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TITLE: Breeding for Improved Wheat Cultivars

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OBJECTIVES:

Develop and release wheat cultivars with high yield potential, high test weights, straw strength, winterhardiness, early maturity, and resistance to diseases common to Arkansas through pedigree, bulk population, and backcross breeding methods.

Cooperate with other public programs to identify lines adapted to Arkansas which can be released through the Foundation Seed Program and join other institutions in joint releases.

ABSTRACT:

Approximately 1000 bu of Foundation Seed of 'Pat' was sold last fall. Certified seed was produced and it was made available to farmers this fall. Also this fall, the line AR 839-25-8-2 was licensed through an agreement with Delta King and Armor (Cullum) Seed Companies; both will share the license and market the variety in Arkansas. Seed sales of the recently released 'Sabbe' have been good.

Field work this past year went well. All six locations were planted in the optimum planting period and excellent stands were obtained at all locations with the exception of Kibler which had poor stands due to excess rainfall shortly after planting. Only plant measurement data was collected from this site. During the spring, the project's work consisted primarily of fertilization and herbicide application. In addition to the normal breeding trials, two disease trials were also planted, Scab Observation and Rust Observation nurseries to enhance the development of disease resistant germplasm. All plots were harvested by June 30. Yields were high. In the most advanced nursery, the Elite Wheat Lines (EWL) 13 experimental lines had yields higher than that of NK Coker 9663 averaged across all locations.

During the winter the greenhouse crossing program to produce future lines was expanded. There were three main efforts: 1) standard variety development (125 crosses), 2) scab-resistant varieties (50 crosses), and 3) imidazolinone herbicide resistant varieties (16 crosses).

INTRODUCTION:

In Arkansas, wheat yields have increased at a rate of about 0.5 bu/A per year since 1924. Yield increases in wheat and other crops are due to improved cultural practices as well as genetic improvement. Studies in other regions have estimated that improved wheat cultivars are responsible for somewhere between 28% to 55% of the yield increases. Pathogens are also under genetic control and will select races which will attack prevalent cultivars. The absence of aggressive breeding programs would not only stop yield increases due to new cultivars but also the yield of cultivars currently grown would decrease since pests would develop which would overcome resistance.

The University of Arkansas' breeding program has stressed cultivar development through the use of adapted crosses to maximize efficiency but has continued to broaden the genetic base of the program to guard against genetic vulnerability and limited genetic improvement. The program uses a combination of the bulk and pedigree methods to minimize cost. In order to obtain high yielding, adapted cultivars, increased emphasis will be given to disease resistance. The Arkansas program unlike other programs is putting major emphasis on the development of high test weight genotypes since a substantial component of test weight is under genetic control.

MATERIALS AND METHODS:

Parents are chosen for their high-yield potential and adaptation to Arkansas conditions. Crosses are being made between genotypes with complementary traits in the greenhouse at Fayetteville. The F₁ generation is also grown in the greenhouse. Beginning with the F₂ generation, a combination of pedigree and bulk breeding methods are followed until sufficient homozygosity is reached to increase seed for yield testing.

Selected lines are then tested and re-selected in replicated yield plots. Lines selected move in a step-wise progression through the following nurseries: Wheat Observation (2 locations with one replication per location), Advanced Wheat Strains (4 locations), and Elite Wheat Lines (4 locations). Locations include Kibler, Stuttgart, Keiser, Marianna, and Rohwer. Numerous locations are used to help ensure selection of genotypes that are adapted to a number of soil types and environments. All lines in the nurseries are harvested for yield, and data is taken on test weight, lodging, maturity date, plant height, and winterhardiness. Reaction type and level of severity of diseases present is also recorded each spring. Lines that appear to have potential as cultivars are entered in the Arkansas Commercial Variety Test. The seed of each line in the Elite Wheat nursery is sent to the USDA Soft Wheat Quality Lab to be tested for baking and milling quality to ensure that the lines released from the program meet industry standards.

