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INTENSIVE CULTURE OF WHEAT

IN CANADA

ANNUAL REPORT

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Intensive Culture of Wheat in Canada

Annual Report

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PROJECT OBJECTIVES

To determine the agronomic and economic potential of production systems incorporating intensive culture techniques for wheat production in the main wheat producing regions of Canada.

To more fully assess the potential for profitable intensive management in the various regions of the country, a package of agronomic practices will be developed and field tested by cooperating scientists and producers during the period of April 1, 1985 to October 31, 1988.

Specifically, the project will:

1. Evaluate the potential of intensive culture of triple-m (semi-dwarf) and winter wheats.

2. Evaluate the management x cultivar interactions.

3. Determine optimum crop density including row spacing and seeding rates.

4. Evaluate fertility management, specifically nitrogen rates, and method and timing of applications.

5. Evaluate plant growth regulators (PGR) for their effect on yield enhancement in both lodging and non-lodging crop conditions.

6. Evaluate the need for and effectiveness of pest control agents such as fungicides and insecticides.

7. Monitor environmental conditions in order to assess the impact of the various moisture and temperature regimes found both within and between regions on the effectiveness of intensive cereal management.

INTENSIVE CULTURE OF WHEAT IN CANADA

SUMMARY OF FINDINGS - 1986

Note: Observations and conclusions drawn in this report are based primarily on 1986 results, which may not reflect long term trends due to weather conditions. Thus the reader is urged to interpret the results with caution. Weather summaries are given for each of the major trial sites to assist with interpretation.

1. The overall objective of the Intensive Culture of Wheat project is to evaluate the potential of intensive culture of triple - M and winter wheats. During the second year of the study trials were also initiated to examine the response of conventional hard red spring wheat to intensive management.

2. Intensive wheat management trials were established in Alberta, Manitoba and Quebec. Problems were encountered with winter wheat trials in all three locations. Unexpected flooding caused the Quebec trials to be relocated; the yield potential of the Manitoba trials was lower due to seeding delays caused by fall rains; and the Alberta winter trials were influenced by an undetermined factor in the soil restricting yields and causing variability. Despite these problems many of the trials were still able to show responses to management. Establishment of spring wheat trials generally posed less of a challenge. However, at Minto dry seed bed conditions caused uneven germination and unacceptable stand variability in two trials and alternative trials were established. The general weather conditions in the west were less condusive to high yield in 1986 compared to 1985. Two of the major weather limitations were hot dessicating winds in late May and early June, which particularly reduced the yield potential of the winter wheat. Rainfall and soil moisture at grain filling was generally lower in 1986 than in 1985, further reducing the potential yield. Maximum yields were

lowered. For example, HY320 yielded as high as 7.4 tonnes/ha in Manitoba in 1985 but maximum yields in 1986 were 5.8 tonnes/ha. The maximum yields for Norstar winter wheat were 6.7 tonnes/ha and 4.6 tonnes/ha for 1985 and 1986 respectively. Lodging was not a significant factor in any trial conducted in Alberta or Manitoba. Yields in the 1986 Quebec trials reached 4.7 tonnes/ha in the best winter wheat trials, and as high as 7.8 tonnes/ha in the spring wheat trials. The high yields recorded for Max indicate a very favourable growing season for spring wheat in Quebec during 1986.

3. Despite the lower yield level in Western Canada in 1986, significant cultivar x management responses were found, particularly in non-fallowed trials in Manitoba. Little response to management was detected on fallow trials in Alberta. Examples of the maximum yield increases found in Manitoba trials are as follows:

Variety	Yield (kg/ha)		% Increase
	Low Mgt.	High Mgt.	
Norstar W. Wht.	2196	4614	110
Norwin W. Wht.	2496	3693	48
Thunderbird W. Wht.	2352	2993	27
HY320	3149	5186	64
Katepwa	3243	4172	29

Spring wheat cultivars in Quebec appeared to give differential response to management. Casavant responded positively to increased inputs, whereas Max tended to have reduced yields in response to increased inputs. Caution must be used in interpreting the cultivar x management trial, in that the packages applied may not be optimum for all cultivars. More cultivar specific work is required.

4. Crop density x fungicides trials generally did not support a need to dramatically increase seed rates in the prairies. Optimum yields were usually obtained with the lower seeding rates tested. Maximum winter wheat yields in Manitoba were achieved with the highest seed rates. However, the cost for the small increase would not be economical. The Alberta trials achieved maximum winter wheat yields with lowest seed rates. The response

of the Quebec crop to planting density was not consistent. In one trial a large advantage to increasing density was observed; fungicide treatments did not influence the response. However, in a second trial, population x N, no benefit could be shown to increasing seed rates.

5. While no crop density x disease incidence interaction was noted in western trials, diseases were present in most trials. Powdery mildew was the primary disease found in Alberta trials, and fungicide application allowed for increased yields of Neepawa wheat. Manitoba trials were plagued by stem and leaf rust, septoria and tanspot. Large yield increases were found in both winter and spring wheat trials when diseases were controlled with foliar fungicides. Examples of maximum yield increases for Manitoba data are as follows:

Variety	Yield (kg/ha)	
	Without Fungicide	With Fungicide
Norstar	3115	4421
HY320	~~4573~~ 4753	6135
Katepwa	3514	4093

Powdery mildew, septoria and rust were found to be a disease problem on Max spring wheat and Monopol winter wheat in Quebec. Although differences were not significant, yields were increased by as much as 1200 kg/ha in Max and 1600 kg/ha in Monopol winter wheat when fungicides were applied.

6. Nitrogen studies in Alberta indicate that addition of nitrogen over 30 kg/h to winter wheat was detrimental. Obviously nitrogen was not the primary a factor limiting yield. Spring wheat response to nitrogen was more positive. However, the most economic rates would have been about 70 kg/ha. The method of application was not significant. Split applications performed as well as single applications either broadcast or banded.

7. Serious interactions between nitrogen, plant growth regulators and stem rust make interpretation of Manitoba N + PGR responses difficult. Also the

nitrogen responses in HY320 were variable between trials even though individual trials had low variability.

8. Projections for yields based on available water and subsequent nitrogen requirement were far from being reached and must be reviewed. Generally, limited nitrogen response was found at all locations, both east and west, even though initial soil nitrate levels were low in many cases. Attention will be paid to this problem in 1987.

9. Lodging protection was not required in any of the Manitoba or Alberta trials in 1986. Yield enhancement effects were found in a HY320 in Manitoba, and to less extent in Columbus wheat. However, the results were not always consistent between trials. The Alberta trials did not find a yield enhancement from PGR applications. Lodging occurred in many of the Quebec trials although in many instances it was not severe. Plant growth regulators were shown to reduce plant height and control lodging in Max spring wheat.

10. Crop yields are always limited by the factors which are in the most limited supply (or in case of detrimental factors such as plant diseases or excess heat, by the factors which are excessive). Farmers face a continual challenge to supply the optimum growth environment for their crop in a way which will allow the least cost unit of production. The western Canadian intensive wheat management trials have been able to demonstrate that there are opportunities for western Canadian farmers to use more intensive management to increase yields and lower unit costs in wheat production. However, the projects have also shown that if the foundation for high yielding crops is not adequate, the application of added inputs will not be beneficial. For example, the large scale winter wheat trial at Portage la Prairie, Manitoba, suffered from a sparse plant population due to late seeding: added inputs did not increase yield over conventional management. Similar dry seed bed conditions and wild oat problems may have interfered with crop response at Spruce Grove.

Economic analysis of the winter wheat and spring wheat cultivar x management trials in Manitoba indicate that more intensive management can pay dividends even under 1986 prices. The margins, however, are much lower than those obtained in 1985.

The trials conducted in Quebec also show many positive responses to the cultivar x management component examined. Large scale Quebec trials indicated that positive net financial gains could be achieved by adding various components. Greater knowledge of the use of intensive management is required, however, before overall recommendations can be made.

PART 1

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EXECUTIVE SUMMARY OF 1986 RESULTS: K.G. BRIGGS

1-1 ICM research was conducted in 1986 in small plot trials with winter wheat and spring wheats at Edmonton, and in large scale on-farm plots with spring wheat at Fuhr Farms, Spruce Grove. Large scale winter wheat work at Spruce Grove was impossible due to inability to seed early enough in the fall in 1985 and 1986, because of rapeseed not yet being harvested due to late rains. This factor may be a major limitor for winter wheat in the Edmonton region.

2-1 <u>WINTER WHEAT (SMALL PLOTS W240)</u>
Excellent winter wheat survival of Norstar was obtained seeding into barley stubble at the end of August 1985, using various conventional double disc seeders (no till equipment is unavailable). Yield potential was rated at 90 - 100 bu/acre at the 5 leaf stage, but only very low yields were realized due to combinations of (a) 6 days of near 30C maximum temperatures at the end of May, (b) drought stress periodically during the boot and filling stages, (c) mildew development, and (d) a patchy but severe presence throughout the plots resembling copper deficiency. (The latter is still being diagnosed, as of January 1987).

2-2 Results from the Row Spacing x Seeding Rate experiment with Norstar indicated that the 6" row spacing combined with the 60 kg/ha seeding rate was most effective for raising yield, and no significant interactions of row spacing with rate were found. The main yield components contributing most to high yield at the 60 kg seeding rate were 1000 kernel weight and kernels per head. Maturity was unaffected by row spacing or seeding rate, but was 2 - 3 weeks earlier than nearby spring wheat plantings.

2-3 In a trial of Cerone and Cycocel PGR's at various rates, conducted at two fertility levels, use of PGR was not beneficial to yield compared to the untreated control, but lodging was not significant in the trial. The trial only averaged 985 kg/ha. In a second trial, Cycocel was applied at the recommended rate to Norstar grown at 6 fertility levels (early broadcast treatments of N from 0 - 150 kg/ha). No significant lodging occurred in this trial either, which also suffered a low average yield at 1551 kg/ha. Cycocel had no significant effect on yield or maturity in this trial, and was clearly not a beneficial input. Addition of more than 30 kg/ha of N spring broadcast tended to depress yields, perhaps due to moisture limitations.

2-4 In a trial of TILT fungicide (8 application regimes) and MANCOZEB (1 regime) a significant level of powdery mildew developed in the unsprayed control plots of Norstar (as reported in 1985 in farmscale trials). Only TILT (at or near recommended rates) effectively controlled the infestation, but this control did not result in a significant yield increase compared to the control. Although TILT was effective, its use was not therefore economical.

3-1 <u>SPRING WHEAT (SMALL PLOTS W240)</u>
All spring wheat trials in the W240 in 1986 were considered excellent trials, and all were grown on barley stubble except the "Multicultivars x Management" trial which was on fallow due to lack of space. Very high yields (> 100 bu/acre) were again achieved on fallow with some varieties and no drought stresses were apparent there. However, maximum yields on stubble in other trials were much lower (60 - 70 bu/acre range) and drought stress and height reduction was apparent due to moisture shortage

on stubble. May and June rainfall in Edmonton equalled the 30 year average, but shortage of stored moisture prior to the 5th leaf stage appears to have limited the yield potential.

3-2 Seeding method (combinations of 5", 6" rows and 300, 500 seeds/sq.m.) by fungicide trials for Neepawa and Oslo indicated that TILT at the recommended rate was effective in reducing the incidence of powdery mildew. Mancozeb (as expected from the label) did not control mildew. TILT treatment on Neepawa significantly increased the yield (298 kg/ha) compared to the unsprayed control, but no significant yield increase was obtained for Oslo. For neither variety was use of the fungicide economical. The best yield for Neepawa was obtained with the International seeder (6" spacing, at either 300 or 500 seeds/m^2) whereas for Oslo the rate or method of seeding did not influence yield or maturity. Using a 5" row spacing and 500 seeds/m^2 for Neepawa resulted in 2 - 5 days earlier maturity, but also a low yield. Fungicide effectiveness was uninfluenced by seeding method or rate, for Oslo or Neepawa.

3-3 The PGR's CYCOCEL and CERONE were tested in trials where Neepawa and Oslo were given an array of fertilizer treatments, from 0 to 420 kg/ha of N applied, including three with banded application. Significant N responses above the first 31 kg/ha applied were not obtained for Neepawa, and the maximum yield recorded for Neepawa was 4035 kg/ha. The highest yield for Oslo was obtained from the 131 kg/ha N rate broadcast at seeding (4378 kg/ha), a treatment that also gave the 2nd highest yield for Neepawa. For Oslo, in no case did split application result in significant yield increase compared to the control or to broadcast treatment at the same rate. No significant lodging occurred in these trials, and no significant yield improvement was obtained from PGR use, indicated that their use was uneconomical in this trial. Trials in two years in diverse moisture conditions with spring wheats do not indicate that use of PGR's are either necessary or economical for maximizing economic return. Neither do these trials indicate any advantage for split N applications, compared to a single application at seeding. In 1986 Neepawa responded with yield increase only up to 31 kg/ha broadcast, but Oslo responded up to 131 kg/ha of broadcast nitrogen. If these two varieties have different N response curves they are as yet inadequately described, especially under different moisture regimes in the Parkland region.

3-4 Trials were conducted for Neepawa and Oslo at two fertility levels, to examine the efficacy of several different PGR's. No significant lodging occurred in these trials and the PGR's did not significantly affect yield for either variety. The Neepawa trial averaged 3575 kg/ha and the Oslo trial 4438 kg/ha. PGR's in this trial included Cycocel and Cerone (at various rates and split applications) and Nitrozyme. Nitrozyme had no significant effects on yield or maturity of Neepawa or Oslo. Further examination of PGR use on these two spring wheat varieties does not seem warranted.

3-5 A trial of 16 spring wheat cultivars was conducted at two management levels on summerfallow. Very high average yields were recorded in this trial (5281 kg/ha) and the highest yield was 6562 kg/ha, for HY320, but no significant lodging occurred, suggesting that PGR use was unnecessary. Of the seven cultivars that were identified in 1985 as being significantly higher yielding than Neepawa, but of earlier maturity, only two repeated this performance in 1986 (PT741, PT325). "ICM" treatment significantly reduced yield when averaged over all cultivars, but significant cultivar x management interaction for yield occurred in 1986. The nature of these yield interactions and other interactions was complex. All semidwarfs were characterized by higher harvest indexes than the taller CWRS wheats.

3-6 For 3 of the cultivars in the cultivar x management trial described in 3-5 above an "Optimal Varietal Management" treatment was added (for HY320, Oslo and Neepawa). This treatment targeted high yield potential on the basis of available spring moisture, projected rainfall and customized ICM treatments for each variety. Our 1986 regime did not raise yields significantly above "Conventional" management, and therefore was very uneconomical due to the extra and specific input costs for each variety, particularly for N fertilizer. No fungicide or PGR was used in the OVM treatments, but yield potentials were severely overestimated when estimating N requirements.

3-7 A combined analysis of the cultivar x management trial was conducted for the 14 varieties that were in test in 1985 and 1986. Comparable "Conventional" and "ICM" treatments were applied in each year. Year effects, cultivar effects and year x cultivar effects were all significant for yield and maturity. In contrast management, management x cultivar and management x year x cultivar effects were not significant for yield or maturity. This suggests that the manner in which the cultivars are grown may be of less importance than the stability of performance of cultivars in the varying weather conditions of different years. This conclusion requires validation on stubble, and for more years and locations.

3-8 In the 2 year cultivar x management trial 6 cultivars were identified that did not yield significantly less than HY320, but which are as early as or earlier than Neepawa in maturity. None of these cultivars are licensed, and several cannot be under current regulations for seed identity.

4-1 <u>SPRING WHEAT FARM TRIALS</u>
The cultivars Neepawa and Oslo were grown in 2 replicate, 1 acre plots, to examine the effects of seedrate (2 levels), fertility level (3 levels - Conventional, High Conventional and 2 x High Conventional) and Cycocel (on Neepawa only). Mainplot treatments were Oslo (300 and 500 seeds/m^2), Neepawa (300 and 500 seeds/m^2, and 500 seeds/m^2 plus Cycocel). Each of these was run at 3 N fertility levels with P_2O_5 nonlimiting. (Available N was: Conventional 78 lbs/acre; High Conventional 108 lbs/acre; ICM = 2 x High Conventional at 208 lbs/acre). Total number of treatments was therefore 15. Wild oat infestations were not fully controlled due to a dry spring, followed by late germination, and the site suffered from extreme early drought, a very unusual event for Spruce Grove. The average yield achieved for the trial was only 3019 kg/ha, only 60% of that achieved in 1985. The highest average yield achieved was 4679 kg/ha (for Oslo at 300 seeds/m^2). No significant lodging occurred.

4-2 Significant effects on yield and maturity were not found in the large scale plots due to management, variety or for any of the management x variety interactions in 1986, for Neepawa or Oslo. The only significant effects in the entire trial were (a) a significant height reduction of Neepawa by CYCOCEL at the high seeding rate (b) a higher test weight and height for Neepawa compared to Oslo, (c) improved test weight of Oslo at the higher seeding rate, and (d) reduced test weight at higher fertility levels. 1986 results would not support any shift from "Conventional" management methods.

4-3 All grain from Spruce Grove graded "Feed", but yield differences were not significant between Neepawa and Oslo.

4-4 It was judged that some of the lack of significant yield differences in the combined plots might be due to random patches of wild oats. Metre square plots were therefore also harvested, all in wild oat "free" areas, in an effort to eliminate any wild oat effect. From these data the yields of the three fertility levels still were not significantly different, nor was the fertility by treatment interaction significant. However, from these data it was demonstrated that Neeapwa at 500 seeds/m^2 (with or without Cycocel) yielded worst of the five treatments. At the same seeding rate there was no significant yield difference between Neepawa and Oslo, at the average recorded yield level of 4202 kg/ha. However, Oslo averaged 2 - 7 days earlier maturing than Neepawa in 1986.

4-5 1986 data at Spruce Grove do not provide evidence in favour of much deviation from "Conventional" approaches for growing spring wheat. Lack of moisture at critical stages did not encourage high yields in 1986.

SECTION 1: SMALL SCALE TRIALS (W240)

a) Winter Wheat

Location W240, University of Alberta Farm, Edmonton, Alberta
NE-12-52-25-W4.

The soil test result (Norwest Labs) described the nutrient status (lbs/acre) for this site as: 7 nitrate, 33 phosphate, 578 potassium, 13 sulfate, 21600 calcium, 182 sodium, 2830 magnesium, pH 6.1, 0.16 E.O. (salinity), 11% organic matter, and medium texture. Recommendations were a) 93 lbs N/acre, 18 lbs P_2O_5/acre placed and 13 lbs S/acre for excellent crop conditions (target yield 51 bu/acre) and b) 75 lbs N/acre, 18 lbs P_2O_5/acre placed and 13 lbs S/acre for average crop conditions (target yield 41 bu/acre). Pre-seeding field operations consisted of a light soil disturbance using a spring tooth cultivation to loosen the soil surface. Post-seeding operations consisted of a single application of gramoxone to kill all secondary growth of the previous barley crop. With winter wheat following barley some level of root rot was expected in this area. In fact, root rot levels above 3 to 6 percent were not observed in the winter wheat trials.

EXPERIMENT 1: RATES OF SEEDING X ROW SPACING

Legal location: NE-12-52-25-W4

The objective of this trial was to determine optimum crop density by varying seeding rates and row spacings for Norstar winter wheat.

One variety of winter wheat, Norstar, was seeded into standing barley stubble on August 29, 1985 (August 31, 1985 for the Swift Current drill). The trial consisted of 3 seed drills each with 4 replicates with a randomized block design. The drills used were: International disc drill (with 6 inch or 15 cm spacings), Nordsten (Danish) disc drill (with 5 inch or 12 cm spacings) and the Swift Current disc drill (with 9 inch or 23 cm spacings).

Fertilizer regime for the trial was as follows: Fertilizer placed with the seed consisted of a ratio of 20 kg N/ha: 50 kg P_2O_5: 30 kg K_2O/ha: 10 kg S/ha (in the form of 34-0-0, 11-51-0, 0-0-60 and 21-0-0 respectively). 34-0-0, at a rate of 80 kg N/ha was hand broadcast on October 7, 1985, and at a rate of 60 kg N/ha on April 23, 1986. General weed control was Buctril M at Zadoks GS23 on May 6. CYCOCEL application of 2.5 l/ha in 200 l water at GS31 on May 23. The double application of TILT at 0.5 l/ha in 200 l water was applied at GS 37 and GS 49 to 55 on June 6 and 17 respectively. Disease present was powdery mildew and was adequately controlled. Norstar was harvested on August 12, 1986.

The treatments were set up as follows (and were repeated for each of the 3 different seeders; Nordsten, International and Swift Current).

1. 60 kg seed/ha (170 seeds/m^2).
2. 90 kg seed/ha (260 seeds/m^2).
3. 120 kg seed/ha (340 seeds/m^2).
4. 150 kg seed/ha (430 seeds/m^2).
5. 180 kg seed/ha (515 seeds/m^2).

TABLE A1. WINTER WHEAT TRIAL 1. ROWSPACING X SEEDING RATES ANALYSIS ON 4 REPLICATES

	df	Yield	K/m^2	1000 K	kg/Hl	Lodging	Maturity
rep	3	NS	NS	NS	NS	NS	NS
row	2	*	*	*	NS	NS	NS
rate	4	**	**	*	NS	NS	NS
row x rate	8	NS	NS	NS	NS	NS	NS
C.V. %		18.2	18.4	6.1	0.8	0.0	0.0

TRIAL 1. ROW SPACING X SEEDING RATES ANALYSIS ON 3 REPLICATES

	df	$Plants/m^2$	Tillers/Plant	$Heads/m^2$	Height	Kernels/Head
rep	2	NS	NS	NS	NS	NS
row	2	NS	NS	NS	*	*
rate	4	*	NS	**	NS	**
row x rate	8	NS	NS	NS	**	NS
C.V. %		19.2	26.1	14.8	7.6	26.6

TABLE A2. SIGNIFICANT (0.05) MAIN EFFECTS OF ROW SPACING FOR YIELD, KERNELS PER M^2, KERNEL WEIGHT, HEIGHT AND KERNELS PER HEAD. WINTER WHEAT TRIAL 1.

	Yield (kg/ha)		K/m^2		1000 K (gms)		Height (cm)		K/Head	
1. 5 inch (12 cm) spacing	1840	b	5175	b	32.0	b	59.3	b	9.)	b
2. 6 inch (15 cm) spacing	3630	a	9344	a	35.6	a	84.0	a	14.1	b
3. 9 inch (23 cm) spacing	2549	b	6830	ab	33.8	ab	67.4	ab	22.3	a
S.E.	208.5		754.7		1.2		3.1		2.3	

TABLE A3. SIGNIFICANT (0.05) MAIN EFFECTS OF SEEDING RATE FOR YIELD, KERNELS PER M^2, KERNEL WEIGHT, PLANTS PER M^2, HEADS PER M^2 AND KERNELS PER HEAD. WINTER WHEAT TRIAL 1.

	Yield (kg/ha)		K/m^2		1000 K (gms)		Plants/m^2		Heads/m^2		K/Head	
1. 60 kg/ha	3430	a	8974	a	34.9	a	261.0	b	400.7	c	21.5	a
2. 90 kg/ha	2770	b	7203	b	34.7	a	281.6	ab	453.8	abc	15.9	b
3. 120 kg/ha	2536	bc	6779	bc	33.5	ab	320.2	ab	409.1	bc	14.6	b
4. 150 kg/ha	2187	c	5987	c	32.7	b	342.1	a	472.2	ab	11.9	b
5. 180 kg/ha	2442	bc	6638	bc	33.1	ab	328.9	a	510.8	a	11.8	b
S.E.	224.1		584.6		0.9		26.3		29.7		1.8	

TABLE A4. SIGNIFICANT (0.05) INTERACTIVE EFFECTS OF ROW SPACING AND SEEDING RATE FOR HEIGHT. WINTER WHEAT TRIAL 1.

	SEEDING RATES (kg/ha)				
	60	90	120	150	180
1. 5 inch (12 cm)	62.3	56.3	61.7	55.0	61.0
2. 6 inch (15 cm)	82.3	89.3	83.7	83.7	81.3
3. 9 inch (25 cm)	80.3	73.0	58.7	63.0	62.0
INTERACTION S.E.	14.0				

RESULTS AND DISCUSSION: WINTER WHEAT TRIAL 1

1. Due to equipment limitations, row spacing effects are confounded with different seeding equipment. 15 inch - Nordsten, 6 inch - International and 9 inch - Swift Current type. All are double disc seeders.

2. There were no interactions between row spacings and seeding rate except for height (Table A1). At the 9 inch (Swift Current) row spacing, increased seeding rates significantly reduced height. At the 5 inch (Nordsten) row spacing, plant height was significantly reduced compared to the 6 inch row spacing.

3. Alterations in seeding rate resulted in significant effects on plants per m^2, heads per m^2, kernels per m^2, 1000 kernel weight, kernels per m^2 and yield (Table A1, A3). The highest average yield level was obtained from the 60 kg/ha rate producing 3430 kg/ha. The lowest yields resulted from 120, 150 and 180 kg/ha rates. The main contributors to high yield at the 60 kg rate were kernels per head (resulting in high kernels per m^2) and 1000 kernel weight (Table A3).

4. Positive associations between high seeding rate (i.e. 150 and 180 kg/ha) plants per m^2 and heads per m^2 were also apparent but did not result in high yields (Table A2, A3).

5. Row spacing (seeder) significantly affected yield, kernels per m^2, 1000 kernel weight, kernels per head and height (Table A1). For yield and yield components, the 6 inch row spacing gave the highest mean values in all cases but also resulted in taller plants (Table A2). The 5 inch (Nordsten) row spacing gave the lowest mean values for yield and yield components but also gave the shortest plants.

6. The average yield level achieved in the experiment was rather low at 2673 kg/ha. The main conclusions from this experiment are that the 6 inch row spacing (International) combined with the 60 kg/ha seeding rate were most effective for increasing yield. Variation of row spacing did not affect maturity.

Small scale winter wheat Trials 2, 3 and 4 severely, but irregularly, were affected with symptoms resembling copper deficiency, resulting in stunting of plants, leaf deformation and dehydration and subsequent proliferation of late tillers. The exact cause of these symptoms is not yet known, but no pathogens could be isolated from affected plants (Personal communication, Lou Piening, Agriculture Canada, Lacombe). Soil and plant analyses from affected and unaffected areas are underway. Trials 2, 3 and 4 suffered from a high level of variability because of this effect and were characterized by a high level of non-significant differences.

EXPERIMENT 2: PLANT GROWTH REGULATOR X FERTILITY

Legal location: NE-12-52-25-W4

The objective of this trial was to determine the most suitable plant growth regulator for Norstar winter wheat and its interaction with fertility.

One variety of winter wheat, Nortar, was seeded into standing barley stubble on August 29, 1985 using an International disc drill seeder with 6 inch row spacings. The trial had a split plot design with 4 replicates. The seeding rate was set at 150 kg/ha (430 seeds/m^2). Fertilizer placed with the seed consisted of a ratio of 20 kg N/ha: 50 kg P_2O_5/ha: 30 kg K_2O/ha: 10 S/ha (using 34-0-0, 11-51-0, 0-0-60, and 21-0-0 respectively). 34-0-0, at a rate of 80 kg N/ha was hand broadcast on Oct. 7, 1985 and at a rate of 60 kg N/ha was hand broadcast on April 23, 1986. General weed control consisted of a single application of Buctril M on May 6. A blanket application of TILT, at 0.5 L/ha in 200 L water, was applied at two stages during the growing season at Zadoks GS 37 and GS 49 to 55 on June 6 and June 17, respectively. Disease present was powdery mildew and was adequately controlled. Norstar was harvested on August 11, 1986.

The treatments were set up as follows:
Main Plot: Plant Growth Regulator

	Rate (gai)	Zadoks GS	Date Applied
1. Control	-	-	-
2. CERONE	75	39	June 9
3. CERONE	150	39	June 9
4. CERONE	300	39	June 9
5. CYCOCEL	920	31	May 31
6. CYCOCEL/CYCOCEL	460/460	23/31	May 16, May 31
7. TERPAL C	690	32-37	June 3
8. CYCOCEL/CERONE	690/150	31/39	May 31/June 9

Subplot Fertility
1. Target 50 bu/acre (3420 kg/ha). No additional N applied.
2. Target 75 bu/acre (5040 kg/ha). 60 kg N/ha applied at GS 21 on May 2.

TABLE A5. WINTER WHEAT TRIAL 2. PLANT GROWTH REGULATORS X FERTILITY ANALYSIS ON 4 REPLICATES

	df	Yield	Kernels/m^2	1000 K	kg/Hl	Lodging	Maturity
rep	3	*	*	NS	*	NS	NS
pgr	7	NS	NS	NS	NS	NS	NS
fert	1	NS	NS	NS	NS	NS	NS
pgr x fert	7	NS	NS	NS	NS	NS	NS
C.V. %		32.9	29.2	7.9	2.0	0.0	0.0

WINTER WHEAT TRIAL 2. PLANT GROWTH REGULATORS X FERTILITY ANALYSIS ON 3 REPLICATES

	df	Heads/m^2	Height	Kernels/Head
rep	2	*	NS	*
pgr	7	*	NS	NS
fert	1	NS	NS	NS
pgr x fert	7	NS	NS	NS
C.V. %		10.7	10.0	30.5

WINTER WHEAT TRIAL 2. PLANT GROWTH REGULATOR X FERTILITY ANALYSIS ON 2 REPLICATES

	df	Plants/m^2	Tillers/Plant
rep	1	NS	NS
pgr	7	NS	NS
fert	1	NS	NS
pgr x fert	7	NS	NS
C.V. %		16.4	17.9

TABLE A6. SIGNIFICANT (0.05) MAIN EFFECT OF PLANT GROWTH REGULATORS FOR HEADS PER m^2. WINTER WHEAT TRIAL 2.

	Heads/m^2	
1. CONTROL	401.5	abc
2. CERONE, 75 gai, GS39	429.5	ab
3. CERONE, 150 gai, GS39	411.7	ab
4. CERONE, 300 gai, GS39	427.7	ab
5. CYCOCEL, 690 gai, GS31	441.8	a
6. CYCOCEL/CYCOCEL, 230/230 gai, GS23/31	435.5	ab
7. TERPAL C, 690 gai, GS32-37	390.5	bc
8. CYCOCEL, 690 gai GS31/CERONE, 150 gai, GS39	359.7	c
S.E.	15.5	

RESULTS AND CONCLUSIONS: WINTER WHEAT TRIAL 2

1. Fertility levels were non-significant for all variables as were plant growth regulator by fertility interactions (Table A5).

