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SOYBEAN PERFORMANCE
IN INDIANA, 2003

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INTRODUCTION

Soybeans are evaluated annually at several locations in Indiana. These trials are conducted according to the policies and procedures of the Indiana Agricultural Research Programs at Purdue University. In this bulletin, results of the 2003 performance trials are given, as well as multiple year averages for those entries tested in the past three test years. Data for experimental entries are not included.

The first soybean trials, in this program, were conducted in 1969 and included both public varieties and private labeled soybeans. There were 20 entries in the first trial. This year, 2003, is the first year no public soybean varieties were included in the trial.

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Performance results for private entries are presented. Private entries, entered voluntarily by the owner, were accepted in the trial after meeting 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 seed 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 soybean performance trial should contact the author by February 1.

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PERFORMANCE TRIAL METHODOLOGY

Location of Trials

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

In 2003, trials were planted at five locations (see Figure 1). The locations, numbered from north to south are:

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

Location 2. Tippecanoe County, near Lafayette, Conventional and Roundup Ready® soybeans in conventional tillage, were tested at the Purdue University Agronomy Center for Research and Education, on Drummer silty clay loam, a very dark gray or black, poorly drained depressional soil. Drummer was formerly classified as Chalmers.

Location 3. Tippecanoe County, near Lafayette, Roundup Ready® soybeans were planted in a no-till seedbed, at the Throckmorton-Purdue Agricultural Center, on Toronto-Millbrook silt loam, a very dark grayish-brown, somewhat poorly drained 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 County 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 County 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.

**Methods Used in the Trials**

In 2003, Conventional soybean maturity groups were placed together in the same trial at all locations. In the Roundup Ready® trial, in no-till, (location 2 only), maturity groups II and III were placed in the same trial. Roundup Ready® soybeans in conventional seedbed trials, at all locations, were grouped by maturity, and planted in the respective early or late maturity group. High-germinating seed (usually 90 percent or better) was used in the trial. The soybean plots were planted in a randomized complete block design with four blocks at each location. Anticipated maturity differences between adjacent plots were restricted to 10 days or less.

**Planting Equipment Used in the Trials.** Two different planters were used to establish the trials reported in this bulletin. Conventional tillage seedbeds, at all five locations, were planted using an Almaco grain drill. Roundup Ready® soybeans, planted in no-till (location 2 only) were planted with a Great Plains No-Till Drill. (Roundup Ready® is a trademark of Monsanto Company.) The drills are described in the following paragraphs.

The Almaco Grain Drill was designed and custom built for research plot work. The drill is equipped with 10 John Deere openers set on 7.5 inch row spacing, and is equipped with spring-loaded press wheels. The drill dropped a pre-counted number of seeds in each 33 linear feet of row.

In all trials, except for the no-till Roundup Ready® trial at location 2, the planting rate for proprietary entries, selected by the owner, varied from 3.0 live seeds per linear foot of row (209,088 live seeds per acre) to 4.0 live seeds per linear foot of row (278,784 live seeds per acre). Assuming 90 percent emergence, this should produce stands from 188,179 to 250,905 plants per acre.

The Great Plains No-Till Drill is equipped with 11 openers set on 7.5-inch row spacing. The drill is equipped with a belt cone distributor, which dropped a pre-counted number of seeds equivalent to 200,000 seeds per acre. Unless otherwise stated, (for the no-till trials), germination was assumed to be 90 percent for all of the entries. The target population was 162,000 plants per acre assuming that 90 percent of the viable seed emerged. The no-till trials, at location 2, were conducted by Dr. E. P. Christmas and were planted with the Great Plains No-Till drill.

Statistically valid yield comparisons may be made within the trials using either of these planters. Practical comparisons may be made among the trials planted with the same equipment, if planted at the same time, at the same location. Comparisons made between trials conducted using these two different planters could lead to incorrect conclusions.

Conventional farm equipment was used for seedbed preparation. Conventional tillage seedbeds, prepared for Conventional and Roundup Ready® soybeans, were clean-tilled prior to planting. All conventional tillage seedbeds, for Conventional soybeans only, were treated with pre-plant herbicides,
and the Conventional soybean trials at locations 1, 3 and 4 were sprayed with post emergence herbicides. Season long weed control was adequate, except for the trial at location 4. Hand-weeding was used to remove weeds that emerged late in the season.

Seedbeds were clean tilled for all Roundup Ready® soybean trials planted in conventional tillage seedbeds, and were sprayed once with Roundup Ultra® just prior to canopy closure. Season long weed control was adequate, and hand-weeding was used to remove weeds that emerged late in the season.

