Intensive Management Practices for Wheat in the Southeastern Coastal Plains

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Wheat (*Triticum aestivum* L.) is becoming a more important crop in the southeastern Coastal Plain because it can provide increased midyear cash flow, but at current average yield levels of 35 bu/acre, monocrop wheat shows a net loss of $24 to $59/acre. Six field studies were conducted between 1984 and 1988 on either Dothan sandy loam (fine-loamy, siliceous, thermic Plinthic Paleudult) or Marlboro loamy sand (clayey, kaolinitic, thermic Typic Paleudult) to compare traditional management (TM) and intensive cereal management (ICM) practices for this region. Cultivars, N fertilizer rates, fungicide applications, and use of a growth regulator were evaluated. Cultivar selection, N fertilization rate, and water were the most important factors for both management systems. Application of fungicide reduced the incidence of disease, but selection of a resistant cultivar accomplished the same goal. Applying a growth regulator reduced plant height, but also decreased yield and test weight in several studies. Lodging was not a problem, indicating that plant growth regulators are not needed for sandy, low organic matter soils in the southeastern Coastal Plain. When adequate plant-available water was provided through rainfall or irrigation, applying a total of 120 to 140 lb N/acre in three applications produced grain yields of 100 bu/acre or more. At this level, wheat can be an economically viable crop for Coastal Plain farmers, returning a profit of $125 to $225 per acre after subtracting fixed costs for land, management, and interest. The primary management practices required to achieve higher profit levels are selections of optimum cultivars and prevention of water and N stress.

WHEAT HAS traditionally been considered to be a low-input crop in the southeastern Coastal Plain with primary research emphasis being to optimize N rates and to develop cultivars with better disease and insect resistance. Recently, interest in ICM practices for wheat has increased because very high yields have been demonstrated in Europe and other parts of the U.S. (Joseph et al., 1985; Johnson et al., 1988). Need for increased midyear cash flow also has increased demand for research that identifies management practices needed to make wheat an economically viable crop for the southeastern Coastal Plain.

Genetic improvements including disease resistance, yield potential, and earlier maturity have made doublecropping wheat with soybean [*Glycine max* L. (Merr.)], cotton (*Gossypium hirsutum* L.), or grain sorghum [*Sorghum bicolor* (L.) Moench] more feasible for this region. Crop budgets, prepared by Clemson University Extension Service personnel, confirm an increased profit potential for many doublecrop combinations. One example is an increased profit of approximately $58/acre for wheat plus no-till soybean as compared to monocrop, no-till soybean (Karlen and Gooden, 1987). Those same budgets, however, show a net loss of $24 to $59/acre for monocrop wheat grown at current state average yields of 35 bu/acre.

Intensive management for wheat (Frederick and Marshall, 1985) generally includes use of high fertility (Alley and Brann, 1987; Bruckner and Morey, 1988), fungicides, higher seeding rates with narrow row spacing (Joseph et al., 1985; Johnson et al., 1988), plant growth regulators, and cultivars with high yield potential (Marshall and Ohm, 1987). Studies evaluating ICM for wheat have been conducted in several production environments (Hargrove et al., 1988) but none have been reported for high-strength, low water-holding soils (Campbell et al., 1974) found in the southeastern Coastal Plain.

This report summarizes results for six field studies conducted between 1984 and 1988 on either Dothan sandy loam or Marlboro loamy sand at Clemson University's Edisto Research and Education Center near Blackville, SC. The objective was to determine which ICM practices significantly increased wheat yield and net returns when compared with current production recommendations.

MATERIALS AND METHODS

Experimental Design and Preplant Tillage Practices

Intensive cereal management and TM practices for wheat were evaluated in six field studies conducted between 1983 and 1988. Split-plot experimental designs, replicated three or four times, with the smallest plots being 165 sq ft (5.5 ft wide by 30 ft long) were used for each study. Soil samples were collected and analyzed by the Clemson University Soil and Plant Analysis Lab. to determine lime, P, and K requirements (Table 1). Preplant tillage in 1983, 1984, and 1985 consisted of chisel plowing at depth of 12 in. and disking to incorporate preplant fertilizer. In 1986 and 1987, plots were moldboard plowed before disking to incorporate lime and fertilizer. Broadleaf winter weeds were controlled by applying 0.75 pt/acre 2,4-D[1] [(2,4-

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[1] Mention of trademark, proprietary product, or vendor does not constitute a guarantee or warranty of the product by the USDA or the South Carolina Agric. Exp. Stn., and does not imply its approval to the exclusion of other products or vendors that may also be suitable.

