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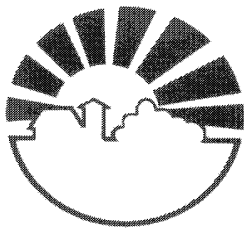
PERFORMANCE OF PUBLIC AND PRIVATE SMALL GRAINS IN INDIANA, 2001



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Agricultural Research Programs
Purdue University
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(The authors wish to give credit to Cindy Boone, Department of Agronomy,
for placing this bulletin on the Purdue University web site.)

Performance of Public and Private Small Grains in Indiana, 2001

INTRODUCTION

Small grains are evaluated annually at several locations in Indiana. These trials are conducted according to the policies and procedures of Indiana Agricultural Research Programs at Purdue University. In this bulletin, results of the year 2001 small grain performance trials are presented for those entries which are believed to be available to producers for seeding purposes. Data for experimental entries are not included.

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http://www.agry.purdue.edu/ext/variety.htm

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Performance results for both private and public entries are presented. Certified seed was used for seeding most of the public varieties. Private entries, entered voluntarily by the owner, were accepted in the trial after meeting the requirements for eligibility and payment of a testing fee. No verification has been made that the seed or the quality of the seed entered in this trial is the same as that offered for sale to the public.

Plans and rules for entering this trial are available, upon request, to anyone at any time. Persons wishing to enter the small grain performance trial should contact the author by August 1 for fall-seeded small grains and by February 1 for spring-seeded small grains.

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PERFORMANCE TRIAL METHODOLOGY

This section contains information on locations and procedures used in conducting the trials.

Location of Trials

In 2001, trials were conducted at five locations for winter wheat and two locations for spring oats (see Figure 1). The locations, numbered from north to south, are:

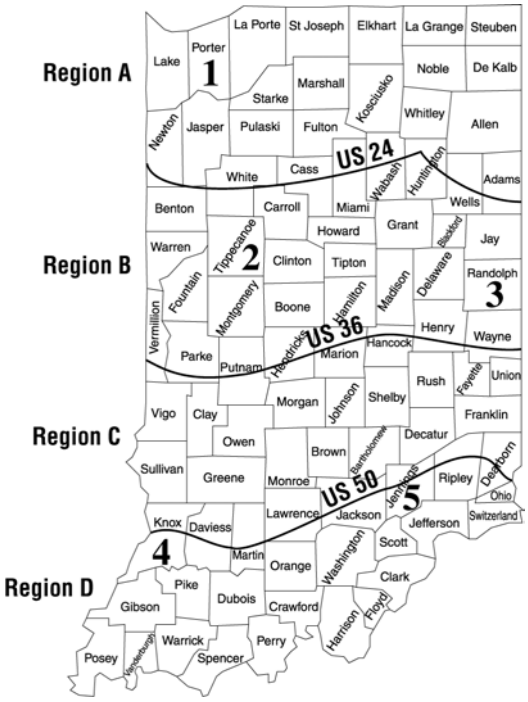
Location 1. Porter County at the Pinney-Purdue Agricultural Center near Wanatah, on Runnymede loam, a dark gray depressional soil underlaid by sandy substrata.

Location 2. Tippecanoe County at the Purdue University Agronomy Research Center near Lafayette, on Drummer (Chalmers) silty clay loam, a very dark gray or black, poorly drained depressional soil.

Location 3. Randolph County at the Davis-Purdue Agricultural Center near Farmland, on Blount silty clay loam, a dark grayish-brown, somewhat poorly drained soil.

Location 4. Knox Co., at the Southwest-Purdue Agricultural Center near Vincennes on Ade loamy fine sand, a very dark gray, gently sloping somewhat excessively drained soil. Ade soil has low available water capacity and rapid permeability. Organic matter is relatively high and surface runoff is slow.

Location 5. Jennings Co., at the Southeast-Purdue Agricultural Center near Butlerville, on Avonburg silt loam, a light grayish, nearly level, somewhat poorly drained soil, with fragipan in the sub-soil.



The fly-free dates in Indiana are: Region A, Sept. 22 (north) to Sept. 26 (south); Region B, Sept. 26 (north) to Oct. 1 (south); Region C, Oct. 1 (north) to Oct. 6 (south); and Region D, Oct. 6 (north) to Oct. 9 (south).

Figure 1. Location of trials and fly-free dates.

Methods Used in the Trials

Seedbeds were prepared using conventional farm equipment. A randomized complete block design, with 4 blocks, was used in all trials. The wheat plots were planted in drill strips 35 feet long and 75 inches wide, and the oat plot drill strips were 75 feet long and 70 inches wide. All plots were end trimmed at harvest to approximately 20 feet in length for wheat and 21 feet for oats, and all rows were harvested. Plot width of 75 inches for wheat and 70 inches for oats was used for calculating harvest area for yield.

The plots were harvested with an Almaco plot combine, and were weighed and moisture tested automatically, on the combine, using a Seed Spector II and a Psion HC 110. The Almaco plot weight and moisture equipment was calibrated using a Chantillon scales and a Motomco moisture meter, and the calibrations were checked throughout the harvest season.

It should be pointed out that the electronic weighing and moisture testing equipment, on the Almaco plot harvester, are not the same as equipment used to meet official grain grading standards, but are believed to be suitable for field plot work.

Grain yields from the test plots are reported as estimates of bushels per acre, adjusted to 14 percent moisture content.