Roundup Ultra® was applied to the no-till (in corn stalks) seedbed, as chemical burn down prior to planting. The trial was sprayed again with Roundup Ultra®, about the time of canopy closure. Spot spraying with Roundup Ultra® was used to control weeds which escaped the first post emergence spraying, and hand-weeding was used to remove the few weeds that emerged late in the season. (Roundup Ultra® is a trademark of Monsanto Company.)

Trials planted in conventional tillage seedbeds (planted using the Almaco Drill, with 10 rows on 7.5 inch spacing), were calculated as 75 inches wide. Trials planted in the no-till seedbed (performed by Dr. E. P. Christmas using the Great Plains drill), were 11 drill rows wide. Row spacing was 7.5-inches, and plot width was calculated as 82.5 inches wide. The no-till drill was used only at location 2.

Plots in all of the trials were end-trimmed prior to harvest, and all rows were harvested for yield. Observations such as plant height, lodging and maturity were taken from the center rows.

**Yield data.** All of the trials reported in this bulletin were harvested with an Almaco combine. The combine is equipped with a modified John Deere 900 series head with a floating cutter bar. Grain yields were weighed, and moisture tested automatically, on the combine, using a Seed Spector II and a Psion Workabout (computer). The Seed Spector II equipment was calibrated using a Motomco moisture meter and Chantillon scales, and the calibrations were checked throughout the harvest season. It should be pointed out that this equipment is not the same as equipment used to meet official grain grading standards, but is believed to be suitable for field plot work. All yields were adjusted to 13 percent moisture and are reported as bushels per acre.

**Plant height**, taken at maturity, is the average length (to the nearest inch) from the soil surface to the tip of the main stem.

**Lodging** is rated at maturity according to the following scores:
1 - Almost all plants erect.
2 - All plants leaning slightly or a few plants down.
3 - All plants leaning moderately (45 degrees) or 25-50 percent of plants down but still harvestable with conventional equipment.
4 - All plants leaning considerably or 50-80 percent of plants down and difficult to harvest with conventional equipment.
5 - Almost all of the plants down, and harvest losses would occur with conventional equipment.

**Maturity date** is when more than 90 percent of the pods are ripe (tan, brown or gray); and days (to maturity) are the number of days from planting to maturity. Delayed leaf drop and green stems are not considered when assigning maturity. About a week of good drying weather may be needed before soybeans are ready to harvest after reaching maturity. Soybeans should mature about two weeks before the average date of the first killing frost, which ranges from approximately October 10 in northern Indiana to October 25 in southern Indiana.

### Statewide Weather and Harvest Summary

Information contained in this section is gleaned from weekly reports, "Indiana Crop & Weather Report", from the Indiana Agricultural Statistician at Purdue University.

The first Indiana Crop and Weather report for the 2003 growing season, issued for the week ending April 6, 2003, reported soil moisture ratings (in percent) for topsoil as, very short 3, short 8, adequate 66, and surplus 23. Subsoil moisture ratings were, very short 9, short 13, adequate 67, and surplus 11 percent. The crop report for April 27 reported four percent of the Indiana soybean crop was planted, which was on par for average.

By May 4, seventeen percent of the soybean crop was planted. Rain slowed soybean planting in mid-May and by the twenty-fifth of the month, the crop was only 40 percent planted compared to 66 percent for average. At the end of May, topsoil moisture was rated 56 percent adequate and 44 percent surplus. Subsoil was 4 percent short, 60 percent adequate and 36 percent surplus.
By June 1, the crop was 63 percent planted compared to 79 percent for average. Soybean planting progressed at a slower-than-normal pace in June, and at the end of the month, planting was 95 percent completed compared to 98 percent for the five-year average. At the end of June, 89 percent of the crop had emerged compared to 96 percent for the five-year average. The crop was rated, 1 percent very poor, 9 percent poor, 36 percent fair, 46 percent good and 8 percent excellent. A year earlier soybeans were rated 61 percent good to excellent.

Heavy rain and flooding occurred over most of the central part of the state around the fourth of July. The July 6 report rated topsoil moisture as 4 percent very short, 20 percent short, 47 percent adequate and 29 percent surplus. Subsoil moisture was 4 percent very short, 16 percent short, 61 percent adequate and 19 percent surplus. A week later topsoil was rated 5 percent short, 42 percent adequate and 53 percent surplus. By July 13, virtually all soybeans had emerged and 23 percent were blooming. One percent of the soybeans were setting pods compared to 8 percent for average. The soybean condition was rated 51 percent good to excellent, which was the same rating as last year. The July 20 report rated soil moisture 56 percent adequate and 37 percent surplus. Soybean condition rating declined to 49 percent good to excellent compared to 36 percent the previous year. Five percent of the soybeans were setting pods compared to 18 percent for average. Moisture remained adequate during July with topsoil ratings 65 percent adequate to 29 percent surplus. The soybean condition rating remained around 51 percent good to excellent. Fifteen percent were setting pods, compared to 33 percent for average.

