conditions, severe levels of rust developed in small areas of fields of susceptible varieties in the San Joaquin Valley. Because of the late development and limited spread of the disease, yield losses were minimal (Table 5, p. 191).

In mid July, stripe rust developed up to 40–100% severities on susceptible winter and spring wheat entries in the monitoring nurseries at Tule Lake, a high elevation area in northeastern California. The rust level was relatively low compared to those in the past several years.

Pacific Northwest. As usual, stripe rust reached 50% severity by the first week in April and 60% severity during the third week in April on susceptible entries in winter wheat nurseries at Mount Vernon in northwestern Washington. By the end of May in northwestern Washington, 100% stripe rust severities were observed on susceptible winter wheat entries and 40% severities on susceptible spring wheat entries.

In mid-April, early-planted HRWW fields had up to 10% stripe rust severity in south-central Washington. Timely application of fungicides prevented further development of stripe rust in this region and prevented further spread of the disease to other regions. The dry weather conditions from late April to late May and reduced rust inoculum, made rust development slow and light in the major wheat growing regions in the Pacific Northwest. In mid-May, low levels of stripe rust were found in nurseries in the Palouse region with some hot spots of severities up to 40%. In early June, stripe rust severities ranged from 10% to 40% in eastern Washington winter and spring wheat plots.

By the end of May, wheat stripe rust was reported in experimental fields in Pendleton, Oregon, and Moscow, Idaho. In mid June, wheat stripe rust developed in eastern and central Washington fields and in dryland and irrigated fields in northeastern Oregon. In mid June, stripe rust severities reached 100% on susceptible entries around Pullman and Walla Walla and 60-80% at Lind, Pendleton and Hermiston on winter wheat and 40–60% on susceptible entries at these locations on spring wheat. However, stripe rust was light in commercial wheat fields due to resistance of cultivars, low inoculum, and dry weather conditions from late April to late June.

Hot and dry weather conditions during the first two weeks of July stopped the stripe rust season in most of the Pacific Northwest. Similar to 2006, stripe rust of wheat was light in commercial fields and therefore, yield losses caused by stripe rust were low. However, stripe rust did develop to 100% severity on susceptible entries in unirrigated experimental plots of both winter and spring wheat under natural infection in Washington, and 60-80% severities in wheat nurseries in northeastern Oregon and northern Idaho.

Canada. In late July, isolated pustules of stripe rust were observed in some fields in Saskatchewan, Canada, but the severity was very low.

NEBRASKA

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Nebraska wheat crop.

In 2007, 2,050,000 acres (830,00 ha) of wheat were planted in Nebraska and 1,960,000 acres (790,000 ha) were harvested with an average yield of 43 bu/acre (2,890 kg/ha) for a total production of 84,280,000 bu (2,304,504,000 kg). The 2006 Nebraska wheat crop was estimated at 61,200,000 bu (1,667,088,000 kg), which represented a 36 bu/acre state (2,420 kg/ha) average yield on 1,700,000 harvested acres (688,500 ha). The autumn was generally conducive to good emergence across the state. The winter was relatively mild with more snow than normal in western NE. Winterkilling was minor, however, a late spring frost was damaging (surprisingly so) to early lines in areas of Nebraska where the wheat was advanced. Most of the wheat was in the rosette stage when the frost came, so it was assumed the damage would be minor, however, some lines seemed to be weakened and became more susceptible to the onset of later diseases and stresses. The spring growing season began and stayed on the dry side in parts of western NE, thus reducing diseases other than viruses. However, much of eastern NE had ample moisture during flowering and grain-fill leading to high yields, leaf diseases, and FHB. At harvest, much of the rains stopped, and the harvest seed quality was good.

Waxy wheat development and characterization.