Test weights were performed after harvest, in the Vartest building, using standard test weight equipment.

Lodging is expressed in percent from 0 to 100. Plots with a score of 0 to 25 percent are generally harvestable with conventional equipment, from either direction, and at optimum speed. Plots with a lodging score of 25 to 50 percent are harvestable, but may require reduced speed. As lodging percentages exceed 50 percent, harvesting problems escalate quickly and beyond 75 percent some grain may be lost, or damaged by contact with the soil.

Plant height, taken at harvest, was from the center of the plot and was measured to the nearest inch from the soil surface to the top of the head.

Winter killing data, at all locations, are generally taken when the plants were beginning spring growth. The data are based on visual observation and not on actual stand count, and are influenced by differences in plant vigor and vegetative growth. In 2001, no winter killing was observed in the winter wheat performance trials.

Date headed is the day when 80 to 90 percent of the heads have ruptured the boot.

Fertilization programs are described in the footnotes of each table. Starter fertilizer was applied, at planting, at all locations, and all winter wheat trials were top-dressed with supplemental nitrogen in the spring.

Soil test results for each of the trials, in 2001, are presented in the footnotes. The soil test values for phosphorus (P) and potassium (K) are expressed in parts per million (ppm) instead of pounds per acre (lbs./acre). To change ppm to lbs./acre, multiply ppm by 2. Conversely, to change lbs./acre to ppm, divide lbs./acre by 2.

Seeding rates for proprietary wheat entries were chosen by the owner, and ranged from 1.4 to 1.8 million live seeds per acre. Public wheat varieties were seeded at 1.5 million live seeds per acre, and the oat trials were seeded at 1.53 million live seeds per acre.

Seed Size and Plant Populations

Seed size will vary among seed lots for any entry. In extreme cases, the smallest size seed may contain nearly double the number of seeds per bushel in comparison with the largest size seed.

A final stand of 1 to 1.3 million plants per acre, or 30 plants per square foot, is the optimum population for soft red winter wheat production in Indiana. Yields generally plateau at this population, with any additional yield increases due to favorable weather combined with best management practices.

Approximately 90 percent of the live seed sown should emerge, if high quality seed is sown in a firm, moist seedbed. A seeding rate of 1.5 million live seeds per acre should produce a final stand of 1.35 million plants per acre, which is 30 plants per square foot.

The number of seeds per pound may be determined by counting out 100 seeds and weighing them on a gram scale (most grain elevators have one). Divide the weight of the 100-seed sample into 454 (the number of grams in a pound), and multiply by 100 (the number of seeds counted). Example: 100 seeds weigh 3.2 grams; 454 divided by 3.2 times 100 = 14,188 seeds per pound. Then adjust for germination to determine the final seeding rate. If the seed germinates 95 percent, there will be 13,478 live seeds per pound (14,188 times 0.95). Dividing 1,500,000 by 13,478 gives 111 pounds of seed per acre, or the amount needed to establish a stand of 30 plants per square foot.

This information is useful in deciding the population you want to achieve in the original stand, and for decisions you may need to make regarding an inadequate stand. Ask your seed dealer to furnish the seed count, in number of seeds per pound, and the recommended seeding rate for the seed lot you are planting. Then calculate the pounds per acre needed to provide an optimum population in the original stand.

The same principle applies to oats. However, the original stand is more important in oats, because during some seasons there may be little or no tillering, particularly if seeding is delayed, or moisture is deficient. The recommended oat population is 35 plants per square foot or 1.52 million plants per acre.

A plump-seeded oat variety (3 grams per 100 seeds) would require about 112 pounds of live seeds per acre. Use the same procedure for calculating oat seeding rates and stands as for wheat, but remember that oat populations need to be greater than wheat populations.

Stand reductions, in winter wheat, may occur if winter conditions are severe. The wheat plant, if properly hardened through a gradual hardening process, should be able to tolerate temperatures as low as –5° F without injury. At temperatures of –5° to –10° F injury could occur if unfavorable conditions such as dry soil, low phosphorus, late planted and/or small plants, or other plant stresses are present. If temperatures reach -10° F or lower, and remain at that temperature for two hours or longer, injury is likely. The extent of the injury will depend on the condition of the plant, how low the temperature goes, and how long it remains at that level.

Snow cover of 1 to 2 inches on wheat offers excellent protection against sub-zero temperatures. If cold weather is forecast, keep a record of the amount of snow cover, the extreme low temperature and the duration of the low temperature. This will be useful information in predicting the possibility of damage to the wheat crop.

When making stand counts on small grains, divide 144 (the number of square inches in a square foot) by the drill row spacing in inches to get the number of linear inches of drill row needed to equal 1 square foot. Example: 144 divided by 7 inches (drill row spacing) = 20.5 inches of linear drill row needed to equal 1 square foot. Make numerous random spot checks throughout the field by counting the number

of plants or seeds in 20.5 inches of row length, and average several observations to estimate the population.

For purposes of making yield estimates, each wheat plant should produce one culm (main stem) and one or more tillers. The culm normally produces a head, but under stress the tillers may not produce heads. Less than ideal conditions reduce grain production in the tiller first and then in the culm.

One head of wheat usually produces one gram of seed (or grain), which is normally 30 to 32 grains of wheat. One head of wheat per square foot is equal to 1.6 bushels per acre. At 30 heads per square foot (one head per plant), the estimated yield potential is 48 bushels per acre.