Other Universities in the soft wheat region have variety development programs. Evaluation of public lines initially takes place in regional uniform nurseries and then through the commercial variety test. Released lines adapted to Arkansas will be introduced through the foundation seed program to seedsmen.

RESULTS AND DISCUSSION:

Results from this year's research are found on the following pages. The information is divided into three basic sections: 1) New and future releases, 2) Yield nurseries and 3) Early generations.

1) NEW AND FUTURE RELEASES:

Approximately 1000 bu of Foundation Seed of 'Pat' was sold last fall. Certified seed was produced by Arkansas seed dealers this summer and seed was made available to farmers this fall. Pat has performed very well in the State Variety Tests for the past two years (Table 1). Pat has also done well in Mississippi and is the highest yielding variety across Arkansas and Mississippi for the last two years (Table 2). This fall the line, AR 839-25-8-2, was licensed in an agreement that Delta King and Armor (Cullum) Seed Companies. Both of these companies will share the license and will market the variety in Arkansas and surrounding states. This line is very similar in performance to 'Pat' (Table 1). Seed sales of 'Sabbe' has been good and it continues to perform well under high-input conditions.

Foundation seed of ARLA 85411 was produced at Marianna this year in anticipation of release. It is a line with excellent resistance to both stripe rust and leaf rust that had performed well in Arkansas and in Mississippi for the past two years. However, its performance in 2002 was below average and therefore a decision was made this summer not to release this line.

This past year Virginia Tech released two new public varieties, 'Sisson' and 'McCormick.' Sisson is very susceptible to stripe rust and has performed poorly in Arkansas. McCormick has performed much better in Arkansas, but did not offer substantial improvement in currently offered public varieties. Therefore, neither varieties were added to the Foundation Seed Program.

Two experimental lines, AR910-9-1 and AR839-28-1-2, are being considered for release. Small amounts of Breeder Seed were planted at Marianna in the fall. After data is collected during 2002-03 a decision will be made.

Table 1. Performance in the Arkansas Wheat Tests across all Locations for 2001 & 2002 (17 tests).