2. The average yield level in this experiment was very low (985 kg/ha). The low yield may be attributable to several effects: a) the "field variability" problem referred to earlier, b) the 26 to 32C temperatures for 6 days at Zadoks GS 31 and c) drought and heat stress in some parts of June. The occurrence of a major drought effect could be confirmed by height reduction by up to 20 to 30 cm of plants within trials compared to plants growing adjacent to unseeded areas.

3. Plant growth regulators had significant effects only on heads per m^2. However, no significant lodging occurred in this trial (Table A5). None of the growth regulator treatments resulted in significant change in heads per m^2 compared to the control (Table A6).

4. In this trial plant growth regulators were clearly not beneficial at either fertility level.

EXPERIMENT 3: FERTILITY X CYCOCEL

Legal location: NE-12-52-25-W4

The objective of this trial was to determine the benefits of various levels of nitrogen fertilizer applications and their interaction with CYCOCEL.

Norstar winter wheat was seeded into standing barley stubble on August 29, 1985 using an International disc drill seeder with 6 inch row spacings. Seeding rate was set at 150 kg/ha (430 seeds/m^2) and experimental design was split-plot with 4 replicates. Fertilizer placed with the seed as starter, consisted of a ratio of 20 kg N/ha: 50 kg P_2O_5/ha: 30 kg K_2O/ha: 10 kg S/ha (using 34-0-0, 11-51-0, 0-0-60 and 21-0-0 respectively). General weed control consisted of a single application of Buctril M on May 6. A blanket application of TILT, at 0.5 l/ha in 200 l water, was applied at two stages during the growing season at Zadoks GS 37 and GS 49 to 55 on June 6 and June 17 respectively. Disease present was powdery mildew and was adequately controlled by fungicide application. This trial was harvested on August 11, 1986.

The treatments were set up as follows:

Main Plot: Fertilizer (single application, spring broadcast on April 23, 1986 at Zadoks GS 21 in the form of 34-0-0).

1. Control
2. 30 kg N/ha
3. 60 kg N/ha
4. 90 kg N/ha
5. 120 kg N/ha
6. 150 kg N/ha

Subplot: CYCOCEL

1. Control
2. CYCOCEL at 1.5 l/ha at GS 31 on May 30.

TABLE A7. WINTER WHEAT TRIAL 3. FERTILITY X CYCOCEL ANALYSIS ON 4 REPLICATES.

	df	Yield	Kernels/m^2	1000 K	kg/Hl	Maturity	Lodging
rep	3	NS	NS	NS	NS	NS	NS
fert	5	**	**	NS	NS	NS	NS
Cycocel	1	NS	NS	NS	NS	NS	NS
fert x Cycocel	5	NS	NS	NS	NS	NS	NS
C.V. %		29.0	28.0	5.3	1.4	0.0	0.0

WINTER WHEAT TRIAL 3. FERTILITY X CYCOCEL ANALYSIS OF 3 REPLICATES.

	df	Heads/m^2	Height	Kernels/Head
rep	2	**	**	NS
fert	5	*	NS	NS
Cycocel	1	NS	NS	NS
fert x Cycocel	5	NS	NS	NS
C.V. %		10.3	9.2	31.4

WINTER WHEAT TRIAL 3. FERTILITY X CYCOCEL ANALYSIS ON 2 REPLICATES

	df	Plants/m^2	Tillers/Plant
rep	1	NS	NS
fert	5	NS	NS
Cycocel	1	NS	NS
fert x Cycocel	5	NS	NS
C.V. %		21.9	27.3

TABLE A8. SIGNIFICANT (0.05) MAIN EFFECTS OF FERTILITY FOR YIELD, KERNELS PER M^2 AND HEADS PER M^2. WINTER WHEAT TRIAL 3.

	Yield (kg/ha)		Kernels/m^2		Heads/m^2	
1. CONTROL	2354.9	a	6541.7	a	444.8	a
2. 30 kg N/ha	1854.9	ab	5097.4	ab	427.3	a
3. 60 kg N/ha	1300.2	bc	3649.0	bc	404.0	ab
4. 90 kg N/ha	1376.0	bc	3832.6	bc	374.0	b
5. 120 kg N/ha	974.5	c	2814.3	c	384.2	b
6. 150 kg N/ha	1490.0	bc	4145.6	bc	409.7	ab
S.E.	184.7		497.5		17.2	

RESULTS AND CONCLUSIONS: WINTER WHEAT TRIAL 3

1. As in Trial 2 (Winter wheat) neither the plant growth regulator (CYCOCEL) nor the fertility by plant growth regulator interaction had significant effects on any variables (Table A7). The average yield level of this trial was 1551 kg/ha, low for reasons described earlier.

2. Fertility levels significantly affected yield, kernels per m^2 and heads per m^2 (Table A7, A8). Addition of extra nitrogen compared to the control generally reduced yield. Possible explanations for this effect relate to the high levels of moisture stress and "field" stresses described earlier. The blanket application of fungicide to this trial controlled powdery mildew effectively.

3. CYCOCEL used in this trial was clearly not beneficial. Higher levels of fertilizer resulted in lower yields, probably related to growth stresses from drought. It should be noted that droughts are very unusual at the Edmonton site.

EXPERIMENT 4: FUNGICIDES

Legal location: NE-12-52-25-W4

The objective of this trial was to determine the most effective fungicide (and rate) for Norstar winter wheat.

Norstar wheat was seeded into standing barley stubble on August 29, 1985 using an International disc drill seeder with 6 inch row spacings. Seeding rate was set at 150 kg/ha (430 seeds/m^2) with 4 replicates of a randomized block design. Starter fertilizer placed with the seed consisted of a ratio of 20 kg N/ha: 50 kg P_2O_5/ha: 30 kg K_2O/ha: 10 kg S/ha (in the form of 34-0-0, 11-51-0, 0-0-60 and 21-0-0 respectively). 34-0-0, at a rate of 80 kg N/ha, was hand broadcast on Oct. 7, 1985 and another 60 kg N/ha, was hand broadcast on April 23, 1986. General weed control consisted of a single application of Buctril M on May 6. A blanket application of CYCOCEL, at 2.5 l/ha in 200 l water at Zadoks GS 31 was applied on May 23. Disease development was measured both by the Horsfall-Barrett scale and by a scale recommended by Dr. J.P. Tewari.

Treatments were set up as follows:

	Rate	GS	Date Applied
1. Control	-	-	-
2. TILT	0.25 l/ha	37	June 6
3. TILT	0.387 l/ha	37	June 6
4. TILT	0.5 l/ha	37	June 6
5. TILT/TILT	0.25/0.25 l/ha	37/49-55	June 6/June 13
6. TILT/TILT	0.5/0.5 l/ha	37/49-55	June 6/June 13
7. TILT	0.25 l/ha	49-55	June 13
8. TILT	0.387 l/ha	49-55	June 13
9. TILT	0.5 l/ha	49-55	June 13
10. MANCOZEB/ MANCOZEB	2.25/2.25 kg/ha	49/+10 days	June 13/June 22

Powdery mildew development was scored on June 6 (Zadoks 39) and again (after treatments were applied) on June 26 (Zadoks 70) using the J.P. Tewari (JPT) scale and the Horsfall-Barrett (HB) scale, in the field, and also on sampled plants in the laboratory.

TABLE A9. WINTER WHEAT TRIAL 4. FUNGICIDES ANALYSIS OF 4 REPLICATES

	df	Yield	Kernels/m^2	1000 K	kg/Hl	Maturity	Lodging
rep	3	*	*	NS	*	NS	NS
fung	9	NS	NS	NS	NS	NS	NS
C.V. %		43.7	37.1	7.4	2.0	0.0	0.0

WINTER WHEAT TRIAL 4. FUNGICIDES ANALYSIS ON 3 REPLICATES

	df	Heads/m^2	Height	Kernels/Head
rep	2	NS	*	NS
fung	9	NS	NS	NS
C.V. %		13.7	14.7	46.1

WINTER WHEAT TRIAL 4. FUNGICIDES ANALYSIS ON 2 REPLICATES

	df	Plants/m^2	Tillers/Plant
rep	1	NS	NS
fung	9	NS	NS
C.V. %		27.5	32.6

TABLE A9-2. POWDERY MILDEW DEVELOPMENT IN WINTER WHEAT TRIAL 4, TREATED WITH DIFFERENT FUNGICIDES.

June 6 JPT Scale 1.7 (out of max. 9)
HB Scale 1.7 (out of max. 11).

		Field Visual			Lab Assessment		
		JPT	HB	% Plants Infected	JPT	HB	% Plants Infected
June 26	1. Control	3.3	2.5	5	0.5	2.5	5
	2. TILT at 0.25	3.8	1.9	3	1.3	2.0	3
	3. TILT at 0.39	3.0	1.2	1	1.0	3.0	6
	4. TILT at 0.50	2.1	1.1	1	0	0.5	1
	5. TILT at 0.25/0.25	3.0	1.4	1	0	1.0	1
	6. TILT/TILT at 0.5/0.5	2.7	0.9	1	0	1.0	1
	7. TILT at 0.25 (L)	3.2	1.0	1	2.2	3.5	9
	8. TILT at 0.39 (L)	2.8	2.0	3	1.0	1.5	2
	9. TILT at 0.50 (L)	3.9	1.9	3	1.3	2.5	5
	10. MANCOZEB/MANCOZEB	4.3	2.8	6	0.8	2.0	3

RESULTS AND CONCLUSIONS: WINTER WHEAT TRIAL 4

1. Powdery mildew development was significant in this trial, as indicated by the 1.7 rating at Zadoks 39, and the relatively high ratings at Zadoks 70 in the unsprayed control (Table A9-2). Whilst there were some differences from the methods used to assess infective levels several early applied TILT treatments were effective in arresting development of mildew (Table A9-2).

2. Despite the differences in fungicide effectiveness there were no significant effects of fungicides on yield, yield components, maturity or other characters (Table A9). The average experimental yield level was 1649 kg/ha, which is very low for winter wheat, due to limitations described earlier.

3. Powdery mildew development in this trial was at a significant level and several fungicide treatments were effective in controlling disease. However, no significant yield response was obtained confirming that application was not economical.

b) SMALL SCALE SPRING WHEAT TRIALS (W240)

Location: W240, University of Alberta Farm, Edmonton, Alberta
NE-12-52-25-W4

The spring wheat trials consisted of four experiments, three of which (Crop Density x Fungicide, Fertility x Plant Growth Regulator and Plant Growth Regulator x Fertility) were seeded into a field which had been barley the previous year and the fourth (Cultivars x Management) was seeded into fallow, due to limitations of space.

The soil test result (Norwest Labs) described the soil nutrient status (lbs/acre) for the stubble field as: 26 nitrate, 27 phosphate, 356 potassium, 36.9 sulfate, 8520 calcium, 63.0 sodium, 1000 magnesium, pH 6.1, 0.18 E.C. (salinity), 9% organic matter, and fine texture. Recommendations were a) 74 lbs N/acre, and 18 lbs P_2O_5/acre placed for excellent crop conditions (target yield of 67 bu/acre) and b) 59 lbs N/acre and 18 lbs P_2O_5/acre placed for average crop conditions (target yield 54 bu/acre).

The soil test result (Norwest Labs) described the soil nutrient status (lbs/acre) for the fallow field as: 200 nitrate, 13 phosphate, 292 potassium, 33.4 sulfate, 9140 calcium, 79.4 sodium, 1040 magnesium, pH 6.0, 0.54 E.C. (salinity), 10% organic matter and medium texture. Recommendations were: a) 32 lbs P_2O_5/acre placed for excellent crop conditions (target yield 91 bu/acre) and b) 32 lbs P_2O_5/acre placed for average crop conditions (target yield 73 bu/acre).

EXPERIMENT 1: CROP DENSITY X FUNGICIDE (NEEPAWA; OSLO)

Legal location: NE-12-52-25-W4

The objectives of this trial were to determine optimum crop density by varying seeding rate and, in the case of Neepawa wheat, the optimum row spacing, and to evaluate the need for foliar fungicides.

Two varieties of spring wheat, Neepawa and Oslo, were seeded into separate trials having split-plot design and 4 replicates. The Oslo and part of the Neepawa were seeded on May 6 with the International disc drill with 6 inch spacings and 2 different seeding rates. On May 7 the remainder of the Neepawa plots were seeded with the Nordsten (Danish) disc drill with 5 inch row spacings and 2 seeding rates. The previous crop was barley and had been cultivated twice and harrowed before seeding.

All seed was treated with Vitavax. On May 5, prior to seeding, 30 kg K_2O/ha (0-0-60) and 10 kg S/ha (21-0-0) were broadcast, cultivated and harrowed. As well, 90 kg P_2O_5/ha (0-45-0) was "banded" with the International drill. Nitrogen was broadcast as 46-0-0, at rates of 90 kg N/ha, 45 kg N/ha and 45 kg N/ha on May 13, June 10 and June 26, respectively. Weeds were controlled with an application of HOEGRASS II on June 3. Neepawa received a blanket application of CYCOCEL, at the 2.5 l/ha rate in 200 l water, on June 10 when the crop was at GS 31. Neepawa trials were harvested on August 27 while Oslo was harvested on August 22.

Treatments: Main plot for Neepawa

1. 5 inch spacings, target 300 seeds per m^2.
2. 5 inch spacings, target 500 seeds per m^2.
3. 6 inch spacings, target 300 seeds per m^2.
4. 6 inch spacings, target 500 seeds per m^2.

Main plot for Oslo

1. 6 inch spacings, target 300 seeds per m^2.
2. 6 inch spacings, target 500 seeds per m^2.

Subplots (for both varieties)

1. Control.
2. TILT, single application at Zadoks 49-55 (0.51/ha in 200 L water) applied on June 27.
3. MANCOZEB/MANCOZEB at Zadoks 49/+10 days (2.25 kg/2.25 kg/ha in 200 1 water) applied on June 27/July 7.

TABLE A10. SPRING WHEAT TRIAL 1. CROP DENSITY X FUNGICIDE (NEEPAWA) ANALYSIS ON 4 REPLICATES.

	df	Maturity	Yield	Kernels/m^2	1000 K	kg/Hl	Lodging
rep	3	*	NS	NS	**	**	NS
S. Method	3	*	*	NS	**	*	NS
fung	2	NS	*	*	NS	NS	NS
S. Method x fung	6	NS	NS	NS	NS	NS	NS
C.V. %		1.7	9.3	8.0	3.5	0.8	0.0

(S = Seeding)

SPRING WHEAT TRIAL 1. CROP DENSITY X FUNGICIDE (NEEPAWA) ANALYSIS ON 3 REPLICATES.

	df	Plants/m^2	Tillers/Plant	Heads/m^2	Height	Kernels/Head
rep	2	NS	*	**	NS	NS
S. Method	3	**	**	**	**	**
fung	2	NS	**	NS	NS	NS
S. Method x fung	6	NS	NS	NS	NS	NS
C.V. %		7.5	15.9	19.9	5.0	22.9

TABLE A11. SIGNIFICANT (0.05) MAIN EFFECTS OF SEEDING METHOD FOR MATURITY, YIELD, KERNEL WEIGHT, HECTOLITRE WEIGHT, PLANTS PER M^2, TILLERS PER PLANT, HEADS PER M^2, HEIGHT AND KERNELS PER HEAD. TRIAL 1 NEEPAWA.

	Maturity	Yield (kg/ha)	1000 K (gms)	kg/Hl	Plants/m^2	Tillers/ Plant	Heads/m^2	Height (cm)	K/Head
1. 5 inch (12 cm) rows, 300 seeds/m^2	110.3 a	3525.6 ab	32.3 b	78.5 a	262.6 b	3.5 ab	919.9 a	68.3 b	11.9 b
2. 5 inch (12 cm) rows, 500 seeds/m^2	107.8 b	3144.6 b	31.0 c	77.7 b	446.8 a	2.0 c	896.4 a	67.7 c	10.7 b
3. 6 inch (15 cm) rows 300 seeds/m^2	110.5 a	3959.0 a	33.6 a	78.5 a	163.8 c	4.2 a	664.8 b	74.7 a	16.5 a
4. 6 inch (15 cm) rows 500 seeds/m^2	110.2 a	4065.6 a	33.9 a	78.7 a	234.4 b	3.0 b	705.8 b	75.3 a	16.9 a
S.E.	0.9	170.0	0.6	0.3	10.3	0.3	79.3	1.8	1.6

TABLE A12. SIGNIFICANT (0.05) MAIN EFFECTS OF FUNGICIDE FOR YIELD, KERNELS PER M^2 AND TILLERS PER PLANT. TRIAL 1 NEEPAWA.

	Yield (kg/ha)	Kernels/m^2	Tillers/plant
1. CONTROL	3576.8 b	10435.1 ab	2.8 b
2. TILT, 0.5 L, GS 49-55	3874.7 a	11010.5 a	3.4 a
3. MANCOZEB/MANCOZEB, 2.25/ 2.25 kg, GS49/+ 10 days	3569.6 b	10248.8 b	3.4 a
S.E.	196.3	485.2	0.3.

TABLE A12-2. POWDERY MILDEW DEVELOPMENT IN NEEPAWA AND OSLO SPRING WHEAT (TRIALS 1), UNSPRAYED (U), AND WITH FUNGICIDE APPLIED, SCORED JUNE 6, JUNE 27, AND JULY 14.

	HB Grade		HB Grade Formula %
Unsprayed, June 6	Neepawa	0.7	2.0
	Oslo	1.5	3.0
Unsprayed, June 27	Neepawa	5.2	18.8
	Oslo	3.5	14.1
Sprayed, July 14	Neepawa - TILT	1.1	2.6
	- M/M	4.0	19.9
	Oslo - TILT	1.5	3.5
	- M/M	3.0	11.7

RESULTS AND CONCLUSIONS: TRIAL 1 NEEPAWA

1. Disease development on spring wheat in Edmonton is usually at a negligible level. However, this trial was grown in close proximity to the winter wheat trials which seemed to provide a source of heavy inoculum for powdery mildew. The development of this disease in unsprayed controls is indicated in Table A12-2.

2. Fungicide treatments had significant effects on yield, kernels per m^2 and tillers per plant (Table A10). MANCOZEB had no significant effect of yield or kernels per m^2 but did increase tillers per plant compared to the control (Table A12). TILT did not significantly increase kernels per m^2 but did significantly increase tillers per plant and yield (Table A12). The yield increase was 8% over the control (298 kg/ha increase). There was no significant interaction of fungicides with seeding rates.

3. Seeding rates significantly affected days to maturity, yield, all yield components except kernels per m^2), test weight and height (Table A10). The 5 inch row spacing with 500 seeds per m^2 was significantly earlier in maturity than the other seeding methods (Table A11).

4. The seeding method with the earliest maturity (5 inch rows, 500 seeds/m^2) also resulted in the lowest yield. This low yield was associated with low kernel weight, low tillers per plant and low kernels per head as well as low plant height and low test weight (Table A11).

5. As indicated by plants per m^2, considerable difficulty was found in establishing the target seed densities of 300 and 500 seeds per m^2 with the International seeder (Table A11). For these two treatments, respectively, only 55% and 47% of the viable seed planted became established. Despite this factor, the highest yields were obtained with this seeder. By contrast, seeding estabishment losses with the Nordsten seeder did not exceed 12%. For the 6 inch row spacing treatments (International), the low plant densities achieved are clearly compensated for by higher kernels per head, 1000 kernel weight, and to some extent, by tillering.

6. In this trial where powdery mildew was a problem, TILT at the recommended rate effectively controlled the disease. Yield protection from mildew by TILT was 298 kg/ha in a situation where the unsprayed control yielded 3577 kg/ha. Effectiveness of TILT was not influenced by method of seeding. MANCOZEB was, as expected from the label, not effective in controlling yield losses from powdery mildew.

TABLE A13. SPRING WHEAT TRIAL 1. CROP DENSITY X FUNGICIDE (OSLO) ANALYSIS ON 4 REPLICATES.

	df	Maturity	Yield	$Kernels/m^2$	1000 K	kg/Hl	Lodging
rep	3	*	NS	NS	NS	NS	NS
rate	1	NS	NS	*	NS	NS	NS
fung	2	NS	NS	NS	**	*	NS
rate x fung	2	NS	NS	NS	NS	NS	NS
C.V. %		0.8	11.9	12.5	3.0	1.0	0.0

SPRING WHEAT TRIAL 1. CROP DENSITY X FUNGICIDE (OSLO) ANALYSIS ON 3 REPLICATES.

	df	$Plants/m^2$	Tillers/Plant	$Heads/m^2$	Height	Kernels/Head
rep	2	NS	NS	*	NS	NS
rate	1	NS	NS	*	*	NS
fung	2	NS	NS	NS	NS	NS
rate x fung	2	NS	NS	NS	NS	NS
C.V. %		10.4	26.3	20.5	3.9	18.7

TABLE A14. SIGNIFICANT (0.05) MAIN EFFECT OF RATE FOR KERNELS PER M^2, HEADS PER M^2 AND HEIGHT. TRIAL 1 OSLO.

	Kernels/m^2		Heads/m^2		Height (cm)	
1. 6 inch (15 cm), 300 seeds/m^2	10059.2	b	435.1	b	63.9	a
2. 6 inch (15 cm), 500 seeds/m^2	10782.5	a	505.7	a	60.1	b
S.E.	923.5		68.2		1.7	

TABLE A15. SIGNIFICANT (0.05) MAIN EFFECTS OF FUNGICIDE FOR KERNEL WEIGHT AND HECTOLITRE WEIGHT. TRIAL 1 OSLO

	1000 KWT (gms)		kg/Hl	
1. Control	33.5	b	76.0	b
2. TILT, 0.5 L/ha, GS 49-55	36.0	a	77.0	a
3. MANCOZEB/MANCOZEB, 2.25 kg/2.25 kg/ GS49/+10 days	35.5	ab	76.8	ab
S.E.	0.6		0.5	

RESULTS AND CONCLUSIONS: TRIAL 1 OSLO

1. There were no significant effects on yield as a result of the fungicide treatment, seeding rate, or the fungicide by rate interaction (Table A13). Seeding rate by fungicide interaction was not significant for any variables measured.

2. Fungicide effects were only significant for 1000 kernel weight and test weight (Table A13). Compared to the control, TILT gave a significant improvement in 1000 kernel weight and test weight whereas MANCOZEB resulted in no significant improvement.

3. The higher seeding rate resulted in significantly higher number heads per m^2 and kernels per m^2 as well as reduced plant height (Table A14).

4. In this trial, powdery mildew infection developed to a significant level on untreated Oslo (Table 12-2). Mildew was severe on the lower leaves, light to moderate on the middle leaves and free of disease on the upper leaves at the highest level of infection. This level was not enough, however, to cause differential yield losses, even though TILT was effective in controlling the infection. It may be inferred that fungicide use may not be economical. MANCOZEB was used in this trial because septoria leaf blotch problems were expected but never materialized.

EXPERIMENT 2: FERTILITY X PLANT GROWTH REGULATOR

Legal location: NE-12-52-25-W4

The objective of this trial was to evaluate various types of nitrogen applications and their interaction with plant growth regulators.

The trials were seeded with a Swift Current side banding seeder at 9 inch row spacings with a target seeding rate of 500 seeds per m^2 and 2 varieties of wheat (Neepawa and Oslo) on May 9 using vitavax treated seed. Each trial was replicated 4 times with a split plot design. A blanket application of P_2O_5 (0-45-0) was banded at a rate of 45 kg/ha for all fertility treatments except the controls. Phosphate, at a rate of 45 kg P_2O_5/ha (0-45-0) was also placed with the seed as starter for all treatments except the controls. On May 5, 30 kg K_2O/ha (0-0-60) and 10 kg S/ha (21-0-0) were hand broadcast, cultivated to 4 inches and then harrowed for seed bed preparation. General weed control was HOEGRASS II on June 3. A single application of TILT, at a rate of 0.5 l/ha in 200 l water, was applied at GS 49-55 on June 30 and July 8 for Oslo and Neepawa, respectively. Neepawa plots were harvested on August 28 while Oslo plots were harvested on August 22.

Fertility regime as follows:

Main Plot: Fertility (in kg N/ha) (all applications hand broadcast except for treatments 8, 9 and 10).

	Zadoks GS 00 May 12	Zadoks GS 31 June 1	Zadoks GS 49 June 26	Total Available (including soil N) actual kg N/ha
1. Control	-	-	-	29
2.	31	-	-	60
3.	91	-	-	120
4.	131	-	-	160
5.	0	31	-	60
6.	51	40	-	120
7.	51	40	40	160
8. Banded May 9	31	-	-	60
9. Banded May 9	91	-	-	120
10. Banded May 9	131	-	-	160
11. Target 75 bu/acre	120	46	30	225
12. Target 85 bu/acre	160	73	40	302
13. Based on available soil moisture	200	151	40	420
14.	51	-	-	80
15.	51	-	40	120

Subplot: Plant Growth Regulator

For Neepawa:
1. Control
2. CYCOCEL, 0.69 gai/ha, at GS 31 on June 17
3. CERONE, 0.15 gai/ha, at GS 39 on June 21

For Oslo
1. Control
2. CYCOCEL, 0.69 gai/ha at GS 31 on June 17.

TABLE A16. SPRING WHEAT TRIAL 2. FERTILITY X PLANT GROWTH REGULATOR (NEEPAWA) ANALYSIS ON 4 REPLICATES.

	df	Maturity	Yield	K/m^2	1000 K	kg/Hl	Lodging
rep	3	**	**	**	**	**	NS
fert	14	NS	**	**	**	*	NS
pgr	2	*	**	NS	**	NS	NS
fert x pgr	28	NS	NS	NS	NS	NS	NS
C.V. %		1.0	8.0	8.7	5.2	0.9	0.0

SPRING WHEAT TRIAL 2. FERTILITY X PLANT GROWTH REGULATOR (NEEPAWA) ANALYSIS ON 3 REPLICATES.

	df	Plants/m^2	Tillers/Plant	Heads/m^2	Height	Kernels/Head
rep	2	NS	**	**	**	**
fert	14	NS	**	**	**	**
pgr	2	NS	*	*	**	*
fert x pgr	28	NS	NS	NS	NS	NS
C.V. %		11.0	14.3	10.9	5.5	12.7

TABLE A17. SIGNIFICANT (0.05) MAIN EFFECTS OF FERTILITY FOR YIELD, KERNLES PER M^2, KERNEL WEIGHT, HECTOLITRE WEIGHT. TILLERS PER PLANT, HEADS PER M^2, HEIGHT AND KERNELS PER HEAD. TRIAL 2 NEEPAWA.

	Yield (kg/ha)	Kernels/m^2	1000 K	kg/Hl	Tillers/ Plant	Heads/m^2	Height	Kernels/ Head
1. Control (Soil N = 29 kg/ha)	2800 b	7943 e	33.2 ab	78.1 abc	1.2 d	435.2 f	76.2 c	17.9 e
2. 31 kg N/ha at GS 00	3738 a	10403 bc	33.8 a	78.5 a	1.4 bcd	512.6 cdef	81.6 abc	20.5 abcd
3. 91 kg N/ha at GS 00	3876 a	11008 abc	33.1 ab	77.8 abcd	1.5 abcd	543.3 bcd	79.9 bc	20.2 bcd
4. 131 kg N/ha at GS 00	4028 a	11558 ab	32.7 abc	77.9 abcd	1.7 a	600.3 ab	85.3 ab	19.9 cde
5. 31 kg N/ha at GS 31	2995 b	9061 d	31.3 bc	77.8 abcd	1.3 cd	446.0 ef	76.1 c	20.0 cde
6. 51/40 kg N/ha at GS 00/GS 31	3846 a	11236 abc	32.4 abc	77.9 abcd	1.5 abc	527.0 bcde	82.1 abc	22.5 ab
7. 51/40/40 kg N/ha at GS 00/GS 31/GS 49	3677 a	11203 abc	30.9 c	77.5 bcd	1.4 abcd	507.7 def	79.3 bc	22.7 a
8. 31 kg N/ha banded at GS 00	3604 a	10209 c	33.3 ab	78.3 ab	1.4 bcd	498.4 def	84.9 ab	20.8 abcd
9. 91 kg N/ha banded at GS 00	3840 a	10699 abc	33.7 a	78.4 a	1.7 ab	577.4 abcd	86.7 a	18.8 de
10. 131 kg N/ha banded at GS 00	3849 a	10836 abc	33.3 ab	77.8 abcd	1.7 ab	574.3 abcd	85.6 ab	19.7 cde
11. 120/46/30 kg N/ha at GS 00/GS 31/GS 49	4035 a	11675 a	32.5 abc	77.8 abcd	1.7 a	628.9 a	87.0 a	19.6 cde
12. 160/73/40 kg N/ha at GS 00/GS 31/GS 49	3851 a	11649 a	31.1 c	77.2 d	1.6 abc	573.4 abcd	82.8 ab	21.1 abcd
13. 200/151/40 kg N/ha at GS 00/GS 31/GS 49	3954 a	11570 ab	32.2 abc	77.5 cd	1.7 a	593.1 abc	84.3 ab	20.0 cde
14. 51 kg N/ha at GS 00	3635 a	10463 abc	32.6 abc	78.0 abcd	1.5 abcd	512.4 bcde	82.0 abc	20.4 bcd
15. 51/40 kg N/ha at GS 00/ GS 49	3908 a	11215 abc	32.8 abc	77.9 abcd	1.5 abc	547.6 abcd	82.0 abc	21.4 abc
S.E.	76.9	242.0	0.4	0.2	0.1	15.2	1.2	0.7

TABLE A18. SIGNIFICANT (0.05) MAIN EFFECTS ON PLANT GROWTH REGULATOR FOR MATURITY, YIELD, KERNEL WEIGHT, TILLERS PER PLANT, HEADS PER M^2, HEIGHT, AND KERNELS PER HEAD. TRIAL 2 NEEPAWA.

	Maturity	Yield (kg/ha)	1000 K	Tillers/ Plant	Heads/m^2	Height	K/Head
1. Control	108.9 ab	3778 a	33.4 a	1.45 b	525.0 b	88.5 a	20.9 a
2. CYCOCEL, 0.69 gai, GS 31	108.6 b	3788 a	32.8 b	1.49 ab	532.3 b	81.8 b	20.8 a
3. CERONE, 0.15 gai, GS 39	109.1 a	3562 b	31.6 c	1.58 a	558.4 a	76.9 c	19.5 b
S.E.	0.6	171.9	1.0	0.12	33.9	2.6	1.5

RESULTS AND CONCLUSIONS: TRIAL 2 NEEPAWA

1. Fertility levels had a significant effect on yield, all yield components except plants per m^2, height and test weight, but did not affect maturity (Table A16).