At 30 plants per square foot, under ideal growing conditions, each plant may produce two heads (one culm and one tiller), which would have a yield potential of 96 bushels per acre.

A population of 15 plants per square foot may produce acceptable yields (15 to 20 percent yield loss), but 10 plants per square foot may reduce yields by 50 percent or more, and weed problems are likely.

PERFORMANCE TRIAL RESULTS

An analysis of variance and a test of significance were computed on all performance categories where sufficient data were available. The analysis of variance for bushels per acre yield, was significant at the 10 percent probability level this year (2001) for all of the single-year yield data presented, except for the spring oats trial in Tippecanoe County, Location 2, Table 9.

The Waller-Duncan Bayesian k-ratio t test is used in determining significant differences for the Indiana small grain performance trials. The Bayesian procedure has a direct dependence upon the calculated F-value for entries. As the F-value increases, the Bayesian least significant difference (BLSD) decreases. In computing the BLSD for the test of significance, a k ratio of 100:1 was used. This ratio may be considered in a loose sense to take the place of the 5 percent level of significance. The BLSD value may be used to make all possible pair-wise comparisons, i.e., any two values in the same column of a sub-table may be compared.

Multiple-year results, especially those having the greatest number of years, are generally best for predicting performance. This is because no interaction of entries by years can be computed for one-year data. This interaction (entry by year) is usually larger than the experimental error in one-year analyses.

The coefficient of variability (C.V.) is an indication of the precision of the test. The coefficient of variability is a relative term. It is the ratio of the standard deviation to the grand mean of the test, expressed as a percent. On the western side of Indiana a small grain test with good precision will have a C.V. for yield of 5 percent or less; and on the eastern side of the state, the C.V. will be 10 percent or less. Whenever the C.V. is larger than normal for a test location it indicates that the precision of the test was below normal. When yields are high and the experimental error in the test is small, the C.V. will be small.

Across the years, tests have been performed to determine whether there are specific areas of adaptation for small grain varieties. Is there a variety that is superior on sand, or clay, or adapted to a particular part of the state? To date, there is no evidence to support such a claim.

In long-term averages, those entries that are either at the top or bottom in yield, are generally the same at each test location. For normal production situations, these small grain performance data have broad application in Indiana.

At Location 1, August rain totaled 3.92 inches and September 3.86. On October 2, 2000 (ten days after the fly-free date), the wheat plots were planted in a firm, moist seedbed. Two days after planting, the plots received 1.18 inches of rain. Rain for the month of October totaled 2.79 inches. Emergence was good and stands were vigorous. The first sharp freeze (28° F) came on the nights of October 12 and 13.

November precipitation totaled 2.77 inches. For five nights (from November 19 to 25), night temperatures dropped to the teens

The wheat had time to harden, as December temperatures became increasingly colder. Snow cover (4 inches) provided protection when night temperature dropped to -7° F. on December 9. The snow cover began with 1 inch (December 7) and accumulated to 16 inches by the 21st of the month. A foot or more of snow remained through January, and an inch of snow cover persisted until February 11. The coldest winter temperature came during the night of December 13 when the temperature dropped to -14° F. From then to the end of the month, below 0° F temperatures were recorded on 10 nights. December precipitation totaled 2.04 inches.

Compared to December, January was mild. The coldest nights of the month were on January 3 (-3° F), and January 20 (0° F). January was dry; precipitation totaled 1.04 inches

February was generally mild. The coldest two nights were on February 2 and 3, with -1° F each night. Snow cover remained until February 11. Precipitation for the month was 3.75 inches

March was the driest month of the small grain growing season. Precipitation totaled 0.52 of an inch. The spring oats performance trial was planted March 22 in a firm dry seedbed. Emergence was slow, but adequate stands were established.

April showers came in light rains of generally less than half an inch. Total rainfall for the month was 2.68 inches. During the first week of the month, temperatures warmed rapidly and by the second week, high temperatures reached 78° F. Wheat growth and development during April was good.

May was warm, with the first 90° F temperature arriving on May 16. Rainfall was distributed among frequent, timely showers of generally less than one inch. The heaviest rain (1.11 inches) was on May 15. Total rain for the month was 4.15 inches.

Hot weather arrived in June. The first week in June had temperatures in the 60° F range. Then, at the beginning of the second week of June, and continuing to the end of the month, temperatures were frequently in the high 80° F range. Temperatures of 90° F or above occurred on June 12, 14, 15, and 19. All rain showers, for the month, came in amounts of less than one inch. Rain totaled 3.99 inches.

The wheat trial was mature and nearly ready for harvest at the end of June. The oat trial was maturing rapidly, but was not completely mature at the end of June.

From October 1, 2000 through March 31, 2001 the winter wheat trial received 12.91 inches of precipitation. From April 1, to June 30, 2001 the small grain trials (wheat and oats) received 10.82 inches of rain. On July 3, 4 and 5, light rains (totaling 0.82 of an inch) delayed wheat harvest, but probably was of some benefit to the oats trial. Another shower on July 7 provided the oats trial with an additional 0.47 of an inch of rain.

Data presented for winter wheat, in Table 1 at Location 1, have good precision for the 2001 trial as well as for the multiple-year results. The information should be useful in making performance comparisons.

