctuates throughout the growing season each year. The quantity and availability of mineral nutrients are altered by the addition of fertilizers, manure, and lime in addition to leaching and de-nitrification losses. Furthermore, large quantities of mineral nutrients are removed from soils as a result of plant growth and development, and through the harvest of crops. The soil test will determine the current fertility status and also provide the necessary information needed to maintain the optimum fertility year after year.

Soil testing takes the guesswork out of fertilization and is extremely cost-effective. It not only prevents over-spending on unnecessary fertilizers, but it also eliminates the over-usage of fertilizers, hence helping to protect the environment.

Soil samples can be taken in the spring or fall for established sites. Although it's best advised to test in fall and early spring, it can be done anytime soil is not frozen, barring recent fertilizer or lime applications. For new sites, soil samples can be taken whenever the soil is workable. Optimally, Fall is the best time to test, allowing ample time to apply lime to raise the soil pH.

As clearly evident from the statewide soil fertility status summary, soil testing is strongly recommended for field crops. The cost of soil testing is minor in comparison to the cost of seeds and labor. Routine fertilizer or lime applications can result in excessive soil nutrient levels or deleterious soil pH. For

Continued on page 30

Have You Tested Your Soil? Soil Fertility Summary Trends in Missouri for 2009 Prompts That You Should! *continued from page 29*

example, many fertilizers tend to have lower soil pH, and after several years of fertilization the pH may drop below desirable.

The test results are only as good as the sample taken. It is extremely important to provide a representative sample to the testing lab so that a reliable test and recommendations can be made for the entire area. This can be accomplished by submitting a composite sample. Take 15 random samples in a zigzag pattern at plow depth; mix well and submit a sub-sample from to the lab. We recommend that you divide your field and submit one sample for each 40 acres.

Testing your soil for nutrients and pH is important to provide balanced application of nutrients, while avoiding over application. At University of Missouri Soil Testing Laboratory we offer a regular fertility test that includes measurements of pH, lime requirement, organic matter, available phosphorus, potassium, calcium, magnesium, and cation exchange capacity. Soil pH greatly influences plant nutrient availability. Adjusting pH often corrects the nutrient problem for most plants. The optimum pH for most plants is between 6.0 and 7.0. The lime requirement measurement indicates the amount of amendment (usually lime) necessary to correct a pH problem. Organic matter has several roles in the soil; generally the more organic matter the better. Nitrogen recommendations are based on the organic matter level. Phosphorus, potassium, calcium, and magnesium are all essential plant nutrients. The cation exchange capacity (CEC) value is a measure of the soil's ability to hold nutrients.

Test costs vary according to the number of nutrients tested. The University of Missouri Soil Testing Laboratory charges $10.00 (when submitting directly to the lab) for a regular fertility test. Several other specific analyses are available. These include but are not limited to soil analysis for sulfur, micro-nutrients (Zinc, Iron, Copper, Manganese, Boron), salt content (electrical conductivity), heavy metal analysis, and soil texture. Test reports provide interpretation and nutrient recommendations. The turnaround time for a soil test is 24 hours. Customers have to add mailing time to get the reports by mail.

sYou can contact your Regional Agronomy/Horticulture/ Natural Resources Specialist or local County Extension Office to obtain Sample Information Forms and boxing materials, and can submit samples through their offices. The Regional Specialists at your local Extension Offices can be a source of information for interpreting and personalizing your soil test reports and recommendations. Samples can be also submitted directly to the University of Missouri Soil Testing labs at 23 Mumford Hall, Columbia, MO 65211 (Tel: 573-882-0623). Samples can also be submitted to the Delta Soil Testing Lab located the Delta Research Center at Portageville or mailed to them. Every sample submitted should have a sample information form duly filled. Samples submitted directly to the lab should be accompanied by a check written in favor of MU Soil Testing for the amount due.

The lab maintains a comprehensive web site at http:// soilplantlab.missouri.edu/soil/. It includes information on how to collect soil and plant samples, and how and where to submit them. The web site provides a list of services, pricing, and sample information forms, as well as contact and location information. The lab also provides web access to soil test results with a specifically assigned password for clients upon request. Results can also be sent by e-mail.

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MU's IPM Pest Monitoring Network

By Steven Kirk

As the days grow longer and the weather begins to warm, individuals involved in our agriculture and horticulture sectors begins to ponder the implications of the year's coming growing season. Among the many things on the minds of our producers is the anticipation of how pests may play a role in the coming year's crop production. The University of Missouri's Integrated Pest Management (IPM) Program offers many helpful ways to assist farmers and landowners in managing there pest problems. Among these is the "IPM Pest Monitoring Network" web site located at: http://ppp.missouri.edu/pestmonitoring/index.htm.

Monitoring for pest outbreaks is a cornerstone of MU's IPM Program. IPM stresses scouting practices rather than calendar-based treatments to detect pests and determine if action is necessary. MU's IPM Pest Monitoring Network provides farmers, landowners and pest managers with an up-to-date tally on several economically important insect species captured in pheromone traps throughout Missouri.

Over 30 trappers monitor more than 50 insect traps in 35 of Missouri's counties. By visiting our web site farmers and pest managers can view trap counts that are updated regularly. These include Black Cutworm, True Armyworm, Japanese Beetle, European Corn Borer, Corn Earworm and Fall Armyworm monitored throughout the state. In addition to the insects listed above, we also monitor for Southwestern Corn Borer, Tobacco Budworm, Beet Armyworm and Soybean Looper in the southern and southeastern portions of Missouri.