2. The lowest yields were obtained from the control treatment and the 31 kg N/ha at Zadoks GS 31 treatment. All other treatments yielded significantly more than the control but did not differ significantly from each other (Table A17). It would appear that none of the nitrogen exceeding the 31 kg/ha applied at seeding was effectively used by the plant for yield production. The low yields of the control and treatments were associated with low kernels per m^2, tillers per plant, heads per m^2 and height (Table A17). None of the fertilizer treatments resulted in significantly higher 1000 kernel weights or test weights as compared to the control. The lowest 1000 kernel weights were associated with delayed and/or high nitrogen levels.

3. Delay of application date of the 31 kg N/ha from GS 00 to GS 31 resulted in a 743 kg yield loss (20%) emphasizing the importance of early nitrogen availability (Table A17).

4. No interactions were obtained between fertility levels and plant growth regulators (Table A16).

5. Significant effects of plant growth regulators were found for maturity, yield, all yield components (except plants per m^2 and kernels per m^2) and height (Table A18). However, no significant lodging occurred in this trial. CYCOCEL did not significantly increase yield of Neepawa whereas the CERONE treatment significantly decreased the yield by 6%. The yield reduction by CERONE was expressed through fewer kernels per head and reduced 1000 kernel weight, although heads per m^2 and tillers per plant were increased. CERONE delayed maturity in the statistical sense by 0.2 days.

6. Compared to the control, CYCOCEL reduced height significantly by 6.7 cm and the CERONE reduced it significantly by 11.6 cm.

7. Fertilizer responses that were anticipated from this trial were not obtained, likely due to intermittent heat and drought stresses at Edmonton in 1986. Significant yield responses were only obtained for the first 31 kg of nitrogen applied at seeding. Sophisticated approaches to banding and split applications were not effective. Both CERONE and CYCOCEL were effective at reducing plant height but CERONE also caused a yield reduction. Since lodging was not a problem in this trial where maximum yield level recorded was 4035 kg/ha, the plant growth regulator used in this trial were obviously not economical.

TABLE A19. SPRING WHEAT TRIAL 2 FERTILITY X PLANT GROWTH REGULATOR (OSLO) ANALYSIS ON 4 REPLICATES.

	df	Maturity	Yield	K/m^2	1000 K	kg/Hl	Lodging
rep	3	NS	**	**	NS	**	NS
fert	14	**	**	**	**	**	NS
pgr	1	NS	NS	NS	**	**	NS
fert x pgr	14	NS	*	*	NS	NS	NS
C.V. %		1.1	7.5	7.5	3.3	0.8	0.0

SPRING WHEAT TRIAL 2. FERTILITY X PLANT GROWTH REGULATOR (OSLO) ANALYSIS ON 3 REPLICATES.

	df	Plants/m^2	Tillers/Plant	Heads/m^2	Height	K/Head
rep	2	NS	*	NS	**	*
fert	14	NS	NS	NS	NS	**
pgr	1	NS	NS	NS	**	NS
fert x pgr	14	NS	NS	NS	NS	**
C.V. %		14.2	16.6	9.8	5.4	11.4

TABLE A20. SIGNIFICANT (0.05) MAIN EFFECTS OF PLANT GROWTH REGULATOR FOR KERNEL WEIGHT, HECTOLITRE WEIGHT AND HEIGHT. TRIAL 2 OSLO.

	1000 K	kg/Hl	Height (cm)
1. Control	38.4 a	78.4 a	56.6 a
2. CYCOCEL, 0.69 gai, GS 31	37.7 b	77.8 b	54.3 b
S.E.	0.9	0.4	2.1

TABLE A21. SIGNIFICANT (0.05) MAIN EFFECTS OF FERTILITY FOR MATURITY, YIELD, KERNELS PER M^2, KERNEL WEIGHT, HECTOLITRE WEIGHT AND KERNELS PER HEAD. TRIAL 2 OSLO.

	Maturity	Yield	Kernels/m^2	1000 K	kg/Hl	K/Head
1. Control (Soil N = 29 kg/ha)	102.6 ab	2980 b	7275 g	39.3	79.1 a	17.4 d
2. 31 kg N/ha at GS 00	100.8 c	3569 ab	8811 f	39.0 abc	79.0 a	22.2 bc
3. 91 kg N/ha at GS 00	101.8 abc	3964 ab	9811 bcde	39.0 abc	78.2 abcd	23.8 abc
4. 131 kg N/ha at GS 00	102.4 abc	4378 a	10852 a	38.8 abc	78.3 abcd	25.4 abc
5. 31 kg N/ha at GS 31	102.3 abc	3562 b	9072 ef	37.8 bcdef	78.5 abc	21.7 c
6. 51/40 kg N/ha at GS 00/GS 31	102.6 ab	4006 ab	10251 abcd	37.7 cdef	77.8 bcde	26.3 ab
7. 51/40/40 kg N/ha at GS 00/GS 31/GS 49	103.3 a	3760 b	9739 bcd ef	37.2 def	77.4 de	23.0 abc
8. 31 kg N/ha banded at GS 00	100.9 c	3639 b	9124 ef	38.4 abcd	78.6 abc	22.3 bc
9. 91 kg N/ha banded at GS 00	102.0 abc	3784 b	9537 bcd ef	38.3 abc de	78.3 abcd	22.9 abc
10. 131 kg N/ha banded at GS 00	101.6 abc	3954 ab	9886 abc de	38.6 abcd	78.7 ab	23.2 abc
11. 120/40/30 kg N/ha GS 00/GS 31/GS 49	102.9 a	3977 ab	10528 ab	36.4 f	77.2 e	27.1 a
12. 160/73/40 kg N/ha at GS 00/GS 31/GS 49	102.9 a	3904 ab	10281 abcd	36.6 f	77.3 e	22.9 abc
13. 200/151/40 kg N/ha at GS 00/GS 31/GS 49	102.3 abc	3944 ab	10339 abc	36.8 ef	77.0 e	23.7 abc
14. 51 kg N/ha at GS 00	101.0 bc	3867 b	9455 cdef	39.4 a	78.6 abc	23.4 abc
15. 51/40 kg N/ha at GS 00/GS 49	101.9 abc	3629 b	9273 def	37.7 cdef	77.7 cde	22.6 bc
S.E.	0.3	73.3	186.0	0.3	0.2	0.7

TABLE A22. SIGNIFICANT (0.05) INTERACTIVE EFFECTS OF FERTILITY AND PLANT GROWTH REGULATOR FOR YIELD, KERNELS PER M^2 AND KERNELS PER HEAD. TRIAL 2 OSLO.

	Yield		Kernels/m^2		Kernels/Head	
	Control	Cycocel	Control	Cycocel	Control	Control
1. Control (Soil N =	3032	2928	7307	7244	16.6	18.2
2. 31 kg N/ha at GS 00	3702	3435	8948	8673	23.2	21.3
3. 91 kg N/ha at GS 00	4051	3877	9794	9828	25.3	22.3
4. 131 kg N/ha at GS 00	4478	4278	10964	10740	24.4	26.3
5. 31 kg N/ha at GS 31	3614	3509	9042	9103	23.7	19.6
6. 51/40 kg N/ha at GS 00/GS 31	3796	4216	9740	10763	25.2	27.5
7. 51/40/40 kg N/ha at GS 00/GS 31/GS 49	3981	3538	10252	9227	24.3	21.6
8. 31 kg N/ha banded at GS 00	3530	3748	8889	9360	21.1	23.6
9. 91 kg N/ha banded at GS 00	3916	3653	9697	9377	25.1	20.7
10. 131 kg N/ha banded at GS 00	3888	4020	9690	10083	25.0	21.4
11. 120/46/30 kg N/ha at GS 00/GS 31/GS 49	4000	3954	10534	10522	28.1	26.1
12. 160/73/40 kg N/ha at GS 00/GS 31/GS 49	4193	3615	10952	9610	25.2	20.6
13. 200/151/40 kg N/ha at GS 00/GS 31/GS 49	3894	3994	9986	10691	22.7	24.7
14. 51 kg N/ha at GS 00	3747	3987	9301	9609	23.1	23.7
15. 51/40 kg N/ha at GS 00/GS 49	3336	3922	8482	10065	19.1	26.1
S.E.	316.4		731.5		2.9	

RESULTS AND CONCLUSIONS. TRIAL 2 OSLO

1. Fertility treatments were significant for days to maturity, yield, the yield components, kernels per head, 1000 kernel weight, kernels per m^2 and test weight but not for any other variables (Table A19).

2. For maturity, early application of fertilizer, banded or broadcast at all rates, resulted in significantly earlier maturity compared to the control (from 0.2 to 1.8 days) (Table A21). Exceptions to this occurred where additional fertilizer was applied in split applications and resulting maturities were not significantly different from the control. Effects of banding vs. broadcasting on maturity were not significant at any fertilizer rate (Table A21).

3. Highest yields for Oslo were obtained at the 131 kg N/ha broadcast at seeding (Table A21). This yield was 4378 kg/ha, a significant 47% higher than the control. No significant yield differences were obtained for broadcast vs banding at any fertilizer level. In no case did split applications result in significant improvement in yield compared to the control or to broadcast treatments at seeding at the same nitrogen level.

4. Improved yields, as a result of fertilizer treatments, could not be explained by extra tillering. For the significantly affected yield components (1000 kernel weight and kernels per head) there were no obvious patterns for explaining differences (Table A21). However, fertilizer treatments had very major effects on kernels per head compared to the control resulting in very high kernels per m^2 for the highest yielding treatments.

5. Test weight was significantly reduced by split fertilizer applications and was, in some cases, associated with low yield (Table A21). Applications of fertilizer at seeding all resulted in higher test weights unless further split applications were applied.

6. CYCOCEL significantly reduced height of Oslo by 2.3 cm (Table A20). It also reduced 1000 kernel weight and test weight. No significant lodging occurred in this trial which had an average yield level of 3795 kg/ha. Given Oslo's strong straw strength and the negative main effects of CYCOCEL in this trial, use of this plant growth regulator on Oslo is not recommended. Some significant interactions of CYCOCEL by Fertility treatment were obtained but no clear response pattern was found (Table A22). Similarly, some fairly major shifts in kernels per head and kernels per m^2 were found in this trial resulting from fertility by plant growth regulator interaction. However, as with yield, no clear response patterns were obvious.

EXPERIMENT 3: PLANT GROWTH REGULATOR X FERTILITY

Legal location: NE-12-52-25-W4

The objective of this trial was to evaluate plant growth regulators and their interaction with fertility levels for yield enhancement.

Two trials (one each for Neepawa and Oslo both treated with Vitavax), each with 4 replicates in a split plot design, were seeded with the Nordsten (Danish) disc drill at 5 inch row spacings and at a target seeding rate of 500 seeds per m^2 on May 6. On May 5, prior to seeding, 30 kg K_2O/ha (0-0-60) and 10 kg S/ha (21-0-0) were hand broadcast, cultivated to 4 inches and harrowed. As well 90 kg P_2O_5/ha (0-45-0) was banded with the International drill. General weed control cosisted of a single application of HOEGRASS II on June 3. A blanket application of TILT, at the 0.5 l/ha in 200 l water at GS 49-55, was applied June 30 for the Oslo and July 2 on the Neepawa. The Neepawa was harvested on August 27 while the Oslo was harvested on August 22.

The treatments were set up as follows:

Main Plot: Plant Growth Regulator

For Neepawa:

	Rate (gai/ha)	GS	Date Applied
1. Control	-	-	-
2. CERONE	75	39	June 21
3. CERONE	150	39	June 21
4. CERONE	300	39	June 21
5. CYCOCEL	690	31	June 10
6. CYCOCEL/CYCOCEL	230/230	23/31	June 6/June 10
7. TERPAL C	690	32-37	June 21
8. CYCOCEL/CERONE	690/150	31/39	June 10/June 21
9. CYCOCEL/TERPAL C	460/690	29/37	June 9/June 21
10. NITROZYME	15 fl.oz./acre	13-15	June 3

For Oslo:

	Rate (gai/ha)	GS	Date Applied
1. Control	-	-	-
2. CYCOCEL	690	31	June 10
3. CYCOCEL/CYCOCEL	230/230	23/31	June 6/June 10
4. TERPAL C	460	32/37	June 21
5. NITROZYME	15 fl.oz./acre	13-15	June 3

The recommended NITROZYME treatment requires both a seed treatment and then a foliar application with a surfactant (Can Plus 411 0.25% v/v). For Oslo, since the seed had been treated with VITAVAX, seed treatment was not possible.

Subplot: Fertility (both Neepawa and Oslo)

1. 60 kg N/ha (34-0-0) at GS 00 applied on May 13.
2. 60/60/40 kg N/ha (34-0-0) at GS 00/31/49 applied on May 13/ June 9/June 26.

TABLE A23. SPRING WHEAT TRIAL 3. PLANT GROWTH REGULATOR X FERTILITY (NEEPAWA) ANALYSIS ON 4 REPLICATES.

	df	Maturity	Yield	K/m^2	1000 K	kg/Hl	Lodging
rep	3	*	NS	NS	NS	NS	NS
pgr	9	NS	NS	NS	**	NS	NS
fert	1	NS	NS	**	**	**	NS
pgr x fert	9	NS	NS	NS	NS	NS	NS
C.V. %		1.7	10.8	10.4	4.2	0.7	52.6

SPRING WHEAT TRIAL 3. PLANT GROWTH REGULATOR X FERTILITY (NEEPAWA) ANALSYIS ON 3 REPLICATES.

	df	$Plants/m^2$	Tillers/Plant	$Heads/m^2$	Height	K/Head
rep	2	NS	NS	NS	NS	*
pgr	9	NS	NS	NS	**	NS
fert	1	NS	NS	NS	NS	NS
pgr x fert	9	NS	NS	NS	NS	NS
C.V. %		9.3	18.1	13.3	6.0	14.6

TABLE A24. SIGNIFICANT (0.05) MAIN EFFECT OF PLANT GROWTH REGULATOR FOR HEIGHT AND KERNEL WEIGHT. TRIAL 3 NEEPAWA.

	Height		1000 K	
1. Control	82.3	a	34.6	a
2. CERONE, 0.15 gai, GS 39	80.3	ab	33.7	ab
3. CERONE, 0.31 gai, GS 39	73.7	bc	33.2	abc
4. CERONE, 0.63 gai, GS 39	71.7	cd	31.7	bcd
5. CYCOCEL, 0.69 gai, GS 31	81.2	ab	33.3	ab
6. CYCOCEL/CYCOCEL, 0.23/0.23 gai, GS 23/GS 31	83.0	a	34.1	a
7. TERPAL C, 0.69 gai, GS 32 - 37	64.7	d	31.0	cd
8. CYCOCEL/CERONE, 0.69 gai/0.15 gai, GS 31/GS 39	68.7	cd	32.6	abcd
9. CYCOCEL/TERPAL C, 0.46 gai/0.69 gai, GS 29/GS 37	64.2	d	30.9	d
10. NITROZYME, 15 oz/acre, GS 13 - 15	81.0	ab	32.6	abcd
S.E.	1.4		0.4	

TABLE A25. SIGNIFICANT (0.05) MAIN EFFECTS OF FERTILITY FOR KERNELS PER M^2, KERNEL WEIGHT AND HECTOLITRE WEIGHT. TRIAL 3 NEEPAWA.

	K/m^2		1000 K		kg/Hl	
1. Control (Soil N = 29 kg/ha)	9786	b	33.6	a	78.9	a
2. 31 kg N/ha at GS 00	10765	a	31.9	b	78.3	b
S.E.	753.3		1.0		0.4	

RESULTS AND CONCLUSIONS: TRIAL 3 NEEPAWA

1. The average yield level in this trial was 3575 kg/ha but there were no significant effects of plant growth regulator, fertility treatment or their interaction for yield or maturity. No significant lodging occurred in this Neepawa trial (Table A23).

2. Plant growth regulator treatments had significant effects on height and 1000 kernel weight. All treatments containing CERONE, except the lowest rate (0.15 gai/ha), reduced height whereas treatments with CYCOCEL did not significantly reduce height (Table A24). CERONE, at the recommended rate, significantly reduced height by 8.6 cm but the largest height reduction was obtained from TERPAL C at the recommended rate (0.69 gai/ha) by 17.6 cm. CERONE at double the recommended rate significantly reduced 1000 kernel weight compared to the control, as did TERPAL C and the CYCOCEL/TERPAL C split application.

3. NITROZYME applied to Neepawa wheat (using the rates and procedures recommended by Agri-Services, Edmonton, 1986) did not cause significant effects compared to the control for any variables measured.

4. Fertility treatment had significant effects for kernels per m^2, 1000 kernel weight and test weight (Table A25).

TABLE A26. SPRING WHEAT TRIAL 3. PLANT GROWTH REGULATOR X FERTILITY (OSLO) ANALYSIS OF 4 REPLICATES.

	df	Maturity	Yield	K/m^2	1000 K	kg/Hl	Lodging
rep	3	*	**	**	NS	NS	NS
pgr	4	NS	NS	NS	**	*	NS
fert	1	**	NS	**	**	**	NS
pgr x fert	4	NS	NS	NS	NS	NS	NS
C.V. %		1.3	9.0	8.7	5.1	0.9	0.0

SPRING WHEAT TRIAL 3. PLANT GROWTH REGULATOR X FERTILITY (OSLO) ANALYSIS ON 3 REPLICATES.

	df	Plants/m^2	Tillers/Plant	Heads/m^2	Height	Kernels/Head
rep	2	NS	NS	NS	NS	*
pgr	4	NS	NS	NS	**	*
fert	1	NS	NS	*	NS	NS
pgr x fert	4	NS	*	NS	NS	NS
C.V. %		12.3	8.8	8.4	4.5	12.3

TABLE A27. SIGNIFICANT (0.05) MAIN EFFECTS OF PLANT GROWTH REGULATOR FOR KERNEL WEIGHT, HECTOLITRE WEIGHT, HEIGHT AND KERNELS PER HEAD. TRIAL 3 OSLO.

	1000 K		kg/Hl		Height		K/Head	
1. Control	39.7	a	79.4	a	66.8	a	23.8	b
2. CYCOCEL, 0.69 gai, GS 31	37.6	b	78.7	ab	62.3	b	23.0	b
3. CYCOCEL/CYCOCEL, 0.23/0.23 gai, GS 23/31	38.0	ab	78.7	ab	62.5	b	22.8	b
4. TERPAL C, 0.69 gai, GS 32-37	35.2	c	77.8	b	58.0	c	22.9	b
5. NITROZYME, 15 oz/acre, GS 13-15	38.5	ab	79.6	a	64.7	ab	25.8	a
S.E.	0.9		0.3		1.3		1.3	

TABLE A28. SIGNIFICANT (0.05) MAIN EFFECTS OF FERTILITY FOR MATURITY, KERNELS PER M^2, KERNEL WEIGHT, HECTOLITRE WEIGHT, AND HEADS PER M^2. TRIAL 3 OSLO.

	Maturity		K/m^2		1000 K		kg/Hl		$Heads/m^2$	
1. Control (Soil N = 29 kg/Ha)	105.9	b	10829	b	39.6	a	79.5	a	472.5	b
2. 31 kg N/ha at GS 00	107.5	a	11823	a	36.0	b	78.2	b	506.1	a
S.E.	1.0		699.5		1.4		0.5		28.9	

TABLE A29. SIGNIFICANT (0.05) INTERACTIVE EFFECT OF PLANT GROWTH REGULATOR AND FERTILITY FOR TILLERS PER PLANT. TRIAL 3 OSLO.

	Tillers per Plant	
	Control	31 kg N
1. Control	1.3	1.4
2. CYCOCEL, 0.69 gai, GS 31	1.4	1.4
3. CYCOCEL/CYCOCEL, 0.23/0.23 gai, GS 23/31	1.2	1.6
4. TERPAL C, 0.69 gai, GS 32-37	1.5	1.6
5. NITROZYME, 15 oz/acre, GS 13-15	1.1	1.6
INTERACTION S.E.	0.2	

RESULTS AND CONCLUSIONS: TRIAL 3 OSLO.

1. The average yield level for this trial was 4438 kg/ha. No significant lodging occurred. Yield was not significantly affected by plant growth regulator, fertility or their interaction. Maturity was only significantly affected by fertilizer level with a 1.6 day delay in maturity caused by the higher nitrogen rate (Table A26, A28).

2. Plant growth regulators significantly affected height, 1000 kernel weight, kernels per head and test weight (Table A26). Single and split-applications of CYCOCEL significantly reduced height compared to the control and TERPAL C reduced height significantly compared to the CYCOCEL treatments (Table A27). CYCOCEL and TERPAL C, at recommended rates, both significantly reduced 1000 kernel weight compared to the control. TERPAL C significantly reduced test weight compared to the control. None of the CYCOCEL or TERPAL C treatments significantly affected kernels per head.

3. The higher rate of fertility (31 kg N/ha) resulted in a significant increase in heads per m^2 (11%) and kernels per m^2 (11%) but this did not significantly affect yield. The higher rate of fertility significantly reduced 1000 kernel weight and test weight (Table A28).

4. The only significant interaction between plant growth regulator and fertility level was found for tillers per plant (Table A29). Tillering response was greatest at the higher fertility rate for the 3 treatments: CYCOCEL (split-application), TERPAL C and NITROZYME, although this did not result in significantly increased yields in any case.

5. The recommended NITROZYME treatment requires seed treatment supplemented by foliar application at GS 13 to 15. In this trial seed treatment was not possible as Oslo had already been VITAVAX treated. There were no significant effects of the NITROZYME treatments for any of the variables except kernels per head (Table A27). Kernels per head were significantly increased by 11% but this was not reflected in significantly higher yield.

EXPERIMENT 4: CULTIVARS X MANAGEMENT LEVEL

Legal location: NE-12-52-25-W4

The objective of this trial was to evaluate 16 cultivars, licensed and otherwise, and their interaction with 2 management levels (3 in the cases of Neepawa, HY320 and Oslo).

This trial was seeded with a Swift Current double disc drill at 9 inch row spacings on May 10 and was replicated 4 times with a randomized block design. This trial was seeded into fallow land onto which blanket applications of 30 kg K_2O/ha (0-0-60) and 10 kg S/ha (21-0-0) were hand broadcast then harrowed and 90 kg P_2O_5/ha (0-45-0) was "banded" with the International drill, all on May 5. Weeds were controlled with a single application of HOEGRASS II on June 3. A majority of the plots were harvested on August 28 with some earlier cultivars harvested on August 22 and the latest cultivars on September 8.

The 16 cultivars used were: 1) HY320, 2) Oslo, 3) Norquay, 4) PT726, 5) PT741, 6) PT742, 7) PT329, 8) Glenlea, 9) Neepawa, 10) Katepwa, 11) Columbus, 12) Park, 13) BW569, 14) PT325, 15) QT8132 and 16) BW92 (Entries 4, 5, 6 and 15 are University of Alberta lines).

Management treatments were as follows:

1. Conventional treatment: target seeding rate of 300 seeds per m^2 on all varieties; no additional nitrogen fertilizer added; no plant growth regulators or fungicides were used.

2. Integrated crop management (ICM) treatment: target seeding rate of 500 seeds per m^2 on all varieties; seed treated with VITAVAX; target yield of 6720 kg/ha (100 bu/acre) with 3 split fertilizer applications: 38 kg N:20 kg N:20 kg N/ha at GS 00/31/49 on May 20, June 10 and June 26 respectively; CYCOCEL at 2.5 l/ha in 200 l water applied at GS 31 on June 17. TILT fungicide was not applied due to inclement weather conditions.

3. Optimum varietal management (OVM) treatment: target seeding rate of 500 seeds per m^2, varieties HY320, Oslo and Neepawa only; seed treated with VITAVAX, CYCOCEL and TILT, not required; fertilizer dependent on soil moisture and expected precipitation - 3 split-fertilizer applications of 160 kg, 62 kg and 50 kg N/ha at GS 00/31/49 on May 20, June 10 and June 26, respectively.

Three methods of analyses for this trial were used as follows:

1) Analysis of 16 cultivars and 2 management levels.
2) Analysis of 3 cultivars and 3 management levels.
3) Analysis of 1985 and 1986 cultivar by management trial with 14 cultivars and 2 management levels (conventional and ICM).

TABLE A30: SPRING WHEAT TRIAL 4. CULTIVARS X MGT (1986) 16 CULTIVARS, 2 MGMT LEVELS. ANALYSIS ON 4 REPLICATES.

	df	Maturity	Yield	Kernels/m^2	1000 K	kg/Hl	TOTDM	HI	Lodging
rep	3	NS	NS	NS	NS	NS	NS	NS	NS
cult	15	**	**	**	**	**	**	**	NS
mgt	1	NS	**	NS	**	**	NS	**	NS
cult x mgt	15	**	*	NS	NS	**	NS	**	NS
C.V. %		1.9	8.0	8.4	4.2	0.7	6.6	4.9	99.0

SIGNIFICANT WHEAT TRIAL 4. CULTIVARS X MGT (1986) 16 CULTIVARS, 2 MGT LEVELS. ANALYSIS ON 3 REPLICATES.

	df	Plants/m^2	Tillers/Plant	Heads/m^2	Height	Kernels/Head
rep	2	NS	*	*	**	NS
cult	15	*	*	**	**	**
mgt	1	**	**	**	**	**
cult x mgt	15	NS	NS	NS	NS	NS
C.V. %		13.5	14.4	10.7	3.7	13.6

TABLE A 31 PART A: SIGNIFICANT (0.05) MAIN EFFECTS OF CULTIVAR FOR MATURITY, YIELD, KERNELS PER M^2, KERNEL WEIGHT, HECTOLITRE WEIGHT, TOTAL DRY MATTER, HARVEST INDEX, PLANTS PER M^2, TILLERS PER PLANT, HEADS PER M^2, HEIGHT AND KERNELS PER HEAD. TRIAL 4 16 CULTIVARS, 2 MGT LEVELS.

	Maturity		Yield		K/m^2		1000 K		kg/Hl	
HY320	119	ab	6562	a	17586	a	34.71	fg	76.54	de
Oslo	111	de	5784	bc	15471	b	34.68	fg	76.63	cde
Norquay	111	de	4780	fg	12069	efghi	36.70	ef	74.65	g
PT726	111	de	5592	bcde	14615	bc	35.69	fg	76.96	bcde
PT741	111	de	6068	ab	13665	cd	41.28	bc	78.12	ab
PT742	110	ef	5737	bcd	13543	cd	39.35	cd	78.54	a
PT329	107	f	4533	g	11483	ghi	36.61	ef	75.20	fg
QT8132	100	g	4640	g	10904	i	39.53	cd	78.12	ab
Glenlea	118	ab	5408	bcdef	11582	fghi	43.29	ab	78.76	a
Neepawa	114	cd	5203	cdefg	13568	cd	35.58	fg	77.77	abcd
Katepwa	114	cd	4962	efg	12666	defg	36.37	efg	78.10	ab
Columbus	121	a	4653	g	11208	hi	38.56	de	77.88	abcd
Park	111	de	4678	g	12779	def	34.01	g	78.19	ab
BW569	116	bc	5078	defg	13276	de	35.54	fg	77.97	abc
PT325	112	cde	5894	b	12244	efgh	44.70	a	78.12	ab
BW92	111	de	4919	efg	12663	defg	36.10	fg	76.01	ef
S.E.	0.5		105.1		275.3		0.40		0.14	

TABLE A31 (CONTINUED) PART B

	TOTDM		HI		Plants/m^2	
HY320	1258	a	0.48	a	288	b
Oslo	1125	bcd	0.48	a	267	b
Norquay	1006	fg	0.44	abc	270	b
T726	1104	cd	0.47	a	303	ab
PT741	1150	bcd	0.49	a	266	b
PT742	1117	bcd	0.48	a	337	ab
PT329	1078	def	0.39	d	291	b
QT8132	887	h	0.48	a	331	ab
Glenlea	1100	cd	0.46	ab	304	ab
Neepawa	1175	bc	0.41	bcd	313	ab
Katepwa	1125	bcd	0.41	bcd	324	ab
Columbus	1089	de	0.40	cd	320	ab
Park	990	g	0.44	abcd	371	a
BW569	1146	bcd	0.41	bcd	322	ab
PT325	1190	ab	0.46	ab	297	b
BW92	1020	efg	0.45	abc	371	a
S.E.	18.2		0.01		10.5	

TABLE A31 (CONTINUED) PART C

	Tillers/Plant		Heads/m^2		Height		K/Head	
HY320	1.9	abcd	514.5	def	77.2	fg	34.3	a
Oslo	2.2	a	545.3	cde	73.0	h	28.2	bc
Norquay	2.1	ab	515.8	def	74.3	gh	28.4	bcde
PT726	2.1	ab	579.7	cd	73.3	gh	26.2	bcd
PT741	2.2	a	566.0	cd	80.5	ef	24.5	bcde
PT742	1.8	abcd	583.3	cd	73.3	gh	23.2	cdef
PT329	1.8	abcd	504.7	defg	86.2	cd	22.4	def
QT8132	1.4	d	462.0	fg	62.3	i	23.4	cdef
Glenlea	1.6	bcd	483.2	efg	104.0	a	24.4	bcde
Neepawa	2.2	a	675.5	ab	98.8	b	19.7	ef
Katepwa	2.3	a	704.3	a	99.2	b	17.9	f
Columbus	2.0	abc	606.3	bc	104.2	a	18.8	ef
Park	2.0	abc	668.5	ab	88.2	c	19.0	ef
BW569	2.2	a	663.2	ab	99.7	b	19.6	ef
PT325	1.5	d	432.7	g	99.8	b	29.8	ab
BW92	1.5	cd	534.8	cdef	83.7	de	24.5	bcde
S.E.	0.1		15.2		0.8		0.8	

TABLE A32. SIGNIFICANT (0.05) MAIN EFFECTS OF MANAGEMENT FOR YIELD, KERNEL WEIGHT, HECTOLITRE WEIGHT, HARVEST INDEX, PLANTS PER M^2, TILLERS PER PLANT, HEADS PER M^2, HEIGHT AND KERNELS PER HEAD. TRIAL 4 16 CULTIVARS, 2 MGT LEVELS.

	Yield		1000 K		kg/HL		HI	
Conventional	5386.1	a	38.6	a	77.72	a	0.46	a
ICM	5175.3	b	36.8	b	76.97	b	0.44	b
S.E.	297.4		1.1		0.39		0.02	

	Plants/m^2		Tillers/Plant		Heads/m^2	
Conventional	241	b	2.2	a	529	b
ICM	382	a	1.6	b	601	a
S.E.	29.7		0.19		42.9	

	Height		K/Head	
Conventional	89.5	a	25.5	a
ICM	82.7	b	22.1	b
S.E.	2.2		2.3	

TABLE A33. SIGNIFICANT (0.05) INTERACTIVE EFFECTS OF CULTIVAR AND MANAGEMENT FOR MATURITY, YIELD, HECTOLITRE WEIGHT, HARVEST INDEX. TRIAL 4 16 CULTIVARS, 2 MGT LEVELS.