Entry Name	Yield	Test wt	Ldg	Pt ht	Head date	Mat. date	Wint kill	Leaf rust
	bu/A	lb/bu	%	in			%	%
DELTA KING 7777	76.5	55.2	9	37	4-20	5-23	0	30
DIXIE 900	76.1	55.6	2	38	4-19	5-23	2	0
DELTA KING 7900	75.5	54.8	3	38	4-19	5-22	4	3
AR 839-28-1-2	75.3	55.7	1	36	4-20	5-23	1	2
ARMOR 2025	75.2	54.7	4	37	4-18	5-22	2	1
AGS 2000	74.8	55.1	9	35	4-17	5-22	2	0
AR 839-25-8-2	74.6	55.8	4	34	4-20	5-24	1	2
PAT	74.4	56.3	1	36	4-23	5-26	1	2
DELTA KING 9333	74.3	55.0	4	39	4-20	5-22	0	1
ARMOR 3035	74.1	54.7	4	37	4-20	5-23	2	1
DELTA GROW 4888	73.9	54.5	6	37	4-19	5-22	2	2
AGRIPRO SHELBY	73.8	56.3	20	36	4-19	5-22	1	4
AGRIPRO NATCHEZ	73.3	53.4	21	37	4-21	5-23	0	0
PIONEER BRAND 26R24	73.3	54.0	15	35	4-19	5-21	2	1
CROPLAN GENET. 554W	72.9	54.4	14	33	4-19	5-21	1	1
DELTA KING 9216	72.7	53.3	11	36	4-20	5-23	2	2
PIONEER BRAND 26R46	72.6	55.1	2	34	4-17	5-21	3	1
DIXIE 922	72.2	54.5	7	38	4-20	5-22	2	1
DELTA KING 1551W	72.1	54.6	4	34	4-21	5-23	1	4
VA98W-593	72.0	56.6	15	32	4-20	5-24	0	5
PIONEER BRAND 26R38	71.4	54.1	7	36	4-18	5-21	5	6
SOUTH. STATES SS 535	70.9	56.5	10	32	4-20	5-22	1	2
SABBE	70.7	54.0	3	35	4-22	5-25	0	12
USG 3209	70.7	54.5	9	31	4-18	5-21	4	0
ARMOR 4045	70.3	54.3	8	37	4-19	5-23	3	4
LA 90185G3-1-3-4-2	70.2	53.1	17	35	4-18	5-23	7	2
HBK 3030	69.9	54.3	3	32	4-18	5-22	2	1
F 334W	69.9	56.1	2	37	4-23	5-26	0	1
FFR 522	69.6	55.7	13	34	4-18	5-22	1	0
USG 3709	69.5	52.5	4	36	4-19	5-22	1	30
TERRAL TV 8555	69.4	54.2	2	31	4-20	5-22	1	0
PROGENY 103	69.4	53.2	19	35	4-20	5-21	3	2
NK COKER 9663	69.3	56.3	18	37	4-19	5-22	1	2
DELTA GROW 5300	69.2	53.4	17	35	4-20	5-21	3	3
PROGENY 156	68.8	53.4	8	36	4-21	5-23	2	1
NK COKER 9152	68.7	54.3	16	37	4-18	5-20	1	0
SOUTH. STATES SS 522	68.4	55.7	7	34	4-18	5-22	1	0
AR LA85411	68.0	55.5	8	33	4-19	5-21	1	0
FFR 510	67.8	53.5	15	35	4-17	5-19	4	1
ARMOR 3235	67.7	53.7	8	36	4-21	5-23	3	5
ROANE	67.0	56.2	12	32	4-21	5-23	4	0
LA 90518PB43-3-1-4	66.5	53.5	11	33	4-18	5-20	2	0
DELTA KING 9027	66.2	52.3	16	35	4-19	5-22	1	1
AGRIPRO PATTON	66.1	52.7	6	35	4-19	5-23	1	0
NK COKER 9543	65.7	52.9	10	32	4-18	5-21	3	0
SOUTH. STATES SS 518	64.5	51.0	18	32	4-16	5-20	4	0
DELTA KING 9121	63.3	52.9	10	33	4-20	5-23	1	0
Grand mean	70.8	54.5	9	35	4-19	5-22	2	3
LSD (5%)	4.0	1.0						
C.V. (%)	9.4	3.1						

Ldg = Lodging

Pt ht = Plant height

Table 2. Two and one year averages across Arkansas, Mississippi, and Louisiana.

Entry Name	2001&2002 AR-MS	2002 AR-MS	2002 AR-MS-LA
	-----bu/A-----		
PAT	73.7	70.4	65.7
DIXIE 900	73.2	73.3	
DELTA KING 7777	72.1	71.7	59.9
DELTA KING 7900	71.5	72.4	65.9
DELTA KING 1551W	71.0	69.9	
PIONEER BRAND 26R38	70.0	62.1	60.3
AGRIPRO SHELBY	69.0	69.3	
AGS 2000	68.3	68.5	68.1
USG 3209	68.3	65.9	66.4
CROPLAN GENET. 554W	68.1	68.6	
PIONEER BRAND 26R46	68.0	63.6	
SOUTH. STATES SS 535	67.8	65.0	
SABBE	67.5	68.5	
USG 3709	67.4	64.8	
DELTA KING 9216	67.1	66.3	60.6
VA98W-593	67.0	64.5	63.4
NK COKER 9152	66.7	67.0	65.3
ARMOR 3235	66.6	64.0	
AGRIPRO NATCHEZ	66.3	68.9	66.9
TERRAL TV 8555	65.7	61.3	
ROANE	62.6	64.1	
LA 90518PB43-3-1-4	62.5	59.8	62.7
DELTA KING 9027	62.2	61.7	
AR LA85411	61.8	62.6	
FFR 510	61.3	60.2	
DELTA KING 9121	61.2	57.0	50.6
SOUTH. STATES SS 518	56.9		