Table 1. Soil pH, Mehlich 1 extractable soil-test parameters, lime, and fertilizer rates applied to determine optimum management practices for wheat in the southeastern Coastal Plain.

Parameter	Study 1	Study 2	Study 3	Study 4	Study 5	Study 6
pH	6.0	5.8	>6.3	>6.3	5.8	5.5
	lb/acre					
P	≥120	≥120	≥120	≥120	81-100	101-120
K	183-208	209-235	183-208	183-208	183-208	99-128
Ca	531-670	671-800	801-1200	801-1200	531-670	401-530
Mg	33-40	33-40	>101	>101	>101	47-66
Lime	0	0	0	0	2,000	2,000
TM fertilizer						
N-P-K	80-40-149	80-40-149	90-20-75	90-20-149	80-40-149	80-40-149
ICM fertilizer						
N-P-K	150-40-149	150-40-149	150-20-75	150-20-149	30-40-149 + (50, 70, 90, or 110 N)	30-40-149 + (50, 70, 90, or 110 N)
S-B-Cu	6.5-2.0-2.5					
Mn-Zn	15-3.5					

Dichlorophenoxy) acetic acid] in 1984, but Brominal (3,5-Dibromo-4-hydroxybenzonitrile) was applied thereafter at a rate of 1 pt/acre for weed control. Treatments were hand-harvested in 1984, but in subsequent years, a plot combine was used to harvest the 48 in.-wide center strip in each plot. Grain yield for each treatment was adjusted to a moisture content of 13% before analyzing data using a split-plot analysis of variance (ANOVA) (Steel and Torrie, 1980). Single degree of freedom contrasts were made when planned and appropriate.

Initial ICM/TM Comparison

Cultural practices for the ICM and TM systems are summarized in Table 2. In 1983–1984, ICM included a higher N rate, supplemental S, and micronutrients; 1 lb/acre a.i. of Disyston [0,0-Diethyl S-{2-(ethylthio) ethyl} phosphorodithioate] for insect control; Cerone [(2-Chloroethyl) phosphonic acid] for growth regulation; and supplemental irrigation to prevent water stress. Clemson University crop production recommendations, including application of 80 lb N/acre; P and K according to soil-test; and no supplemental irrigation were the basis for TM practices. Whole plots were split to include two wheat varieties ('Coker 983' and 'Pioneer Brand 2550') drilled at a density of 20 seed/ft (90 lb/acre) in rows spaced 8 in. apart. Sub-subplots were established in Study 1 to evaluate no fungicide and applications of Tilt [1-{2-(2,4-dichlorophenyl)4-propyl-1,3-dioxolan-2-ylmethyl}-1H-1,2,4-triazole], or Bayleton [1-(4-Chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone] as methods for controlling powdery mildew (*Erysiphe graminis* D.C.). Plant growth stage was monitored using the Feekes scale (Large, 1954) so that fungicide treatments (Bayleton and Tilt) could be applied as recommended at growth stages 7-8 and 8-9, respectively.

In 1984–1985 (Study 2), the fungicide comparisons were terminated because yield levels were not high

Table 2. Management schedule for intensive and traditional wheat production treatments in the southeastern Coastal Plain.