	Maturity		Yield		Hectolitre Weight		Harvest Index	
	CONV	ICM	CONV	ICM	CONV	ICM	CONV	ICM
HY320	118	120	6690.5	6434.4	76.87	76.21	0.50	0.47
Oslo	113	109	6238.1	5330.1	77.75	75.50	0.51	0.45
Norquay	114	108	5022.1	4537.1	78.84	74.46	0.46	0.42
PT726	110	113	5646.8	5537.1	77.88	76.03	0.47	0.47
PT741	111	111	6205.1	5931.0	78.58	77.66	0.49	0.48
PT742	111	108	5917.3	5557.4	78.94	78.14	0.50	0.46
PT329	107	107	4957.6	4108.6	76.47	73.92	0.42	0.36
QT8132	100	100	5051.2	4229.0	78.63	77.62	0.52	0.45
Glenlea	120	117	5536.3	5279.5	78.71	78.80	0.43	0.47
Neepawa	114	115	5111.7	5295.1	77.92	77.61	0.40	0.42
Katepwa	113	115	4980.9	4942.5	78.36	77.83	0.41	0.40
Columbus	121	120	4440.1	4865.1	78.01	77.74	0.39	0.40
Park	112	110	4720.7	4636.1	78.36	78.01	0.44	0.44
BW569	115	116	4901.5	5253.6	77.79	78.18	0.41	0.41
PT325	112	112	5873.1	5914.4	78.14	78.10	0.46	0.45
BW92	111	112	4884.1	4954.4	76.29	75.73	0.44	0.45
INTERACTION S.E.	2.4		403.9		0.82		0.03	

INTERACTION MEANS FOR WUE. TRIAL 4. 16 CULTIVARS X 2 MGT LEVELS.

	Water Use Efficiency	
	Conventional	ICM
HY320	237.6	228.5
Oslo	221.5	252.6
Norquay	198.1	236.9
PT726	224.2	196.6
PT741	245.4	235.2
PT742	259.3	266.7
PT329	258.9	198.4
QT8132	188.6	157.5
Glenlea	196.6	211.6
Neepawa	181.5	188.0
Katepwa	176.9	175.5
Columbus	157.7	172.8
Park	167.6	183.8
BW569	174.1	186.6
PT325	208.6	210.0
BW92	173.4	175.9
Interaction S.E.	24.5	

SMALL SCALE PLOTS. TRIAL 4. CULTIVARS X MGT. ANALYSIS ON 4 REPLICATES.

16 Cultivars x 2 Mgt. Levels

Source	df	WUE
Rep	3	NS
Cult	15	**
Mgt	1	NS
Cult x Mgt	15	NS

3 Cultivars x 3 Mgt. Levels

Source	df	WUE
Rep	3	NS
Cult	2	**
Mgt	2	NS
Cult x Mgt	4	NS

SMALL SCALE PLOTS. TRIAL 4. 16 CULTIVARS X 2 MGT LEVELS. MEANS

Cultivar	WUE	
HY320	233.0	abc
Oslo	237.1	abc
Norquay	217.5	bc
PT726	210.4	bcd
PT741	240.3	ab
PT742	263.0	a
PT329	228.6	bc
QT8132	173.1	ef
Glenlea	204.1	cde
Neepawa	184.8	def
Katepwa	176.2	ef
Columbus	165.2	f
Park	175.7	ef
BW569	180.3	def
PT325	209.3	bcd
BW92	174.7	ef
S.E.	7.4	

Mgt	WUE	
Conventional	204.4	a
ICM	204.8	a
S.E.	20.8	

RESULTS AND CONCLUSIONS: TRIAL 4 16 CULTIVARS X 2 MANAGEMENT LEVELS

1. As in 1985, this cultivar x management trial was grown on summer fallowed land and was the only ICM trial not grown on stubble in 1986. Fallow yields in 1986 were 45 to 50% higher than stubble yields for equivalent treatments, but were lower than 1985 fallow yields. The average yield level in this experiment was 5281 kg/ha and the highest recorded yield was 6562 kg/ha for HY320.

2. Cultivar effects were highly significant for all characters except lodging. (No significant lodging was recorded for this trial.) (Table A30). In the 1985 trial, 7 varieties were identified that were significantly higher yielding than Neepawa and were as early or earlier in maturity. Only 2 of these varieties repeated this performance in 1986: PT741 and PT325. Two striking differences from the 1985 results were the extreme lateness of Columbus (2 days later than HY320) and the poor yield performance of Norquay and PT329 when averaged over management practices. The significant cultivar x management interactions for maturity, yield and other characters will be discussed later.

3. Significant differences existed between cultivars for all yield components and these differences were unaffected by management level (Table A30). In Table A31, plants per m^2 is the average recorded for the 300 and 500 targeted seeding rates (average 400). All cultivars were shown to have viable germination rates prior to seeding of 95% or better. Despite this, stand establishment ranged from a low of 266 to 371 plants per m^2 representing an establishment shortfall of 35% to 7%. As in 1985, the contribution of different yield components to final yield was very variety specific, with kernels per head and seed size, perhaps, being more important than kernels per m^2. Descriptive agronomic data are listed in Table A31 Part a, b and c).

4. All semi-dwarfs were characterized by a harvest index equal to or greater than 0.44. Neepawa, Katepwa, Columbus and BW 569 had harvest indices of 0.41 or less. Park and BW92 had harvest indices equal to the semi-dwarfs.

5. Results comparing conventional management and preset integrated crop management are presented in Table A32. Management level, averaged over cultivars, significantly affected yield although some of the responses were variety specific (see later description). The ICM treatment was effective in significantly increasing plants per m^2 and heads per m^2, and significantly reduced height. However, significant reductions resulted by applying ICM for yield, tillers per plant, 1000 kernel weight, kernels per head, harvest index and test weight (Table A32).

6. Speculation as to why the ICM treatment did not improve yield includes the following: 1) nutrient levels tested prior to the experiment were very high, as in 1985, and 2) moisture levels on the fallow field may have been non-limiting. No drought stress or edge effects were visually detectable in this trial at any time during the growing season although such effects were very prominent for the trials located on stubble. In addition, extra fertility application in the ICM treatment did result in more heads per m^2, but perhaps the sink capacity developed was too great for moisture availability during the filling period. This resulted in reduced 1000

kernel weight (Table A32).

7. For the second year in a row the yields from conventional management treatments were, in general, equal to or better than the ICM treatment on fallow.

8. Significant interactions of cultivar x management were found for maturity, yield, test weight, and harvest index (Table A33). The days to maturity of the majority of varieties was unaffected by the management level, however, PT 726 was delayed in maturity while the varieties Oslo, Norquay, PT 742 and Glenlea required fewer days to reach maturity. The cultivar x management interaction for yield was highlighted by a yield increase for Columbus under ICM and yield decreases for Oslo, Norquay, PT742, PT329 and QT8132. Other varieties were unaffected by the interaction. Interaction of cultivar by management for hectolitre weight is mainly expressed by variation in the amount of negative effects. In no case did ICM result in significantly improved hectolitre weight (Table A33). As a group, the semi-dwarfs seem more susceptable to hectolitre weight loss than do the CWRS cultivars. For many of the varieties, harvest index was not significantly affected by the cultivar x management interaction. However, several varieties were significantly and negatively affected: QT8132, PT329, Oslo, Norquay and PT742.

TABLE A33. SPRING WHEAT TRIAL 4. CULTIVARS X MANAGEMENT ANALYSIS ON 4 REPLICATES. 3 CULTIVARS AND 3 MANAGEMENT LEVELS. 1986.

	df	Maturity	Yield	K/m^2	1000 K	kg/Hl	Lodging	TOTDM	HI
rep	3	NS	NS	NS	NS	NS	NS	NS	NS
cult	2	*	*	*	NS	NS	NS	**	*
mgt	2	NS	NS	NS	**	**	NS	NS	**
cult x mgt	4	**	NS	NS	NS	**	NS	NS	**
C.V. %		1.9	8.2	8.4	3.7	0.6	0.0	6.8	3.8

SPRING WHEAT TRIAL 4. CULTIVARS X MANAGEMENT ANALSYIS ON 3 REPLICATES. 3 CULTIVARS, 3 MANAGEMENT LEVELS. 1986.

	df	$Plants/m^2$	Tillers/Plant	$Heads/m^2$	Height	K/Head
rep	2	NS	NS	NS	NS	NS
cult	2	NS	*	*	**	**
mgt	2	**	**	*	**	NS
cult x mgt	4	NS	NS	*	NS	NS
C.V. %		11.9	14.5	8.7	3.8	14.7

TABLE A34. SIGNIFICANT (0.05) MAIN EFFECTS OF CULTIVAR FOR MATURITY, YIELD, KERNELS PER M^2, TOTAL DRY MATTER, HARVEST INDEX, TILLERS PER PLANT, HEADS PER M^2, HEIGHT AND KERNELS PER HEAD. TRIAL 4. 3 CULTIVARS X 3 MANAGEMENT LEVELS. 1986.

	Maturity		Yield		K/m^2		TOTDM		HI	
1. HY320	119.5	a	6503	a	17338	a	1247	a	0.48	a
2. Oslo	110.2	b	5560	b	14657	b	1091	c	0.47	a
3. Neepawa	115.2	a	5187	b	13527	b	1176	b	0.41	b
C.V. %	1.3		270.8		740.1		46.2		0.01	

	Tillers/Plant		$Head/m^2$		Height		K/Head	
1. HY320	1.7	b	515.4	b	77.9	b	33.5	a
2. Oslo	2.0	a	551.8	b	72.9	c	26.9	b
3. Neepawa	2.1	a	708.7	a	99.4	a	19.0	c
S.E.	0.2		29.6		1.8		2.3	

TABLE A35. SIGNIFICANT (0.05) MAIN EFFECTS OF MANAGEMENT FOR KERNEL WEIGHT, HECTOLITRE WEIGHT, HARVEST INDEX, PLANTS PER M^2, TILLERS PER PLANT, HEADS PER M^2, HEIGHT AND KERNELS PER HEAD. TRIAL 4. 3 CULTIVARS X 3 MANAGEMENT LEVELS. 1986.

	1000 K		kg/Hl		H.I.	
1. Conventional	35.9	a	77.5	a	0.47	a
2. ICM	34.1	b	76.4	b	0.44	b
3. Optimum Var. Mgt.	35.7	a	77.2	a	0.45	b
S.E.	0.8		0.2		0.01	

	$Plants/m^2$		Tillers/Plant		$Heads/m^2$		Height		K/Head	
1. Conventional	223	b	2.5	a	550	b	86.4	a	28.8	a
2. ICM	360	a	1.7	b	607	a	79.6	b	26.0	ab
3. Optimum Var. Mgt.	387	a	1.6	b	619	a	84.2	a	24.6	b
S.E.	22.3		0.2		29.6		1.8		2.3	

TABLE A36. SIGNIFICANT (0.05) INTERACTIVE EFFECTS OF CULTIVAR AND MANAGEMENT FOR MATURITY, HECTOLITRE WEIGHT, HARVEST INDEX AND HEADS PER M^2. TRIAL 4. 3 CULTIVARS AND 3 MANAGEMENT LEVELS. 1986.

	Maturity			kg/Hl			Harvest Index			Heads/m^2		
	Conv.	ICM	OVM	Conv.	ICM	OVM	Conv.	ICM	OVM	Conv.	ICM	OVM
1. HY320	117.8	120.0	120.8	76.9	76.2	76.7	0.50	0.47	0.48	532.0	497.0	517.3
2. Oslo	112.5	108.8	109.3	77.8	75.5	77.0	0.51	0.45	0.46	471.3	619.3	564.7
3. Neepawa	114.0	114.8	116.8	77.9	77.6	78.0	0.40	0.42	0.41	646.3	704.7	775.0
INTERACTION S.E.		2.8			0.7			0.03			77.3	

LARGE SCALE SPRING WHEAT COMBINED PLOTS.

Source	df	Water Use Efficiency
Rep	1	NS
Mgt	2	NS
Var	4	NS
Mgt x Var	8	NS

LARGE SCALE MAIN EFFECT MEANS FOR WATER USE EFFICIENCY.

Variety	WUE
Oslo, 300 seeds/m^2	143.0
Oslo, 500 seeds/m^2	157.7
Neepawa, 300 seeds/m^2	135.0
Neepawa, 500 seeds/m^2	142.0
Neepawa, 500 seeds/m^2 + CCC	144.3
S.E.	9.2

Management	WUE
Conventional	159.1
High Conventional	148.9
ICM	125.1
S.E.	11.9

SMALL SCALE PLOTS. TRIAL 4. 3 CULTIVARS X 3 MGT LEVELS.

Cultivar	WUE Mean	
HY320	230.9	a
Oslo	232.3	a
Neepawa	184.2	b
S.E.	13.1	

Management	WUE Mean	
Conventional	213.5	a
ICM	223.1	a
O.V.M.	210.1	a
S.E.	13.1	

SMALL SCALE PLOTS. CULTIVAR X MGT INTERACTION MEANS. TRIAL 4. 3 CULTIVARS X 3 MGT LEVELS.

	Water Use Efficiency		
	Conventional	ICM	OVM
HY320	237.6	228.5	226.7
Oslo	221.5	252.6	222.7
Neepawa	181.5	188.0	183.0
Interaction S.E.	15.3		

RESULTS AND CONCLUSIONS: TRIAL 4, 3 CULTIVARS: NEEPAWA, OLSO AND HY320, AND 3 MANAGEMENT LEVELS; CONVENTIONAL, ICM AND OPTIMUM VARIETAL MANAGEMENT (OVM). 1986.

1. Optimum varietal management (OVM) treatments were only carried out on Neepawa, Oslo and HY320 due to limitations of seed and space.

2. In this analysis, management levels were not significant for maturity and yield, although for maturity there was a significant cultivar by management interaction (Table A33). For days to maturity, the ICM and OVM treatments delayed maturity of HY320 and hastened maturity of Oslo (Table A36). Maturity of Neepawa was unaffected by ICM but was delayed by OVM. For main effects Oslo did not yield significantly more than Neepawa, but was significantly earlier maturing by 5 days. HY320 significantly out-yielded Neepawa by 25% but was 4 days later maturing. HY320 and Oslo had significantly higher harvest index than Neepawa. Differential effects of management levels on maturities are worthy of more study.

3. In hindsite, comments on the OVM treatments are appropriate. Since OVM did not out-yield the conventional treatment the extra input costs of fertilizer and higher seeding rate for OVM must be judged as losses compared to the conventional treatment. A major error in OVM, in 1986, was an over-estimation of yield potential relative to normal rainfall expectation.

TABLE A37. SPRING WHEAT CULTIVARS X MANAGEMENT OVER TWO YEARS (1985-86). ANALYSIS ON 4 REPLICATES. 14 CULTIVARS AND 2 MANAGEMENT LEVELS.

	df	Yield	1000 K	kg/Hl	Maturity	TOTDM	HI
year	1	*	NS	*	**	NS	**
cult	13	**	**	NS	**	NS	**
year x cult	13	**	**	**	**	**	**
mgt	1	NS	**	**	NS	NS	NS
cult x mgt	13	NS	NS	NS	NS	NS	NS
year x cult x mgt	14	NS	*	**	NS	NS	**
C.V. %		9.3	3.6	0.7	2.3	8.0	4.2

SPRING WHEAT CULTIVARS X MANAGEMENT OVER TWO YEARS (1985-86). ANALYSIS ON 2 REPLICATES. 14 CULTIVARS AND 2 MANAGEMENT LEVELS.

	df	K/m^2	$Plants/m^2$	Tillers/Plant	$Heads/m^2$	Height	Kernels/Head
year	1	NS	**	**	**	*	**
cult	13	*	NS	NS	*	**	*
year x cult	13	**	*	*	NS	**	**
mgt	1	*	**	**	NS	**	**
cult x mgt	13	NS	NS	NS	NS	NS	NS
year x cult x mgt	14	NS	**	NS	NS	NS	NS
C.V. %		9.0	15.7	25.7	17.9	3.8	16.1

TABLE A38. SIGNIFICANT (0.05) MAIN EFFECTS OF YEAR FOR YIELD, HECTOLITRE WEIGHT, MATURITY, PLANTS PER M^2, TILLERS PER PLANT, HEADS PER M^2, HEIGHT, KERNELS PER HEAD AND HARVEST INDEX. CULTIVARS X MGT OVER 2 YEARS.

	Yield	kg/Hl	Maturity	Plant/m^2
Test Year 1985	5803 a	78.34 a	109 b	173.2 b
Test Year 1986	5352 b	77.39 b	113 a	301.8 a
S.E.	365.3	0.41	1.8	26.4

	Tillers/plant	Heads/m^2	Height	K/Head
Test Year 1985	5.0 a	839 a	84.8 b	17.7 b
Test Year 1986	2.0 b	578 b	87.2 a	23.7 a
S.E.	0.6	89.8	2.3	2.4

	HI
Test Year 1985	0.49 a
Test Year 1986	0.44 b
S.E.	0.01

TABLE A39. SIGNIFICANT (0.05) MAIN EFFECTS OF MANAGEMENT FOR KERNEL WEIGHT, HECTOLITRE WEIGHT, KERNELS PER M^2, PLANTS PER M^2, TILLERS PER PLANT, HEIGHT AND KERNELS PER HEAD. CULTIVARS X MANAGEMENT OVER 2 YEARS.

	1000 K		kg/HL		K/m^2	
Conventional	38.9	a	78.07	a	13368	b
ICM	37.9	b	77.66	b	13695	a
S.E.	1.0		0.41		863.8	

	$Plants/m^2$		Tillers/Plant		Height		K/Head	
Conventional	197.8	b	3.8	a	88.6	a	21.7	a
ICM	277.2	a	3.2	b	83.3	b	19.8	b
S.E.	26.4		0.6		2.3		2.4	

TABLE A40 PART A. SIGNIFICANT (0.05) MAIN EFFECTS OF CULTIVAR FOR YIELD, KERNEL WEIGHT, MATURITY, KERNELS PER M^2, HEADS PER M^2, HEIGHT, KERNELS PER HEAD AND HARVEST INDEX. CULTIVARS X MANAGEMENT OVER 2 YEARS.

	Yield		1000 K		Maturity		K/m^2	
HY320	6741	a	39.19	cde	122	a	16159	a
Oslo	5982	abcd	35.98	def	111	bcd	15442	ab
Norquay	5727	abcde	37.79	cdef	109	d	14032	abcd
PT726	5985	abcd	37.56	cdef	108	d	14833	abc
PT741	6240	ab	41.91	abc	110	bcd	13833	abcd
PT742	6005	abcd	40.10	bcd	109	cd	13915	abcd
PT329	5119	cde	38.64	cdef	106	d	12272	cd
Glenlea	5577	bcde	44.23	ab	116	abc	11693	d
Neepawa	5072	cde	34.86	ef	111	bcd	13511	bcd
Katepwa	4833	e	35.49	def	110	bcd	12648	cd
Columbus	5003	de	37.98	cdef	116	ab	12263	cd
Park	4966	e	33.79	f	108	d	13390	bcd
BW569	4846	e	34.56	ef	112	bcd	13064	bcd
PT325	6087	abc	45.66	a	111	bcd	12383	cd
S.E.	138.1		0.37		0.7		326.5	

TABLE A40 (CONTINUED) PART B

	Heads/m^2		Height		K/Head		HI	
HY320	649	cde	74.8	cd	26.7	a	0.53	a
Oslo	710	abcd	75.3	cd	23.7	ab	0.49	abc
Norquay	707	abcd	72.8	cd	21.9	abc	0.49	abc
PT726	728	abcd	72.9	cd	22.6	abc	0.50	ab
PT741	691	abcde	79.1	c	22.4	abc	0.51	ab
PT742	679	bcde	72.4	d	21.3	abcd	0.50	ab
PT329	665	cde	88.1	b	19.6	bcd	0.44	cde
Glenlea	509	e	97.9	a	23.3	ab	0.47	bcd
Neepawa	801	abc	95.0	a	17.0	cd	0.42	e
Katepwa	878	a	95.4	a	15.3	d	0.42	e
Columbus	752	abc	100.3	a	18.1	bcd	0.42	e
Park	737	abcd	87.3	b	17.8	bcd	0.46	bcde
BW569	857	ab	95.9	a	16.7	cd	0.41	e
PT325	557	de	96.9	a	23.6	ab	0.48	abcd
S.E.	33.9		0.9		0.9		0.01	

RESULTS AND CONCLUSIONS: 2 YEARS DATA (1985-86) WITH 14 CULTIVARS AND 2 MANAGEMENT LEVELS, EDMONTON.

1. Results from any ICM procedures must be reproducible from year to year to be of value for making recommendations for farmers. This combined year analysis is considered to be of high importance to the ICM project. In addition, in this region effects on yield and maturity are of far more significance than other characters. For these characters, year effects were significant, cultivar effects were significant and year x cultivar effects were significant (Table A37). In contrast, management, cultivar x management and year x cultivar x management effects were not significant. Such a result suggests that the manner in which the varieties are grown may be of less importance than the stability of performance of cultivars in the varying weather conditions of different years.

2. For cultivar x management interactions, assessed over 2 years, no significant effects were found, suggesting that special management of individual varieties may not be important under fallow conditions. This conclusion now requires testing under stubble conditions.

3. Mean values for all variables where significances occurred are attached for the record (Tables A38, A39, A40), except for second order interactions.

4. For main effects of year, 1986 compared to 1985 was characterized by significantly lower yield, later maturity, improved plant stand, lower test weight, lower tillers per plant, lower heads per m^2, lower harvest index, and increased height and kernels per head (Table A38).

5. Cultivar performance (over 2 years at this one location) indicates that there are 6 varieties that do not yield significantly less than HY320 but which are equal to or earlier than Neepawa in maturity (Table A40). None of these varieties are yet licensed for the Parkland Region of Western Canada. The marked yield superiority and lateness of HY320 compared to all other varieties is obvious. (HY320 is 33% higher yielding than Neepawa and 11 days later maturing.)

SECTION 2: FARM SCALE TRIAL. SPRING WHEAT TRIAL, SPRUCE GROVE, ALBERTA.

Co-operator: Mr. Bruce Fuhr, Fuhr Farms.

Legal location: NE-5-53-27-W4.

The soil test result (Norwest Labs) described the soil nutrient status (lbs/acre) for this site as: 42 nitrate, 40 phosphate, 396 potassium, pH 7.3, 0.78 E.C. (salinity), 7% organic matter, and medium texture. Recommendations were a) 43 lbs N/acre, and 10 lbs P_2O_5/acre placed for excellent crop conditions (target yield 67 bu/acre) and b) 34 lbs N/acre and 10 lbs P_2O_5/acre placed for average crop conditions (target yield 54 bu/acre). The field for this trial was seeded to winter wheat in the fall of 1985, but total winter kill occurred, so the field was redesignated for spring wheat.

Two varieties of wheat, Neepawa and Oslo (which was treated with Vitavax) were seeded on May 20 with a Morris M-10 double disc press drill seeder at 6 inch row spacings. Each plot was 0.71 acres (2844 m^2) in size with strip plot design and 2 replicates. HOEGRASS II, on June 6, and Glean, on June 13, were sprayed in an attempt to control excessive populations of wild oats and broadleaf weeds. Field preparation for seeding included cultivation followed by banding of phosphate fertilizer (11-51-0), the same direction as seeding, 20 lbs P_2O_5/acre on May 7 with a John Deere 655 air seeder (with 12 inch spacings). Anhydrous (82-0-0) was banded at 3 fertility levels (listed later), at right angles to seeding, on May 16. The field was then rod weeded and harrowed to complete the field preparations. 11-51-0, at a rate of 20 lbs P_2O_5/acre, was placed with the seed as starter. Unusually dry conditions at seeding led to poor seedling establishment, and also appeared to give wild oats an advantage, with considerable late germination of wild oats in patches on the rises and in the hollows.

Treatments were as follows:

Main Plot: Variety and Seeding Rate

1. Oslo, 300 seeds/m^2.
2. Oslo, 500 seeds/m^2.
3. Neepawa, 300 seeds/m^2.
4. Neepawa, 500 seeds/m^2.
5. Neepawa, 500 seeds/m^2 + single application of CYCOCEL, at rate of 1.5 l/ha in 240 l water, at Zadoks GS 31 on June 24.

N.B. CCC was not used on Oslo, as Oslo is a very strong strawed semidwarf, and no evidence for yield enhancement *per se* by CCC yet exists for the Edmonton region.

Subplot: Fertility Management Levels

1. Conventional: (using the "Average" crop recommendations from the Norwest Lab soil test result). Total available nitrogen = 78 lbs N/acre. Of this 27 lbs N/acre (82-0-0) was banded.
2. High Conventional: (using the "Excellent" crop recommendation from Norwest Labs). Total available nitrogen = 108 lbs N/acre. Of this 57 lbs N/acre (82-0-0) was banded.

3. ICM: (used 2 times the High Conventional with a target yield of 100 bu/acre). Total available nitrogen = 208 lbs N/acre. Of this 157 lbs N/acre (820-0) was banded.

TILT fungicide was not applied to the large scale trial in 1986 due to an extremely low incidence of disease, and inclement conditions during the optimum spraying period of mid-July.

It was not possible in 1986, at this site, to repeat the very high yields of 1985, mainly due to the limitations of climate. Seeding was done under rather dry conditions and spring rains were not favorable for germination of the crops. In addition, post-emergent wild oat herbicides were not completely effective in controlling wild oats, particularly on rises and in hollows. For this reason, less emphasis is placed on the data from the field scale combined plots (harvested with a Hage combine, 185.8 m^2) than on the m^2 plots which were all located in relatively wild oat free areas (less than 10 panicles per m^2). A more important contribution to the low yields was the very low May, June and August rains compared to the 30 Year Average. In addition, one week after seeding 6 consecutive days with maximum tempertures in the 26 to 32 C range occurred, likely limiting development of tillers and spikelet primordia. Such hot spells and droughts at the Spruce Grove location are extremely unusual.

TABLE A41. ANALYSIS OF LARGE SCALE SPRING WHEAT ON COMBINED (LARGE PLOT) SAMPLES

	df	Plants/m^2	Tillers/Plant	Heads/m^2	Height	Maturity
rep	1	NS	NS	NS	NS	NS
mgt	2	NS	NS	NS	NS	NS
var	4	NS	NS	NS	**	NS
mgt x var	8	NS	NS	NS	NS	NS
C.V. %		13.3	32.6	22.9	6.7	2.1

	df	Yield	1000 K	kg/Hl	K/m^2	K/Head
rep	1	NS	NS	NS	NS	NS
mgt	2	NS	NS	*	NS	NS
var	4	NS	NS	**	NS	NS
mgt x var	8	NS	NS	NS	NS	*
C.V. %		14.3	4.9	1.6	12.6	18.1

TABLE A42: SIGNIFICANT (0.05) MAIN EFFECTS OF VARIETY FOR HEIGHT AND HECTOLITRE WEIGHT. SPRUCE GROVE COMBINED (LARGE PLOT) SAMPLES.

	Height		kg/Hl		Grade
Oslo, 300 seeds/m^2	69.3	c	69.79	c	Feed
Oslo, 500 seeds/m^2	72.0	c	71.75	b	Feed
Neep, 300 seeds/m^2	92.0	ab	73.63	a	Feed
Neep, 500 seeds/m^2	96.5	a	73.66	a	Feed
Neep, 500 seeds/m^2 + CCC	87.7	b	73.72	a	Feed
S.E.	2.5		0.52		

TABLE A43: SIGNIFICANT (0.05) MAIN EFFECTS OF MANAGEMENT FOR HECTOLITRE WEIGHT. SPRUCE GROVE COMBINED SAMPLES.

	kg/Hl	
1. High Conventional	74.24	a
2. Conventional	72.99	a
3. ICM	70.30	b
S.E.	0.67	

TABLE A44: SIGNIFICANT (0.05) INTERACTIVE EFFECT OF MANAGEMENT AND VARIETY FOR KERNELS PER HEAD. SPRUCE GROVE COMBINED (LARGE PLOT) SAMPLES.

	Kernels/Head		
	High Conventional	Conventional	ICM
Oslo, 300 seeds/m^2	22.9	20.9	14.0
Oslo, 500 seeds/m^2	12.3	15.5	26.7
Neep, 300 seeds/m^2	19.6	19.3	19.7
Neep, 500 seeds/m^2	20.4	19.0	13.4
Neep, 500 seeds/m^2 + CCC	22.7	18.0	14.4
INTERACTION S.E.	7.3		

TABLE A45: SPRUCE GROVE COMBINED SAMPLES. MEANS FOR YIELD AND MATURITY.

	Yield	Maturity
Oslo, 300 seeds/m^2	2989	110.5
Oslo, 500 seeds/m^2	3298	110.2
Neepawa, 300 seeds/m^2	2822	113.0
Neepawa, 500 seeds/m^2	2968	113.0
Neepawa, 500 seeds/m^2 + CCC	3016	113.0
S.E.	192.8	1.1
Significant Differences (0.05)	NS	NS

	Yield	Maturity
High Conventional	3114	110.6
Conventional	3326	112.4
ICM	2616	112.8
S.E.	248.9	1.4
Significant Differences (0.05)	NS	NS

LARGE SCALE. INTERACTION MEANS FOR VARIETY X MANAGEMENT.

	Water Use Efficiency		
	Conventional	High Conventional	ICM
Oslo, 300 seeds/m^2	173.9	157.1	97.9
Oslo, 500 seeds/m^2	145.2	164.1	163.9
Neepawa, 300 seeds/m^2	158.1	129.6	117.2
Neepawa, 500 seeds/m^2	164.4	142.2	119.3
Neepawa, 500 seeds/m^2 + CCC	153.7	151.7	127.3
Interaction S.E.	26.1		

RESULTS AND CONCLUSIONS: LARGE SCALE SPRUCE GROVE COMBINED PLOTS.

1. No significant differences were obtained for yield or maturity for management, variety or the management by variety interaction (Table A41). This entire trial was characterized by largely non-significant differences for most characters. No significant lodging occurred in this trial. The average yield level achieved was 3019 kg/ha. (See Table A45 for means of yield and maturity.) This compares to an average yield level of 5540 kg/ha for Neepawa and Oslo in somewhat different management regimes at this site in 1985.

2. The height of Oslo was unaffected by seeding rate, but the height of Neepawa at the high seeding rate was significantly reduced by the CYCOCEL application (Table A42). The test weight of Neepawa was unaffected by changes in seeding rate or application of CYCOCEL, but was significantly better than Oslo at either seeding rate. Test weight of Oslo was significantly improved by changing from the lower to the higher seeding rate.

3. The only significant effect of management was on test weight where the ICM treatment resulted in significant reduction compared to the Conventional or High Conventional treatments (Table A43).