The oat trial at Location 1, presented in Table 8, has good yields and excellent precision for an oat trial in northwest Indiana. The data should be useful in making performance comparisons.

At Location 2, in 2000, August and September were dry with 1.66 and 2.70 inches of rain respectively. The regular-date-of-seeding trial was planted September 29 in a firm, moist seedbed. Stands became well established and plant growth was vigorous.

October was dry, with 1.68 inches of rain for the month. The late-seeded wheat trial was planted on October 23 in a firm, relatively dry seedbed. Emergence was not uniform, and plant growth and development were slow. The first beneficial rain (1.22 inches) did not arrive until November 10. November rain totaled 3.12 inches. By November 21, night temperatures were in the teens.

Temperatures, in the teens, were frequent the first week of December, and on December 12, the first single digit temperature (8° F) was recorded. The lowest night temperature of the winter was -9° F recorded on December 25 and 26. December precipitation totaled 2.25 inches.

Snow cover (1 inch) began on December 12, and accumulated to depths of 6 to 8 inches. Snow remained until January 30, 2001. Wheat plants in both trials had excellent protection, although some snow mold was observed in the plots.

January was dry, with 0.62 of an inch of moisture for the month. January 2 was the coldest day of the month with -2° F.

The coldest February days were on 2 and 3, with 2° F recorded. February precipitation totaled 3.56 inches. March was the driest month of the small grains (wheat and oats) growing season, with 0.46 of an inch of moisture. The spring oats trial was planted March 23 in a dry seedbed. Emergence was slow, but adequate stands were established.

From October 1, 2000 through March 31, 2001, the winter wheat plots received 11.69 inches of moisture. From April 1 through June 30, 2001, the trials (wheat and oats) received 7.97 inches of rain.

April rain totaled 2.77 inches and May 2.92. During the first week of May, temperatures were generally above 80° F, and on May 16 the temperature was 93° F. After two days of 90°+ F weather, temperatures cooled, and during the last week of the month, temperatures were in the mid-60° F range.

Mid-June temperatures exceeded 90° F for six days, accelerating the ripening of the wheat crop. June precipitation was 2.28 inches.

Rain, during the first week of July, arrived too late for the regular-date-of-seeding wheat trial, but may have been of some benefit to the late-seeded wheat and the spring oats trials.

July rain totaled 4.81 inches, with more than half arriving the first week of the month. Half of the regular-date-of-seeding winter wheat trial was harvested on July 3, and the second half was harvested July 6. Weather was dry for harvesting the late-seeded winter wheat trial on July 13, and the spring oats trial on July 16.

Results of the regular-date-of-seeding winter wheat trial at Location 2, Table 2, have good precision and should be useful for making performance comparisons. The late-seeded winter wheat trial had stand problems which developed in the spring, and became progressively worse during May and June. The stand problem was not adequately diagnosed and does not appear in performance Table 3, but probably did affect the performance of the entries. More confidence should be placed in the multiple-year data sub-tables than in the 2001 results.

The spring oats performance trial, at Location 2 presented in Table 9, was not, statistically, significant in yield differences, and is not useful in making yield comparisons.

At Location 3, August and September, in 2000, received beneficial amounts of rain. August rain totaled 3.89 inches, and September 5.49. On October 5, 1.39 inches of rain fell, which delayed wheat planting. The trial was planted October 16, in a firm, moist seedbed, and vigorous, uniform stands were established. Rain for October totaled 1.91 inches. Temperatures were cool, and frost was reported on October 6, 11, 12, 29, 30 and 31.

November precipitation was 2.11 inches. Temperatures were cooler, and on November 21 through 24, night temperatures were in the teens.

December was the coldest month of the winter. About an inch of snow arrived on December 2, well ahead of the lowest temperatures of the month. Snow continued to accumulate, in light amounts of little more than a trace, until December 14, when 7 inches of snow arrived. Snow remained in depths of 3 to 7 inches until mid-January. From December 15 through 21, single digit night temperatures were recorded. Night temperatures then dropped to below zero for 6 of the next 8 days. December 28 and 29 were the coldest winter days with -9° F night temperature. December precipitation was 2.43 inches.

January was the driest month of the winter wheat growing season, with 0.58 of an inch of moisture. January weather was warmer than December, with 4 nights recording single digit temperatures.

February was warmer than January. Two days had single digit night temperatures (February 2 and 3). Precipitation for the month was 1.51 inches.

March was dry, with 0.99 of an inch of moisture for the month. The month was warmer with 1 day recording single digit night temperature.

April rain came, in a number of beneficial showers, and totaled 3.52 inches. Temperatures warmed rapidly, which promoted vigorous growth.

May rain totaled 5.54 inches, and was distributed throughout the month in showers of less than 1 inch. Temperatures were warm and mild, but no high temperature reached 90° F.

June rain totaled 3.27 inches, and 4 days recorded temperatures of 90° F or above.

The winter wheat trial, at Location 3, had a generally favorable growing season. Precipitation, from October 1, 2000 through March 31, 2001 totaled 9.53 inches. From April 1 through June 30, 2001, rain totaled 12.33 inches. Prior to harvest, July rain totaled 0.79 of one inch, and probably had no impact except for delaying harvest.

Trial results, for Location 3 in 2001, presented in Table 4, have better precision than in previous years. Yields are lower but other traits are similar to previous years' data. The trial results should be useful for comparing performance among the entries.