Treatment/practice	Study 1 1983-84	Study 2 1984-85	Study 3 1985-86	Study 4 1985-86	Study 5 1986-87	Study 6 1987-88
Intensive management						
Soil type	Dothan sl	Dothan sl	Marlboro ls	Dothan sl	Dothan sl	Marlboro ls
Planting date	11/17/83	11/14/84	11/09/85	12/18/85	11/11/86	11/12/87
First N appln.	11/17/83	11/14/84	11/09/85	12/18/85	11/11/86	11/12/87
Second N appln.	2/20/84	2/11/85	2/07/86	2/07/86	2/05/87	2/02/88
Third N appln.	3/31/84	3/11/85	2/28/86	3/12/86	3/05/87	3/04/88
Insecticide	11/23/83	12/12/84	11/09/85	12/18/85	12/08/86	12/17/87
Second insecticide	none	none	2/07/86	2/07/86	3/06/87	3/10/88
Herbicide	3/12/84	12/19/84	12/18/85	12/18/85	12/08/86	12/17/87
Second herbicide	none	none	none	none	3/17/87	none
First fungicide	4/03/84	3/20/84	3/12/86	3/25/86	3/26/87	3/31/88
Second fungicide	4/16/84	4/11/84	4/01/86	4/11/86	4/16/87	4/21/88
Growth regulator	4/06/84	4/01/84	none	4/01/86	4/13/87	3/28/88
Irrigation	1.0 inches	4.6 inches	3.0 inches	1.5 inches	1.5 inches	1.5 inches
Harvest date	6/05/84	6/10/85	6/02/86	6/02/86	6/03/87	6/13/88
Traditional management						
Soil type	Dothan sl	Dothan sl	Marlboro ls	Dothan sl	Dothan sl	Marlboro ls
Planting date	11/17/83	11/14/84	11/09/85	12/18/85	11/11/86	11/12/87
First N appln.	11/17/83	11/14/84	11/09/85	12/18/85	11/11/86	11/12/87
Second N appln.	2/20/84	2/11/85	2/07/86	2/07/86	2/05/87	2/02/88
Insecticide	none	none	11/09/85	12/18/85	12/08/86	12/17/87
Herbicide	3/12/84	12/19/84	12/18/85	12/18/85	12/08/86†	12/17/87†
Fungicide	none	none	none	none	none	none
Irrigation	none	none	none	1.5 inches	1.5 inches	1.5 inches
Harvest date	6/05/84	6/10/85	6/02/86	6/02/86	6/03/87	6/13/88

† In studies 5 and 6, the traditional treatments were simply replicated plots included as check plots in the low N treatment, therefore, they also received the second applications of insecticide and herbicide.

enough to expect an economic fungicide response. This allowed the whole plots to be split to evaluate nine wheat cultivars. Three hybrid (Hybrex Brand 'HW3015', 'HW3021', and '3022') and six inbred-line cultivars ('Coker 916', Coker 983, 'Hunter', 'McNair 810', 'McNair 1003', and Pioneer Brand 2550) were randomized within each whole plot and planted in 8 in. rows using a seeding rate of 90 lb/acre (20 seed/ft) for inbred line cultivars and 75 lb/acre (15 seed/ft) for hybrids.

Row Spacing, Nitrogen, and Cultivar Effects

Two ICM studies were conducted in 1985–1986. In Study 3, a row-spacing of 4 in. instead of 8 in. and an increased N rate were evaluated for one hybrid wheat cultivar (Hybrex Brand HW3021), seven inbred-line wheat cultivars (Pioneer Brand 2550, 'Saluda', 'Florida 302', Coker 983, 'Williams', 'Coker 9323', and 'Massey'), and one triticale [*Triticosecale* wittmack cv. 'Florida 201'] cultivar on a Marlboro loamy sand. In Study 4, row spacing, N, N plus Cerone, N plus fungicide, and N plus Cerone plus fungicide were evaluated on Dothan sandy loam using Coker 983, Saluda, and Hybrex Brand HW3023 wheat. The 4-in. row spacing treatments were seeded at a rate of 80 lb/acre (8 seed/ft), while the 8-in. row spacing was seeded at a rate of 80 lb/acre (16 seed/ft). Plots receiving fungicide were sprayed with 2 lb/acre a.i. Dithane M-45 (Zinc ion, manganese ethylene bisdithiocarbamate) plus copper sulfate plus 4 oz/acre Bayleton when plants were at Feekes growth stage 7-8. At growth stage 10, a second Dithane M-45 plus copper sulfate application was made. The Cerone treatment was imposed by applying a rate of 0.38 lb/acre a.i. when plants were at growth stage 9. Plant height measurements were made at growth stage 10.5 and lodging was evaluated just before harvest.