R. Graybosch.

Approximately 25 waxy winter wheats were evaluated for agronomic performance in Nebraska. As part of coöperative projects with Kansas State and Oklahoma State Universities, the study also was seeded at two Kansas locations and at Pendleton, OR. Eight lines evaluated were deemed promising enough to continue testing in 2008. Disease susceptibility was an issue with many lines, and these were discontinued. Two waxy winter wheats (NX03Y2489 and NX04Y2107) were entered in the 2008 Northern Regional Performance Nursery. Experiments to identify new uses for partial waxy (reduced amylose) and waxy (amylose-free) starches of bread and durum wheats were continued. Durum starches were modified via hydroxypropylation. Substituted fully waxy starches had increased peak viscosities, breakdowns, reduced final viscosities, setbacks, and pasting times. These modified forms of starches are used as thickeners in foods and frozen preparations such as pie fillings, sauces, gravies, and salad dressings. Coöperative experiments with scientists at Kansas State University and the USDA–ARS–GMRPL at Manhattan established the following: a) replacement of wild-type bread flour by 10–20% waxy wheat flour can improve both loaf volume and shelf-life stability, perhaps reducing the need for artificial shelf-life extenders in commercial bakeries and b) automated seed sorting technology, coupled with near-infrared spectroscopy, can separate waxy kernels (all null alleles) from partial waxy kernels (at least one null allele and one functional allele) or wild-type kernels (all functional alleles). This rate is sufficient to select waxy kernels from breeding lines or to purify contaminated samples.

Hard red winter wheat development.

P. S. Baenziger, R. Graybosch, Lan Xu, S. Wegulo, and G. Hein.

Camelot is a HRWW cultivar developed coöperatively by the Nebraska Agricultural Experiment Station and the USDA–ARS and released in 2008 by the developing institutions. Camelot was released primarily for its superior adaptation to rain-fed wheat-production systems in Nebraska and adjacent areas in the northern Great Plains. Camelot will be exclusively marketed by the NuPride Genetics Network in keeping with their marketing plans. Camelot was tested under the experimental designation NE01604.

NH03614 CL is a HRWW cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA–ARS and released in 2008 by the developing institutions and the South Dakota Agricultural Experiment Station and the Wyoming Agricultural Experiment Station. NH03614 CL contains a patented gene owned by BASF. BASF retains ownership of the gene. NH03614 CL was released primarily for its herbicide resistance and superior adaptation to rain-fed, wheat-production systems in Nebraska, Wyoming, and South Dakota, and wheat-producing counties in adjacent states. NH03614 CL is a Clearfield™ wheat that will be used with Beyond® herbicide (active ingredient imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid) BASF Corp., Triangle Park, NC). NH03614 CL will be marketed as Husker Genetics Brand 'Compass'. NH03614 CL was tested under the experimental designation NNH03614.

Hard white winter wheat development.

R. Graybosch and P.S. Baenziger.

Anton HWWW was coöperatively developed and released in 2007 by the USDA–ARS and Nebraska Agricultural Experiment Station. Anton was released primarily for its low levels of grain and flour polyphenol oxidase (PPO). Low levels of grain PPO correlate with enhanced end-use quality, including final product color in noodle applications. Low PPO also is desirable for the establishment of a viable Great Plains hard white wheat production industry. Anton was tested under the experimental designation NW98S097.

Development of WSMV-resistant winter wheat.

R. Graybosch, G. Hein, P.S. Baenziger, and L. Divis.

Mace is a HRWW cultivar coöperatively developed and released in 2007 by the USDA–ARS and Nebraska Agricultural Experiment Station. Mace was released primarily for its resistance to WSMV, and its adaptation to rain-fed and irrigated wheat production systems in Nebraska and adjacent areas in the northern Great Plains. Resistance to WSMV is conditioned by the *Wsm1* gene, present on an introgressed chromosome arm from *Th. intermedium*. Mace was tested under the experimental designation N02Y5117.

Organic wheat breeding efforts.

P.S. Baenziger, R. Little, L. Xu, C. Shapiro, D. Lyon, S. Knezevic, K. Russell, G. Hein, S. Wegulo, R. Flores, V. Schlegel, R. Wehling, and L. Sarno.

The long-term goal of this effort is to develop small grains cultivars and cropping systems incorporating small grains that will improve the profitability and competitiveness of organic producers. The specific objectives of our research are to: 1. determine if current advanced experimental wheat lines and released cultivars have potential for organic wheat production and 2. based upon what we learn in the organic wheat trials, augment our wheat-breeding program to develop wheat cultivars ideally suited to organic production. Others will attempt to 3. develop an integrated organic soil fertility management program to increase grain protein content and 4. reduce tillage or increase organic matter in organic systems by the use of small grains cover crops to suppress weeds, or to suppress weeds by flaming. Our outreach efforts will include the development of workshops and web-based materials to explain the wheat breeding process and variety selection, prioritizing the desirable traits for organic production and marketing, involving organic producers in the planning and on-farm evaluation (using on-farm demonstration plots) of an integrated organic farm package involving the best cultivar(s) grown using the best fertility regime and cover crops. This project should be very complementary to our conventional wheat breeding effort in that organic producers emphasize the need for excellent end-use quality and disease resistance, but can accept lower yields. Conventional wheat producers emphasize the need for higher yield and can accept average disease resistance and end-use quality. Hence, each set of lines can be used as parents to develop improved lines or the complementary program.