During the forepart of August, soybeans continued to develop at a slower-than-normal pace. By August 10, forty-four percent of the plants were setting pods compared to 69 percent for average. The crop condition was rated 59 percent good to excellent, and soil moisture continued to be favorable.

Hot, dry weather arrived in mid-August along with aphids and disease. By the third week of August, hot dry weather was causing some stress on the crop. The last week of August, 93 percent of the soybeans were setting pods compared with 98 percent for average. Six percent of the beans were shedding leaves compared to 15 percent for average. The soybean condition was rated 56 percent good to excellent compared to 38 percent last year. Rain fell over much of the state and provided much needed relief to the soybean crop.

Heavy rain, on Labor Day, brought flooding and ponding of water to many low areas. By the first week of September, virtually all soybeans were setting pods, except for the double cropped soybean acreage. Twelve percent of the soybeans were shedding leaves compared to 33 percent for average. The crop condition was rated 60 percent good to excellent compared to 32 percent last year. Soil moisture was rated 64 percent adequate and 31 percent surplus. By September 14, six percent of the soybeans were mature compared to 22 percent for average. The soybean condition was rated 59 percent good to excellent compared to 30 percent the previous year. The third week of September, 57 percent of the soybeans were shedding leaves, 22 percent of the crop was mature and 5 percent was harvested. Soil moisture was 78 percent adequate and 5 percent surplus. At the end of September, the soybean crop was 42 percent mature compared to 67 percent for average. Nine percent of the soybean acreage was harvested compared with 20 percent for average. Grain moisture in the harvested soybeans was averaging about 14 percent.

Soybean harvesting made good progress in October and by the third week, 64 percent of the crop was harvested compared to 74 percent for average. By the end of the month, virtually all of the crop was mature, and 84 percent of the crop was harvested.

By the November 9 report, 97 percent of the soybean crop was harvested, which was on par for average.

On November 20, 2003 the Indiana Agriculture Report presented the following information:

"Based on conditions November 1, ....... Soybean production is forecast at 203.3 million bushels, down 5 percent from the October 2003 forecast, and down 15 percent from the 239.5 million bushels produced in 2002. The expected yield of 38 bushels per acre is 3.5 bushels below last year’s yield of 41.5 bushels per acre. The acreage expected to be harvested for beans, at 5.35 million acres, is 7 percent less than in 2002, but unchanged from the October estimate."
DISCUSSION

It is not possible to absolutely determine or predict the response of plants to the environment. The results of every field trial conducted are influenced by the treatment and by the experimental error. In these trials, the treatment is the soybean entry (variety, brand, or blend) planted in the trial. Experimental error is a composite term to indicate everything that could not be controlled by the person performing the trial. Experimental error is not intended to include human error. These trials are conducted on the assumption that all the entries in the trial are equal until evidence is obtained that they are not equal. In order to obtain this evidence it is necessary to determine whether the trial results were influenced most by the entries or by experimental error. To do this an analysis of variance is performed and the relationship of the yielding ability of the entries to experimental error is determined. The analysis of soybean performance trials show that maturity relationships are very predictable whereas yield relationships are the most difficult to predict.

Probability levels have been established to assess the validity of a trial. Generally trials should be significant at the 10 percent probability level. This means 1 trial in 10 could be a fluke and not be detected. In this bulletin, 12 of the 2003 (single location) trials are significant at the 10 percent probability level, and 4 trials are not. The 2003 trials, which are not significant, at the 10 percent probability level are:

Table 1, Conventional soybeans, in conventional tillage.
Table 7, Roundup Ready® soybeans, in no-tillage.
Table 8, Conventional soybeans, in conventional tillage.
Table 9, Roundup Ready® soybeans, conventional tillage.

The analysis of variance makes it possible to compute a coefficient of variability (C.V.). The coefficient of variability is a relative term. It is the ratio of the standard deviation to the grand mean of the trial, expressed as a percent. On the western side of Indiana a normal C.V. for soybeans is 5 to 10 percent; whereas on the eastern side it is 10 to 15 percent. Whenever the C.V. is larger than normal for a trial location, it indicates the precision of the trial was below normal. When yields are high and the experimental error is small, the C.V. will be small.