High Yield ICM/TM Comparison

Four N rates (80, 100, 120, or 140 lb/acre), foliar fungicide, growth regulator, and row spacing treatments were evaluated using Coker 983 and Saluda wheat cultivars on Dothan sandy loam in 1986–1987 and on Marlboro loamy sand in 1987–1988. Seeding rate in 4-in. rows was 100 lb/acre (10 seed/ft). Check plots, planted using an 8-in. row spacing and 75 lb/acre (15 seed/ft), were included in subplots receiving 80 lb N/acre for comparisons representing TM practices. A solution containing 4 oz Bayleton/acre plus 2 lb Dithane/acre M-45 plus copper sulfate (0.25% v/v) was applied to randomized sub-subplots within each N subplot when the Coker 983 and Saluda cultivars were at Feekes growth stage 6 and 5, respectively. A second application of Dithane M-45 plus copper sulfate was made 3 wk later. Cerone was applied at 0.38 lb/acre a.i. when plants were at Feekes growth stage 9. In Study 6, the seeding rate in 4-in. rows was 120 lb/acre (12 seed/ft) and Cerone was applied at 0.38 lb/acre when the Coker 983 was at growth stage 8 and Saluda was at growth stage 9.

RESULTS AND DISCUSSION

Initial ICM/TM Comparisons

Grain yield and test weight were not significantly different for the ICM and TM systems in Study 1, but wheat yields averaged only 66 and 64 bu/acre, respectively. There was a significant ($P \leq 0.01$) cultivar difference with average yields of 60.6 and 70.0 bu/acre for Pioneer Brand 2550 and Coker 983, respectively. Cultivar test weight differed significantly ($P \leq 0.01$), averaging 55.1 and 57.0 lb/bu, respectively. There were no significant yield or test weight benefits associated with either fungicide treatment at this yield level so those treatments were discontinued for the 1984–1985 season.

Grain yields in Study 2 showed an increase ($P \leq 0.05$) for ICM practices (51.8 bu/acre) when compared to TM practices (42.9 bu/acre). Supplemental irrigation water applied to the ICM plots presumably caused this yield response because seasonal rainfall totaled only 16.7 in. (Table 3). This may seem to be ample rainfall for wheat in many regions, but Coastal Plain soils can generally retain only 1 in. of plant available water per foot, and rooting depth is often limited to 30 in. because of subsoil acidity.

Test weight averaged 54.9 and 55.7 lb/bu for TM and ICM systems in Study 2. This difference was significant ($P \leq 0.06$). Cerone did not influence plant height, but cultivar yield, test weight, and plant height were significantly different (Table 4). There were no significant interactions in either Study 1 or Study 2.

Row Spacing, Nitrogen, and Cultivar Effects

Yield, test weight, incidence of powdery mildew, and lodging response for cultivars evaluated in Study 3 are summarized in Table 5. There were no significant differences between the ICM and TM systems for either yield or test weight when averaged across cultivars. The incidence of powdery mildew was meas-

Table 3. Rainfall received while evaluating intensive management practices for wheat in the southeastern Coastal Plains.

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Total
					in				
1983-84	1.65	4.18	4.31	3.76	4.13	5.96	5.28	10.34	39.61
1984-85	2.36	0.94	1.03	2.81	5.11	0.98	0.48	2.99	16.70
1985-86	3.61	8.04	2.63	1.42	2.71	3.04	1.08	1.94	24.47
1986-87	4.69	3.75	2.91	7.57	5.33	5.73	1.10	2.04	33.12
1987-88	0.72	1.91	1.20	3.44	2.12	2.30	4.26	1.54	17.49

Table 4. Yield, test weight, and plant height of nine wheat cultivars, averaged for intensive and traditional management programs near Blackville, SC, for Study 2 in 1984–85.

Cultivar	Yield bu/acre	Test weight lb/bu	Plant height in
Coker 983	53.2	57.0	29.0
Hybrex 3021	52.7	55.0	38.8
Hunter	50.9	57.8	27.8
Hybrex 3015	50.4	55.0	41.0
McNair 1003	49.9	52.1	35.0
Hybrex 3022	45.2	56.2	35.5
McNair 810	42.9	55.4	31.0
Coker 916	41.7	54.5	31.0
Pioneer 2550	39.3	54.4	35.0
LSD (0.05)	5.8	1.2	2.3
CV (%)	12.2	2.1	4.6

ured only in TM plots because fungicides were applied to ICM plots. Lodging was measured only in ICM plots because with only 80 lb N/acre wheat did not lodge. Significant differences in yield and test weight occurred among cultivars. Coker 983 yields were highest as in Studies 1 and 2, but more importantly, average yield levels exceeded 80 bu/acre.