4. Although there were no significant differences in yields, costs and returns for this data are shown on page A-83. Only feed grades were obtained, as listed in Table A42. The Neepawa treatments did not have the price advantage of making C.W. grades in 1986 at Spruce Grove. Significant downgrading likely occurred in this trial due to a very wet period delaying harvest of all combined plots.

(5. Quality determinations on the various treatments used at Spruce Grove will be conducted during 1987 to determine fertilizer effects on protein and other quality traits.)

TABLE A46: ANALYSIS OF LARGE SCALE SPRING WHEAT ON M^2 SAMPLES (HAND HARVESTED)

	df	Yield	1000 K	kg/Hl	K/m^2
rep	1	NS	NS	NS	NS
mgt	2	NS	NS	NS	NS
trt	4	**	**	**	NS
mgt x trt	8	NS	NS	NS	NS
C.V. %		20.7	7.8	2.1	18.8

TABLE A47: SIGNIFICANT (0.05) MAIN EFFECTS OF TREATMENT FOR YIELD, KERNEL WEIGHT, AND HECTOLITRE WEIGHT. LARGE SCALE M^2 SAMPLES.

	Yield	1000 K	kg/Hl
Oslo, 300 seeds/m^2	4679 a	34.8 a	73.3 c
Oslo, 500 seeds/m^2	4334 ab	34.9 a	74.8 b
Neep, 300 seeds/m^2	4156 ab	32.9 b	74.6 b
Neep, 500 seeds/m^2	3738 b	33.4 ab	76.3 a
Neep, 500 seeds/m^2 + CCC	3791 b	30.8 c	75.6 ab
S.E.	383.7	1.2	0.71

TABLE A48. (PROVISIONAL) TABLE OF MEAN YIELDS, KG/HA, FOR 15 TREATMENTS AT SPRUCE GROVE, 1986 (14.5% M.B.)

	Combined Plots			M^2 Plots		
	Conv.	High Conv.	ICM	Conv.	High Conv.	ICM
Oslo 300 seeds/m^2	3636	3285	2047	5116	4716	4204
Oslo 500 seeds/m^2	3036	3430	3427	3981	4553	4467
Neepawa 300 seeds/m^2	3306	2710	2451	4741	3817	3908
Neepawa 500 seeds/m^2	3437	2974	2494	4002	3320	3891
Neepawa 500 seeds/m^2 + CCC	3215	3172	2663	3616	4029	3728
	NS (0.05)			NS (0.05)		
	(Means include tramlines and wild oat patches)			(No tramlines, wild oat "free" data)		

1986 SPRUCE GROVE SPRING WHEAT COSTS AND RETURNS

			OSLO 300	OSLO 500	NEEPAWA 300	NEEPAWA 500	NEEPAWA 500 + CCC
SOIL TEST	ALL TREATMENTS		0.35	0.35	0.35	0.35	0.35
HOEGRASS II	ALL TREATMENTS		18.20	18.20	18.20	18.20	18.20
GLEAN	ALL TREATMENTS		8.42	8.42	8.42	8.42	8.42
BANDING COST	ALL TREATMENTS		3.50	3.50	3.50	3.50	3.50
P205, 20 LBS/ACRE	ALL TREATS.		8.00	8.00	8.00	8.00	8.00
TOTAL, 'COMMON' COSTS			38.47	38.47	38.47	38.47	38.47
CYCOCEL		C	-	-	-	-	9.81
		HC	-	-	-	-	9.81
		ICM	-	-	-	-	9.81
MACHINE OPERATION		C	20.00	20.00	20.00	20.00	25.00
		HC	20.00	20.00	20.00	20.00	25.00
		ICM	20.00	20.00	20.00	20.00	25.00
82-0-0	27 LBS	C	6.75	6.75	6.75	6.75	6.75
	57 LBS	HC	14.25	14.25	14.25	14.25	14.25
	157 LBS	ICM	39.25	39.25	39.25	39.25	39.25
11-51-0	20 LBS	C	8.00	8.00	8.00	8.00	8.00
(starter)	20 LBS	HC	8.00	8.00	8.00	8.00	8.00
	20 LBS	ICM	8.00	8.00	8.00	8.00	8.00
SEED (TREATED) $4.50 PLUS $1 VITAVAX		C	9.10	14.50	7.75	12.25	12.25
		HC	9.10	14.50	7.75	12.25	12.25
		ICM	9.10	14.50	7.75	12.25	12.25
TOTAL, 'SPECIFIC COSTS'		C	43.85	49.25	33.65	47.00	61.81
		HC	51.35	56.75	50.00	54.50	69.31
		ICM	76.35	81.75	75.00	79.50	94.31
TOTAL VARIABLE COSTS $/ACRE		C	82.32	87.72	72.12	85.47	100.28
		HC	89.82	95.22	88.47	92.97	107.78
		ICM	114.82	120.22	113.47	117.97	132.78

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YIELDS ACHIEVED BUSHELS/ACRE		OSLO 300	OSLO 500	NEEPAWA 300	NEEPAWA 500	NEEPAWA 500 + CCC
1. COMBINED (NSIG)	C	67.9	56.7	61.7	64.2	60.0
	HC	61.3	64.0	50.6	55.5	59.2
	ICM	38.2	64.0	45.8	46.6	49.7
2. M.SQ. (NSIG INT.)	C	95.5	74.3	88.5	74.7	67.5
	HC	88.0	85.0	71.3	62.0	75.2
	ICM	78.5	83.4	72.9	72.6	69.6

PRICES PER BUSHEL (1986 BASIS) *3 CWRS 2.62
FEED 2.07

GROSS RETURNS, $/ACRE (YIELDS FROM COMBINED PLOTS, Nonsig. P 0.05)

GROSS REVENUE (FEED)	C	140.55	117.37	127.72	132.89	124.20
	HC	126.89	132.48	104.74	114.89	122.50
	ICM	79.07	132.48	94.81	96.46	102.80
GROSS MARGIN (FEED)	C	58.23	29.65	55.60	47.42	23.92
	HC	37.07	37.26	16.27	21.92	14.72
	ICM	-35.75	12.26	-18.66	-21.51	-29.90
GROSS MARGIN (*3 CWRS)	C	-	-	89.53	82.73	56.92
	HC	-	-	44.10	52.44	47.32
	ICM	-	-	6.53	4.12	- 2.57

GROSS RETURNS, $/ACRE (YIELDS FROM METRE SQUARE PLOTS, sig. P 0.05)

GROSS REVENUE (FEED)	C	197.69	153.80	183.20	154.63	139.73
	HC	182.16	175.95	147.60	128.34	155.66
	ICM	162.50	172.64	150.90	150.28	144.07
GROSS MARGIN (FEED)	C	115.37	66.08	111.08	69.16	39.45
	HC	92.34	80.73	59.13	35.37	47.88
	ICM	47.68	52.42	37.43	32.31	11.29
GROSS MARGIN (*3 CWRS)	C	-	-	159.75	110.24	76.57
	HC	-	-	98.34	69.47	82.24
	ICM	-	-	77.53	72.24	49.57

RESULTS AND CONCLUSIONS: LARGE SCALE SPRUCE GROVE M^2 PLOTS

1. Because of the problems with wild oat patchiness in the large plots, data from m^2 samples were collected in relatively wild oat free areas (less than 10 wild oat panicles/sq. m) for yield, 1000 kernel weight, kernels per m^2 and test weight. No significant differences were obtained for management levels (ICM, Conventional and High Conventional Fertility Levels) for yield, 1000 kernels per m^2, or test weight (Table A46).

2. However, significant effects were found for treatments for yield, 1000 kernel weight and test weight (Table A47). Neepawa did not respond significantly for yield due to changes in seeding rate or CYCOCEL application. Yield of Oslo did not respond significantly to increased seeding rate. The highest yield recorded in the trial was 4679 kg/ha with Oslo at 300 seeds per m^2. For 1000 kernel weight, Oslo was unaffected by seeding rate, whereas for Neepawa significantly better seed size was obtained from the 300 and 500 seeds per m^2 rate not sprayed with CYCOCEL. Test weight results from the m^2 samples were somewhat different from the combined plots but the test weight advantage of Neepawa over Oslo is generally obvious. Test weight differences from the two assessment methods (combined vs. hand harvested m^2) may be explained by the fact that the m^2 plots were harvested earlier, prior to major fall rains.

SECTION 3: WEATHER SUMMARY

a) Spruce Grove (Large Scale Trials)

Actual mean temperature (C) for this site were: May 11.7, June 14.6, July 15.2, August 16.7, and September 8.2. Temperature, in C, at +C or -C from the 30 year average; May +1, June +1, July -1, August +2 and Septmebere -2. Rainfall as a percent of the 30 Year Average; June 56, July 159, August 33.8, and September (to the 18th) 125. (Total rainfall from May 1 to May 20 was not collected.)

See Figure 4.

b) Edmonton, W240 (Small Scale Trials)

Actual mean temperature (C) for this site were; May 11.4, June 14.5, July 14.7, August 15.6, and September 8.0. Temperature, in C, at +C or -C from the 30 Year Average; May +1, June 0, July -2, August 0 and September -2. Rainfall as a percent of the 30 Year Average; May 111, June 109, July 189 and August 26.

See Figure 4.

EXTENSION ACTIVITIES

a) Field Days

i) U of A Farm, July 21 with approximately 30 District Agriculturalists.

ii) U of A Farm, July 30 with approximately 25 people including our large scale co-operator and chemical company representatives.

iii) Spruce Grove, July 31, with approximately 20 farmers attending.

iv) U of A Farm, August 2, Dr. J. Beaton, PPI, Cochrane.

b) Meetings and Presentations.

i) 10/1: HY320 production under ICM. Camrose (Secan). Audience 100.
ii) 12/2: ICM for you. Olds College (Alta. Agric.). Audience 50.
iii) 25/2: New choices in wheat varieties and management for the Parkland Josephburg. Audience 40.
iv) Attended: Denver ICM Conference, March, 1986, Colorado.
Union Carbide Small Grains Seminar, November 1986, Toronto.

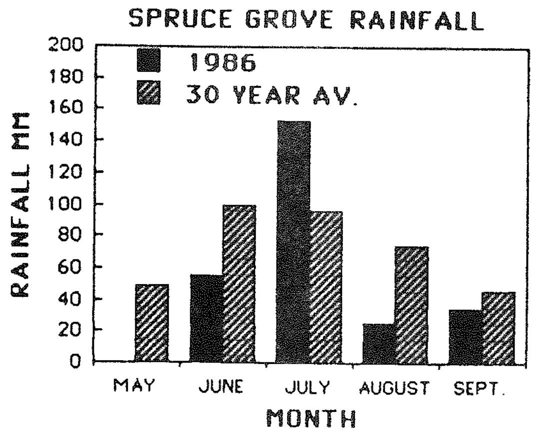
c) Publications.

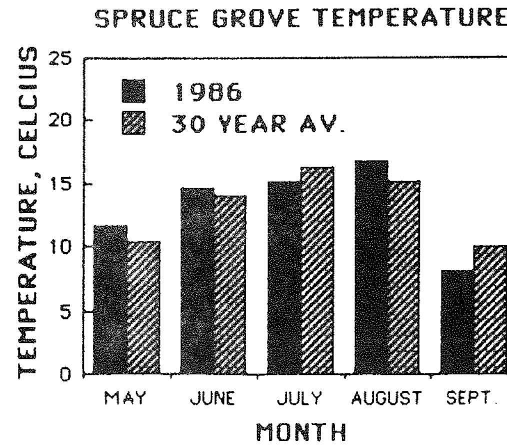
1. Briggs, K.G. 1986. Influence of row spacing, seeding rate and planting dates on maximizing yields. In Maximum Wheat Yield Research Systems Workshop, PPI/FAR March 5-7, 1986 Denver, Colorado.
2. Contributor: High yielding cereal production in Western Canada - A Production Guide (Hoechst, 1986).

3. Briggs, K.G., J.P. Tewari, W.H. Vanden Born and D. Audette. 1986. 100 bushel wheat yields, north of the 53rd parallel. Better Crops with Plant Food. Spring 1986: 24-25.

WEATHER SUMMARY

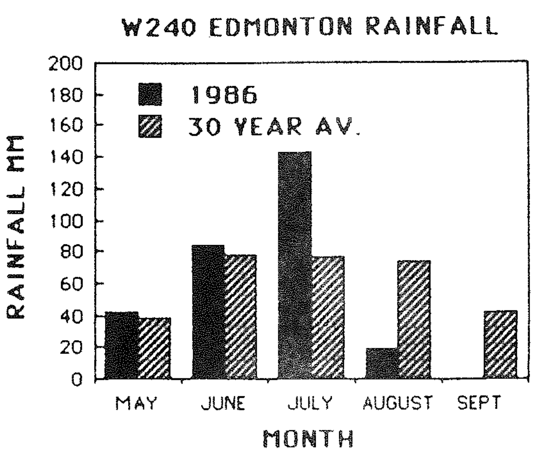
EDMONTON & SPRUCE GROVE

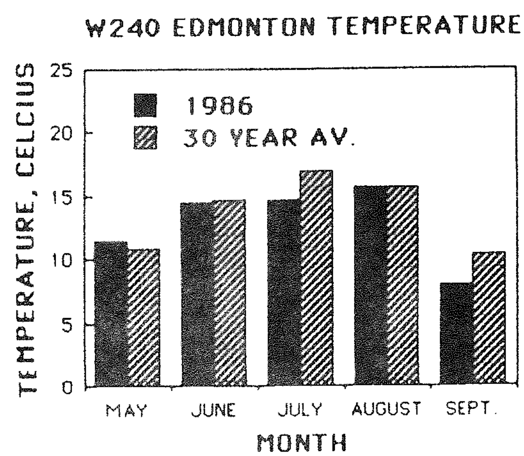




NOTE EXTREMELY HIGH MAXIMUM DAILY TEMPERATURES IN MAY, AS FOLLOWS :

MAY 26 28.5	MAY 29 30.0
MAY 27 31.6	MAY 30 30.6
MAY 28 26.6	MAY 31 31.6





PART 2

MANITOBA

AG-QUEST, Independent Agricultural Research Services

Personnel: D.R.S. Rourke, Director
R.J. Doell, Research Associate

EXECUTIVE SUMMARY OF 1986 MANITOBA RESULTS

There are several important factors that must be taken into account when comparing the 1986 results to those of the previous year. The cool wet fall of 1985 delayed seeding of the winter wheat, as well as slowing the growth. Consequently the wheat was only at the 1 leaf stage at freeze up. Winter survival was good but the crop had poor vigour in spring. Hot dry windy weather in late May and early June, as well as an early infestation of rust all reduced the yield potential. Attack by root rot and Hessian fly also served to decrease the level and consistency of yield.

Spring wheat trials were seeded approximately 3 weeks later than 1985, just before the hot weather previously mentioned. This dried out the seedbed and reduced germination. Two trials had to be abandoned for this reason.

The results of the 1986 trials will be briefly summarized under the topics of PGR's, fungicides, fertility and varieties.

PLANT GROWTH REGULATORS

In the absence of lodging, all PGR's tested on winter wheat lowered yields, with the exception of Cycocel applied at the 1.15 kg/ha rate. This rate resulted in a significant yield increase. Cerone treatments tended to reduce yield, possibly due to a delay in maturity which made the plants more susceptible to rust. PGR's tended to reduce height, though at the rates tested, differences were not often significant, possibly due to the stunting effect of the diseases and drought early in the growing season.

In HY320, when PGR's reduced height, they also tended to lower yields. When PGR's did not reduce height in HY320, yield increases of nearly 900 and 400 kg/ha occurred for applications of Cerone at .15 kg/ha and Cycocel at .69 kg/ha respectively. All PGR applications for HY320 were made at the same time on all trials.

PGR's tended to reduce height and increase yields in Columbus wheat, though yield increases were not significant. There was no lodging in any of the spring wheat PGR trials in 1986.

PGR's have shown to be of value in tall wheats in years where lodging is a problem. Yield enhancement in the absence of lodging appears to be too erratic to be relied upon to provide a return for the use of PGR's for this purpose.

FUNGICIDES

Fungicide applications increased yields in Norstar winter wheat regardless of seeding rate and row spacing. Yield increases of up to 1300 kg/ha were recorded for 2 applications of Tilt. One application of Tilt and 2 applications of Dithane resulted in yield increases of 600 and 1000 kg/ha respectively. Winter wheat in this trial had good yield potential, due in part to extra high levels of P and K fertilizers.

Fungicides also had positive though less dramatic effects on spring wheat, especially HY320, Wheaton and Katepwa. Favourable responses to fungicides were greater when the crop was grown under high levels of fertility and at a high seeding rate. Fungicides are essential in producing the current winter wheat varieties and can be used to some advantage in the more disease-susceptible spring wheat varieties. Reliable disease forecasting is essential in maximizing the benefits of fungicides. More information regarding application volume and pressure could help to increase effectiveness of products currently under investigation.

NITROGEN FERTILITY

Increasing N fertility of winter wheat in 1986 was of little value unless the N was fall banded. An increase from 60 to 160 kg N resulted in a significant yield decrease in Experiment 3. Adding N did not increase yields significantly over the untreated check, unless more than 160 kg/ha was broadcast applied or the N was fall banded at rates greater than 120 kg/ha. Split applications tended to decrease yields when compared to single applications. The reason for this dismal response is that the nitrogen delayed maturity, making the wheat more susceptible to rust.

Response of HY320 to nitrogen is quite variable and can only be attributed to a location effect. The two fertility experiments were about 100 m apart and topography was similar. In the fertility x PGR trial, all nitrogen applications did not differ significantly from each other, regardless of rate, timing or method of application. All rates tested, with the exception of the 60 kg rate applied as a split application, were significantly higher yielding than the untreated check. In the PGR x fertility trial, increasing N from 60 to 160 kg/ha in split applications resulted in a yield increase of 463 kg/ha, compared to a 88 kg/ha increase for similar treatments in the Fertility x PGR trial. Both trials had low Coefficient of Variation, thus the reasons for the differences are not obvious.

The response of Columbus wheat in a PGR x fertility trial is similar to HY320, with the 160 kg N as a split application yielding over 650 kg/ha more than the 60 kg/ha N rate.

The response to nitrogen in 1986 did not compare favourably with 1985 for either HY320 or for winter wheat. The lack of a consistent yield increase coupled with depressed grain prices may make high N rates unaffordable. The principle of splitting the N continues to look attractive primarily as a means of saving money if the yield potential of the crop is poor. However methods of applying the post emergent treatments, which would ensure the applied nitrogen is available to the plant, are required.

WHEAT CULTIVARS

The varieties of winter wheat with the best response to the ICM package used were Sundance, Norstar, Redwin, UD1080 and Ram. Despite their lower yields, the semidwarf varieties may be more economical because they don't need a PGR. Some cultivars (i.e. Ram) are also more disease resistant than Norstar or Sundance and may not require a fungicide either.

For spring wheats, the highest yields without fungicides were achieved by Marshall. Once fungicides were added, Wheaton was the highest yielding variety. Significant yield increases occurred in HY320, Wheaton and Katepwa when fungicides were added. All varieties responded to increases in N from 100 to 150 kg/ha coupled with an increase in seeding rate, but increases in yield were non significant. Increases in yield are due primarily to increase in seeding rate (M633).

SECTION 1

EXPERIMENT 1 CROP DENSITY X FUNGICIDE ON NORSTAR WINTER WHEAT
MINTO, 1986

OBJECTIVE: To determine the effect of crop densities and fungicide treatments on disease levels and the subsequent effects on growth and yield of winter wheat.

TREATMENT LIST
CROP DENSITY:
1. 300 SEEDS/M2 IN 9.5 CM ROWS
2. 300 SEEDS/M2 IN 19 CM ROWS
3. 500 SEEDS/M2 IN 9.5 CM ROWS
4. 500 SEEDS/M2 IN 19 CM ROWS

FUNGICIDES:
1. UNTREATED CHECK
2. TILT (PROPICONAZOLE 25% EC) APPLIED AT .125 kg ai/ha AT ZADOKS 49
3. DITHANE M-45 (MANCOZEB 80% WP) APPLIED AT 1.6 kg ai/ha AT ZADOKS 49 AND 10 DAYS LATER
4. TILT (PROPICONAZOLE 25% EC) APPLIED AT .125 kg ai/ha AT ZADOKS 49 AND AGAIN 24 DAYS LATER AT ZADOKS 75.

MATERIALS AND METHODS
Norstar winter wheat was treated with Vitavax and seeded into standing canola stubble on September 17, 1985, using an Amazone NT375 hoe drill. Rates of seeding were 300 seeds/m2 on treatments 1 and 2, and 500 seeds/m2 on treatments 3 and 4. 80 kg/ha P2O5 and 60 kg/ha K2O were applied with the seed. Plants were at the 2 leaf stage at freeze-up. 80 kg/ha N was applied May 13, and 40 kg/ha N was applied on May 28 and again on June 16. All nitrogen was applied as broadcast ammonium nitrate. Main plots (seeding density) were 3.75 x 30 m, and sub-plots (fungicides) were 3.75 x 7.5 m. All treatments were replicated four times in a split block design. Weeds were controlled with Hoegrass applied at a rate of .71 kg/ha on May 26, and with Sabre applied at a rate of 0.57 kg/ha on June 1. Dithane was applied to the appropriate plots at a rate of 1.6 kg ai/ha on June 13 and June 23. Applications were made with a compressed air bicycle sprayer delivering a volume of 123 l/ha at a pressure of 335 kPa. Tilt was applied to appropriate plots at a rate of .125 kg/ha on June 13 and again on July 7 using a compressed air bicycle sprayer delivering a volume of 110 l/ha at a pressure of 265 kPa.
Plant counts were taken April 29 on two 1/4 m2 samples in each main plot. Heads/m2 were determined July 25 by counting fertile tillers on two 1/4 m2/plot. Plant heights were determined July 31 by taking the height of 10 handfuls of plants/plot. Disease levels were assessed July 4 and July 16 by visually calculating the % leaf area infected on 5 flag leaves/plot. Plots were harvested on August 5 with a K.E.M. plot combine and yields were adjusted to 14.5% moisture. Data was analyzed at the 5% level and means were compared using the appropriate LSD value.

RESULTS AND DISCUSSION
SEEDING RATE AND ROW SPACING: Seeding rates of 300 seeds/m2 resulted in plant stands of close to 100% of the seeding rate. Seeding rates of 500 seeds/m2 resulted in plant stands of about 75% of the seeding rate. Narrow row spacing resulted in better plant stands than wide row spacing, possibly due to less competition between plants in the row. The higher seeding rate resulted in

slightly shorter plants and more heads/m2, though differences from the lower seeding rate were not significant. Seeding rate or row spacing had no effect on rust levels July 4 or July 16. Yields for 500 seeds/m2 seeding rate tended to be higher than yields for 300 seeds/m2 seeding rate, but differences were not significant. There were no differences in thousand kernal weight (TKW) or in the number of kernals/head. There was no lodging in the trial.

FUNGICIDES: Application of fungicide had no significant effects on plant heights or heads/m2 when compared to the untreated check. Fungicides significantly reduced levels of stem and leaf rust as shown by ratings July 4 and July 16. Levels of stem rust increased rapidly after rating, so while ratings do not show the final level of disease they do provide relative differences. Plant disease levels were lowest with either 2 applications of Dithane or 2 applications of Tilt. A single application of Tilt was less effective. All fungicide treatments increased yields significantly, due to significant increases in TKW, as there were no significant differences in kernals/head. All fungicide treatments differed significantly from each other. The highest yields (4420 kg/ha) were obtained with 2 applications of Tilt, followed by 2 applications of Dithane (4170 kg/ha) and 1 application of Tilt (3750 kg/ha). The untreated check yielded only 3110 kg/ha.

SUMMARY

1. Seeding rates and row spacings tested had no significant effect on heads/m2, thousand kernal weight, kernals per head, or the resultant yield. There was no significant effects on disease levels.
2. Application of fungicides significantly increased grain yield, primarily due to increased kernal weight.

Table M1: EFFECT OF CROP DENSITY AND FUNGICIDES ON NORSTAR WINTER WHEAT

TMT	FUNG	SEED RATE	ROW SPG	LEAF RST JL4	LEAF RST JL16	STM RST JL4	STM RST JL16	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNAL /HEAD
1	CHK	300	9.5	5	76	2	5	86	467	3055	25.4	28
2	TILT	300	9.5	0	20	0	4	83	493	3784	26.8	29
3	DITH	300	9.5	1	6	1	0	83	487	4033	30.8	27
4	2TLT	300	9.5	0	15	0	1	82	470	4151	33.7	27
5	CHK	300	19	6	69	2	5	83	536	2948	22.7	25
6	TILT	300	19	1	25	1	4	86	520	3571	26.9	26
7	DITH	300	19	2	6	1	0	85	502	4197	29.9	28
8	2TLT	300	19	1	5	0	0	82	482	4617	34.0	28
9	CHK	500	9.5	6	84	2	1	84	496	3264	23.7	29
10	TLT	500	9.5	0	20	0	1	83	594	3796	28.2	25
11	DITH	500	9.5	2	9	1	0	81	523	4272	30.7	27
12	2TLT	500	9.5	0	18	0	0	83	476	4395	33.4	28
13	CHK	500	19	6	83	3	6	82	537	3193	24.3	25
14	TILT	500	19	0	18	0	1	80	533	3848	29.2	25
15	DITH	500	19	2	13	1	0	80	535	4192	31.4	25
16	2TLT	500	19	0	15	0	0	80	485	4522	34.4	27
	LSD (.05)			2	18	1	2	6	89	481	3.9	5
	CV			54	42	88	93	4.8	12.2	8.7	9.4	13

Table M2: MAIN EFFECTS

SEEDING RATE	LEAF RUST JL4	LEAF RUST JL16	STEM RUST JL4	STEM RUST JL16	PLANT HGT	HEADS /M2	YIELD KG/HA	TKW GM	KERNAL /HEAD
300/M2 9.5 CM	1	29	1	3	83	479	3756	29.2	28
300/M2 19 CM	2	26	1	2	84	510	3833	28.4	27
500/M2 9.5 CM	2	33	1	1	83	522	3931	29.0	27
500/M2 19 CM	2	32	1	2	80	522	3939	29.8	25
LSD (.05)	1	9	1	1	5	51	250	2.8	3
FUNGICIDE:									
UNTREATED CHK	6	78	2	4	84	509	3115	24.0	26
TILT	0	21	0	3	83	535	3750	27.8	26
DITHANE (2X)	1	8	1	0	82	512	4173	30.7	27
TILT (2X)	0	13	0	0	82	478	4421	33.9	28
LSD (.05)	1	9	1	1	2	44	244	1.8	2

EXPERIMENT 2 FERTILITY X PLANT GROWTH REGULATOR, WINTER WHEAT
MINTO, 1986

OBJECTIVE: To determine the effects of two plant growth regulators and various levels of nitrogen applied at different growth stages on the growth and yield of winter wheat.

TREATMENT LIST

N FERTILITY:

TREATMENT	GROWTH STAGE					TOTAL
	00	21	31	49		APPLIED N (KG N/HA)
1						0
2			60			60
3			120			120
4			180			180
5			40	20		60
6			80	40		120
7		20	80	40	40	180
8		80 BANDED				80
9		120 BANDED				120
10		180 BANDED				180

PLANT GROWTH REGULATOR:

1. UNTREATED CHECK
2. CYCOCEL (CHLORMEQUAT CHLORIDE) @ 1.15 kg a.i./ha @ ZADOKS 31
3. CERONE (ETHEPHON) @ .15 kg a.i./ha @ ZADOKS 39

MATERIALS AND METHODS

Norstar winter wheat was treated with vitavax and seeded at a rate of 500 seeds/m2 on September 17, 1985 near Minto, Manitoba. The crop was seeded into standing canola stubble using an Amazone NT375 hoe drill with 19 cm row spacing. 40 kg/ha P2O5 and 30 kg/ha K2O were applied with the seed. Nitrogen was broadcast on appropriate plots at growth stages 21, 31, and 49 on May 13, May 28, and June 16 respectively. Fall banded treatments were applied September 18. All nitrogen was applied as ammonium nitrate. Plot size was 2 x 7.5 m and all plots were replicated four times in a split block design. Weeds were controlled with applications of Hoegrass at .71 kg/ha on May 26, and Sabre at 0.56 kg/ha on June 1. Cycocel was applied to the appropriate plots on May 26 at a rate of 1.15 kg/ha in 200 l/ha at Zadoks 31. Cerone was applied to the appropriate plots on June 11 at a rate of .15 kg/ha in 100 l/ha at Zadoks 49. The temperatures at time of application of PGR were 28C and 15C for May 26 and June 11 respectively. Tilt was applied at a rate of .125 kg/ha on June 13 (Zadoks 49) to control diseases.
The number of fertile heads/m2 were determined by sampling two 1/4 m2 areas in each plot on July 24. Plant height per treatment was determined by taking the average height of 10 handfuls of wheat on each plot August 1. Plots were harvested on August 6 with a K.E.M. plot combine and yields were adjusted to 14.5% moisture. Data was analyzed at the 5% level and means were compared using the appropriate L.S.D. values. Soil samples to a depth of 120 cm were taken May 16 and August 7 to determine water use efficiency. Plant tissue samples collected on June 16 and grain samples were sent to the Manitoba Provincial Soil Testing Lab for nutrient and protein analysis respectively.

RESULTS AND DISCUSSION

PLANT GROWTH REGULATORS: There was no lodging in the experiment. Both plant growth regulators reduced height significantly at the rates tested. Heights were reduced about 6 cm compared to the untreated check. Cycocel significantly reduced heads/m2 compared to the untreated check. Cerone had no significant effect on heads/m2. Cycocel significantly increased yield, yielding nearly 500 kg/ha more than plots treated with Cerone or the untreated check plots. Cerone significantly decreased the TKW compared to the untreated check. Plots treated with Cycocel had significantly more kernals/head than the check or Cerone treated plots, which did not differ significantly from each other. Protein levels remained constant despite differences in yield between PGRs over all fertility treatments.

FERTILITY: There were no differences in maturity between fertility treatments. Heavy disease pressure from the stem rust caused premature ripening of all treatments, but was most pronounced in treatments receiving higher levels of N. Plant heights tended to increase with increased nitrogen application. Single applications generally resulted in taller plants than split applications. Heads/m2 also tended to increase with increased nitrogen. There were no significant differences in heads/m2 between rates and methods of nitrogen application. All treatments receiving nitrogen had significantly more heads/m2 than the untreated check. Banded treatments tended to be higher yielding than broadcast applications or split applications of the same total N rates. Split applications had a tendency to be lower yielding than single applications, though differences were not significant. High rates of nitrogen applied in spring tended to decrease thousand kernal weight (TKW). Fall application did not have as great an effect. There were significant differences in the number of kernals/head. As nitrogen rates increased, kernals per heads tended to increase as well. Single applications of N generally increased kernals/head more than split applications of the same amount. Fall banded applications generally had a higher number of kernals/head than comparable spring broadcast applications. Water use efficiency ranged from 99 kg/cm water to 149 kg. W.U.E. increased as nitrogen rates increased, due to yield increases. Fall banded nitrogen resulted in the highest W.U.E. compared to spring broadcast and split applications. There were no significant fertility x PGR interactions. Protein levels increased as applied nitrogen increased. Splitting N did not increase protein levels when compared to single applications. With the exception of the 60 kg rate, fall banded treatments tended to have lower protein levels, possibly as a result of higher yields.