Single-year trials, in this report, generally require yield differences of 7 to 10 bushels for (statistical) significance. This year (2003) for single locations, BLSD (k=100) yield differences for significance, ranged from 3.9 to 15.0 bushels per acre.

A test of significance must be performed to determine if the yield difference between two entries is due to experimental error or due to the yielding ability of the entries. The single-year trial only reflects what happened one year at one location, and is generally inadequate for predicting how the soybeans may perform in the future. Data from multiple years, and in some instances multiple locations, when combined and analyzed, provide a superior estimate of how soybeans will perform in the future.

Soybean data from any source must include years (preferably three), must be analyzed, and must have a test of significance before it has any value as a basis for performance prediction.

An analysis of variance, which includes years, will show that years have a very strong influence on yields. Also, an analysis of variance that includes locations will show that locations also influence the performance of the entries in the trial.

Brief periods of favorable or unfavorable weather, when the plants are vulnerable to weather stress, can change the yield relationship among entries from year to year. Maturity relationships are photoperiod influenced and are much less affected by weather from year to year.

Often it is not beneficial or appropriate to combine data across locations from these performance trials. The trials are far enough apart from north to south that the entries in the trial may not be adapted to several locations. The trial environments from east to west are also very different, especially in regard to the presence and severity of Phytophthora rot. It is important to realize that locations may all provide similar trial results one year and produce quite different results the following year.

This year (2003) data combinations were made, from selected locations, for Roundup Ready® soybeans (in conventional tillage) for maturity group III only. Locations 2 and 3 were combined for yields averaged across two locations in central Indiana, and yields were averaged across locations 4 and 5 for southern Indiana. These data are reported in Tables 17 and 18 respectively.
Trial results are ranked by yield. The Waller-Duncan Bayesian k ratio t test is used for the test of significance. A k ratio of 100:1 was used in computing the Bayesian least significant difference (BLSD) for the test of significance. This ratio may be considered in a loose sense to take the place of the (LSD) 5% level of significance. The BLSD value may be used to make all possible pair-wise comparisons among the entries. Yield differences smaller than the BLSD value should be considered due to chance (experimental error) and not due to superior performance.

An asterisk (*) is included in the yield column in each sub-table. The asterisk denotes all yields in the sub-table which are not, statistically, significantly different from the top yield. Do not place undue emphasis on yield differences followed by an asterisk. The BLSD value must still be used to determine if the particular yields being compared are, statistically, significantly different.

At Location 1, April rain totaled 2.96 inches and was distributed in showers of less than one inch, except for 1.32 inches which fell on April 5. Temperatures warmed rapidly in April, reaching 80° F on April 2, and 80° F and above, again in mid month.

May rain totaled 7.13 inches. The heaviest rain (2.16 inches) came on May 9 and the rest of the precipitation came in showers of less than an inch and a half. May temperatures were generally mild and provided good weather for seedbed preparation. The soybean trials were planted May 19, about 10 days later than the optimum planting date. Emergence was uniform, and vigorous stands were established.

June rain totaled 2.46 inches. Precipitation was distributed throughout the month, with most of the rain coming in showers of half of an inch, or less. The latter half of June had three days with temperatures of 90° to 92° F.

July was wet, with 17 days receiving measurable precipitation. July rain totaled 7.82 inches. Two July rains exceeded an inch (July 5, 1.56 and July 18, 1.06 inches). The rest of the rain came in amounts of less than an inch. The total rain for the period July 1 to 14 totaled 4.11 inches. Three days in July had temperatures of 90° to 95° F. Otherwise, daytime high temperatures ranged from 71° to 88° F.

The first half of August had 6 days without precipitation and the last half of the month had 8 days with no rain. August rain totaled 2.10 inches and was distributed among eleven showers of less than two-thirds of an inch. The largest rain (0.63 of an inch) came on August 30. During the last half of the month, six days had temperatures of 90° to 94° F.

September rain totaled 2.81 inches, also distributed among eleven showers, and came in amounts ranging from 0.01 of an inch to 1.19 inches. The largest rain (1.19 inches) came on September 1. During the first half of September, 11 days had no rain, and during the last half of the month, 5 days received no precipitation. Temperatures were cooler with daytime temperatures ranging from 55° to 85° F.

All soybeans, in the trials, were mature before the first killing freezes, which arrived during the first week of October. The trials were harvested October 10.