Interactions between cultivar and management practices were significant for yield ($P \leq 0.10$) because of disease differences for Saluda and lodging differences for Williams. Saluda is susceptible to powdery mildew, therefore it yielded significantly more with ICM practices (85.6 bu/acre) than with TM practices (69.8 bu/acre). Williams lodged because of increased N with ICM and yielded less (74.1 bu/acre) than with TM practices (84.9 bu/acre).

Individual ICM components were evaluated in Study 4 for three cultivars. Average yields across management systems were 92.4, 88.0, and 79.2 bu/acre for Saluda, Coker 983, and Hybrex 3023, respectively [LSD(0.05) = 4.4 bu/acre]. Lower yield for Coker 983 presumably reflected a high infestation of leaf rust (*Puccinia recondita* Rob. ex. Desm.). Cultivar test weights were significantly different, averaging 62.7, 62.9, and 61.2 lb/bu, respectively [LSD(0.05) = 0.6 lb/bu]. There were significant differences between ICM and TM management systems (Table 6).

Single degree of freedom (df) contrasts showed that N rate was the most significant ICM parameter as far as increasing yield, while row spacing was more influential on test weight. Lodging was not a problem, but applying Cerone to high N plots significantly decreased plant height by approximately 3 in. A negative effect of Cerone was that it significantly decreased grain yield. Interactions between cultivar and management practice were not significant ($P \leq 0.05$).

High Yield ICM/TM Comparison

The ICM parameters evaluated in Studies 5 and 6 were selected after evaluating results of the previous four studies. It appeared that for the southeastern Coastal Plain, N fertilization rate and choice of cultivar were the two most important parameters required to achieve high wheat yields. Two popular and recommended (Graham and Gambrell, 1988) wheat

Table 5. Cultivar differences in yield, test weight, incidence of powdery mildew, and lodging in Study 3 conducted near Blackville, SC, in 1986.

Cultivar	Yield bu/acre	Test weight lb/bu	Mildew	Lodging
			%	%
Coker 983	81.0	62.4	4cd†	0‡
Florida 302	80.8	60.2	0d	11
Williams	79.5	60.4	10bc	6
Saluda	77.7	63.0	51a	12
Hybrex 3021	76.6	60.1	17b	25
Pioneer 2550	72.8	61.1	41a	0
Massey	70.9	60.7	Trace d	16
Coker 9323	69.2	59.1	18b	1
Florida 201§	63.7	55.1	0d	0
LSD (0.05)	7.9	1.0	–	16
CV (%)	10.5	1.6	–	144

† Mildew ratings were made for only the traditional management plots because fungicide applied to intensive management plots completely prevented powdery mildew. Mean values and statistical separation using Duncan's NMRT were provided by G. C. Kingsland from Clemson University's 1986 Ag Chemical School Proceedings. Original data were not available to recalculate LSD and CV values.

‡ Lodging ratings were made on only the intensive management plots because with 80 lb N/acre, lodging did not occur in the traditional management plots.

§ Triticale has a standard marketable weight of 48 lb/bu, so Florida 201 yields were calculated using that value.

Table 6. Effect of intensive management treatments on yield, test weight, incidence of leaf rust, and plant height when averaged for three cultivars in Study 4.

Management practice	Yield bu/acre	Test weight lb/bu	Leaf rust %	Plant height in
150 lb/acre N	90.1	62.2	75†	33.6‡
150 N + Cerone	86.6	62.1	71	30.9
150 N + fungicide	88.5	62.2	3	–
150 N + Cerone + fungicide	86.5	62.4	5	–
90 N in 4-in. rows	83.6	62.2	60	–
90 N in 8-in. rows	84.0	62.6	60	–
LSD (0.05)	2.9	0.5	19	0.8
CV (%)	4.1	0.9	28	3.1

† Visual leaf rust ratings were made for the susceptible cultivar, Coker 983.