2) YIELD NURSERIES

The most advanced experimental lines were tested in the Elite Wheat Lines (EWL) nursery at Keiser, Stuttgart, Marianna, and Rohwer. The average of the experimental lines over all four locations is presented in Table 3. AR 910-9-1 which was among the highest yielding lines in the test, will be tested for the second year in the Arkansas Variety Test and in the Uniform Nurseries (regional soft wheat test) for possible release. AR 93035-4-1, which is a line derived from a cross between Pioneer 2548 and a Romanian line obtained 10 years ago, was also entered in the Southern Regional trials. Another high yielding line from the same cross, AR93035-4-2, will be purified for plant type and for more advanced testing next year. The Advanced Wheat Strains nursery was grown at Keiser, Stuttgart, Kibler, and Baton Rouge, LA. The test at Kibler was not harvested due to poor stands. Results are given for the two Arkansas locations in Table 4. There were several experimental lines that appeared promising. These lines were advanced to the Elite test for further testing in 2002-03.

To enhance disease resistant to Head Blight (Scab) a special nursery was initiated to screen experimental lines for agronomic traits as well as scab resistance. The results of this nursery are presented in Table 5. Several lines possess the same level of resistance as the resistant check 'Ernie' but have yields similar to 'Pat'. The results for the Wheat Rust evaluation nursery are presented in Table 6. Many of the resistant lines contain one of two genes that were originally derived from the wild grass *Triticum tauschii*. Currently there are no soft wheat cultivars containing this gene for resistance. In another test, resistant lines that have a gene from another wild grass, *Triticum boeoticum*, were selected in the field and will be entered in this special nursery in 2002-03.

The White Wheat trial was conducted at Keiser and the results are presented in Table 7. There were several white wheats that had grain yields higher than the red-seeded soft wheat, indicating that white wheat can obtain comparable yields as the red-seeded varieties in Arkansas.

Table 3. Performance of breeding lines and checks in the Elite Wheat Test in 2002 across 4 locations (Stuttgart, Keiser, Marianna, Rohwer).

Entry	Yield bu/A	Test weight lb/bu	Plant ht in.	Heading date	Maturity date	Leaf rust %	Lodge %
PAT	75.1	54.9	37.5	4/20	5/22	9	3.0
AR839-28-1-2	74.9	54.8	36.6	4/19	5/21	7	2.0
AR93035-4-2	72.0	52.3	35.3	4/18	5/20	22	1.0
SABBE	72.0	52.3	35.7	4/19	5/21	19	0.2
AR93027-5-1	72.0	53.3	36.2	4/19	5/21	20	0.0
AR910-9-1	71.7	52.0	37.7	4/15	5/17	3	9.6
SHELBY	71.1	55.6	37.7	4/16	5/17	33	8.6
AR839-25-8-2	70.7	54.5	36.8	4/19	5/20	9	0.2
AR93027-3-2	70.5	52.8	35.8	4/19	5/22	25	0.2
ARAR93035-4-1	69.9	53.7	37.3	4/19	5/21	14	1.2
AR800-1-3-1	69.6	54.2	36.5	4/19	5/22	4	3.2
AR93005-6-5	69.4	54.6	36.7	4/18	5/21	1	0.6
AR93005-6-4	68.9	54.1	36.8	4/19	5/22	0	2.0
AR93002-3-3	68.0	54.3	37.4	4/18	5/21	6	0.0
AGS2000	68.0	53.3	36.7	4/15	5/20	11	9.8
AR763-6-2-1	67.9	54.4	36.3	4/18	5/21	15	3.8
AR93173-3-3	67.2	52.6	33.4	4/20	5/22	13	6.2
COKER9663	67.1	55.1	38.4	4/17	5/19	9	13.8
AR93035-4-4	67.1	52.9	36.6	4/19	5/21	13	1.0
AR93005-6-1	66.8	54.5	36.3	4/20	5/22	1	0.4
AR910-9-2	66.7	50.6	38.0	4/15	5/18	2	10.0
AR850-1-1	66.3	55.6	34.1	4/17	5/19	38	0.2
AR93002-2-3	66.2	51.3	35.4	4/19	5/20	7	0.4
AR93035-7-1	65.8	52.6	35.4	4/18	5/21	27	4.0
AR93092-4-1	65.6	53.9	38.0	4/18	5/21	8	3.2
AR763-6-4-1	65.1	53.3	36.2	4/19	5/20	16	14.6
AR910-12-1	65.0	51.1	37.1	4/16	5/18	5	11.6
AR494	65.0	51.6	37.5	4/19	5/20	15	5.0
AR95156-2-1	64.3	53.8	37.4	4/18	5/20	24	1.6
AR93187-6-1	63.8	52.8	35.2	4/20	5/31	22	0.2
AR93124-1-1	63.5	51.9	36.4	4/19	5/21	7	6.2
AR93027-4-1	63.2	51.6	37.6	4/19	5/21	44	0.2
AR93108-8-1	62.5	51.1	38.2	4/17	5/18	15	4.6
AR-LA85411	62.0	54.6	35.5	4/17	5/18	0	3.6
AR93113-2-2	61.4	53.5	33.7	4/19	5/19	14	1.8
AR872-8-1	60.3	51.1	34.8	4/18	5/20	21	0.4
AR93189-4-1	60.3	52.4	34.8	4/20	5/21	32	0.4
AR95155-5-2	59.5	50.7	32.6	4/17	5/20	56	1.2
AR94194-2-3	58.3	52.5	32.4	4/19	5/20	31	0.6
AR93004-1-1	51.5	51.3	36.9	4/19	5/21	3	6.6