SUMMARY

1. In the absence of lodging, Cycocel significantly increased yields compared to the untreated check, or plots treated with Cerone. This was largely due to a significant increase in the number of kernals/head.

2. Split applications resulted in lower yields than single treatments at all fertility levels.

3. Fall banded treatments resulted in higher yields than spring applications or split applications except at the 60 kg/ha rate where the single spring application was slightly higher.

Table M3: FERTILITY X PLANT GROWTH REGULATOR - WINTER WHEAT

TREATMENT FERTILITY	PGR	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD	% PROTEIN
1 0	CHK	81	408	1670	24.7	17	7.5
2 0	CYC	75	399	1889	24.1	20	7.0
3 0	CER	74	432	1562	22.9	16	7.5
4 0/60	CHK	86	477	1835	20.9	18	8.5
5 0/60	CYC	81	425	2601	21.6	28	9.0
6 0/60	CER	82	499	1993	20.8	19	9.0
7 0/120	CHK	89	506	1919	19.9	19	9.5
8 0/120	CYC	84	466	2482	21.1	26	10.0
9 0/120	CER	84	532	2007	18.8	21	9.5
10 0/180	CHK	91	523	2314	19.9	22	9.5
11 0/180	CYC	82	457	2476	21.6	25	9.5
12 0/180	CER	83	508	1914	19.0	20	10.0
13 0/40/20	CHK	85	427	1561	19.9	17	9.0
14 0/40/20	CYC	79	418	2063	21.4	24	8.5
15 0/40/20	CER	80	442	1527	19.6	18	9.0
16 0/80/40	CHK	89	480	1524	18.7	17	10.0
17 0/80/40	CYC	83	485	2521	20.4	26	9.5
18 0/80/40	CER	85	500	1747	18.0	19	10.0
19 20/80/40/40	CHK	88	464	2028	20.6	21	9.5
20 20/80/40/40	CYC	81	495	2450	21.5	23	10.0
21 20/80/40/40	CER	80	467	2041	19.1	23	10.0
22 80 FALL B	CHK	89	478	1910	20.9	19	9.0
23 80 FALL B	CYC	85	468	2530	21.9	25	9.0
24 80 FALL B	CER	83	478	1876	19.7	20	9.5
25 120 FALL B	CHK	91	494	2556	22.8	22	8.5
26 120 FALL B	CYC	85	490	2867	24.2	25	9.0
27 120 FALL B	CER	85	501	2321	21.3	22	9.0
28 180 FALL B	CHK	90	499	2596	22.6	23	9.5
29 180 FALL B	CYC	84	458	2890	23.4	27	9.0
30 180 FALL B	CER	80	495	2700	22.7	24	10.0
LSD (.05)		6	80	649	2.9	6	
COEFF. OF VAR.		4.9	12.0	21.3	9.7	18.4	

Table M4: FERTILITY X PLANT GROWTH REGULATOR - WINTER WHEAT
MAIN EFFECTS

FERTILITY:

TREATMENT		PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD	% PROTEIN
1	0	76	413	1707	23.9	17	7.3
2	60	83	467	2143	21.1	22	8.8
3	120	86	501	2136	19.9	22	9.7
4	180	85	496	2234	20.2	22	9.7
5	0/40/20	81	429	1717	20.3	20	8.8
6	0/80/40	85	488	1806	17.6	21	9.8
7	20/80/40/40	83	475	2173	20.4	23	9.8
8	60 F	86	475	2105	20.8	21	9.2
9	120 F	87	495	2581	22.8	23	8.8
10	180 F	84	484	2729	22.9	25	9.5
	LSD (.05)	4	57	461	2.0	3	

PGR:

TREATMENT		PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD	
1	CHK	88	476	1991	21.1	20	9.1
2	CYC	82	456	2477	22.1	25	9.1
3	CER	81	485	1931	19.8	20	9.4
	LSD (.05)	2	23	196	1.0	2	

Table M5: WUE *

TMT	YIELD (CHK)	SOIL WATER @ HARVEST	WATER USED	WUE
1	1670	25.75	26.95	99
2	1835	20.78	31.92	84
3	1919	22.34	30.36	94
4	2313	21.27	31.43	108
5	1561	25.48	27.22	91
6	1524	28.14	24.56	105
7	2028	23.56	29.14	106
8	1910	21.99	30.71	92
9	2556	22.22	30.48	125
10	2596	25.28	27.42	149

* WATER USED = PRECIP. IN GROWING SEASON +
(SOIL WATER @ SEEDING - SOIL WATERR @ HARVEST)
= 16.7 CM + (36 CM - CM)
WUE = YIELD / (WATER USED - 10 CM)

Table M6: PLANT TISSUE ANALYSIS

TMT	MACRONUTRIENTS %						MICRONUTRIENTS ppm			
	N	P	K	S	Ca	Mg	Cu	Fe	Mn	Zn
1	3.0S	0.26S	2.0S	0.19S	0.23S	0.12M	6.0S	105S	46S	14M
2	3.6H	0.28S	2.1S	0.26S	0.24S	0.13M	7.2S	165S	48S	16S
3	3.7H	0.29S	2.2S	0.28S	0.27S	0.14M	6.3S	97S	46S	15S
4	3.8H	0.28S	2.2S	0.30S	0.25S	0.14M	5.9S	95S	49S	17S
5	3.5H	0.28S	2.3S	0.25S	0.25S	0.13M	6.6S	95S	45S	16S
6	3.8H	0.28S	2.2S	0.28S	0.24S	0.14M	6.9S	90S	45S	17S
7	3.8H	0.30S	2.2S	0.28S	0.26S	0.14M	15.0S	195S	49S	19S
8	3.8H	0.28S	2.2S	0.26S	0.25S	0.17S	8.0S	125S	52S	16S
9	3.9H	0.27S	2.2S	0.27S	0.28S	0.16S	6.1S	85S	50S	16S
10	3.9H	0.28S	2.2S	0.28S	0.27S	0.17S	7.3S	88S	53S	16S

L = LOW M = MARGINAL S = SUFFICIENT H = HIGH E = EXCESS

EXPERIMENT 3 PLANT GROWTH REGULATOR X FERTILITY - WINTER WHEAT
MINTO, 1986

OBJECTIVE: To determine the response of winter wheat to various plant growth regulators applied to wheat grown under two fertility regimes.

TREATMENT LIST

PLANT GROWTH REGULATORS	RATE KG/HA	GROWTH STAGE
1. UNTREATED CHECK	--	--
2. CERONE	.075	39
3. CERONE	.150	39
4. CERONE	.300	39
5. CYCOCEL	.920	31
6. CYCOCEL	.460	31
7. TERPEL C	.690	39
8. CYCOCEL/CERONE	.690/.150	31/39
9. CYCOCEL	.690	31
10. CYCOCEL	.460	31

FERTILITY (NITROGEN) RATE	RATE KG/HA	GROWTH STAGE
1. MODERATE	60	21
2. HIGH	80/40/40	21/31/49

MATERIALS AND METHODS
Norstar winter wheat was seeded September 17, 1985 near Minto, Manitoba using an Amazone NT375 hoe drill. Row spacing was 19 cm and seeding rate was 500 seeds/m2. Plots were seeded directly into standing canola stubble. 40 kg/ha P2O5 and 30 kg/ha K2O were placed with the seed. On high N plots 80 kg/ha N was broadcast on May 13, 40 kg/ha N on May 28, and 40 kg/ha N on June 16. Moderate N plots received one broadcast application of 60 kg/ha N on May 13. Ammonium nitrate was used for all nitrogen applications. Plant growth regulator treatments 5,6,8a,9, and 10 were applied May 26 at 12:00 noon with an air temperature of 28C. Treatments 2,3,4,7, and 8b were applied June 11 at 9:00 am with an air temperature of 15C. May 26 treatments were applied in 200 l/ha and a pressure of 265 kPa and June 11 treatments were applied in 100 l/ha at the same pressure. Treatments were made with a compressed air bicycle sprayer. Weeds were controlled with applications of Hoegrass at .71 kg/ha on May 26 and Sabre at 0.57 kg/ha on June 1. Tilt was applied at a rate of .125 kg/ha on June 13 to control diseases. Plant heights were measured by taking the averge height of 10 handfuls of wheat in each plot. Heads/m2 were determined by sampling two 1/4 m2 areas in each plots. Plots were harvested on August 5 with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and means were compared using the appropriate LSD values.

RESULTS AND DISCUSSION
FERTILITY: Increasing the fertility from 60 kg/ha to 160 kg/ha N increased plant height and heads/m2 significantly. There was no effect on kernals/head. Kernal weights and yields were significantly lowered under high fertility due to a severe rust epidemic. Rust did more damage on the plants grown under the high fertility due to their more lush growth and delayed maturity. The timing and number of applications of fungicide applied did not provide sufficient protection for the heavy rust epidemic of 1986.

PLANT GROWTH REGULATORS: Terpel C was most effective in reducing height, followed by applications of/or including Cerone. No lodging occurred in this trial. Plant growth regulators all reduced yields when compared to the untreated control, possibly by delaying maturity and thereby increasing susceptibility to rust. The three rates of Cerone, as well as the Cycocel/Cerone split applications, reduced yields significantly. All PGR treatments reduced thousand kernal weights significantly. PGR treatments did not change kernals/head significantly when compared to the untreated check. There were no significant PGR x fertility interactions.

SUMMARY

1. In the absence of lodging, PGRs resulted in non-significant yield decreases.

2. Increasing the nitrogen rate resulted in significantly lower yields, due to severe rust infection.

Table M7: PLANT GROWTH REGULATORS AND FERTILITY ON WINTER WHEAT

TREATMENT	RATE	GROWTH STAGE	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD
1 CHK C			79	447	3152	28.1	25
2 CHK I			83	520	2983	24.0	25
3 CERONE C	.075	39	77	456	2736	24.3	25
4 CERONE I	.075	39	78	438	2564	21.6	28
5 CERONE C	.150	39	76	435	2661	24.0	26
6 CERONE I	.150	39	76	458	2590	22.0	26
7 CERONE C	.300	39	70	499	2656	25.6	21
8 CERONE I	.300	39	70	488	2426	20.5	25
9 CYCOCEL C	.920	31	74	464	3083	24.6	27
10 CYCOCEL I	.920	31	84	503	3000	22.9	26
11 CYCOCEL C	.460	31	79	463	3157	25.1	27
12 CYCOCEL I	.460	31	84	472	2773	22.0	27
13 TERP C C	.690	37	66	496	2875	23.1	25
14 TERP C I	.690	37	69	488	2690	21.8	26
15 CCC/CER C	.690/.150	31/39	68	478	2704	23.3	24
16 CCC/CER I	.690/.150	31/39	74	503	2495	21.0	24
17 CYCOCEL C	.690	31	76	457	2910	25.6	25
18 CYCOCEL I	.690	31	80	468	2630	21.3	27
19 CYCOCEL C	.460	31	81	431	3077	25.0	29
20 CYCOCEL I	.460	31	86	502	2719	21.0	26
LSD (.05)			7	60	445	2.6	4
COEFF. OF VAR.			6.2	9.0	11.3	7.9	10.6

WINTER WHEAT COSTS, $/HA

INPUTS	ICM	CONV.
LAND	74.00	74.00
INSURANCE	12.35	12.35
N	92.80 (160 kg)	34.80 (60 kg)
P	23.80	23.80
K	6.60	6.60
HOEGRASS	32.11	32.11
SABRE	11.12	11.12
PGR (Cycocel)	40.00	-
FUNGICIDE (Tilt)	79.00 (2 applic)	-
SEED GRAIN + TMT	31.60 (500 s/m)	19.36 (300 s/m)
TOTAL	417.63	222.15

WINTER WHEAT PROFIT, $/HA

	ICM				CONV			
VARIETY	YIELD[1]	GROSS[2]	COSTS[3]	NET[4]	YIELD	GROSS	COSTS	NET
NORSTAR	4433	424	418	6	2248	215	222	-7
UD1080	4042	387	"	-31	1465	140	"	-82
REDWIN	4162	398	"	-20	1601	153	"	-69
NORWIN	3693	354	"	-64	2494	239	"	17
BIGHORN	3190	305	"	-113	1799	172	"	-50
THUNDERBIRD	2993	287	"	-131	2352	225	"	3
RAM	3811	365	"	-53	2201	211	"	-11
VICTORY	2401	230	"	-188	2106	202	"	-20
ROSE	3548	340	"	-78	2498	239	"	17
MONOPOL	1675	160	"	-258	629	60	"	-162
ABSOLVENT	2217	212	"	-206	1119	107	"	-115
VUKA	728	70	"	-348	317	30	"	-192
M-41	2800	268	"	-150	1908	183	"	-39
M-42	1756	168	"	-250	801	77	"	-145
M-43	1929	185	"	-233	1018	97	"	-125
SUNDANCE	4717	452	"	34	2141	205	"	-17

1 Kg/ha

2 1CWRW @ 95.73 / tonne

3 Total costs/ha without machinery or return to labour.

4 Net return/ha without machinery costs or return to labour.

EXPERIMENT 5 DISEASE CONTROL ON HY320 WHEAT, MINTO MANITOBA

OBJECTIVE: To determine the effectiveness of various fungicides in reducing disease and increasing yield of HY320 wheat.

TREATMENT LIST

FUNGICIDE	RATE KG/HA	GROWTH STAGE
1 UNTREATED CHECK	--	--
2 TILT	.125	50
3 TILT	.068	50
4 TILT	.125	31 + 20 days + 20 days
5 DITHANE M-45	1.60	50 + 10 days
6 DITHANE M-45	1.20	50 + 10 days
7 DITHANE M-45	1.60	31 + every 10 days for 6 applications

MATERIALS AND METHODS

Wheat was treated with Vitavax and seeded at a rate of 500 seeds/m2 in 15 cm rows near Minto, Manitoba on May 23 using an Amazone D7 shoe drill. 60 kg/ha P2O5 and 30 kg/ha K2O were banded prior to seeding. 120 kg/ha N was broadcast May 27 as ammonium nitrate. Plot size was 2 x 7.5 m. Experimental design was a randomized complete block with four replicates. Fungicides were applied with a compressed air bicycle sprayer according to recommendations; 100 l/ha at 265 kPa for treatments 2,3 and 4, and 115 l/ha at 335 kPa for treatment 5,6 and 7. Treatments 2 and 3 were applied July 14. Treatment 4 was applied June 25 and again on July 14 and August 7. Treatments 5 and 6 were applied July 14 and July 22, and treatment 7 was applied 6 times at 9 day intervals, starting June 25 and ending August 7. Weeds were controlled with applications of Hoegrass II at a rate of 1.08 kg a.i./ha and with Sabre at a rate of 0.57 kg a.i./ha June 21 and June 29. Diseases were assessed visually by rating the % leaf area infected on 5 flag leaves/plot. Plots were harvested September 9 with a K.E.M. plot combine, and grain yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and means were compared using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Ratings on August 11 show a significant reduction of leaf rust and septoria/tanspot by all fungicide treatments, as do August 19 ratings for septoria/tanspot. Six applications of DITHANE or 3 of TILT provided significantly better control than the other treatments. Yields from reduced rate treatments (3 and 6), while not significantly different from the full rate treatments (2 and 5), did tend to be slightly lower. All fungicide treatments significantly increased yields when compared to the untreated check, largely due to significant increases in thousand kernal weight (TKW). The highest yields were obtained with six applications of DITHANE (tmt 7). Yields obtained from treatment 7 were significantly greater than the untreated check or treatments involving reduced rates.

Table M13: DISEASE CONTROL ON HY320

TREATMENT	RATE	GROWTH STAGE	LEAF RUST* AU11	LEAF RUST* AU19	SEPTORIA/TANSPOT AUG 11	SEPTORIA/TANSPOT AUG 19	YIELD KG/HA	TKW GM
1 CHECK			9a	4ab	18a	78a	4753c	33.9c
2 TILT	.125	50	1b	6a	1b	30b	5723ab	38.5b
3 TILT	.068	50	2b	7a	2b	38b	5562b	38.9b
4 TILT 3X	.125	31+20d+20d	0b	2b	0b	12c	5971ab	42.0a
5 DITH 2X	1.60	50+10d	2b	7a	3b	28b	5866ab	38.5b
6 DITH 2X	1.20	50+10d	1b	7a	2b	36b	5609b	39.6b
7 DITH 6X	1.60	31+10dX5	1b	6a	1b	15c	6135a	41.9a
CV			81.3	36.8	95.6	20.0	5.7	3.5

* % leaf area infected

Means in the sama column with the same letter do not differ signicantly at the 5% level according to Duncan's Multiple Range Test.

EXPERIMENT 6 DISEASE CONTROL ON KATEPWA WHEAT, MINTO MANITOBA

OBJECTIVE: To determine the effectiveness of various fungicides in reducing disease and thereby increasing yield of Katepwa wheat

TREATMENT LIST

FUNGICIDE	RATE KG/HA	GROWTH STAGE
1 UNTREATED CHECK	—	—
2 TILT	.125	50
3 TILT	.068	50
4 TILT	.125	31 + 20 days + 20 days
5 DITHANE M-45	1.60	50 + 10 days
6 DITHANE M-45	1.20	50 + 10 days
7 DITHANE M-45	1.60	31 + every 10 days for 6 applications

MATERIALS AND METHODS

Wheat was treated with vitavax and seeded at a rate of 90 kg/ha in 19 cm rows near Minto, Manitoba on May 27 using an Amazone hoe drill. 40 kg/ha P2O5 and 20 kg/ha K2O were banded with the seed. 90 kg/ha N was banded as anhydrous ammonia prior to seeding. Plot size was 2 x 7.5 m. Experimental design was a randomized complete block with four replicates. Fungicides were applied with a compressed air bicycle sprayer according to recommendations; 100 l/ha at 265 kPa for treatments 2,3, and 4, and 115 l/ha at 335 kPa for treatments 5,6, and 7. Treatments 2 and 3 were applied July 14 at Zadoks 50. Treatment 4 was applied June 25 (Zadoks 31) and again on July 14 and August 7. Treatments 5 and 6 were applied on July 14 and July 22, and treatment 7 was applied 6 times at 9 day intervals starting June 25 and ending August 7. Weeds were controlled with an application of Hoegrass II at a rate of 1.08 kg a.i./ha on June 11. Diseases were visually assessed by rating the % leaf area infected on 5 flag leaves/plot. Plots were harvested September 9 with a K.E.M. plot combine, and grain yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and means were compared using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

August 11 ratings show a significant reduction in leaf rust and septoria/tanspot by all fungicide treatments. Higher rates of fungicide tended to be more effective, but differences were not significant. By August 19 fungicicdes had no significant effect on disease levels, with the exception of treatment 7 (6 applications of DITHANE-M45) which had a lower incidence of tanspot/septoria. Natural senescence of the leaves at this date also made evaluation difficult. All fungicide treatments resulted in increased yields, though only treatment 7 was significantly higher than the untreated check. Thousand kernal weight did not differ significantly from the untreated check. A significant response to one application of the fungicide Tilt was noted for the cv. Neepawa in the CV X Management Trial (#11). This may be a factor of the higher fertility and higher seeding rate in trial #11. This could result in a denser plant stand (more conducive to infection and spread of diseases) and a greater yield potential (greater response to fungicide).

Table M14: DISEASE CONTROL ON SPRING WHEAT - KATEPWA

TREATMENT	RATE	GROWTH STAGE	LEAF RUST* AU11	LEAF RUST* AU19	SEPTORIA/TANSPOT* AUG 11	SEPTORIA/TANSPOT* AUG 19	YIELD KG/HA	TKW GM
1 CHECK			11a	5a	63a	95a	3514b	34.6ab
2 TILT	.125	50	3bc	6a	4c	93a	3702ab	36.8a
3 TILT	.067	50	4b	6a	13bc	93a	3695ab	35.6ab
4 TILT 3x	.125	31+20d+20d	1c	6a	3c	88a	3784ab	36.4a
5 DITH 2x	1.60	50+10d	3bc	5a	13bc	90a	3838ab	35.8ab
6 DITH 2x	1.20	50+10d	4b	6a	23b	93a	3613ab	33.0b
7 DITH 6x	1.60	31+10d(x6)	2bc	5a	6c	68b	4093a	36.5a
COEFF. OF VAR.			41.5	19.6	50.8	14.3	8.6	5.6

* % leaf area infected

Means in the same column with the same letter do not differ significantly at the 5% level according to DMRT.

EXPERIMENT 7 FERTILITY X PLANT GROWTH REGULATOR, HY320
MINTO, 1986

OBJECTIVE: To determine the effects of different amounts of nitrogen applied at various growth stages and the effects of two plant growth regulators on the growth and yield of HY320 wheat.

TREATMENT LIST
N FERTILITY

TMT	GROWTH STAGE 00	31	49	APPLIED N TOTAL (KG N/HA)
1				0
2	60			60
3	120			120
4	160			160
5	40	20		60
6	80	40		120
7	80	40	40	160
8	80			80 BANDED
9	120			120 BANDED
10	160			160 BANDED
11	180			180 TARGET YLD 5000KG/HA
12	260			260 TARGET YLD 6700KG/HA
13	137	68		205 (DETERMINED BY AVAILABLE WATER)
14	80		40	120

PLANT GROWTH REGULATOR

1. UNTREATED CHECK
2. CYCOCEL (CHLORMEQUAT CHLORIDE) @ .69 kg a.i./ha at Zadoks 31
3. CERONE (ETHEPHON) @ .15 kg a.i./ha at Zadoks 39

MATERIALS AND METHODS:

HY320 wheat was treated with vitavax and planted at a rate of 500 seeds/m2 on May 23 near Minto, Manitoba, using an Amazone D7 shoe drill with a row spacing of 15 cm. 60 kg/ha P2O5 and 30 kg/ha K2O were banded prior to seeding. Nitrogen was applied to the appropriate plots on May 27, June 27, and July 14 at Zadoks growth stages 00, 31, and 55 respectively. All nitrogen was broadcast unless otherwise stated. For treatment 13 fertility was determined by available soil water and expected rainfall during the growing season. Water use efficiency was assumed to be 250 kg/ha/cm. Wheat was assumed to require .045 kg N/kg grain. Expected available water was calculated at each nitrogen application and N was adjusted accordingly. Initial calculations assumed a 2:1:1 split. Ammonium nitrate was used as the N source. Plot size was 2 x 7.5 m and each treatment was replicated four times in a split block design. Cycocel was applied to the appropriate plots on June 25, at a rate of .69 kg/ha in 200 l/ha. Temperature at spraying was 25C and Zadoks growth stage was 31. Cerone was applied to the appropriate plots on July 7 at a rate of .15 kg/ha in 100 l/ha. Temperature at spraying was 20C and Zadoks growth stage was 39. Weeds were controlled with applications of Hoegrass II at 1.08 kg/ha on June 11 and with Sabre at 0.56 kg/ha on June 21 and June 29. Tilt was applied

on July 14 at a rate of .125 kg/ha in 100 l/ha at Zadoks growth stage 50 to control diseases.
Heads/m2 were determined by sampling two 1/4 m2 areas in each plot August 11. Tissue samples were taken July 14. Soil samples to a depth of 120 cm were taken June 3 and September 11 to determine water use efficiency. Plant height was measured September 5 by taking the average height of 10 handfuls of wheat per plot. Plots were harvested September 8 (reps A and B) and September 24 (reps C and D) with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the 5% level and means were compared using the appropriate LSD values. Grain and tissue samples were sent to the Manitoba Provincial Soil Testing Lab for protein and nutrient analysis respectively.

RESULTS AND DISCUSSION:

PLANT GROWTH REGULATORS: There was no lodging in this trial. The PGRs tested had no effect on plant height. Treatment with Cerone significantly increased the number of heads/m2 compared to Cycocel, which in turn had significantly more heads/m2 than the untreated plots. Both PGRs tested significantly increased yields over the untreated check. Cerone increased yields by over 850 kg/ha and Cycocel increased yields by almost 400 kg/ha. Cerone treated plots had significantly higher thousand kernal weight (TKW) than either the check or plots treated with Cycocel. Both Cycocel and Cerone significantly increased the number of kernals/head. PGR treated plots did not differ in protein content, though both were slightly lower than the untreated check plots, probably due to the increased yield in the treated plots.

FERTILITY: Increasing fertility tended to result in increased plant height. Treatments receiving 0 nitrogen had a significantly lower number of heads/m2 than any other treatment. The greatest number of heads were found in treatments receiving 160 kg N/ha in split application. All treatments receiving nitrogen yielded significantly more than the unfertilized check. There were no significant differences between nitrogen treatments. Banded treatments tended to be higher yielding than split application which tended to be higher than single broadcast applications though differences were not significant. Increasing fertility resulted in decreased TKW. All treatments receiving over 120 kg/ha N had lower TKW than treatments receiving 60, 80, or 120 kg/ha N, though differences were not always significant. Plots receiving no nitrogen had the highest TKW. Nitrogen rates and timing had no significant effect on kernals/head.
There were no plant growth regulator x fertility interactions. The best WUE was achieved by tmt 7 (80/40/40) followed by tmt 13 (137/68/0). Lowest WUE were tmts 1 (0) and 4 (160 N). Increasing N tended to increase protein levels, up to about 160 kg/ha. With the exception of the 60 kg/ha tmt, splitting the N did not result in increased levels of protein. Banded treatments tended to be lower in protein than comparable split or single broadcast applications.

SUMMARY:
1. In the absence of lodging, the PGRs tested increased yields significantly, largely as a result of a greater number of heads/m2 and more kernals/head.

2. All levels of nitrogen application increased yield significantly when compared to the unfertilized check; however, there were no significant differences between rates or method of nitrogen application.

Table M15: FERTILITY X PLANT GROWTH REGULATOR - SPRING WHEAT

TREATMENT	N	PGR	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD	% PROTEIN
1	0	CHK	74	356	3503	39.5	26	10.0
2	0	CYC	73	387	3799	38.7	26	10.5
3	0	CER	73	392	3883	42.7	24	10.5
4	60	CHK	75	458	3933	37.0	24	12.1
5	60	CYC	74	420	4505	36.2	31	11.0
6	60	CER	76	455	4861	39.5	27	11.6
7	120	CHK	75	480	4011	35.9	23	13.1
8	120	CYC	76	500	4402	34.4	26	13.1
9	120	CER	73	488	4973	38.7	26	12.6
10	160	CHK	76	401	3682	34.0	27	13.6
11	160	CYC	79	482	4493	32.6	29	13.6
12	160	CER	76	465	4801	36.2	29	12.6
13	40/20	CHK	74	444	3551	36.1	21	13.6
14	40/20	CYC	75	426	4209	35.2	28	11.6
15	40/20	CER	75	487	4793	37.7	26	11.6
16	80/40	CHK	78	473	4275	35.1	26	12.6
17	80/40	CYC	78	486	4581	36.0	26	13.1
18	80/40	CER	77	491	4842	37.4	26	13.1
19	80/40/40	CHK	77	496	4154	33.8	25	13.6
20	80/40/40	CYC	74	532	4540	34.4	25	13.6
21	80/40/40	CER	76	542	4957	33.2	28	13.1
22	80 B	CHK	75	439	3593	34.5	24	12.6
23	80 B	CYC	77	473	4449	35.4	27	11.6
24	80 B	CER	78	442	5004	38.6	30	12.1
25	120 B	CHK	79	448	4350	35.6	27	12.6
26	120 B	CYC	77	471	4680	35.5	28	12.1
27	120 B	CER	77	519	4925	37.5	25	12.6
28	160 B	CHK	78	457	4274	34.7	27	13.1
29	160 B	CYC	76	462	4614	35.1	29	10.5
30	160 B	CER	78	494	5010	36.7	28	12.6
31	180 T75	CHK	74	455	3839	34.1	25	13.1
32	180 T75	CYC	75	453	3969	32.3	28	13.6
33	180 T75	CER	77	540	4878	36.5	25	12.6
34	260 T100	CHK	78	435	4190	33.5	29	13.1
35	260 T100	CYC	79	502	4347	32.9	27	14.1
36	260 T100	CER	76	496	4904	35.5	28	13.6
37	137/60/0	CHK	78	528	4135	34.3	23	13.6
38	137/60/0	CYC	76	485	4388	31.6	29	13.1
39	137/60/0	CER	76	513	5087	35.5	28	13.1
40	80/0/40	CHK	78	456	4285	35.1	27	13.1
41	80/0/40	CYC	77	497	4318	35.2	25	12.1
42	80/0/40	CER	78	475	5035	38.1	28	12.1
	LSD (.05)		4	61	746	3.0	5	
	COEFF. OF VAR.		4.1	9.3	12.1	6.1	14.5	

Table M16: FERTILITY X PGR - SPRING WHEAT - MAIN EFFECTS

FERTILITY:

TREATMENT		PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD	% PROTEIN
1	0	73	378	3728	40.3	23	10.3
2	60	75	444	4433	37.5	27	11.6
3	120	75	489	4462	36.3	25	12.9
4	160	77	449	4325	34.2	28	13.3
5	40/20	75	452	4184	36.3	25	12.3
6	80/40	78	483	4566	36.2	26	12.9
7	80/40/40	76	523	4550	33.8	26	13.4
8	80 B	77	451	4348	36.2	27	12.1
9	120 B	77	479	4651	36.2	27	12.4
10	160 B	77	471	4633	35.5	28	12.1
11	180 T75	76	483	4229	34.3	26	13.1
12	260 T100	78	477	4480	34.0	28	13.6
13	137/68/0	77	509	4537	33.8	27	13.3
14	80/0/40	78	476	4546	36.1	26	12.4
	LSD	2	40	486	1.8	3	

PLANT GROWTH REGULATOR:

TREATMENT		PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD	% PROTEIN
1	CHK	76	452	3984	35.2	25	12.8
2	CYC	76	470	4378	34.7	27	12.4
3	CER	76	486	4854	37.4	27	12.4
	LSD (.05)	1	15	190	0.8	1	

Table M17: WUE *

TMT		YIELD (CHK)	SOIL WATER @ HARVEST	WATER USED	WUE
1	0	3503	27.03	20.97	319
2	60	3933	27.36	20.64	370
3	120	4011	26.13	21.87	338
4	160	3682	25.37	22.63	292
6	80/40	4275	26.94	21.06	387
7	80/40/40	4154	30.10	17.90	526
13	137/68	4135	28.10	19.90	418

* WATER USED = PRECIP. IN GROWING SEASON +
(SOIL WATER @ SEEDING - SOIL WATER @ HARVEST)
= 17.25 CM +(30.75 CM - CM)
WUE = YIELD / (WATER USED - 10 CM)

Table M18: PLANT TISSUE ANALYSIS

TMT	MACRONUTRIENTS %						MICRONUTRIENTS ppm			
	N	P	K	S	Ca	Mg	Cu	Fe	Mn	Zn
1	3.9H	0.26S	1.5S	0.32S	0.40S	0.24S	5.9S	135S	55S	21S
2	4.3E	0.28S	1.6S	0.34S	0.42S	0.27S	6.2S	83S	54S	23S
3	4.6E	0.30S	1.7S	0.37S	0.47S	0.25S	7.1S	95S	58S	23S
4	4.5E	0.29S	1.6S	0.35S	0.49S	0.28S	6.4S	80S	58S	25S
5	4.5E	0.30S	1.6S	0.37S	0.49S	0.25S	6.5S	89S	57S	22S
6	4.6E	0.30S	1.6S	0.36S	0.48S	0.28S	7.0S	83S	60S	25S
7	4.5E	0.29S	1.7S	0.35S	0.47S	0.25S	6.4S	105S	60S	22S
8	4.4E	0.28S	1.5S	0.35S	0.47S	0.29S	6.3S	80S	56S	25S
9	4.5E	0.30S	1.6S	0.35S	0.47S	0.28S	6.9S	81S	59S	25S
10	4.2E	0.30S	1.5S	0.35S	0.47S	0.27S	6.9S	78S	51S	24S
11	4.5E	0.30S	1.8S	0.40S	0.47S	0.25S	5.9S	110S	54S	22S
12	4.7E	0.31S	1.8S	0.33S	0.49S	0.27S	6.8S	78S	52S	22S
13	4.5E	0.28S	1.6S	0.40S	0.55S	0.27S	6.0S	80S	55S	23S
14	4.3E	0.30S	1.6S	0.40S	0.44S	0.25S	6.2S	80S	50S	26S

L = LOW   M = MARGINAL   S = SUFFICIENT   H = HIGH   E = EXCESS

EXPERIMENT 8 MICRONUTRIENT TRIAL MINTO, 1986

OBJECTIVE: To determine if applications of micronutrients would result in increased crop growth and yield of highly fertilized Katepwa spring wheat.