‡ Plant height ratings were made for high N plots, with and without Cerone.

cultivars (Coker 983 and Saluda) that differ in susceptibility to powdery mildew were selected for further evaluation.

Yields for Saluda and Coker 983 averaged 93.9 and 94.8 bu/acre with test weights of 62.6 and 62.8 lb/bu, respectively, in Study 5. Yield differences were not statistically significant ($P \leq 0.05$), but the test weight difference, although small, was significant. For comparison, yields in TM check plots that were planted in 8-in. rows and fertilized with 80 lb N/acre averaged 83.8 and 91.8 bu/acre for Saluda and Coker 983, respectively. Test weight in the TM check plots averaged 63.1 and 63.4 lb/bu, respectively.

Yield and test weight responses to N (Table 7) were significant ($P \leq 0.05$). Splitting 140 lb N/acre into three applications throughout the growing season resulted in average yields that exceeded 100 bu/acre and also significantly increased test weight of the grain when compared to 80 lb/acre, the recommended rate for wheat in the South Carolina Coastal Plain. There was no significant difference in test weight among ICM treatments, but single df contrasts confirmed that ap-

Table 7. Effect of N treatments on yield and test weight when averaged for two cultivars and four intensive management treatments in Study 5.

N rate lb/acre	Yield bu/acre	Test weight lb/bu
80	88.9	62.5
100	91.7	62.8
120	95.9	62.7
140	100.8	63.0
LSD (0.05)	4.7	0.3
CV (%)	5.3	0.8

plication of fungicide was significant at this yield level. Average yields were 99.0, 94.0, 94.0, and 90.4 bu/acre for the (fungicide + 4-in. row spacing), (4-in. row spacing), (fungicide + growth regulator + 4-in. row spacing), and (growth regulator + 4-in. row spacing) treatments, respectively. A positive response to fungicide was anticipated for Saluda because of its susceptibility to powdery mildew, and therefore, there was a highly significant cultivar by management practice interaction. Visual ratings of powdery mildew for Saluda fertilized with 80, 100, 120, or 140 lb N/acre averaged 1, 2, 8, and 16% infection, respectively, in plots that did not receive fungicide, while in fungicide-treated plots there was only a trace of mildew. Coker 983 is resistant to powdery mildew and no infection was observed.

Application of the growth regulator Cerone significantly reduced plant height from 38.6 to 36.9 in., but also reduced yield. Growth regulators are included in ICM programs to reduce lodging when N rates are increased. Straw strength for both cultivars evaluated in this study is classified as excellent (Graham and Gambrell, 1988), and lodging was not a severe problem. None occurred within the Coker 983 plots. Visual lodging ratings for Saluda fertilized with 80, 100, 120, or 140 lb N/acre averaged 0, 2, 7, or 2%, respectively, without Cerone and 0, 0, 2, and 0%, respectively, with Cerone. Lack of a growth regulator response for lodging may have occurred because wheat cultivars adapted to a more southern climate mature earlier, and also because sandy southeastern Coastal Plain soils often have lower residual N levels than soils in areas where growth regulators have produced a more positive response.

Yield levels obtained in Study 5 with 140 lb N/acre were among the highest recorded for the southeastern Coastal Plain. This enabled us to make estimates of potential profitability for wheat in this region. Assuming a cash price of $2.95/bushel or a $4.10/bushel price with current government support, a profit of $125 to $225/acre could be obtained after subtracting fixed costs for land, management, and interest. To achieve that level of profit, management attention must be given to the crop to prevent water and N stress, because at current average yield levels of 35 bu/acre, monocrop wheat budgets show a net loss of $24 to $59/acre.

Yields for Saluda and Coker 983 averaged 79.9 and 91.9 bu/acre in Study 6. The 12 bu/acre higher yield for Coker 983 was consistent with previous studies,

Table 8. Intensive management treatment effect on yield, test weight, seed weight, and incidence of powdery mildew when averaged for cultivars and N rates in Study 6 conducted near Blackville, SC, during 1987–88.