From June 1 through September 30, the soybean trials at location 1 received a total of 15.19 inches of rain. Normal (average) precipitation (1971-2000) for northwest Indiana, June 1 through September 30, is 15.46 inches. During June, July and August, 12 days had daytime high temperatures of 90° to 95° F. Average yields were down 4 to 13 percent (1.8 to 5.7 bushels per acre) from yields in 2002. Statistically, the Conventional soybean trial (maturity groups II and III combined) was not significant at the 10 percent probability level. The Roundup Ready® trials (maturity groups II and III) were, statistically, significant at the 10 percent probability level. Weather extremes from wet to dry and the presence of white mold contributed to yield reduction in 2003. In this particular instance (2003) when comparing test locations 1 and 2, the earlier maturing the cultivar, and the farther north in the state, the more severe the impact from white mold appeared to be. Performance data from location 1 in 2003, presented in Tables 1, 2 and 3, should be used with caution. Previous year’s data or data from other trial locations may be a better source of information.

At Location 2, April precipitation totaled 2.70 inches. The heaviest rain (1.11 inches) came on April 4. The remaining 1.59 inches came in 11 showers of less than half of an inch.
May rain totaled 6.8 inches. Sixteen days in May received measurable precipitation. The heaviest rain (2.13 inches) fell on May 5, and the rest of the precipitation was distributed throughout the month in showers of less than one inch. Wet soil delayed planting the trials until May 22, which was about 12 days later than the optimum planting date. Soybean emergence was normal and good stands were obtained. May temperatures were cool, with low temperature for the month (34°F) on May 11. Only two days in May (May 1 and 10) had high temperature at or above 80°F.

June rain totaled 3.83 inches with virtually all of it coming in the first half of the month. From June 15 through June 30 there was a total of 0.24 of an inch of rain. Temperatures were mild. Two days (June 25 and 26) had daily high temperature of 91°F.

July rain totaled 7.9 inches. Rain persisted over the course of eight days (July 5 through 12) and brought 6.16 inches of precipitation. The last half of the month was relatively dry with seven showers, which ranged from a trace to 0.64 of an inch. Daytime high temperatures on July 4, 5, 7, 8 and 9 ranged from 90° to 95° F. During the rest of the month high temperatures ranged from 74° to 89° F.

August was warm and dry. Five days (August 22, 26, 27, 28 and 29) had daytime high temperatures ranging from 92° to 94° F. Precipitation for the month totaled 3.55 inches and more than half of it came on the last two days of the month. August 1 through 17 received seven showers which totaled 1.58 inches of rain. August 18 through 28 received no precipitation. Rain on August 29 and 30 totaled 1.97 inches.

Rain total for September was 7.14 inches. Two major rains fell during the month, 2.51 inches on September 1, and 1.67 inches on September 27. Eight other showers (all in amounts of less than an inch) were distributed throughout the month. Temperatures were mild, with daytime highs ranging from 66° to 86° F.

All soybeans in the trials at location 2 were mature, and were harvested, before the first killing freeze (October 2, 27° F). The Conventional soybean trial (maturity groups II and III combined) and the Roundup Ready® maturity group II trial, were harvested on September 30. The Roundup Ready® maturity group III trial was harvested October 2.

From June 1 through September 30, the soybean trials at location 2 received a total of 22.42 inches of rain. Normal (average) precipitation (1971-2000) for west central Indiana, June 1 through September 30, is 15.87 inches. During June, July and August, 12 days had daytime high temperatures of 90° to 95° F. Weather extremes from wet to dry and the presence of white mold contributed to yield reduction in 2003.

Average yields were down 20 to 40 percent (11.8 to 27.9 bushels per acre) from 2002 yields. The 2003 trials at location 2 were, statistically, significant at the 10 percent probability level. Performance data from location 2 in 2003, presented in Tables 4, 5, 6 and 7, should be used with caution. Previous year’s data or data from other trial locations may be a better source of information.

At Location 3. April rain was distributed throughout the month in eight showers of less than half of an inch. Rain total for the month was 1.53 inches. Temperatures were mild with the daily high averaging 62.3°F and the average daily low averaging 40.1°F.

May rain totaled 5.49 inches. Eleven of the first eighteen days of May had measurable precipitation, which totaled 4.97 inches. From May 19 through 30 there was no precipitation. The last day of the month received 0.52 of an inch of rain. May temperatures averaged 70.2°F for the daily high and 50.1°F for the nightly low. The soybean trials were planted May 28 in firm, moist seedbeds. The planting date was about two weeks later than the optimum planting date. Emergence was normal, and uniform, vigorous stands were established.

June was relatively dry with 3.20 inches of rain. Rain was distributed, among twelve showers throughout the month, in amounts of less than three-fourths of an inch. From June 16 through 26 there was no measurable precipitation. Temperatures were mild. One day, June 26, had a high temperature of 90°F.