TREATMENT LIST

TMT	N	P	K	MICRONUTRIENT	RATE	METHOD	STAGE	DATE
1	120	60	30	55% MgO dry	11 kg/ha MgO	banded	pre-plant	May14
2	120	60	30	5% Mg EDTA	131 g/ha	banded	pre-plant	May13
3	120	60	30	2-sequestered Mg 4%	116 g/ha	foliar	3-4 lf + anthesis	Junell July14
4	120	60	30	33% Zn sulfate	2.8 kg/ha	banded	pre-plant	May14
5	120	60	30	9% Zn EDTA	110 g/ha	banded	pre-plant	May13
6	120	60	30	2-sequestered Zn 9%	113g/ha	foliar	3-4 lf + anthesis	Junell July14
7	120	60	30	Potassium Phosphate	1kgP2O5/ha	foliar	anthesis	July14
8	120	60	30					
9	120	30	30					
10	120	60	30	2-Librel BMX*	1kg/ha	foliar	3-4 lf+ 9 days	Junell June20
11	120	60	30	Potassium Phosphate	2kgP2O5/ha	foliar	anthesis	July14
12	120	60	30	Potassium Phosphate	4kgP2O5/ha	foliar	anthesis	July14
13	120	60	30	2-7.5% Cu EDTA	93g/ha	foliar	3-4 lf+ 9 days	Junell June20
14	120	---	30					
15	120	60	---					
16	120	---	---	Phosphoric acid	2kgP2O5/ha	foliar	anthesis	July14

Cu,Mg and Zn recommendtions and supply courtsy of King Agri Serve
Potassium Phosphate supplied courtsy Agriculture Canada
Librel BMX recommendations and supply courtsy of Allied Colliods
BMX is a chelate blend of 1.7% Cu,3.35% Fe,1.7% Mn,0.60% Zn, and inorganic B(0.875%) and Mo(0.023%).

MATERIALS AND METHODS:

Katepwa wheat was planted at a rate of 300 seeds/m2 on May 14, 1986, near Minto, Mantioba, using an Amazone NT300 hoedrill with 19 cm row spacing. 120 kg N, 60 kg P2O5 and 30 kg K2O/ha were banded prior to seeding except for 0 P2O5, 0 K2O, 30 P2O5, 0 P2O5, and 0 K2O on treatments 8,9,14 and 15 respectively. Treatments 1,2,4 and 5 were banded prior to seeding. Treatments

3,6,10 and 13 were applied June 11 with a compressed air bicycle sprayer, and treatments 10 and 13 were applied again on June 20. Treatments 3,6,7,11,12 and 16 were applied again on July 14 (anthesis). Treatments 3,6,7,11, and 12 were applied with a spray volume of 110 l/ha , whereas treatments 10 and 13 were applied using a spray volume of 200 l/ha . Plot size was 3 x 10 m and all treatments were replicated four times in a randomized complete block. Heads/m2 were determined by sampling 2 1/4 m2 areas in each plot. Plant heights were determined by taking the average height of 10 handfuls of wheat in each plot. Plots were harvested August 28 with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the 5% level and means were compared with Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

The nutrient levels tested did not result in significant differences in plant height, or heads/m2. Only the low rate of potassium phosphate (tmt 7) was significantly lower in yield than the check, though the higher rates (tmts 11 and 12) tended to be lower as well. Zinc treatments were consistantly higher yielding than the check, although differences were not significant. Only the foliar application of zinc resulted in a significantly higher TKW than the check. All others did not differ significantly at the levels tested.

Due to the preliminary nature of this trial and the lack of visual defeciency symptoms tissue samples were not taken.

Based on the results of tissue samples from other trials micronutrient defeciencies appear to be more prevalent in winter wheat. Tissue samples taken from winter wheat plants in Experiment 2 indiciate marginal levels of Zn and Mg.

SUMMARY

Despite promising results reported by Gary Paulsen (Kansas State University), applications of foliar potassium phosphate on Katepwa do not appear to be beneficial.

Micro nutrient applications did not result in economic yield increases.

Although the plot area had a low phosphate test (16 kg P205/ha), little response to added phosphate was observed.

A poor response was also observed for applications of potash.

The modest yield levels indiciate that the yield potential of Katepwa was not realized. The application of Tilt which was delayed due to rain was late for optimun disease control. 1986 rainfall distribution appeared to favour early season growth resulting in shallow rooted plants which may have suffered moisture stress later in the season

Table M19: MICRONUTRIENT TRIAL

TREATMENT	PLANT HEIGHT	HEADS/M2	YIELD KG/HA	TKW
1 Mg D BA	101a	518a	3352abc	39.0abc
2 Mg L BA	102a	502a	3492ab	38.8abc
3 Mg L FO	104a	519a	3170bc	38.5abc
4 Zn D BA	100a	485a	3603a	38.6abc
5 Zn L BA	103a	526a	3533ab	39.4abc
6 Zn L FO	101a	475a	3545a	40.3a
7 K-P 1 KG	100a	478a	3087c	37.5c
8 CHECK	102a	528a	3459ab	38.3bc
9 P2O5 @ 30	101a	452a	3523ab	38.1bc
10 Librel	101a	448a	3503ab	40.0ab
11 K-P 2 KG	102a	481a	3281abc	39.1abc
12 K-P 4 KG	103a	528a	3291abc	39.8ab
13 Cu FO	102a	479a	3480ab	39.6ab
14 P CHECK	103a	470a	3383abc	38.6abc
15 K CHECK	105a	496a	3561a	38.8abc
16 Phosphoric	103a	501a	3269abc	38.6abc

*Means in the same column with the same letter do not differ significantly at the 5% level according to Duncan's Multiple Range Test.

EXPERIMENT 9 PLANT GROWTH REGULATORS X FERTILITY ON HY320
MINTO, MANITOBA

OBJECTIVE: To determine the response of HY320 to plant growth regulators applied to wheat grown under two fertility regimes

TREATMENT LIST

PLANT GROWTH REGULATORS	RATE KG/HA	GROWTH STAGE
1. UNTREATED CHECK	---	---
2. CERONE	.075	39
3. CERONE	.150	39
4. CERONE	.300	39
5. CYCOCEL	.690	31
6. CYCOCEL/CYCOCEL	.230/.230	23/31
7. TERPEL C	.460	37

N FERTILITY	RATE KG/HA	GROWTH STAGE
1. MODERATE	60	00
2. HIGH	80/40/40	00/31/49

MATERIALS AND METHODS
HY320 wheat was treated with Vitavax and seeded near Minto, Manitoba on May 23, 1986 at a rate of 500 seeds/m2. Plots were seeded with an Amazone D7 shoe drill with a row spacing of 15 cm. Previous crop was flax. 60 kg/ha P2O5 and 30 kg/ha K2O were banded prior to seeding moderate N plots, nitrogen was broadcast on May 27, and on high N plots it was broadcast on May 27, June 27, and July 14. Ammonium nitrate was used as the nitrogen source. Plot size was 2 x 7.5 m and each treatment was replicated four times in a split block design. All PGR treatments were applied with a compressed air bicycle sprayer at a pressure of 265 kPa and with a volume of 200 l/ha for treatments 5 and 6 and a volume of 100 l/ha for treatments 2,3,4, and 7. Treatment 6a was applied June 13, 10:00 am at 15C, 6b and 5 on June 25, 6:30 pm at 25C, 7 on July 3, 9:00 am at 22C, and 2,3,and 4 on July 7, 9:00am at 20C. Weeds were controlled with applications of Hoegrass II at 1.08 kg/ha on June 11, and Sabre at 0.57 kg/ha on June 21 and 29. Tilt was applied at a rate of .125 kg/ha on July 14 to control diseases. Plant heights were measured by taking the average height of 10 handfuls of wheat per plot. Heads/m2 were determined from two 1/4 m2 samples in each plot. Plots were harvested with a K.E.M. plot combine on September 24. Yields were adjusted to 14.5% moisture. Data was analyzed at the 5% level, and means were compared using the appropriate LSD.

RESULTS AND DISCUSSION
FERTILITY: Increasing the fertility from 60 to 160 kg/ha N significantly increased plant heights, heads/m2 and yield, and significantly reduced thousand kernal weight. Fertility had no significant effect on kernals/head, though the lower fertility treatments tended to have more kernals/head.

PLANT GROWTH REGULATORS: Cerone at .300 kg/ha and Cycocel at .69 kg/ha significantly reduced plant height compared to the check. Other treatments did not reduce heights significantly. PGRs had no effect on heads/m2. The .300 kg/ha rate of Cerone reduced yields significantly compared to the check. The split application of Cycocel resulted in a non-significant yield increase. All other PGR treatments tested reduced yields, though differences were not significant. All PGR treatments reduced thousand kernal weight, though only treatments of Cycocel or Terple C resulted in significant decreases. PGR treatments did not have a significant effect of kernals/head. There were no significant fertility x PGR interactions.

SUMMARY

1.Increasing nitrogen resulted in significantly higher yields, largely due to a greater number of heads/m2.

2.PGRs reduced plant height 1-7 cm and, with the exception of the split application of Cycocel, also tended to decrease yields, though differences were not significant.

COMMENTS

The results of this experiment are a contradiction of the results of experiment 7, where PGRs increased yield significantly and fertility had little or no effect. Both experiments were grown under the same conditions and were separated by less than 100 m.

Table M20: PLANT GROWTH REGULATORS AND FERTILITY ON HY320 WHEAT

TREATMENT		RATE STAGE	GROWTH HGT CM	PLANT /M2	HEADS KG/HA	YIELD GM	TKW /HEAD	KERNALS
1 CHECK	C			78	453	4674	41.8	26
2 CHECK	I			82	523	5160	38.0	27
3 CERONE	C	.075	39	77	425	4393	41.2	25
4 CERONE	I	.075	39	79	552	4999	37.1	25
5 CERONE	C	.150	39	77	430	4494	39.1	27
6 CERONE	I	.150	39	78	549	4978	37.5	25
7 CERONE	C	.300	39	72	443	4298	40.9	24
8 CERONE	I	.300	39	74	551	4730	36.4	24
9 CYCOCEL	C	.690	31	76	444	4668	38.9	28
10 CYCOCEL	I	.690	31	78	528	5030	38.0	25
11 CCC/CCC		.230C/.230	23/31	78	437	4841	40.8	28
12 CCC/CCC		.230I/.230	23/31	81	561	5043	36.3	25
13 TERPEL C	C	.460	37	76	439	4477	39.0	27
14 TERPEL C	I	.460	37	80	532	5147	36.4	27
LSD (.05)				3	71	416	2.4	4
COEFF. OF VAR.				2.7	10.1	6.1	4.4	10.7

Table M21: PLANT GROWTH REGULATORS AND FERTILITY - MAIN EFFECTS

PLANT GROWTH REGULATORS

TREATMENT	HGT CM	PLANT /M2	HEADS KG/HA	YIELD GM	TKW /HEAD	KERNALS
1 CHK		80	488	4917	39.9	26
2 CERONE		78	489	4696	39.1	25
3 CERONE		77	489	4736	38.3	26
4 CERONE		73	497	4514	38.7	24
5 CCC		77	486	4849	38.4	26
6 CCC/CCC		79	499	4942	38.5	27
7 TERPEL C		78	485	4812	37.7	27
LSD (.05)		3	49	234	1.3	3

FERTILITY

TREATMENT	HGT CM	PLANT /M2	HEADS KG/HA	YIELD GM	TKW /HEAD	KERNALS
1 60		76	439	4549	40.2	26
2 160		79	542	5012	37.1	25
LSD (.05)		1	29	188	1.1	2

EXPERIMENT 10 PLANT GROWTH REGULATORS X FERTILITY - COLUMBUS WHEAT
MINTO, 1986

OBJECTIVE: To determine the response of Columbus wheat to plant growth regulators applied to wheat grown under two fertility regimes.

TREATMENT LIST

PLANT GROWTH REGULATOR	RATE KG/HA	GROWTH STAGE
1 UNTREATED CHECK	--	--
2 CERONE	.075	39
3 CERONE	.150	39
4 CERONE	.300	39
5 CYCOCEL	.690	31
6 TERPEL C	.460	37
7 TERPEL C	.690	37
8 CYCOCEL/CERONE	.690/.150	31/39
9 CYCOCEL/TERPEL C	.460/.460	29/37

N FERTILITY	RATE KG/HA	GROWTH STAGE
1 MODERATE	60	00
2 HIGH	80/40/40	00/31/49

MATERIALS AND METHODS

Columbus wheat was treated with Vitavax and seeded near Minto, Manitoba on May 23, 1986 at a rate of 500 seeds/m2. Plots were seeded with an Amazone shoe drill with a row spacing of 15 cm. Previous crop was flax. 60 kg/ha P2O5 and 30 kg/ha K2O were banded prior to seeding. On moderate N plots, nitrogen was broadcast on May 27, and on high N plots it was broadcast on May 27, June 27, and July 14. Ammonium nitrate was used as the nitrogen source. Plot size was 2 x 7.5 m, and each treatment was replicated four times in a split block design. All PGR treatments were applied with a compressed air bicycle sprayer at a pressure of 265 kPa and with a volume of 100 l/ha for treatments 2,3,4,6,7,8b, and 9b and a volume of 200 l/ha for treatments 5, 8a, and 9a. Treatments for growth stage 29, 31, 37, and 39 were applied on June 18, 25, July 3 and July 7 at temperatures of 18, 25, 22, and 20C respectively. With the exception of the June 25 treatment date which was applied at 6:30 pm, all applications were made at about 9:00 am. Weeds were controlled with applications of Hoegrass II at 1.08 kg/ha on June 11 and Sabre at 0.56 kg/ha on June 21 and June 29. Tilt was applied at a rate of .125 kg/ha on July 14 to control diseases. Plant heights were measured at maturity by taking the average height of 10 handfuls of wheat on each plot. Heads/m2 were determined from two 1/4 m2 samples in each plot. The experiment was harvested on September 15 with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and means were compared using the appropriate LSD values.

RESULTS AND DISCUSSION

FERTILITY: Increasing the N fertility from 60 to 160 kg/ha increased the heads/m2, yield and thousand kernal weight significantly and resulted in non-significant increases in plant height and kernals/head.

PLANT GROWTH REGULATORS: Split applications of Cycocel with Terpel C or Cerone resulted in significant reductions in height. There was no lodging in the trial. PGRs tended to increase heads/m2, although differences were not significant. PGRs also tended to increase kernals/head. The .48 kg/ha rates of Cerone and the Cycocel/Cerone split application reduced yield although not significantly. The other PGR treatments resulted in slight but non-significant yield increases. All PGR treatments reduced TKW except for Cycocel at .69 kg/ha and the Cycocel/Terpel C split application, which had no effect.

SUMMARY

1. Increasing N rates resulted in significant yield increases, largely due to more heads/m2.
2. All PGRs reduced plant height. Except for Cerone at .3 kg and the CCC/Cerone split application, PGRs increased yields, though differences were not significant.

Table M22: PLANT GROWTH REGULATORS AND FERTILITY ON COLUMBUS WHEAT

TREATMENT	RATE	GROWTH STAGE	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD
1 CHECK C			98	517	3509	40.4	17
2 CHECK I			102	627	4194	41.5	16
3 CERONE C	.075	39	97	581	3709	38.1	17
4 CERONE I	.075	39	97	637	4242	39.5	17
5 CERONE C	.150	39	92	533	3464	38.2	17
6 CERONE I	.150	39	94	626	4448	40.6	18
7 CERONE C	.300	39	87	593	3341	36.7	16
8 CERONE I	.300	39	92	678	4047	38.5	16
9 CYCOCEL C	.690	31	94	500	3610	38.8	19
10 CYCOCEL I	.690	31	95	726	4203	40.8	15
11 TERPEL C C	.460	37	92	480	3614	37.7	20
12 TERPEL C I	.460	37	95	620	4260	38.4	18
13 TERPEL C C	.690	37	92	555	3653	38.3	18
14 TERPEL C I	.690	37	93	674	4260	39.7	16
15 CCC/CER C	.690/.150	31/39	84	589	3590	37.6	17
16 CCC/CER I	.690/.150	31/39	88	613	4055	39.4	17
17 CCC/TERP C	.460/.460	29/37	92	593	3604	38.7	16
18 CCC/TERP I	.460/.460	29/37	93	585	4309	40.7	19
LSD (.05)			5	112	373	1.9	3
COEF. OF VAR.			3.6	13.3	6.8	3.5	13

Table M23: PLANT GROWTH REGULATORS AND FERTILITY ON COLUMBUS WHEAT - MAIN EFFECTS

PLANT GROWTH REGULATORS:

TREATMENT	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD
1 CHK	100	572	3852	40.9	17
2 CER	97	609	3975	38.8	17
3 CER	93	579	3956	39.4	18
4 CER	89	635	3694	37.6	16
5 CCC	94	613	3906	39.8	17
6 TERP C	94	550	3937	38.1	19
7 TERP C	92	614	3957	39.0	17
8 CCC/CER	86	601	3823	38.5	17
9 CCC/TERP C	93	589	3957	39.7	17
LSD (.05)	4	88	265	1.6	2.3

FERTILITY:

TREATMENT	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD
1 60	92	549	3566	38.3	17
2 160	94	643	4224	39.9	17
LSD (.05)	2	35	130	0.6	1

EXPERIMENT 11 CULTIVAR X MANAGEMENT ON SPRING WHEAT
MINTO 1986

courtesy STOBBE and ROURKE UNIVERSITY OF MANITOBA, PLANT SC. DEPT.

OBJECTIVE: To determine the responses of 6 spring wheat cultivars as the level of management increases.

TREATMENT LIST

CULTIVAR:	ORIGIN	TYPE
1. HY320	SASK.	SEMI-DWARF PRAIRE SPRING
2. MARSHALL	USA	SEMI-DWARF
3. OSLO	USA	SEMI-DWARF
4. WHEATON	USA	SEMI-DWARF
5. GLENLEA	MAN.	TALL-UTILITY
6. KATEPWA	MAN.	TALL-HARD RED SPRING

MANAGEMENT	SEED RATE	NITROGEN	FUNGICIDE
1	200 SEEDS/M2	50 KG/HA	--
2	300	100	--
3	400	150	--
4	400	150	TILT
5	400	75/50/25	TILT

MATERIALS AND METHODS

Six cultivars of wheat were treated with Vitavax and seeded at three rates on May 23, 1986, near Minto, Manitoba, using an Amazone D7 shoe drill with 15 cm row spacing. 60 kg/ha P2O5 and 30 kg/ha K2O were banded prior to seeding. All nitrogen was applied as broadcast ammonium nitrate at Zadoks growth stages 00, 31 and 49 on May 27, June 25 and July 15, respectively. Tilt was applied at a rate of .125 kg/ha on managements 4 and 5 on July 14 (Zadoks 50). Application was made in 100 l/ha with a compressed air bicycle sprayer operating at 275 kPa. Plot size was 3 x 7.5 m and all plots were replicated four times in a split block design. Weeds were controlled with applications of Hoegrass II at 1.08 kg/ha on June 11, and Sabrep at 0.57 kg/ha on June 21 and June 29. Plant counts and head counts were taken on June 19 and August 12, respectively, on two 1/4 m2 areas in each plot. Plant heights were determined September 5 by taking the average height of 10 handfuls of wheat in each plot. Plant disease levels were assessed August 12 by visually determining the % leaf area infected on 5 flag leaves per plot. Plots were harvested September 8 with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the 5% level and means were compared using the appropriate LSD values. Grain samples were sent to the Manitoba Provincial Soil Testing Lab for protein analysis.

RESULTS AND DISCUSSION

VARIETY: There were no significant differences in plant stands between varieties. Maturity ratings showed HY320 to mature later than all other varieties except Glenlea. Differences in plant height were expected due to the different growth habits of the cultivars. Glenlea and HY320 had significantly fewer heads/m2 than any other variety, and Marshall had significantly more than any other variety. Over all managements, Wheaton and Marshall yielded significantly more than any other variety, while Glenlea and Katepwa yielded less than any other variety. As expected, Glenlea had significantly higher thousand kernal weight (TKW) than any other variety. Wheaton and Oslo, though lower than Glenlea, had higher TKW than other varieties. HY320 had the greatest number of kernals/head, followed by Wheaton, Oslo, Marshall, Glenlea and Katepwa. Over all managements, Katepwa had the highest protein, followed byOslo, Glenlea, Marshall, Wheaton, and HY320.

MANAGEMENT: There were significant differences in plants/m2 between the different seeding rates. However, germination was limited to 60% of viable seeds on the 200 and 300 seeds/m2 rates and to about 53% of viable seeds on the 400 seeds/m2 rate, largely due to the dry seedbed.
Over all varieties, management 3 was the fastest maturing, and 1 and 4 were the slowest. Management 3 also resulted in the tallest plants over all varieties. Management 1 had significantly fewer heads/m2 than any other management. All others did not differ significantly regardless of seeding rate, though management 3 did have the highest number of heads/m2. Varieties differed in their yield response to the levels of management. At the 150 kg/ha rate of nitrogen there were no significant differences between split or single applications in any variety. The single application tended to be higher in all varieties except HY320. The application of fungicide at the 150 kg N/ha resulted in significant yield increases in HY320, Wheaton and Katepwa, and non-significant increases in Marshall, Oslo and Glenlea. There were no significant yield increases as a result of increasing seeding rate from 300 to 400 seeds/m2 and fertilizer from 100 to 150, though yields tended to be higher with more inputs. All varieties except Oslo and Glenlea showed a significant response when management was raised from level 1 to level 2. Management levels which included the use of a fungicide, (4 and 5), resulted in significantly higher thousand kernal weights compared to other management levels. There were no significant differences in kernals/head between management levels. Over all varieties, each increase in management resulted in an increase in the protein content,from 11.8% for mgmt I to 13.0% for mgmt V. The smallest increase, 1.1%, was observed for HY320, from 10.5% in mgmt I to 11.6% in mgmt III. The largest increase of 2% was observed in Katepwa between mgmt I (13.1%) and mgmt V (15.1%). Other cultivars were intermediate in protein content.

SUMMARY

1. Marshall was the highest yielding variety under management levels 1,2 and 3; Wheaton was the highest yielding variety under managments 4 and 5
2. Fungicides significantly increased TKW in all varieties except Glenlea, and resulted in significant yield increases in HY320, Wheaton and Katepwa.
3. Increasing management from level 1 to level 2 resulted in significant yield increases in all cultivars except Glenlea. Increase in management from level 2 to level 3 resulted in a non-significant yield increase for all varieties.

Table M24 : CULTIVAR X MANAGEMENT - SPRING WHEAT

	VARIETY	MGMT	PLNTS /M2	%LF RST	%SEPT TSPOT	MATURITY 0-10	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD
1	HY320	1	111	2	29	7	82	268	3149	30.3	39
2	HY320	11	187	4	38	8	81	425	3861	32.3	28
3	HY320	111	229	3	43	9	82	486	4032	29.1	29
4	HY320	1V	217	2	14	8	81	417	4975	36.6	33
5	HY320	V	236	2	5	9	81	494	5186	35.6	30
6	MARSHALL	1	118	1	25	9	78	537	3753	33.4	22
7	MARSHALL	11	178	1	31	9	80	644	4715	34.3	22
8	MARSHAL	111	200	0	28	9	81	666	4847	31.6	24
9	MARSHALL	1V	210	0	8	9	80	654	5236	36.1	23
10	MARSHALL	V	188	0	7	9	77	604	4841	35.6	23
11	OSLO	1	116	3	17	9	74	455	3714	34.3	25
12	OSLO	11	200	4	32	10	73	473	4237	38.4	23
13	OSLO	111	184	5	36	10	75	491	4221	37.6	23
14	OSLO	1V	231	1	6	10	72	492	4784	41.1	24
15	OSLO	V	209	1	5	10	74	518	4447	40.3	22
16	WHEATON	1	118	0	19	9	81	417	3513	36.8	24
17	WHEATON	11	160	0	26	9	81	472	4426	35.3	27
18	WHEATON	111	199	0	19	10	82	553	4757	37.1	24
19	WHEATON	1V	214	0	7	9	82	515	5505	40.3	27
20	WHEATON	V	201	0	7	10	82	497	5314	39.3	28
21	GLENLEA	1	111	1	17	8	103	344	3141	46.9	21
22	GLENLEA	11	166	2	18	9	107	431	3757	42.8	21
23	GLENLEA	111	228	2	15	9	107	429	4060	45.5	22
24	GLENLEA	1V	219	1	7	8	104	417	4206	46.0	23
25	GLENLEA	V	213	1	13	8	104	394	3656	46.8	20
26	KATEPWA	1	127	5	85	9	98	455	2821	33.0	20
27	KATEPWA	11	181	6	87	10	99	586	3243	32.6	17
28	KATEPWA	111	191	6	89	10	101	563	3572	33.0	20
29	KATEPWA	1V	205	3	18	9	98	534	4172	36.8	22
30	KATEPWA	V	226	2	14	9	99	532	4093	37.6	20
	LSD (.05)		43	1	10	1.7	3	115	599	2.6	6
	C.V.		16.3	49.3	28.3	13.1	2.6	16.6	10.1	4.9	16.7

Table M25 : CULTIVAR X MANAGEMENT ON SPRING WHEAT - MAIN EFFECTS

CULTIVAR	PLNTS /M2	MATURITY. 0-10	PLANT HGT CM	HEADS /M2	YIELD KG/HA	TKW GM	KERNALS /HEAD
1 HY320	196	7.9	81	418	4241	32.8	32
2 MARSHALL	179	8.9	79	621	4678	34.2	23
3 OSLO	188	9.6	73	486	4281	38.3	23
4 WHEATON	179	9.2	81	491	4703	37.7	26
5 GLENLEA	187	8.6	105	403	3764	45.6	21
6 KATEPWA	186	9.3	99	534	3580	34.6	20
LSD (.05)	22	1.0	2	61	361	1.5	3
MANAGEMENT							
1 1	117	8.5	86	412	3348	35.8	25
2 11	179	9.0	87	505	4040	35.9	23
3 111	205	9.5	88	531	4248	35.7	24
4 1V	216	8.7	86	505	4813	39.5	25
5 V	212	8.9	86	506	4589	39.2	24
LSD (.05)	17	0.6	1	46	228	1.0	2

Table M26: CULTIVAR X MANAGEMENT - YIELD (KG/HA)

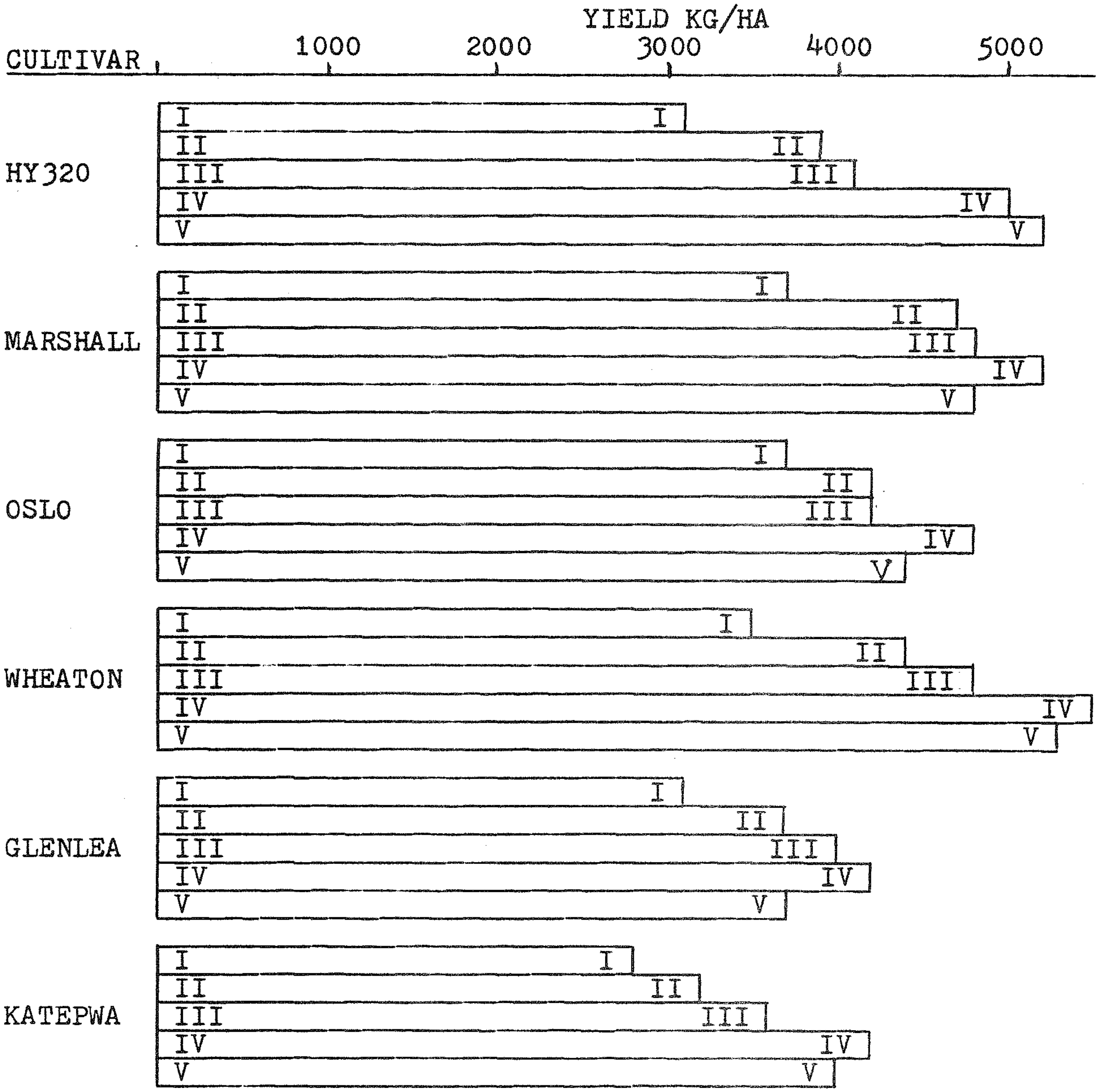
MGMT	HY320	MARSHALL	OSLO	WHEATON	GLENLEA	KATEPWA
1 1	3149c	3753b	3714b	3513c	3141b	2821c
2 11	3861b	4715a	4237ab	4426c	3757ab	3243b
3 111	4032b	4847a	4221ab	4757bc	4060a	3572b
4 1V	4975a	5236a	4784a	5505a	4206a	4172a
5 V	5186a	4841a	4447a	5314ab	3656ab	4073a

* means in each column followed by the same letter do not differ significantly according to Duncan's Multiple Range Test at the .05 level.