Table 4. Performance of breeding lines and checks in the Advanced Wheat Test in 2002 across 2 locations (Stuttgart and Keiser).

Entry	Yield	Test weight	Plant ht	Heading date	Leaf rust	Lodge
	bu/A	lb/bu	in.		%	%
SABBE	75.1	55.1	37.4	4/23	27.2	2.5
AR94071-3-1	74.3	56.7	36.4	4/21	5.0	32.5
AGS2000	72.4	56.6	34.0	4/19	1.3	65.0
SHELBY	68.4	57.0	35.8	4/21	3.7	70.0
COKER9663	66.2	56.5	36.2	4/19	8.5	50.0
AR94112-7-1	64.7	54.2	33.4	4/21	2.6	5.0
AR94047-5-1	64.5	55.2	34.4	4/22	5.6	20.0
AR94123-1-1	64.3	55.3	34.4	4/20	1.8	40.0
AR94060-4-1	63.7	54.8	35.6	4/21	8.1	57.5
AR94123-3-1	63.3	55.2	35.2	4/20	10.4	65.0
AR94062-5-1	63.0	52.4	32.0	4/23	7.7	37.5
AR94123-10-1	62.8	55.2	36.8	4/20	5.8	60.0
AR94009-4-1	62.2	55.7	30.8	4/19	1.7	50.0
AR94123-8-1	62.2	54.6	35.6	4/20	3.5	60.0
AR94055-7-1	61.0	55.3	39.2	4/23	15.5	45.0
AR94168-2-1	60.9	55.5	37.0	4/22	16.1	15.0
AR94081-4-1	60.7	54.7	35.4	4/21	2.6	47.5
AR94055-7-2	60.0	55.7	37.6	4/20	5.1	62.5
AR94150-5-1	59.9	55.8	32.4	4/22	5.2	22.5
AR494	59.9	55.8	37.4	4/20	17.3	37.5
AR94130-10-1	59.2	55.4	32.4	4/20	26.1	52.5
AR94011-1-1	59.0	56.6	36.4	4/21	4.0	37.5
AR94081-8-1	58.5	55.9	38.6	4/21	5.6	67.5
AR94059-15-1	58.2	54.9	35.6	4/24	4.5	52.5
AR94181-5-1	58.1	56.7	33.4	4/21	2.0	52.5
AR94081-12-1	58.0	55.2	36.2	4/20	13.9	67.5
AR94062-1-1	58.0	56.5	38.6	4/23	19.3	52.5
AR94042-1-1	55.6	52.7	33.6	4/24	1.3	10.0
AR94126-2-1	55.5	55.8	31.2	4/23	3.7	72.5
AR94127-12-1	55.1	55.5	35.6	4/24	14.3	55.0
AR94041-6-1	54.7	52.6	34.4	4/23	0.8	27.5
AR94103-6-1	54.5	56.1	34.8	4/22	17.3	42.5
AR94055-1-2	53.9	54.7	37.6	4/20	3.2	17.5
AR94166-5-1	53.9	53.7	35.2	4/23	7.7	32.5
AR94059-13-1	53.1	56.4	36.8	4/22	4.0	62.5
AR94097-5-2	52.5	52.7	36.0	4/23	2.2	45.0
AR94097-9-1	52.1	54.9	29.8	4/22	4.0	30.0
AR94046-4-1	51.8	55.8	30.0	4/22	6.6	27.5
AR94046-4-2	51.8	55.7	31.0	4/22	2.1	7.5
AR94097-16-1	51.7	56.0	31.4	4/23	8.3	27.5
AR94081-16-1	51.3	55.5	36.0	4/20	3.8	70.0
AR94054-4-1	51.0	53.1	34.6	4/21	0.5	12.5