At Location 4, August 2000 received 9.39 inches of rain, and on 7 days during the month, temperatures ranged from 90° to 97° F. The first 4 days in September temperatures were above 90° F. Then temperatures moderated for the rest of the month. September rain totaled 2.29 inches.

The wheat trial was seeded October 20, 2000, approximately 2 weeks after the fly-free date. Nearly half an inch of rain fell 3 days before planting, providing a good seedbed with some moisture present. October rain totaled 2.26 inches.

November rain totaled 3.12 inches and night temperatures, the last half of the month, provided some winter hardening for the wheat plants.

Six inches of snow arrived on December 14 and snow cover remained until January 13, 2001. The coldest winter temperature was on the night of December 20 (-8° F), and on the below-zero nights, snow cover provided excellent protection. December precipitation totaled 2.85 inches.

The coldest January temperature was -4° F on January 3. Precipitation for the month was 0.79 of an inch. February precipitation totaled 2.62 inches, and March (the driest month of the growing season) with 0.71 of an inch.

April remained dry with 1.20 inches of rain, and warm temperatures promoted growth and development of the wheat plants. Dry weather continued in May with rain for the month totaling 2.11 inches. May weather was warmer with both the day and the night temperatures averaging

approximately 20° F higher than April temperature averages.

June received 4.52 inches of rain, but moisture distribution was the problem. During the first 6 days of June, 3.5 inches of rain fell. The next 14 days, received one rain with 0.01 of an inch of moisture. On June 21 and 22, 1.01 of an inch of rain fell. The trial was harvested on June 25.

From October 1, 2000 through March 31, 2001 the winter wheat trial received 12.35 inches of precipitation. From April 1 through June 25, 2001 the trial received 7.83 inches.

Results of the 2001 trial at Location 4 are presented in Table 5. Data in the 2-year sub-table are not useful for making performance comparisons, and the 2001 results are also of very limited value. Yields are not impressive, and the precision in both sub-tables is not acceptable. The data for test weight, and for lodging, may be of some use. The date headed data were taken when most of the entries were headed. Heading dates from the other trial locations may be more accurate.

Data from Tables 6 and 7 should be more reliable for making performance comparisons.

At Location 5, August 2000 rain totaled 7.80 inches, and 1 day (August 9) temperature reached 90° F. September precipitation totaled 4.22 inches. Temperature ranged from 39° F at night to 88° F during the day.

The wheat trial was planted October 19, 2000, approximately 2 weeks after the fly-free date. The trial was planted in a firm, moist seedbed and excellent stands were obtained. October rain totaled 3.02 inches and temperature ranged from 28° to 82° F. November received 3.75 inches of rain.

December precipitation totaled 3.49 inches. Snow arrived December 13 and remained until mid-January. On December 17, night temperatures dropped to 6° F, and single-digit night temperatures remained for 10 days. The coldest night temperature of the winter (-6° F) came on December 25.

January low temperature was -3° F, on January 3. Moisture for January was 1.13 inches, February 1.55, and March 1.13 inches.

April weather was excellent for winter wheat spring growth. Rain totaled 3.03 inches and temperature ranged from 27° to 84° F. May temperature ranged from 38° to 85° F, and rainfall totaled 4.85 inches. Distribution of the rain was ideal; showers, each, were less than 1 inch.

June rain totaled 5.08 inches, with virtually all coming before the June 26 harvest of the trial. Two days (June 13 and 14) had 90° and 91° F respectively. Temperature ranged from 46° to 91° F.

From October 1, 2000 through March 31, 2001, the trial received 14.07 inches of moisture. From April 1 through June 26 rainfall total was 12.92 inches.

Trial results for Location 5 are presented in Table 6. The data in both the two-year table and the 2001 results are highly significant. Yields are high and the precision in the trial is good. The data should be useful in making performance comparisons among the entries.

Weather Summary

Information presented in this section is based on the weekly Indiana Crop and Weather Report, published by the Indiana Agricultural Statistician.

For the week ending September 24, 2000, Indiana soil moisture was rated 10 percent short to very short, and 90 percent adequate to surplus. Four percent of the winter wheat crop was planted, compared with 5 percent the previous year, and 6 percent for average.

Rain slowed progress in wheat planting, but moisture was beneficial for the crop. For the week ending October 15, 46 percent of the crop was planted and 10 percent had emerged. Soil moisture was rated 92 percent adequate to surplus.

After mid-October, wheat planting made excellent progress. The October 29 report indicated 91 percent of the crop was planted, on par with a year earlier and ahead of the 89 percent for average. Soil moisture remained mostly adequate to surplus, with only 15 percent short to very short. The winter wheat condition was rated 73 percent good to excellent.

The final crop report for 2000, issued November 5, reported winter wheat was 98 percent seeded, which was on par for average. Eighty percent of the crop had emerged, and 73 percent was rated good to excellent. Top-soil moisture was rated; 4 percent very short, 22 percent short, 69 percent adequate, and 5 percent surplus. Sub-soil moisture ratings were similar to top-soil ratings.

From mid-December through mid-January, unusually widespread and beneficial snow cover afforded protection from winter's coldest temperatures.

For most areas, January, February and March were dry. Temperatures during that period were relatively mild.