A relatively new feature (installed in 2008) allows individuals the opportunity to sign up to receive electronic Pest Monitoring Alerts when potentially significant insect captures have been reported by our trapping staff. In 2010, additional features will

Continued on page 31

MU's IPM Pest Monitoring Network *continued from page 30*

be added to our Pest Monitoring Alerts including instructions pest scouting, pest identification including damage ID, a map showing trap locations, as well as other important information to help pest managers make sound IPM decisions.

To subscribe to the IPM Pest Monitoring Alerts visit our web site at: http://ppp.missouri.edu/pestmonitoring/subscribe.htm. At the site, fill in the required fields and then mark the boxes next to the insects of interest and click submit. When pest captures reach significant numbers you will automatically be notified via email. Notification of insect captures in pheromone traps do not indicate that treatment is necessary, but indicate that fields in your area may be at risk and should be scouted.

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Surveying for Emerging Races of Wheat Stem Rust

By Laura Sweets

Rust diseases such as stem rust, leaf rust and stripe rust are among the most widespread and potentially damaging diseases of cereal crops worldwide. All three rust diseases can occur on winter wheat grown in Missouri. For the last 15-20 years, resistant varieties have kept losses from stem rust at a minimum. Stem rust has not been widespread or damaging on Missouri winter wheat since about 1995-1996. It may be found in the state at very low levels each year but typically comes in quite late in the season so has little impact on yield. Leaf rust has been a more prevalent and damaging disease over the last 4-5 years. Stripe rust was widespread and, in some fields, severe from 2000-2003 but has not been has prevalent the last few years.

Figure 1. Stem Rust

Now new races of stem rust are threatening wheat production in some parts of the world. The first of these new races known as Ug99 was initially reported in the East African countries of Uganda, Kenya and Ethiopia. Although Ug99 has not been found in North America there is concern that this race could spread to North America. Since most current winter wheat varieties are susceptible to this race of stem rust, it would be a serious threat to wheat production in the United States.

A multi-state effort to monitor for the presence of Ug99 and to provide educational materials related to the identification and management of this disease has been initiated. The publication, "Identifying Rust Diseases of Wheat and Barley" is available online at http://ppp.missouri.edu/pestmonitoring/images/RustDiseasesMO.pdf. This publication contains excellent color pictures of the three rust diseases of wheat and barley to aid in proper identification of rust diseases occurring in the field. Also during the 2010 season there will be a multi-state monitoring program for Ug99 stem rust. Fields in Missouri as well as in all major wheat producing areas of the United States will be surveyed and any plants showing symptoms of stem rust will be collected and submitted for identification of the specific race of stem rust. If the Ug99 race is detected, information will be provided on distribution within the United States and management strategies.

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Visit our Web site at ppp.missouri.edu

Weather Data for the Week Ending March 14, 2010

By Pat Guinan

Station	County	Weekly Temperature (ºF)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	March 1-March 14	Departure from long term avg.	Accumulated Since Apr. 1	Departure from long term avg.
Corning	Atchison	49	37	61	32	42	+4	1.56	+0.74	*	*
St. Joseph	Buchanan	51	38	63	34	43	+4	1.16	+0.35	*	*
Brunswick	Carroll	52	40	62	31	46	+6	1.23	+0.28	*	*
Albany	Gentry	50	38	58	35	43	+5	1.67	+0.84	*	*
Auxvasse	Audrain	55	41	70	31	47	+7	1.18	+0.05	*	*
Vandalia	Audrain	55	41	71	30	47	+8	1.00	-0.32	*	*
Columbia-Bradford	Boone	54	41	70	31	46	+4	1.34	+0.13	*	*
Columbia-Jefferson Farm	Boone	55	41	70	32	47	+5	1.22	+0.01	*	*
Columbia-South Farms	Boone	54	41	70	32	47	+5	1.35	+0.14	*	*
Williamsburg	Callaway	55	42	73	32	48	+7	0.89	-0.31	*	*
Novelty	Knox	51	39	61	31	44	+4	1.56	+0.54	*	*
Linneus	Linn	52	40	60	34	45	+6	1.45	+0.50	*	*
Monroe City	Monroe	53	40	66	29	46	+4	1.01	+0.05	*	*
Versailles	Morgan	56	42	72	36	48	+4	1.20	+0.03	*	*
Green Ridge	Pettis	54	40	69	35	47	+6	0.81	-0.33	*	*
Lamar	Barton	55	41	72	37	47	+2	0.69	-0.77	*	*
Cook Station	Crawford	58	40	76	30	49	+4	0.63	-0.71	*	*
Round Spring	Shannon	59	41	75	30	49	+5	1.02	-0.33	*	*
Mountain Grove	Wright	55	41	72	37	47	+4	0.33	-1.22	*	*
Delta	Cape Girardeau	59	45	70	36	52	+7	1.07	-0.44	*	*
Cardwell	Dunklin	62	46	72	36	53	+6	1.31	-0.53	*	*
Clarkton	Dunklin	61	45	72	37	53	+6	1.29	-0.29	*	*
Glennonville	Dunklin	61	46	71	39	53	+6	1.29	-0.23	*	*
Charleston	Mississippi	60	45	72	36	52	+6	1.11	-0.44	*	*
Portageville-Delta Center	Pemiscot	62	46	72	40	53	+6	1.49	-0.20	*	*
Portageville-Lee Farm	Pemiscot	62	46	72	38	53	+6	1.34	-0.33	*	*
Steele	Pemiscot	62	46	74	39	54	+7	1.47	-0.42	*	*

* Complete data not available for report

‡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.

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