Table 4. continued

Entry	Yield	Test weight	Plant ht	Heading date	Leaf rust	Lodge
	bu/A	lb/bu	in.		%	%
AR94078-2-1	49.9	54.5	37.0	4/21	4.1	27.5
AR94054-13-1	47.3	54.5	35.0	4/21	5.6	30.0
AR94054-10-1	46.5	52.0	33.6	4/21	2.1	50.0
AR94089-5-1	46.2	55.0	35.8	4/22	4.6	80.0
AR96129-1-1	45.4	53.9	37.8	4/24	5.6	0.0
AR94048-5-1	45.0	55.7	35.4	4/22	2.1	30.0

Table 5. Performance of lines in inoculated scab trials at Marianna and Stuttgart with FHB ratings from Fayetteville and Kibler in 2002.

Entry	Yield	Test weight	Heading date	Maturity date	Plant ht	FHB Fayette.	FHB Kibler
	bu/A	lb/bu			in.	%	%
Pat (check)	79.9	56.9	4/20	5/22	39	2.0	1.8
AR93095-4-1	75.8	56.1	4/18	5/21	38	2.5	2.8
AR93035-4-1	75.7	56.6	4/18	5/22	35	1.5	5.5
AR93035-4-3	74.7	57.5	4/17	5/22	36	1.3	5.5
AR93035-4-4	71.5	55.9	4/17	5/21	35	1.3	4.3
Ernie (check)	70.5	55.3	4/15	5/20	34	4.0	4.8
AR93035-4-2	69.1	55.6	4/17	5/22	34	2.0	6.3
AR93188-12-1-1	68.2	55.2	4/18	5/20	34	21.3	33.8
AR93035-7-1	67.8	55.2	4/17	5/22	35	2.3	7.5
AR93108-8-1	66.7	52.8	4/16	5/18	36	30.0	17.5
AR93108-1-3	65.8	54.1	4/18	5/22	34	7.5	6.3
AR93189-3-1	65.6	55.5	4/19	5/20	33	17.5	21.3
AR93188-1-1	65.1	53.9	4/19	5/20	35	11.3	10.0
AR93091-4-2	65.0	56.8	4/19	5/22	39	7.5	2.5
AR93189-4-1	63.7	54.5	4/20	5/21	35	18.8	15.0
AR93108-9-1	63.6	52.9	4/15	5/20	35	12.5	12.5
AR93189-7-1	62.9	55.0	4/18	5/21	34	16.3	37.5
AR93187-6-1	62.6	54.0	4/20	5/21	34	26.3	26.3
AR93108-3-2	62.5	56.3	4/14	5/19	36	8.8	8.0
AR93069-5-1	62.1	58.3	4/18	5/21	37	10.0	11.7
AR93019-2-1	62.1	57.5	4/21	5/21	40	1.6	1.5
AR93048-8-2	61.7	51.9	4/16	5/19	35	16.3	18.8
AR93188-7-1	60.9	53.9	4/20	5/22	34	15.0	17.5
AR93032-6-1	60.4	56.9	4/16	5/20	37	13.8	21.3
AR93108-1-2	60.3	53.1	4/17	5/19	36	23.8	8.8
AR93001-3-2	59.6	56.9	4/17	5/21	36	1.4	5.0
AR878-2-1	59.5	56.1	4/15	5/20	42	2.5	5.5
AR93081-2-1	57.5	53.1	4/18	5/20	40	15.0	7.5
AR93108-8-2	57.2	51.6	4/17	5/19	37	22.5	-
AR857-1-2	57.0	54.2	4/16	5/20	37	0.1	2.0
AR93187-4-2	56.7	54.8	4/19	5/21	34	10.0	12.5
AR93108-4-1	56.3	51.4	4/16	5/20	34	13.8	17.5
AR857-1-1	54.1	55.0	4/16	5/21	35	0.0	0.5
AR880-5-1	53.2	52.9	4/18	5/21	37	2.5	7.5
AR93035-1-1	50.1	56.0	4/18	5/20	37	3.5	5.5
AR922-5-1	46.9	57.3	4/17	5/20	36	3.5	9.3
Mean	63.2	55.1					
CV (%)	11.9	5.4					
LSD ₀₅	8.5	3.4				5.1	7.0