July recorded 10.6 inches of rain for the month, with most of it (8.96 inches) falling between July 2 and 10. After July 10, eight showers brought a total of 1.64 additional inches. Two days (July 5 and 9) had temperatures of 92°F and 90°F, respectively. For the month, daily high temperatures averaged 82.4°F and daily low temperatures averaged 61.1°F.
August rain totaled 3.21 inches with most of it falling during the first half of the month. August 14 through 29 received no precipitation. The last rain for the month (0.85 of an inch) came on August 30. During the dry period, six days had daytime high temperatures which ranged from 90° to 92° F. Daytime high temperatures for the month, averaged 83.7° F.

September rain totaled 8.17 inches. September 1 through 3, received 4.43 inches of rain. September 4 through 14 was dry. September 15 and 16 received 0.55 of an inch. The next 5 days (September 17 through 21) were dry. September 22 through 30, received 3.19 inches of rain. September daytime high temperatures ranged from 58° to 84° F, and averaged 73.9° F.

The first freezing temperature (28° F) came on the nights of October 2 and 3. The Conventional soybean trial and the Roundup Ready® Maturity Group II trial, were both mature before October 2. The Roundup Ready® Maturity Group III trial was near maturity and the latest maturing entries did not appear to be damaged by the cold temperature. All trials at location 3 were harvested October 9.

From June 1 through September 30, the soybean trials at location 3 received 25.18 inches of rain. Normal (average) precipitation (1971-2000) for east central Indiana, June 1 through September 30, is 15.04 inches. Nine days, during the growing season, had high temperatures of 90° to 92° F. The Maturity Group III, Conventional soybeans trial, and the Maturity Group II Roundup Ready® soybeans trial, were not, statistically, significant at the 10 percent probability level. The Roundup Ready® Maturity Group III trial was, statistically, highly significant. Conventional Maturity Group III soybean yields were 11.7 percent lower (6.2 bushels per acre) than yields in 2002. Maturity Group II Roundup Ready® soybean yields were down 15 percent (7.6 bushels per acre) and Maturity Group III Roundup Ready® yields were 9.5 percent (5.2 bushels per acre) below the 2002 yields.

The Conventional Soybean Maturity Group III, and the Roundup Ready® Maturity Group II trials are of limited value for performance comparison. The Roundup Ready® Maturity Group III trial may be useful for making yield comparisons at location 3. The trial results are presented in Tables 8, 9 and 10.

At location 4, April rain came in showers of less than one inch, and totaled 3.54 inches. Temperatures warmed in April and averaged 67° F for daytime highs, and 45° F for nighttime lows.

May was warm with high temperatures averaging 73° and low temperatures averaging 54° F. May rain totaled 7.63 inches. Most of the rain came the first three weeks of the month. The heaviest rain (2.71 inches) came on May 5, followed by 3.4 inches over the next six days. The soybean trials were planted on May 29, about three weeks later than the optimum planting date. The trials were planted in ideal seedbeds. Emergence was rapid, and uniform, vigorous stands were established.

June rain totaled 4.52 inches. Nearly half of the June rain (2.23 inches) fell on June 11 and 12. The last half of the month (June 16 through 30) received four light showers which totaled 0.22 of an inch of rain. Highest daytime temperatures were on June 25 (90° F), 26 (92° F) and 30 (91° F). Daytime temperatures for the month averaged 80° and night temperatures averaged 59° F.

July was hot and relatively dry. Fifteen July days had daytime high temperatures which ranged from 90° to 95° F. Daytime temperatures for the month averaged 88° and night temperatures averaged 66° F. Rain for the month measured 3.7 inches. The largest and most beneficial rain (1.98 inches) came on July 10. The rest of the precipitation (1.72 inches) was distributed among 12 light showers ranging from 0.01 to 0.36 of an inch.

Thirteen August days had daytime temperatures which ranged from 90° to 96° F. Daytime temperatures for the month averaged 88° and night temperatures averaged 66° F. August rain totaled 4.44 inches. Rain was distributed, August 1 through 7 (1.3 inches), 8 through 14 (0.74 of an inch), 15 through 21 (0.20 of an inch), and 22 through 28, no precipitation. The largest rain (1.25 inches) arrived on August 30, followed by 0.95 of an inch on August 31.