The first report of the 2001 growing season, issued for the week ending April 8, reported the condition of the winter wheat crop, 69 percent good to excellent. Sixteen percent of the wheat was jointed compared to 30 percent for the previous year and 17 percent for the 5-year average. Top-soil moisture ratings were; 6 percent very short, 22

percent short, 66 percent adequate, and 6 percent surplus.

The April 15 crop report showed a marked improvement in the wheat crop. The crop was rated 79 percent good to excellent. Thirty-five percent of the wheat was jointed, which was on par for average, but behind the 60 percent jointed the previous year.

Wheat growth and development continued to make good progress during the latter half of April. Eighty-two percent of the wheat was jointed by April 29. Four percent of the wheat was headed, which was on par with the 5-year average. The wheat condition was rated 75 percent good to excellent, which was also average.

The report, for the week ending May 13, stated that virtually all the wheat was jointed. Fifty-five percent of the wheat was headed, compared with 53 percent last year and 34 percent for average. The wheat condition was rated 71 percent good to excellent compared with 77 percent a year ago. Soils were becoming progressively drier. Top-soil moisture was 18 percent very short, 38 percent short, 43 percent adequate, and 1 percent surplus.

The crop report, for the week ending May 27, showed a decline in the condition of the wheat crop. The crop was rated 65 percent good to excellent, down from 71 percent two weeks earlier. Virtually all the wheat was headed compared to 77 percent for average.

The June 10 crop report indicated harvest had started in scattered locations throughout the state. The wheat condition was rated 62 percent good to excellent compared to 84 percent a year ago.

According to the July 1 report, wheat harvest was 48 percent complete. By region, wheat was 5 percent harvested in the north, 38 percent in central regions of the state, and 86 percent complete in the south.

By July 1, soil moisture improved to 78 percent adequate and 8 percent surplus. Thirteen percent was short and 1 percent was very short.

Wheat harvest was virtually complete by the third week of July, compared with 100 percent last year and 90 percent for average.

In summary, the wheat crop got off to a reasonably good start, and had unusually good snow cover for protection against winter's coldest temperatures. The first 3 months of 2001 were mild and dry. Spring growth and development was good, aided by late spring rains. Diseases were not a serious problem in most Indiana wheat fields in 2001. Yields were good, although not as high as the previous year. Test weights were normal, and a little better than the previous year. In using the 1999, 2000 and 2001 data, it should be kept in mind that these winters were mild, and some wheat cultivars, tested only in these years, may not survive a severe Indiana winter.

Weather also favored spring oat production. Planting was timely, and the late spring rains benefited not only yields, but test weights as well.

State-wide Harvest Summary

The Indiana Crop and Livestock Reporting Service, in a report issued July 20, 2001 estimated the 2001 Indiana winter wheat production as follows:

> Based on conditions July 1, Indiana's 2001 winter wheat crop is expected to total 25.1 million bushels, 29 percent below last year's estimate of 35.2 million bushels. The expected yield of 66 bushels per acre is unchanged from the June 1 forecast. If realized, this would be 3 bushels below the record of 69 bushels per acre established in 2000. Intended acreage for harvest as grain, at 380,000 acres, is down 25 percent from a year earlier. As of July 15, wheat harvest had advanced to 96 percent complete. This compares with 97 percent last year and 81 percent for average. .....
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> Nationally, winter wheat production is forecast at 1.37 billion bushels, up 3 percent from the June 1 forecast and down 13 percent from the 2000 crop. Yield is expected to average 43.2 bushels per acre, up 2.0 bushels from last month.

Wheat and Oat Varieties and Brands

The November 6, 2000 issue of the Indiana Agricultural Report, reported the leading varieties and brands, in Indiana, as follows:

> Wheat: Patterson remained Indiana's leading winter wheat public variety for the third year, with 15.8 percent of the 550,000 acres planted for harvest in 2000. Clark and Cardinal tied for second place with 3.1 percent (each). Private varieties continue to be more popular than the public varieties, accounting for 75.1 percent of the total wheat acreage planted during 2000. Pioneer was the leading private variety with 21.6 percent of the total.

Public Wheat Varieties	
Patterson	15.8
Clark	3.1
Cardinal	3.1
Other Public	2.9
Total Public	24.9

Private Wheat Brands	
Pioneer	21.6
Beck	8.3
Countrymark	4.0
AgriPro (Mason)	4.5
AgriPro (Patton)	2.4
All Other	34.3
Total Private	75.1

Public Oat Varieties	
INO 9201	25.2
Ogle	18.6
Noble	8.9
All Others	47.3
Total Public	100.0

Disease Summary

Diseases were not a serious problem in most Indiana wheat fields during 2001. The variable rainfall pattern throughout the state resulted in moderately severe leaf blotch in some areas but very little leaf blotch in others. There was very little Fusarium head blight (scab), except in some local situations where wheat was planted into corn residue, but even there, the incidence of head blight was low.

Stripe rust (yellow rust) was in several fields, but was not severe. This rust is usually not seen in Indiana.