Table 6. Performance of lines in leaf rust trials at Marianna and Stuttgart in 2002.

Entry	Yield bu/A	Test weight lb/bu	Heading date	Maturity date	Plant ht in.	Leaf rust %
SABBE	73.2	53.8	4/18	5/21	36	15.8
COKER 9663	68.2	55.7	4/14	5/19	39	14.1
AR93005-6-4	68.2	55.3	4/19	5/21	35	1.6
AR93005-6-1	67.6	55.5	4/19	5/21	36	1.1
AR93005-6-2	67.0	54.2	4/19	5/23	34	1.6
ARLA 85411	66.4	54.6	4/15	5/18	34	1.6
AR93005-6-5	66.0	55.2	4/17	5/21	35	2.5
AR93110-9-2	64.2	53.6	4/17	5/18	40	1.8
AR908-8-2	63.0	52.2	4/22	5/21	34	0.8
HAZEN	61.7	53.2	4/18	5/20	36	12.5
AR93039-6-1	61.0	54.7	4/21	5/22	37	0.8
AR93094-9-1	61.0	55.2	4/17	5/20	35	10.8
AR908-8-1	60.8	49.8	4/21	5/22	35	0.0
AR93110-9-4	60.8	54.7	4/18	5/18	39	1.6
AR93094-7-1	59.4	52.7	4/17	5/20	36	10.8
AR93127-3-1	59.2	53.5	4/17	5/20	39	0.8
AR876-5-3	59.2	45.0	4/16	5/20	33	24.1
AR93039-1-1	58.9	55.1	4/22	5/24	35	1.6
AR876-5-1	58.5	47.6	4/17	5/20	31	18.3
AR95151-2-2	58.3	54.2	4/13	5/19	37	0.8
AR93005-1-1	57.6	54.6	4/18	5/20	37	5.0
AR93021-1-1	57.1	53.8	4/20	5/23	31	2.6
AR93094-7-2	56.0	54.4	4/17	5/20	33	7.5
AR876-2-1	55.0	53.7	4/18	5/22	31	9.3
AR95151-1-1	53.9	53.3	4/16	5/18	33	24.1
AR93127-1-2	52.8	52.1	4/20	5/22	37	5.8
AR928-5-1	52.5	52.2	4/16	5/19	36	10.8
AR872-8-1	51.6	51.6	4/17	5/21	35	28.3
AR93004-1-1	49.5	54.7	4/18	5/22	35	16.6
AR93127-10-1	44.6	53.7	4/20	5/22	34	1.8

Table 7. Performance of lines in the white wheat test at Keiser in 2002.