September temperatures, for the month, averaged 76° daytime and 54° F for nighttime. High temperatures ranged from 50° to 87° F. September rain totaled 5.84 inches. Most of the rain came during the first week (1.68 inches) and the last nine days (3.99 inches) of the month. From September 8 through 21 there was only one rain (0.17 of an inch). Although no maturity notes were taken on the trials, all of the entries were mature and harvested (October 8) before the first killing freeze, which did not arrive until November 8.
From June 1 through September 30, the soybean trials at location 4 received 18.5 inches of rain. Normal (average) precipitation (1971-2000) for southwest Indiana, June 1 through September 30, is 15.52 inches. Thirty-one days, June 1 through August 30, had high temperatures ranging from 90° to 96° F.

The 2003 Conventional soybean trial (maturity groups III and IV combined) is, statistically, significant at the 10 percent probability level. A serious weed problem (mostly nightshade) developed late in the season, and may have impacted the trial results. The Conventional soybean trial may be of some use in comparing performance between the two entries in the trial.

The Roundup Ready® trials were virtually weed free. The Roundup Ready® Maturity Group III trial is similar to 2002, has better precision, and should be useful in making performance comparisons. The Roundup Ready® Maturity Group IV trial average was 23 percent (16.9 bushels) below the 2002 trial average. Nevertheless, the data may be useful for performance comparisons among the four entries in the trial. The data are presented in Tables 11, 12 and 13.

At Location 5, April was warm and moist. Daytime high temperatures ranged from 41° to 83° F. Nighttime low temperatures ranged from 28° to 60° F. Rain for the month totaled 3.80 inches, with most of it coming during the last half of the month.

May continued wet and warm. Seventeen days in May had measurable precipitation. Rain totaled 5.72 inches. Daily high temperatures ranged from 61° to 82° F and nightly lows ranged from 39° to 67° F. No temperature in May reached 90° F.

June rain totaled 4.92 inches, and was distributed among 12 showers which ranged from 0.03 to 0.91 of an inch. The soybean trials were planted June 9, about a month later than the optimum date of planting. For seven days after planting (June 10 through 16) rain fell daily and flooded (3.53 inches total) the trials. Stands were particularly affected in the Conventional Soybean trial (Maturity Groups III and IV combined). June was mild with only 1 day (June 25) reaching 90° F.

July rain totaled 6.97 inches. Sixty percent of that rain (4.23 inches) came on two days, July 9 (2.88 inches) and July 10 (1.35 inches). The rest of the measurable precipitation came in 13 showers which ranged from 0.01 to 0.57 of an inch. Seven days (July 3 through July 9) had temperatures which ranged from 90° to 93° F.

August rain totaled 2.37 inches with the largest rain (1.1 inches) arriving on August 4. August 1 through 4 had a total of 1.14 inches of rain. The next 24 days (August 5 through 28) had no measurable precipitation. August 29 through 31 had 1.23 inches of rain. Six days, the last half of August, had temperatures ranging from 90° to 92° F.

September temperatures ranged from a daytime high of 86° F to a nighttime low of 37° F. Nine rains brought a total of 5.05 inches for the month. September 1, 2 and 3, had a total of 2.73 inches of rain. September 4 through 13 received no precipitation. September 14 and 15 had a total of 0.27 of an inch, then dry weather prevailed until September 22. September 22 through 30 received 2.05 inches of rain.

The soybean trials were mature and were harvested on October 8 and 9. The first below freezing temperature (30° F) came on October 3, but did not damage the soybeans in the trial.

From June 1 through September 30, the trials at location 5, received 19.31 inches of rain. Normal (average) precipitation (1971-2000) for southeast Indiana, June 1 through September 30, is 15.57 inches. Fourteen days had temperatures which ranged from 90° to 93° F.

The Conventional Soybean trial (Maturity Groups III and IV combined) is significant at the 10 percent probability level. The trial contained 14 entries. Twelve of the entries were experimental lines and two were entries available for sale to the public. Due to the excessive moisture, which came directly after planting, and the presence of soil-borne pathogens, some of the plots had severe loss of stand. The most serious loss of stand occurred in the experimental lines. The two entries reported in this bulletin were in adjacent plots (placed by randomization) but were not in the areas of the most severe flooding. Good stands were maintained in all four plots containing Garst 3906N. Stands were fair to poor in all four plots containing SC Aaron N. The difference in stand may have been a contributing factor in yield. The data, presented in Table 14, should be used with caution.

The Roundup Ready® Maturity Group III trial was much less affected by stand reduction than the Conventional Soybean trial. Seven entries had some stand reduction in one or more plots. The entries are, Garst 3712/RRN, Asgrow AG 3905, Stine S3932-4, Stine S3832-4, TL 378RR, Asgrow AG 3801, SC Jordan NRR. The data, presented in Table 15, are significant at the 10 percent probability, and should be useful for comparing performance.
The Roundup Ready® Maturity Group IV trial was not visibly affected by water or stand reduction. The trial was, statistically, significant at the 10 percent probability level, but the yield differences were not large enough to perform mean separation. The data, presented in Table 16, would indicate the entries may be similar in yielding ability.