Management practice	Yield bu/acre	Test weight lb/bu	Kernel weight oz/1000 seed	Mildew rating %
4-in. rows	89.4	57.4	1.18	26.0†
4-in. rows + Cerone	79.9	56.8	1.13	14.9
4-in. rows + fungicide	92.4	57.2	1.18	1.2
4-in. rows + Cerone + fungicide	82.0	57.2	1.13	0.2
LSD (0.05)	3.0	0.6	0.02	8.9
CV (%)	7.0	2.0	3.7	118

† Visual powdery mildew ratings were made for only the susceptible cultivar Saluda because no disease was found on the resistant Coker 983.

but this response was not significant ($P \leq 0.10$) because of variation among replicates. Test weight averaged 57.2 and 57.1 lb/bu for the two cultivars, respectively. Lower grain yields and test weights for Study 6 than for Study 5 presumably reflect an almost 50% reduction in 1987–1988 rainfall when compared to 1986–1987 (Table 3). A severe (3 in.) rainstorm on the day scheduled for harvest may have further reduced grain yield in Study 6.

Seed weight for Saluda and Coker 983 was significantly different in 1988, averaging 1.2 and 1.1 oz/1000 seed, respectively. Check plot yields and test weights for the two cultivars grown using TM practices were 75.4 and 90.4 bu/acre and 57.1 and 57.4 lb/bu, respectively. Visual powdery mildew ratings showed that infection in Saluda was affected by N fertilization rate. For rates of 80, 100, 120, or 140 lb N/acre infestation averaged 8, 14, 3, and 17%, respectively [LSD(0.05) = 9.8%]. There were no yield, test weight, or seed weight response to increased N rate in 1988, presumably because rain limited yield. The experimental site was irrigated once in April, but based upon tensiometer readings in the surface horizon, we did not feel the crop was water stressed during grain-fill. We observed, that, compared with the 1986–1987 season, stand density and head number were much lower. Those observations and rainfall data for October through December (Table 3) suggest that irrigation should have been applied in the fall to increase early plant growth and to stimulate tiller formation. Previous studies (Karlen and Gooden, 1987) suggested that seasonal rainfall was generally adequate for producing wheat at TM levels, but to produce high yields with more intense management, further evaluation of irrigation throughout the growing season may be warranted.

Among ICM treatments, single df contrasts confirmed that there were significant differences in yield, test weight, seed weight, and incidence of powdery mildew (Table 8). Application of fungicide controlled powdery mildew on the Saluda cultivar and therefore increased grain yield, test weight, and seed weight. Applying Cerone resulted in the lowest grain yield, test weight, and seed weight. We hypothesize that this negative response to the growth regulator occurred because water was already severely limiting plant growth and N accumulation. Application of Cerone apparently increased plant stress and further reduced yield.

INTERPRETIVE SUMMARY

Six field experiments were conducted between 1984 and 1988 to evaluate ICM practices for the southeastern Coastal Plain. Each ICM practice affected the crop, but all of them may not be needed to achieve high wheat yields. Low water retention by most Coastal Plain soils means that water management is very critical for achieving optimum yield. Rain during the wheat growing season usually exceeds evapotranspiration and irrigation requirements are often minimal. If, however, water is limiting early in the season, tillering may be reduced and further expenditure for ICM inputs could be negated. The amount of plant-available water also influences N response. This nutrient can easily become a limiting factor on sandy, low organic matter Coastal Plain soils. Provided adequate water is available, splitting a total rate of 120 to 140 lb N/acre into three applications can produce wheat yields of 100 bu/acre or more.

Application of fungicide to control diseases such as powdery mildew can be included as part of an ICM program, but the more economical choice for the southeastern Coastal Plain appears to be selection of high-yielding, disease-resistant cultivars. Application of the growth regulator Cerone reduced plant height but also consistently reduced wheat yield. By selecting cultivars with good straw strength this ICM input can also be eliminated in this region. Finally, based upon current market prices, wheat can be an economically viable crop for farmers in the Coastal Plain with a potential profit ranging from $125 to $225/acre. The most important ICM components needed to achieve that profit level in the southeastern Coastal Plain are (i) selection of cultivars with high yield potential and good disease resistance, (ii) use of an optimum N rate applied in two or three applications, and (iii) prevention of water stress. Other ICM components such as narrow row spacing and fungicides may increase yield but growth regulators do not appear to be needed.

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