Winter triticale nursery.

P.S. Baenziger.

In 2007, no new triticale lines were recommended for release; however, we selected ten lines for increase (five small and five large increases) as possible replacements or to complement NE426GT and NE422T, which continue to perform well. With the interest in maize for ethanol, we believe that the future is very bright for triticale in that it can be grown over the winter as forage or grain crop in areas where maize cannot be grown successfully. The grain will substitute for maize in animal rations and the forage can be used as forage, cellulosic ethanol feed stocks, or as a ground cover. Coöperation with Iowa State University continues to provide excellent efforts in the grain and, we believe, in the future bioenergy uses of triticale. Forage data for the 2007 triticale variety trial was provided by Dr. Ken Vogel and the USDA–ARS. Germ plasm exchange for this minor crop remains a concern and we are willing to exchange our triticale germ plasm (as well as our wheat germ plasm) with other programs.

Additional information on Dr. P.S. Baenziger's projects in 2007 can be found at http://agronomy.unl.ecu/ grain/ WHTANN0732708.PDF.

Personnel.

Satyanarayana Tatineni joined the USDA–ARS group as a molecular virologist. Mr. Javed Sidiqi successfully completed his M.S. degree. Mr. Zakaria Aj-Alouni successfully completed his Ph.D. degree. Dr. Liakat Ali completed his postdoctoral assignment and accepted a position with the University of Arkansas. We welcome Mr. Richard Little to his new position as Organic Wheat Breeding Project Coordinator. We also welcome Ms. Somrudee Onto and Mr. Ali Bakhsh as new graduate students to our program.

Publications.

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2007 Wheat Production in the Commonwealth of Virginia.

W.E. Thomason, C.A. Griffey, and J. E. Seago

Growing Conditions. Planting conditions for the 2006–07 small grain crop ranged from acceptable soil moisture to excessively wet in some southeastern counties. Forty-two percent of the small grain crop was planted by 29 October, which was exactly the five year mean. Rain and unseasonable warm temperatures in early winter favored small grain development, especially helping later planted stands. Average temperatures in January were more than seven degrees above the long- term average for that time of year and resulted in a boost in small grain growth (Fig 1). Late winter brought unseasonable cool temperatures and dry weather with February and March rainfall at 70 percent of normal (Fig. 2). Cold damage and the dry spring resulted in the wheat crop being rated 54 percent good and 27 percent fair.

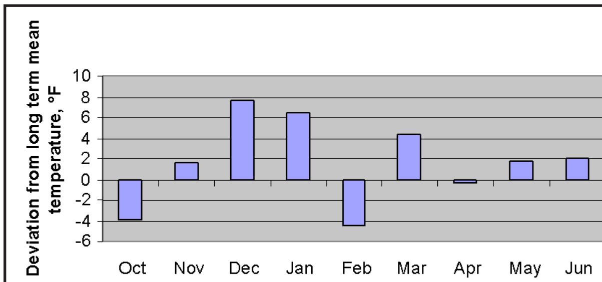

Fig. 1. Temperature deviation from long-term mean.

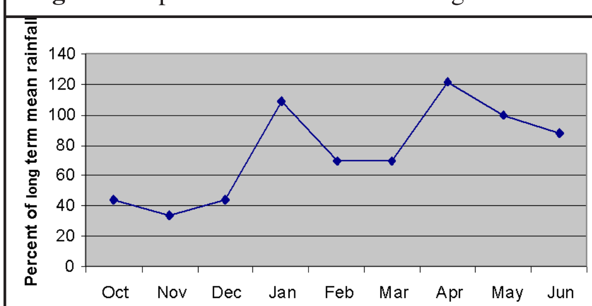

Fig. 2. Percent of long-term mean rainfall.