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OREGON'S CLUB WHEAT PROGRAM THE NEXT STEP

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Since the departure in 1994 of Dr. Pamela Zwer, the OSU club wheat breeder at the Columbia Basin Agricultural Research Center (CBARC), the program has gone through a transition. Efforts and obligations have continued relatively unchanged, however the breeding methods were modified to be more in keeping with the OSU common wheat breeding program directed by Dr. Warren Kronstad. An additional testing site was established at the Rugg farm northeast of Pendleton. Dr. Jim Anderson, USDA-ARS geneticist at Pullman, WA, assumed responsibility for the regional club wheat breeding efforts after he arrived during July, 1996. At that time, the Oregon and USDA-ARS programs were combined. The Oregon Wheat Commission continued to support the club wheat program through September, 1996. Federal funds were approved for the 1996-1997 USDA fiscal year.

Karen Morrow became coordinator of the OSU component of the program when Mike Moore and Vicki Correa resigned during the winter. Mrs. Morrow is supervised by Drs. Jim Anderson and Richard Smiley, Superintendent of CBARC. Karen Morrow utilizes seasonal labor as needed to perform all activities associated with the program. Current funding is by USDA-ARS and the Oregon Agricultural Experiment Station.

In the fall of 1996, Dr. Anderson planted all of the early generation germplasm previously produced by the OSU program. These materials were planted at Pullman to allow Dr. Anderson to closely monitor all plantings. Karen Morrow and her seasonal staff, at Pendleton, made club wheat crosses for the regional program. Screening for resistance to stripe rust and Russian wheat aphid, previous areas of emphasis for the OSU club wheat program at Pendleton, were tabled during 1996. Aphid testing was shifted to the University of Idaho.

In the continued search for club wheat varieties that are improvements over current lines, the club wheat program conducted trials on CBARC's stations at Pendleton and Moro, and at the Rugg site. In 1996, seeding conditions were excellent at each location, and weed competition was minimal. Excellent growing conditions produced high yields.

With moisture being exceptionally good for the year, nitrogen became an issue. Grain proteins in the trials on both stations were low, even with additional nitrogen applied in the spring at Pendleton. The Pendleton trials typically had proteins in the 7 to 8 percent range, and some as low as 6 percent. Protein at Moro was typically in the 6 to 7 percent range. Protein below 9 percent is an indication that the crop was under-fertilized; however such protein levels are satisfactory for club wheat.

Listed in the following tables are data for several promising club lines, including 92CL0049 and 92CL0054. These two lines were approved by a pre-release committee in 1995. Data to

support a decision to release one or both lines are being compiled. Yield data from Pendleton are given for 1995 in Table 1 and for Pendleton and Moro for 1996 in Table 2. Data for Moro were not reported in Table 1 due to severe erosion and mixed stands resulting in unreliable information. Stephens and Rohde data are included as yield benchmarks for each trial. Lines in bold in Table 2 rank in the top ten for both Pendleton and Moro. The poor performance of 92CL0054 in the 1996 Pendleton trial was due to lodging. Generally regarded as tolerant to strawbreaker foot rot, further evaluation as to the reaction of this selection must be made. The CV for 92CL0054 was 23 percent in this trial, indicating a high degree of variability between the four replications of that line. Table 3 is a summary of yield data from the Rugg site grown in 1996. 92CL0049, with a yield of 128 bushels ranked number 1, with 92CL0054 yielding 108. Two other selections, 94CL0033 and 92CL0003 also provided high yields.

Tables 4 and 5 contain quality data for the same trials and years as Tables 1 and 2. Flour yield, mill score, and cake volume are the three major club wheat quality characteristics considered when looking at club wheat quality. Each entry is compared to Paha, the industry standard for club wheat quality. In all categories, the larger number is superior. Flour yield and mill score are important to the milling industry, and cake volume is important to the end product producer. Cake volumes at or above 1300 cubic centimeters are preferred.

Some lines do very well one year, but are mediocre the next for yield and quality. However, other lines do well across years and locations, i.e. 92CL0003, 92CL0006, and 93CL0080 in 1995 and 1996 for yield. 93CL0080 also looks good for quality both years, and appears promising.

Headrows were planted for all of the numbered lines in Table 1 in the fall of 1996. Efforts to purify 92CL0049, one of the lines approved by the OSU Pre-release Committee, are ongoing. Headrows planted in the fall of 1995 were from individual heads selected from purification blocks the previous crop. This is the normal protocol for such efforts, and by this stage the headrow population should be fairly uniform. This was not the case in 1996, as 20 percent of the rows were removed from purification blocks due to a common wheat contaminant that has been an issue throughout the testing and purification efforts for this line. It would appear that one of the parents is causing severe problems at the chromosome pairing stage, thus it may be impossible to achieve the desired uniform club type. Additional rows were removed for various and more subtle reasons as the season progressed. Heads were selected from the remaining rows and were seeded in the fall of 1996. 92CL0054 is the second line approved by the pre-release committee, has been purified and breeder's seed could be made available. Additional advanced lines are planted, in the event one of those is approved for pre-release.

The club wheat program staff also cooperate with Dr. Russ Karow, coordinator of the Statewide Cereal Testing Program. They manage five locations where fall and spring wheat, barley, and triticale are planted. Sites are located at the research stations at Pendleton, Moro, and Hermiston, and at Charlie Anderson's farm near Heppner

and John Cutherbert's farm near La Grande. Dr. Karow's program provides the pre-packaged seed for planting. This program interacts with experiment station personnel and growers to coordinate field requirements, sowing and maintaining the plots throughout the growing season, and harvesting the trials. Data and discussion of the trials are presented at field days and county crops tours. The harvested material is returned to Dr. Karow for processing, statistical analysis, and summarization of the data.