Entry	Yield	Test	Leaf	Leaf
	bu/A	weight lb/bu	rust1 %	rust2 %
Pioneer 25W60	64.1	57.0	4.5	22.3
AR494B2-2	59.8	57.9	3.0	12.3
Jaypee	56.8	58.8	2.7	0.0
Pioneer 25W33	56.4	54.5	3.2	3.7
NY84214-82	55.8	56.9	4.2	7.0
Coker9663	54.7	57.4	2.2	2.0
AR771-16-1-2	53.7	55.3	2.2	0.0
AR839-10-1-1	53.6	55.7	4.2	7.0
Heyne	48.7	57.7	3.0	1.3
Geneva	48.4	56.0	4.2	9.7
Betty	47.8	57.2	4.0	12.3
NY870048W-7388	45.0	57.4	2.7	1.3

3) EARLY GENERATIONS

Crosses were made in the greenhouse in the spring between good parental lines. There were three main efforts: 1) standard variety development (125 crosses), 2) scab-resistant varieties (50 crosses), and 3) imidazolinone herbicide resistant varieties (16 crosses). The resulting offspring (F_1) of last years crosses were grown in the greenhouse over the winter to increase seed. The next three generations (F_2 , F_3 , and F_4) were grown as bulk populations in the field at Stuttgart. This year there were 507 F_2 populations, 324 F_3 populations and 204 F_4 populations produced. Individual plants were selected from the F_6 generation at Fayetteville to produce experimental lines which were planted at Stuttgart and Keiser this fall to begin yield testing.

CONCLUSIONS:

The breeding project has made strides in a number of areas. Approximately 800 experimental lines were tested throughout the state to determine genetic potential for Arkansas wheat producers. For future testing nearly 20,000 new lines were evaluated in the field. In order to produce new experimental lines, over 900 genetically segregating populations were grown in the field as well as making over 200 crosses in the greenhouse to produce new populations. Some specific highlights from this year's work:

- Certified seed of new variety Pat sold.
- AR 839-25-8-2 released through a marketing agreement with Armor and Delta King Seed Companies.
- Breeder seed of AR910-9-1 and AR839-28-1-2 planted for possible release in summer 2003.
- Breeding lines of herbicide-tolerant wheat for Hoelon-resistant ryegrass.
- Four scab resistant lines advanced for regional testing.
- Continue development of lines with newly discovered genes for disease resistance.
- Work in developing speciality (white and waxy) wheat for Arkansas continues.

BUDGET REQUEST (2001-02)

	AWPB	AAES
PERSONNEL:		
Salaries - Project Leader	-	60,000
Sr. Research Associate (25%)	11,266	33,798
Research Associate (50%)	18,797	18,797
Research Specialist (25%)	4,500	13,500
Wages (1800 hr @ \$6)	10,800	-
Fringe Benefits (\$33,688 @ 23.45%)	8,105	29,569
(\$10,800 @ 0.21%)	23	-

Total Personnel	53,491	155,664
 TRAVEL:		
Instate		
Per Diem (100 days @ \$50)	5,000	-
Vehicle	-	2,000
Out of state (Evaluate lines in Louisiana)	250	5,000

Total Travel	5,250	7,000
 EQUIPMENT:		
Depreciation		6,000
 MAINTENANCE/OPERATIONS:		
Expendable Supplies	2,500	-
Fertilizer/Chemicals	2,500	-
Fuel	1,500	-
Computer Supplies	500	800
Greenhouse & Growth Chamber Fees	1,500	1500
Equipment Repairs	2,000	-
Breeder Seed Production	1,000	1,000

Total Maintenance/Operations	11,500	3,300
 OFF CAMPUS RESEARCH ALLOCATIONS:		
Keiser	500	2000
Kibler	300	1000
Stuttgart	500	2000
Marianna	400	1000
 TOTAL BUDGET	 \$71,941	 \$177,964