Disease severity is reported for all trial locations except for the Southwest-Purdue Agricultural Center (Knox Co., Location 4), where dry weather caused leaves to senesce prematurely, which precluded assessment of foliar disease. Leaf blotch was the primary disease at the other locations, and was most severe at the Southeast-Purdue Agricultural Center (Jennings Co., Location 5). At all locations, *Stagonospora nodorum* was the main pathogen responsible for leaf blotch. The 0-9.5 rating scale, used in Table A, reflects the vertical progression of symptoms in the canopy as well as overall severity (percentage of leaf area blighted). Details for the rating scale can be seen in the footnote of Table A. At Location 5, symptoms of leaf blotch had progressed to the flag leaf of several varieties by 5 June. The data for Location 5 taken, on 30 May, indicate how rapidly disease severity progressed from 30 May to 5 June. On 5 June, the more resistant varieties had no more than 50% of the leaf below the flag leaf blighted, and no symptoms of blight on the flag leaf. Leaf blotch was somewhat less severe at the Agronomy Research Center at Lafayette (Tippecanoe Co., Location 2), but symptoms did reach the flag leaf of several varieties. Leaf blotch was generally confined to the leaf below the flag or lower at both Pinney-Purdue (Porter Co., Location 1) and Davis-Purdue (Randolph Co., Location 3), Agricultural Centers. There were poor correlations between leaf blotch ratings at the four locations. The most resistant varieties were generally consistent among locations. Some varieties with an intermediate rating at one location had a high rating at another location. The data for Location 5 and Location 2 probably give the best indication of a variety's resistance to *Stagonospora nodorurm* because disease pressure was greater at these locations than at Location 1 or Location 3.

Glume blotch, resulting from infection of heads by *Stagonospora nodorum*, was not severe and could only be rated at Location 5.

Leaf rust severity was low and it was only possible to take notes at Location 2. Even at Location 2, severities were very low, so the data provide little indication of resistance under conditions favorable for leaf rust. A few varieties had a rating of 0, suggesting that they have a hypersensitive resistance that is effective against the race or races of the pathogen present in the field. Other varieties had pustules, but very few of them. This could result either from a partial (slow rusting) type of resistance or a hypersensitive resistance that is effective against some, but not all, races present in the field.

INFORMATION CONCERNING SEED

Information concerning certified seed may be obtained from the Indiana Crop Improvement Association, which certifies seed from both public and private sources. Publicly developed varieties, presented in this bulletin, are listed under the Indiana Crop Improvement Association address. In both the wheat and oat trials, older public varieties are included as check varieties.

Private companies have requested that inquiries concerning proprietary entries, presented in this bulletin, be directed to the addresses listed below.

Lower case letters preceding the entry name are; v-variety, b-brand, m-mixture (blend), and h-hybrid. Other names associated with the entry name are brand or company names usually associated in the trade with the entry name.

AgriPro Wheat
6025 West 300 South
Lafayette, Indiana 47909
Telephone: 765-572-2001

v Gibson
v Mason
v Mitchell
v Patton

Beck's Superior Hybrids, Inc.
6767 East 276th Street
Atlanta, Indiana 46031
Telephone: 317-984-3508

b Beck 101
b Beck 104
b Beck 108

Central Ohio Seed Testing
6150 Avery Road, P. O. Box 477
Dublin, Ohio 43017
Telephone: 614-889-1136

v Bravo Central Ohio

Croplan Genetics
9656 Breckenridge Station
McCordsville, Indiana 46055
Telephone: 317-335-1676

b Croplan 547W

Diener Seeds
371 North Diener Road
Reynolds, Indiana 47980
Telephone: 219-984-5837

b DB 491W
b DB 500W

Indiana Crop Imp. Assn.
7700 Stockwell Road
Lafayette, Indiana 47909
Telephone: 765-523-2535

Oats

v Classic	Public
v Drumlin	Public
v INO 9201	Public
v Jay	Public
v Killdeer	Public
v Sesqui	Public
v Wabasha	Public

Wheat

v Caldwell	Public
v Cardinal	Public
v Clark	Public
v Ernie	Public
v Goldfield	Public
v Madison	Public
v Patterson	Public
v Roane	Public

Ohio Foundation Seeds
P.O. Box 6, 11491 Fdn. Rd.
Croton, Ohio 43013
Telephone: 740-893-2501

v Hopewell Public

Steyer Seeds
5559 North 500 West
McCordsville, Indiana 46055-9998
Telephone: 317-335-3333

b Bernard Steyer
b Pancho Steyer

Syngenta Seeds, Inc.
P.O. Box 729
Bay, Arkansas 72411
Telephone: 870-483-7691

v NK Coker 9025
v NK Coker 9474
v NK Coker 9543
v NK Coker 9663

DISCUSSION

Soft Red Winter Wheat

Indiana's climate and soils are well suited for the production of high quality soft red winter wheat, and local industries provide a market for the crop. No one wheat has all of the most desirable characteristics, but each has certain advantages. Performance data are presented in Tables 1 to 7.

At higher fertility levels, resistance to powdery mildew and lodging become important factors. Winter hardiness, yielding ability, straw strength, plant height and grain quality are important points to consider when choosing which wheat to plant. Disease resistance to leaf rust, Septoria blotch, and powdery mildew, and insect resistance to Hessian fly are also very important factors in selection. A few entries are better suited to acid soils where aluminum toxicity is a problem.

Early seeding favors Septoria blotch, barley yellow dwarf virus, spindle streak, and the fungus root and foot rots, especially take-all and Fusarium. Seeding after the fly-free date is suggested to reduce severity of these diseases.