This program also plants the Western Regional White Winter Wheat Nursery, coordinated by Dr. Jim Anderson. The purpose of this trial is to test potential new varieties in locations throughout the tri-state area. The Columbia Basin Ag Research Center is responsible for establishing these regional trials at the research stations at Pendleton and Moro.

These efforts were made possible with funds from the Oregon Wheat Commission and the support of the wheat farmers of Oregon.

Table 1. 1995 Pendleton Elite Yield Trials

Trial Name	ID Number or Variety	Pendleton Rank	Bushels per acre	Trial average bushels per acre
Club Elite 1			LSD 15.2	85.2
	93CL0080	1	110.3	
	92CL0049	2	108.1	
	92CL0006	5	104.1	
	Stephens	13	93.3	
	92CL0007	15	90.4	
	Rohde	16	88.7	
	92CL0054	17	88.5	
Club Elite 2			LSD 17.7	85.2
	93CL0012	10	91.6	
	Stephens	17	86.0	
	Rohde	31	76.5	
Club Elite 3			LSD 16.0	70.4
	92CL0003	3	92.4	
	Stephens	4	87.9	
	93CL0133	5	81.9	
	Rohde	21	61.4	

*Data for Moro not reported due to severe erosion and mixed stands resulting in unreliable information.

Table 2. 1996 Top Ten Lines for Moro and Pendleton Elite Yield Trials

ID Number or Variety	Moro Rank	Moro Bu/Acre	Pendleton Rank	Pendleton Bu/Acre
93CL0132	1	82.7	14	79.1
92CL0006	**2**	**80.9**	**3**	**92.1**
Stephens	3	79.2	12	79.4
93CL0196	4	78.4	33	65.0
93CL0080	**5**	**78.3**	**2**	**94.3**
94CL0100	6	77.9	40	60.2
94CL0040	7	77.2	23	70.2
94CL0104	8	76.8	11	79.9
92CL0003	**9**	**76.7**	**4**	**90.4**
94CL0033	**10**	**76.5**	**7**	**87.0**
94CL0018	29	67.2	1	94.5
94CL0025	37	65.9	5	89.0
94CL0076	36	66.1	6	87.5
92CL0049	20	70.4	8	86.8
93CL0081	24	68.4	9	82.1
93CL0094	15	72.5	10	79.9
Rohde	26	67.9	37	61.7
92CL0054	35	66.2	41	59.2
92CL0007	18	71.3	18	75.1
Trial average		68.3		68.5
Trial maximum and minimum bushels/acre	High	Low	High	Low
	82.7	39.2	94.5	33.9

Table 3. 1996 Elite Lines located at the Rugg Site

ID Number or Variety	Rank	Bushels per acre
92CL0049	1	127.8
92CL0003	3	121.6
Stephens	5	117.5
92CL0006	6	114.4
93CL0080	7	113.5
92CL0054	9	108.2
Rohde	20	75.6

$LSD_{0.10} = 13.6$
C.V. = 13.7%

Table 4. 1995 Pendleton Club Wheat Quality Data

Trial Name	ID Number or Variety	Flour Yield[1]	Milling Score	Cake Volume[2]
Club Elite 1				
	92CL0006	74.1	87.9	1275
	92CL0007	71.9	83.1	1275
	92CL0049	73.1	84.1	1295
	92CL0054	77.5	90.8	1235
	93CL0080	74.9	85.8	1325
	Stephens	75.5	88.4	1265
	Rohde	74.1	84.2	1350
	Paha	76.1	87.3	1355
Club Elite 2				
	93CL0012	76.8	91.2	1310
	Stephens	75.6	89.2	1280
	Rohde	74.5	86.7	1225
	Paha	76.4	88.9	1340
Club Elite 3				
	92CL0003	73.3	85.2	1265
	93CL0133	75.9	88.4	1340
	Stephens	77.1	87.2	1235
	Rohde	74.8	84.1	1245
	Paha	76.8	85.7	1335

[1]Flour Yield is the percent of flour returned compared to whole grain that is milled.
[2]Cake volume is measured in cubic centimeters.

Table 5. 1996 Club Wheat Quality Data for Pendleton and Moro

Location	ID Number or Variety	Flour Yield[1]	Milling Score	Cake Volume[2]
Pendleton	92CL0003	69.3	89.6	1300
	92CL0006	67.5	88.1	1245
	92CL0007	68.5	88.1	1235
	93CL0012	66.3	87.7	270
	92CL0049	67.4	86.6	1265
	92CL0054	67.7	85.7	1295
	93CL0080	68.8	87.1	1350
	Stephens	66.5	83.5	1200
	Rohde	65.6	84.3	1250
	Paha	70.2	88.9	1315
Moro	92CL0003	68.8	85.8	1290
	92CL0006	69.2	88.2	1265
	92CL0007	67.5	86.7	1280
	93CL0012	65.3	85.2	1300
	92CL0049	67.9	84.1	1345
	92CL0054	68.3	85.2	1290
	93CL0080	69.1	87.3	1315
	Stephens	66.3	54.5	1290
	Rohde	65.6	51.1	1295
	Paha	69.4	85.9	1330

[1]Flour Yield is the percent of flour returned compared to whole grain that is milled.
[2]Cake volume is measured in cubic centimeters.