**SOURCES OF SEED**

Information concerning certified seed may be obtained from the Indiana Crop Improvement Association, 7700 Stockwell Road, Lafayette, Indiana 47909, which certifies seed from both public and private sources. Private companies have requested that inquiries concerning proprietary entries, presented in this bulletin, be directed to the addresses listed on the following pages.

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

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

- b Beck 283RR
- b Beck 292RR
- b Beck 306NRR
- b Beck 323RR
- b Beck 336NRR
- b Beck 355RR
- b Beck 359
- b Beck 367NRR
- b Beck 375NRR
- b Beck 405NRR
- b Beck 417NRR

**Dairyland Seed Company, Inc.**  
P. O. Box 958, 3570 Highway H  
West Bend, Wisconsin 53095  
Telephone: 800-236-0163

- v DSR-245/RR
- v DSR-268/RR
- v DSR-274/RR
- v DSR-277/RR
- v DSR-297/RR
- v DSR-320/RR
- v DSR-326/RR
- v DSR-340/RR
- v DSR-345/RR
- v DSR-355
- v DSR-357/RR
- v DSR-375/RR
- v DSR-385/RR

**Garst & AgriPro Seed Company**  
2369 330th Street, P.O. Box 500  
Slater, Iowa 50244  
Telephone: 800-831-6630

- b 2603RR  Garst
- b 3212RR/N  Garst
- b 3712RR/N  Garst
- b 3824RR/N  Garst
- b 3906N  Garst
- b 4312RR/STS/N  Garst
- b D294RR/N  Garst
- b D308  Garst
- b D350  Garst
- b D355RR  Garst

**Martin Seeds, Inc.**  
10045 West Second Street  
Williamsport, Indiana 47933  
Telephone: 765-986-2030

- b M-328NRR
- b M-333RR
- b M-337NRR
- b M-432NRR
- b M-435NRR
Miles Farm Supply, L.L.C.
P.O. Box 22879, 2760 Keller Road
Owensboro, Kentucky 42304-2879
Telephone: 270-926-2420
Telephone: 800-666-4537
v SC Aaron N
v SC Abraham N
v SC Jordan NRR
v SC Michael N
v SC Stephen N

Monsanto
3100 Sycamore Road
DeKalb, Illinois 60115
Telephone: 815-758-9323
v AG 2703 Asgrow
v AG 2705 Asgrow
v AG 2801 Asgrow
v AG 3005 Asgrow
v AG 3202 Asgrow
v AG 3401 Asgrow
v AG 3703 Asgrow
v AG 3801 Asgrow
v AG 3905 Asgrow
v DKB 31-51 DeKalb
v DKB 31-52 DeKalb
v DKB 37-51 DeKalb
v DKB 38-52 DeKalb

Rupp Seeds, Inc.
17919 County Road B
Wauseon, Ohio 43567
Telephone: 419-337-1841
v Rupp RS 2499
v Rupp RS 4213RR
v Rupp RS 4230RR
v Rupp RS 4279RR
v Rupp RS 4328RR
v Rupp RS 4345RR

Schillinger Seed, Inc.
50 Glenn Drive
White Heath, Illinois 61884
Telephone: 217-377-9932
v 283RPF Schillinger
v 292RCB Schillinger
v 323RCB Schillinger
v 393RCP Schillinger
v 413RCP Schillinger

Stine Seed Company, Inc.
2225 Laredo Trail
Adel, Iowa 50003
Telephone: 800-362-2510
Telephone: 515-677-2605
b Stine S2743-4
b Stine S2842-4
b Stine S2900-4
b Stine S3832-4
b Stine S3932-4

Trisler Seed Farms, Inc.
3274 East 800 North
Fairmount, Illinois 61841
Telephone: 217-288-9301
v Triso 2907RR(CN)
v Triso 2933RR
v Triso 3222RR(CN)
v Triso 3530RR(CN)
v Triso 3717RR(CN)
v Triso 3833RR(CN)
v Triso 3911RR(CN)
v Triso 4314RR(CN)

W. V. H. Tech Line
2265 West 600 North
West Lafayette, Indiana 47906
Telephone: 765-463-4455
b TL 290RR
b TL 303RR
b TL 317RR
b TL 324RR
b TL 342RR
b TL 353RR
b TL 378RR
b TL 389RR