The organisms causing plant disease are continually evolving, and occasionally new strains, races or biotypes appear that can attack previously resistant wheat. Strains of the leaf rust fungus that have overcome the resistance of older wheats are now widespread in Indiana. Likewise, the powdery mildew fungus has overcome the resistance of older varieties. Leaf rust and powdery mildew can reduce yields of susceptible varieties by 20 percent or more. Strains of the loose smut fungus that can infect older wheat varieties are also present in the state. The best time to detect this disease is just after the wheat heads. Certain fungicide seed treatments will control loose smut.

Wheat Hybrids and Blends

Proprietary wheat hybrids were first included in the 1982 performance trials. Some hybrids were produced using a chemical to sterilize pollen in the seed parent. Other hybrids were produced using the cytoplasmic male sterile and nuclear restorer system. Techniques of hybrid wheat production are often less than 100 percent effective. Therefore, the seed produced on the seed parent may not be 100 percent hybrid.

By Indiana law, seed labeled as hybrid must contain at least 75 percent hybrid seed, and if less than 95 percent hybrid, the hybrid percentage must be stated on the seed label.

Seed having less than 75 percent hybrid is considered a blend. Seed from hybrid wheat, like corn, should not be saved for seeding the following year.

Spring Oats

Spring oats are the most heat tolerant of the spring-seeded small grains and are the only spring-seeded small grain adapted for Indiana. Adaptation to hot weather is usually important in choosing a spring oat. Late maturing varieties perform well, if planted early, in years with ample rainfall and relatively cool temperatures during June and July.

Frequently in Indiana, temperatures are in the upper 80° and low to mid 90° F range, and moisture becomes a limiting factor when oats are filling. This results in low test weights and reduced yields in late-maturing varieties. The farther south a variety is planted, the earlier maturing and more heat tolerant it must be. Yield, straw strength, grain quality and resistance to barley yellow dwarf virus and crown rust are also important in choosing an oat variety.

Oat performance data are presented in Tables 8 to 10.

Table A. Wheat disease ratings in the 2001 winter wheat performance trials, at four Indiana locations, Location 1, Porter Co., Location 2, Tippecanoe Co., Location 3, Randolph Co., and Location 5, Jennings Co. No disease ratings were taken at Location 4, Knox Co.

Entry Type and name (1)		Loc. 2 SLB 6-19(2)	Loc. 2 LR 6-19(3)	Loc. 3 SLB 6-4	Loc. 1 SLB 6-15	Loc. 5 SLB 5-30	Loc. 5 SLB 6-5	Loc. 5 GB% 6-5(4)
b Beck 101		9.00	1.25	6.05	6.88	-	-	-
b Beck 104		8.00	0.25	5.88	6.63	6.58	8.25	2.75
b Beck 108		7.60	0.13	5.58	6.95	6.63	7.83	0.50
b Bernard	Steyer	7.40	0.18	5.85	6.08	6.75	7.55	0.75
v Bravo	Central Ohio	-	-	5.78	-	6.33	8.00	1.00
v Caldwell	Public	8.15	0.00	6.38	6.83	7.05	8.38	5.50
v Cardinal	Public	7.75	1.90	6.28	6.20	6.95	7.50	0.00
v Clark	Public	7.93	0.83	6.13	6.13	6.50	7.70	4.00
b DB 491W		8.10	0.40	-	-	7.05	8.70	6.75
b DB 500W		7.88	0.28	-	-	6.88	8.50	3.25
v Ernie	Public	8.28	0.55	6.33	5.55	6.18	7.43	2.00
v Gibson		-	-	-	-	6.73	8.05	1.75
v Goldfield	Public	7.48	0.13	5.50	5.63	6.05	6.88	0.00
v Hopewell	Public	7.43	0.18	6.00	5.83	6.95	7.33	2.75
v Madison	Public	7.75	0.25	5.43	5.60	6.38	8.23	1.75
v Mitchell	AgriPro	-	-	6.38	6.50	7.05	8.30	3.25
v NK Coker 9025		-	-	-	-	6.25	7.53	1.75
v NK Coker 9474		7.85	0.00	-	-	6.23	7.15	1.50
v NK Coker 9543		-	-	-	-	6.33	8.38	6.75
v NK Coker 9663		-	-	-	-	5.83	7.53	0.25
v Patterson	Public	8.53	1.35	6.25	6.30	6.80	7.95	4.50
v Patton		-	-	5.55	6.33	6.00	7.83	2.00
v Roane	Public	7.60	0.13	5.65	5.15	5.83	7.13	0.50
LSD (0.05)		0.35	1.60	0.67	0.75	0.68	0.42	3.25

(1) Lower case letters indicate entry type as follows: v-variety; b-brand; m-mixture (blend); h-hybrid.
Public entries were developed by Agricultural Experiment Stations (Indiana Agricultural Programs) or in cooperation with the Agricultural Research Service of the USDA.
Other names are company or brand names, generally associated in the trade with variety, brand, hybrid, or blend names.

(2) Leaf blotch severity was scored on a scale of 0-9.5, based on percentage leaf area that was blighted. Percentage area blighted for the flag leaf and 2 leaves below for scale values 5 through 9 are as follows:

Scale value	Percent area blighted on leaf F	F-1	F-2
5		0-1	10-25
6		1-10	25-75
7		10-50	75-100
8	1-20	50-90	100
9	20-90	90-100	100

(3) Leaf rust per cent severity on flag leaf.
(4) *Leptospaeria nodorum* glume blotch per cent on head.