Table M26B: CULTIVAR X MANAGEMENT - PROTEIN CONTENT

MGMT	HY320	MARSHALL	OSLO	WHEATON	GLENLEA	KATEPWA	MEAN
1 I	10.5	11.6	12.6	11.6	11.6	13.1	11.8
2 II	10.5	11.0	13.1	11.0	12.1	13.6	11.9
3 III	11.6	13.1	13.1	12.1	12.6	13.6	12.7
4 IV	11.0	12.1	14.1	12.1	13.1	14.1	12.8
5 V	11.0	13.1	13.6	12.6	12.6	15.1	13.0
MEAN	11.0	12.2	13.3	11.9	12.4	13.9	12.4

CULTIVAR X MANAGEMENT - SPRING WHEAT 1986



I 200 seeds/m 50kg N
II 300 seeds/m 100kg N
III 400 seeds/m 150kg N
IV 400 seeds/m 150kg N Fungicide
V 400 seeds/m 75/50/25kg N Fungicide

SPRING WHEAT COSTS/HA.

MGMT LEVEL	I	II	III	IV	V
N	29.00	58.00	87.00	87.00	87.00
P	35.70	35.70	35.70	35.70	35.70
K	6.60	6.60	6.60	6.60	6.60
LAND	74.00	74.00	74.00	74.00	74.00
INSURANCE	12.35	12.35	12.35	12.35	12.35
HOEGRASS	32.11	32.11	32.11	32.11	32.11
SABRE	11.12	11.12	11.12	11.12	11.12
FUEL	20.00	20.00	20.00	21.25	23.75
SEED TMT.	1.00	1.33	1.67	1.67	1.67
FUNGICIDE	--	--	--	39.50	39.50
PGR	--	--	--	--	--
TOTAL*	220.88	250.21	279.55	320.30	322.80

*Does not include seed costs.

SPRING WHEAT PROFIT, $/HA[1]

VARIETY	HY320[2]	MARSHALL[3]	OSLO[3]	WHEATON[3]	GLENLEA[4]	KATEPWA[5]
MGMT						
I	24.24	54.06	49.72	34.33	48.37	94.50
II	46.99	92.22	53.61	68.07	67.09	114.85[6]
III	25.51	66.86	16.24	57.25	57.38	117.91[6]
IV	61.83	55.88	18.57	73.74	29.90	148.40[6]
V	76.57	23.15	-9.72	56.63	-21.67	134.15[6]

1 Profit/ha does not include machinery costs or labour.
2 Canada Prairie Spring @ 81.73 / tonne
3 Canada Feed @ 76.52 / tonne
4 Canada Utility @ 90.70 / tonne
5 1CW @ 116.52 / tonne
6 1CW 13.5 @ 118.73 / tonne

SECTION 2

MINTO LARGE SCALE WINTER WHEAT TRIAL

MATERIALS AND METHODS

Norstar winter wheat was seeded September 1985, directly into standing canola stubble, at a rate of 120 kg/ha using an Amazone hoe drill. 40 kg/ha P2O5 and 20 kg/ha K2O were applied with the seed. Nitrogen was applied as 34-0-0 on the appropriate treatments on June 9 and June 27. Weeds were controlled with applications of Hoegrass at .71 kg/ha on May 26, and Estaprop at 1.02 kg/ha on June 1. The trial was conducted as a single replicate strip trial with plots 15 x 400 m. Cerone was applied to the appropriate treatments on June 17 (G.S. 45) as well as Tilt at .125 kg/ha on June 29. Plots were harvested August 6 by taking four 1m2 areas in each treatment. These samples were then threshed with a K.E.M. plot combine. Plant heights and heads/m2 counts were done at the same time. Yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and means were compared using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Plant growth regulators significantly reduced plant height while extra N had a tendency to increase plant height. There were no significant differences in heads/m2 compared to the check. Nitrogen alone did not increase yields, but when combined with fungicides yields were increased significantly. The addition of a PGR decreased yield, though not significantly, from the nitrogen and fungicide treatment, or from the untreated check. Fungicides significantly increased TKW regardless of PGR.

SUMMARY

The application of Tilt and extra nitrogen increased yield substantially compared to the lower input management.

TABLE M27: RESULTS OF 1986 MINTO LARGE SCALE WINTER WHEAT TRIAL

TREATMENT	EXTRA N	FUNG	PGR	PLANT HEIGHT CM	HEADS /M2	YIELD KG/HA	TKW GM
1	---	---	---	87 c	496 a	1798 b	20.0 c
2	*	---	---	102 a	451 ab	1777 b	21.4 bc
3	*	TILT	---	88 b	498 a	3042 a	27.7 a
4	*	TILT	TERPEL C	80 d	345 b	2331 ab	26.1 ab

Means within the same column followed by the same letter do not differ significantly at the 5% level (DMRT).

PORTAGE LARGE SCALE WINTER WHEAT TRIAL
Olli Eyvindson, Darrin Hewins - farmer cooperators

MATERIALS AND METHODS
Norstar winter wheat was planted directly into standing canola stubble on the Eyvindson farm near Portage la Prairie on September 24, 1985 at a rate of 120 kg/ha using a Haybuster side banding disc drill. Nitrogen was sidebanded at 110 kg/ha at seeding. 50 kg/ha P2O5 and 50 kg/ha K2O were applied with the seed. The field also received 30 kg/ha of N in early spring. The winter wheat stand was not very uniform due to late seeding into a wet seedbed, followed by some winterkill. Broadleaf weeds were controlled with Sabre. The trial was a single replicate strip trial with plots 12 x 800 m. Treatments included 35 kg/ha of topdressed nitrogen (34-0-0) at growth stages 31 and 49. One l/ha of Terpel C was applied at growth stage 39 and Tilt was applied at 0.5 l/ha at growth stage 51 or Dithane M-45 was applied at 2.0 kg/ha at growth stage 51 and 10 days later. Heads/m2, plant heights and grain yield samples were taken August 4. Grain yields were determined from four 1m2 areas from each treatment. These samples were air dried, then threshed with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and means were compared using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION
Treatments including plant growth regulator (Terpel C) significantly reduced plant height compared to the untreated control, while fungicide treatments had a tendency to increase height. Treatment 4 (N plus fungicide plus PGR) had significantly more heads/m2 than any other treatment except treatment 2 (N plus PGR). Extra nitrogen appears to have increased the incidence of lodging; Terpel C was not able to completely counteract the lodging caused by the nitrogen. The type of fungicide used did not affect heads/m2, but did have an effect on plant height; Dithane caused a greater plant height increase than Tilt when compared to the untreated control. There were no significant differences in yield between treatments.

SUMMARY
The relatively unthrifty stand did not allow improved yield over the yield obtained with standard management.

TABLE M28: RESULTS OF 1986 PORTAGE LARGE SCALE WINTER WHEAT TRIAL

TREATMENT	EXTRA N	FUNG	PGR	HEADS /M2	PLANT HGT CM	YIELD KG/HA	TKW GM	LODGING JULY 29 .2-9**
1	---	DITH	---	509b	112a	3661a	27.5	0.2
2	*	----	TERPEL C	649ab	84e	3421a	23.4	3.0
3	---	----	---	639b	101c	4188a	27.2	0.0
4	*	TILT	TERPEL C	798a	89d	3432a	22.6	2.0
5	---	TILT	---	615b	108b	4156a	26.1	0.2
6	*	TILT	TERPEL C	---	---	4243a	26.2	5.4
7	---	DITH2X	---	---	---	3820a	25.1	0.2

** Lodging - Belgian scale: .2 = no lodging 9 = total area flat
Means within the same column followed by the same letter are not significantly different at the 5% level (DMRT).

MINTO LARGE SCALE KATEPWA TRIAL

MATERIALS AND METHODS

Katepwa wheat was seeded near Minto, Manitoba on May 21 at a rate of 90 kg/ha using an Amazone NT375 hoe drill. Phosphate and potassium were applied with the seed at rates of 40 and 20 kg/ha respectively. Nitrogen was banded in the spring prior to seeding using NH3 at a rate of 75 kg N/ha. Weeds were controlled with an application of Hoegrass at .71 kg/ha on June 11 and with Estaprop at 1.02 kg/ha on June 16. The previous crop was winter wheat. The trial was conducted as a single replicate strip trial; plot size was 15 x 800 m. Treatments included 40 kg/ha of topdressed nitrogen (34-0-0) at growth stages 31 and 49, 1 l/ha of Terpel C applied at growth stage 37, and two applications of Dithane M-45 applied at 2.0 kg/ha at growth stage 49 (July 20) and 10 days later. Plots were harvested on August 21 by taking four 1m2 areas from each treatment. These samples were air dried and threshed with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and means were compared using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

The treatment with extra nitrogen, fungicide and PGR (Terpel C) resulted in the shortest plants, but these differed significantly only from the control. This treatment also resulted in the highest yields, significantly higher than all the other treatments. Treatments with extra nitrogen or extra nitrogen plus fungicide did not differ from the untreated control. The treatment having both nitrogen and fungicide had significantly higher TKW than any other treatment.

SUMMARY

Increased yields over the check relied on the inclusion of three of the extra inputs: nitrogen, fungicide and Terpel C.

TABLE M29: RESULTS OF 1986 MINTO LARGE SCALE KATEPWA TRIAL

TREATMENT	EXTRA N	FUNG	PGR	PLANT HGT CM	YIELD KG/HA	TKW GM
1	---	-----	---	102 a	3068 b	17.1 b
2	*	-----	---	96 b	3082 b	17.4 b
3	*	2xDITH	---	95 b	3042 b	21.6 a
4	*	2xDITH	TERPEL C	91 b	3505 a	17.7 b

Means within the same column which are followed by the same letter are not significantly different at the 5% level (DMRT).

PORTAGE LARGE SCALE KATEPWA TRIAL
Darrin Hewins - farm cooperator

MATERIALS AND METHODS
Katepwa spring wheat was seeded on the Hewins farm near Portage la Prairie, Manitoba on May 21 at a rate of 120 kg/ha using a Haybuster 2408 double disc press drill. Overall fertilizer included 70 kg/ha of 46-0-0 banded prior to seeding; 45 kg/ha P2O5, 12 kg/ha K2O, 4 kg/ha SO4 and 1 kg/ha Zn were applied with the seed. Broadleaf weeds were controlled with Sabre. The previous crop was sugar beets. The trial was conducted as a single replicate strip trial with plots 12 x 800 m. Treatments included 35 kg/ha of topdressed nitrogen (34-0-0) at growth stages 31 and 49, 1 l/ha of Terpel C at growth stage 37, and 2 applications of Dithane M-45 at 2.0 kg/ha applied at growth stage 49 and 9 days later. An exception to this occurred in treatment 3, where the second application of Dithane M-45 was applied at 3 kg/ha. Lodging was insignificant in this trial; treatment 2 was the only treatment with even a hint of lodging. Plots were harvested by taking four 1m2 areas from each treatment. These samples were air dried and threshed with a K.E.M. plot combine. Yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and treatment means were compared with a Duncan's Multiple Range Test.

RESULTS AND DISCUSSION
The triple combination (Terpel C + Dithane + N) had significantly lower yields than the double combination of Dithane and N, though both treatments had significantly higher yields than the untreated check. The increased application of Dithane in combination with Terpel C and extra N increased yields when compared to a normal application of Dithane in combination with Terpel C and extra N, but differences were not significant. Treatment 5 (Terpel C and extra N) had a significantly lower TKW than the untreated check. All other treatments did not differ from the untreated check in the TKW. The highest level of disease was found in treatment 5, probably due to extra N without a fungicide. Dithane M-45 was very effective in reducing the leaf spot disease and leaf rust. Grade difference was detected; treatment 1 graded CWB HRS #3, whereas treatment 2 graded CWB HRS #1.

SUMMARY
Higher input management helped to overcome factors limiting wheat growth, resulting in substantially improved grain yields.

TABLE M30: RESULTS OF THE 1986 PORTAGE LARGE SCALE KATEPWA TRIAL

TREATMENT	EXTRA N	FUNG	PGR	YIELD KG/HA	TKW GM	DISEASE RATING+ SPT/TSP	LEAF RUST
1	---	----	---	2659 c	35.5 a	40	1
2	*	2xDITH	---	4003 a	35.8 a	10	1
3	*	2xDITH++	TERPEL C	3485 ab	34.9 ab	1	trace
4	*	2xDITH	TERPEL C	3280 b	35.6 a	10	1
5	*	----	TERPEL C	3440 b	33.4 b	60	4

\+ % of flag leaf infected (August 4) with septoria/tanspot and leaf rust
++ second application of Dithane M-45 applied at 3.0 kg/ha instead of 2.0 kg/ha (treatment 3 only)
Means within the same column followed by the same letter are not significantly different at the 5% level according to DMRT.

MINTO LARGE SCALE HY320 TRIAL
Bryan Jackson - farmer cooperator

MATERIALS AND METHODS
HY320 semi-dwarf spring wheat was seeded on the Bryan Jackson farm near Minto, Manitoba. The field was seeded May 17, 1986 in three separate directions for a total seed rate of 165 lbs/acre using a Morris 80-14 hoe drill. Phosphate was applied at 80 kg P2O5/ha with the seed. Nitrogen was applied at 55 kg/ha using NH3 in the fall as well as 90 kg/ha of N with the seed. Broadleaf weeds were controlled using Tordon 202C. The previous crop had been a bromegrass-alfalfa hay field which had been broken the previous July and then summerfallowed. The trial was conducted as a single replicate strip trial, with plots 15 x 400 m. Treatments included 40 kg/ha of topdressed nitrogen (34-0-0) at growth stage 31 and 49, and two applications of Tilt at 0.5 l/ha applied at growth stage 51 and 71. Disease was not prevalent until after growth stage 71 (July 20). The main disease was septoria with lesser amounts of tanspot and leaf rust. Plots were harvested by taking four 1m2 areas in each treatment. These samples were air dried, then threshed with a K.E.M. plot combine. Grain yields were adjusted to 14.5% moisture. Data was analyzed at the .05 level and treatment means were compared with Duncan's Multiple Range Test.

RESULTS AND DISCUSSION
The treatments had no significant effect on plant height. All treatments including fungicides increased yields significantly. The addition of extra nitrogen had no significant effect on yield when compared to the untreated check. Treatments with extra N and fungicide, or only fungicide, had significantly higher yields than the other treatments. Treatments including fungicides had the highest TKW while the addition of N alone resulted in the lowest TKW.

SUMMARY
The application of fungicides greatly enhanced the yield of HY320. Disease observations indicate that the later application of Tilt was likely more beneficial than the early application.

TABLE M31: RESULTS OF 1986 MINTO LARGE SCALE HY320 TRIAL

TREATMENT	EXTRA N	FUNGICIDE	PLANT HEIGHT (CM)	YIELD (KG/HA)	TKW (GMS)
1	---	---	76 a	4527 b	32.7 bc
2	2 x 40 KG	---	76 a	4360 b	31.6 c
3	---	2x TILT	79 a	5665 a	36.7 ab
4	2 x 40 KG	2x TILT	77 a	5793 a	38.1 a

Means followed by the same letter are not significantly different at the 5% level (DMRT).

SECTION 3

LOCATION DESCRIPTION MINTO, MANITOBA
1986

WEATHER SUMMARY

TEMPERATURE (C)	APRIL	MAY	JUNE	JULY	AUGUST	SEPT
1986 AVE.	6.1	14.3	18.0	19.6	17.2	11.5
95 YR AVE.	3.1	10.5	15.2	18.7	17.3	11.5
DIFFERENCE	+3C	+3.8C	+2.8C	+0.9C	-0.1C	0C

PRECIP. (mm)	APRIL	MAY	JUNE	JULY	AUGUST	SEPT
1986 TOTAL	48.3	57.4	47.5	106.4	26.4	45.5
95 YR AVE.	30.6	48.6	79.4	70.8	64.4	47.1
% OF AVE.	158%	118%	60%	150%	41%	97%

SOIL FERTILITY:	KG/HA			
	0-60 CM NO3	0-15 CM P2O5	0-60 CM K2O	0-60 CM SO4
WINTER WHEAT (TESTED FALL 1985)	41	21	581	162+
SPRING WHEAT (TESTED SPRING 1986)	41	16	585	162+

SOIL TYPE: RYERSON CLAY LOAM - 38% SAND, 57% SILT, 5% CLAY
pH 7.8
O.M. 5.5

SOIL CAPABILITY FOR AGRICULTURE: CLASS 2 - soils in this class have moderate limitiations that restrict the range of crops or require moderate conservation practises (CANADA LAND INVENTORY).

1986 EXTENSION ACTIVITY

FIELD DAYS

Intensive Wheat Management Tour, July 10
attendance 75 - producers from Manitoba, North Dakota and Saskatchewan.
University of Manitoba - Agricultural Diploma Student Tour, July 16
attendance 65
Weed Tour (Expert Committee on Weeds), July 18
attendence 30

Special Visitor Tours

BASF Marketing Executives, German and Canadian, July 21
attendance 9
Jim Beaton, Phoshpate and Potash Institute of Canada, July 22
John Harapaik, Western Cooperative Fertilizers Limited, July 25
Rigas Karamanos,Esso Chemicals, July
Carl Stewart, Agriculture Canada, July
Pierre Migner,Coop de Federee,July
Felix Mederick,Alberta Agriculture, July
Agri-food Executive Tour, September 4
attendance 25
BASF Research Scientists,German and Canadian, various times
attendance 8

MEETINGS AND PRESENTATIONS

1986 BASF Canada Inc. Technical Exchange Seminar Limburgerhof, West Germany, March 1986, attendance 30
Intensive Management of Wheat in Western Canada ,Canada Grains Council - Annual Meeting, Winnipeg, Manitoba, April 1986, Intensive Wheat Management Update, attendance 200+
Expert Committee on Weeds - Research and Appraisal Meeting
1. "Winter Wheat Production"
2. Summary of 1986 Plant Growth Regulator Research in Western Canada. Saskatoon, Saskatchewan, November 25-27, 1986, attendance 200
Manitoba - North Dakota Zero Till Workshop, "Intensive Winter Wheat Management" Regina, Saskatchewan, January 22-23, 1987, expected attendance 1000
Union Carbide - "Small Grains Management Seminar"
Review of Plant Growth Regulator Activity on Winter Wheat in Manitoba
Banff, Alberta, February 11-13, 1987, expected attendance 60
Canada Grains Council Review of Results - Intensive Wheat Management
Winnipeg, Manitoba, January 27, 1987, expected attendance 25

PAPERS

Rourke, D. 1986, Intensive Culture of Wheat - Update on Council Project. Canada Grains Council, Annual Meeting, April 1986, Winnipeg, Manitoba.

Rourke, D. 1986, Intensive Management of Wheat in Western Canada. 1986 BASF Canada Inc. Technical Exchange Seminar, March 1986, Limburgerhof, West Germany.

Rourke, D. 1986, Winter Wheat Production, Expert Committee on Weeds - technical session. Saskatoon, Saskatchewan, November 1986.

Rourke, D. and R. Doell, 1987, Intensive Winter Wheat Management, proceedings of Manitoba-North Dakota Zero Till Workshop. Regina, Saskatchewan, January 22-23, 1987.

Rourke, D. and R. Doell, 1987, ICM Wheat Production - Disease Control. Elevator Manager Magazine, A.I.S. Publishing, Toronto, Ontario.

Rourke, D. and R. Doell, 1987, Review of Plant Growth Regulator Activity on Winter Wheat in Manitoba, proceedings of Union Carbide Small Grains Management Seminar. Banff, Alberta, Feb. 11-13, 1987.

Rourke, D. and R. Doell, 1986, submissions to Expert Committee on Weeds, Research Report (Plant Growth Regulator section). 9 abstracts.

Rourke, D. and R. Doell, 1986, submissions to Expert Committee on Pesticide Use in Agriculture, Research Report (Plant Disease section). 3 abstracts.

PART 3

QUEBEC

Technical Services
Cooperative Federee de Quebec

Personnel: P. Migner, Manager

EXECUTIVE SUMMARY OF 1986 RESULTS, QUEBEC

Results for 1986 will be discussed briefly under the headings of PGR's, fertility, fungicides, seeding rate and cultivar. Trials of winter wheat established in the fall of 1985 were flooded in the spring of 1986 and had to be relocated in the spring. Spring wheat trials were successfully established and yields as high as 7-8 tonnes/ha were achieved.

PLANT GROWTH REGULATORS

All PGR's tested on Max spring wheat reduced plant height and lodging. Greatest reductions occurred with the use of Terpel C at Zadoks 39-43. PGR's causing the greatest height reductions also reduced TKW's. All PGR's tested reduced yield, with the exception of Cerone which resulted in a non-significant yield increase when compared to the untreated check. On Monopol winter wheat, all PGR's tested reduced height from 4 to 7 cm, though these differences were not always significant. PGR's had no significant effect on yield of Monopol. There were no PGR x fertility interactions for winter or spring wheat.

FERTILITY

Increasing the N applied from 0 to 180 kg/ha on Max spring wheat resulted in yield increases of up to 2300 kg/ha. An increase in lodging also resulted. High levels of N also delayed maturity and increased protein content. Source of nitrogen (urea or ammonium nitrate) had no effect on yield. Application of N as a single or split applications also made no difference.

Monopol winter wheat showed no increases in yield when N applied increased from 120 to 220 kg/ha possibly due to high levels of soil nitrogen. TKW was decreased as a result of the higher nitrogen levels.

FUNGICIDES

Increases in yield of up to 1200 kg/ha in Max wheat were observed when fungicides were used. Yield increases were at least partly due to increases in TKW. Single applications of fungicide at Zadoks 25 were not as effective as split applications at Zadoks 30 and Zadoks 45 or 50, regardless of fungicide used. Measureable decreases in the level of septoria and rusts as well as decreased lodging due to strong plants resulted from fungicide application. Yield increases in Max were not always obtained with fungicides though disease control and increases in TKW did result in all instances.

Monopol winter wheat responded to applied fungicide with yield increases of up to 1600 kg/ha. As with spring wheat, 2 applications were more effective than a single application. Lodging was also decreased and TKW increased as a result of applied fungicides.

SEEDING RATE

The effects of increased seeding rates on the yield of Max wheat were quite variable between experiments. In one use, yield increases of up to 1400 kg/ha were obtained with the higher seeding rate. Days to maturity and grain protein were both reduced as well. In another instance, increasing the seeding rate from 300 to 550 seeds/m2 had no significant effect on yield, protein or lodging of Max wheat.

CULTIVARS

Of the two spring wheat cultivars tested, Casavant was the highest yielding under conventional management, while under ICM, Max and Casavant were similar in yield. In the winter wheat large scale trials, Monopol yielded more than Absolvent under all managements.

Cadette was the highest yielding barley cultivar tested under both conventional management and ICM.

ECONOMICS

Large scale spring wheat trials on three farms showed economic returns ranging from $9.19/ha for applications of PGR to $53.08/ha for fungicide applications. On winter wheat results were variable, ranging from no economic return to a high return of 73.21/ha for fungicide application.

Section 1

Spring wheat, small scale trials

COOP-Ø1 - Cultivar * management

Objective: To determine the effect of management practices on cultivars of spring wheat and spring barley

Treatment list

FACTOR A

MANAGEMENT

	CONVENTIONAL	
	wheat	barley
SEEDING RATE	6Ø seeds / m (3ØØ pl / m2)	47 seeds / m (235 pl / m2)
ROW WIDTH	12 cm	12 cm
FERTILITY		
ZGS Ø	131-59-133	1Ø5-58-151
ZGS 3Ø		
ZGS 5Ø		
FUNGICIDES		
ZGS 24	none	none
ZGS 55		
PGR		
ZGS 24	none	none
ZGS 37		
HERBICIDES		
ZGS 21	Pardner/ Hoe-Grass	Pardner/ Hoe-Grass

ICM

	wheat	barley
SEEDING RATE	85 seeds / m (425 pl / m2)	70 seeds / m (350 pl / m2)
ROW WIDTH	12 cm	12 cm
FERTILITY		150-80-210
before seeding		
ZGS 0	50-83-186	50-81-211
ZGS 30	80-0-0 (urea)	100-0-0 (urea)
ZGS 50	50-0-0 (a nitr)	
FUNGICIDES		
ZGS 24	Tilt	Tilt
ZGS 55	Tilt/Bravo	Tilt/Bravo
PGR		
ZGS 24	Cycocel	
ZGS 37		Cerone
HERBICIDES ZGS 21	Pardner/ Hoe-Grass	Pardner/ Hoe-Grass

Tilt (Propiconazole 490 gr/l)	: 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l)	: 1.75 l/ha
Cycocel (Chlormequat chloride 480 gr/l)	: 1 l/ha
Cerone (Etephon 480 gr/l)	: 1 l/ha
Pardner (Bromoxynil 280 gr/l)	: 1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	: 2.5 l/ha
Dithane M-45 (Mancozeb 80%)	: 2.25 kg/ha
Bayleton (triadimefon 50%)	: 450 gr/ha

FACTOR B

CULTIVAR

1- CASAVANT
2- MAX
3- BIRKA
4- OCF-81-248
5- BT-914
6- OC-83-1190
7- OC-83-1219
8- CADETTE

1986 EXTENSION ACTIVITY

FIELD DAYS

Intensive Wheat Management Tour, July 10
attendance 75 - producers from Manitoba, North Dakota and Saskatchewan.
University of Manitoba - Agricultural Diploma Student Tour, July 16
attendance 65
Weed Tour (Expert Committee on Weeds), July 18
attendence 30

Special Visitor Tours

BASF Marketing Executives, German and Canadian, July 21
attendance 9
Jim Beaton, Phoshpate and Potash Institute of Canada, July 22
John Harapaik, Western Cooperative Fertilizers Limited, July 25
Rigas Karamanos,Esso Chemicals, July
Carl Stewart, Agriculture Canada, July
Pierre Migner,Coop de Federee,July
Felix Mederick,Alberta Agriculture, July
Agri-food Executive Tour, September 4
attendance 25
BASF Research Scientists,German and Canadian, various times
attendance 8

MEETINGS AND PRESENTATIONS

1986 BASF Canada Inc. Technical Exchange Seminar Limburgerhof, West Germany, March 1986, attendance 30
Intensive Management of Wheat in Western Canada ,Canada Grains Council - Annual Meeting, Winnipeg, Manitoba, April 1986, Intensive Wheat Management Update, attendance 200+
Expert Committee on Weeds - Research and Appraisal Meeting
1. "Winter Wheat Production"
2. Summary of 1986 Plant Growth Regulator Research in Western Canada.
Saskatoon, Saskatchewan, November 25-27, 1986, attendance 200
Manitoba - North Dakota Zero Till Workshop, "Intensive Winter Wheat Management" Regina, Saskatchewan, January 22-23, 1987, expected attendance 1000
Union Carbide - "Small Grains Management Seminar"
Review of Plant Growth Regulator Activity on Winter Wheat in Manitoba
Banff, Alberta, February 11-13, 1987, expected attendance 60
Canada Grains Council Review of Results - Intensive Wheat Management
Winnipeg, Manitoba, January 27, 1987, expected attendance 25

PAPERS

Rourke, D. 1986, Intensive Culture of Wheat - Update on Council Project. Canada Grains Council, Annual Meeting, April 1986, Winnipeg, Manitoba.

Rourke, D. 1986, Intensive Management of Wheat in Western Canada. 1986 BASF Canada Inc. Technical Exchange Seminar, March 1986, Limburgerhof, West Germany.

Rourke, D. 1986, Winter Wheat Production, Expert Committee on Weeds - technical session. Saskatoon, Saskatchewan, November 1986.

Rourke, D. and R. Doell, 1987, Intensive Winter Wheat Management, proceedings of Manitoba-North Dakota Zero Till Workshop. Regina, Saskatchewan, January 22-23, 1987.

Rourke, D. and R. Doell, 1987, ICM Wheat Production - Disease Control. Elevator Manager Magazine, A.I.S. Publishing, Toronto, Ontario.

Rourke, D. and R. Doell, 1987, Review of Plant Growth Regulator Activity on Winter Wheat in Manitoba, proceedings of Union Carbide Small Grains Management Seminar. Banff, Alberta, Feb. 11-13, 1987.

Rourke, D. and R. Doell, 1986, submissions to Expert Committee on Weeds, Research Report (Plant Growth Regulator section). 9 abstracts.

Rourke, D. and R. Doell, 1986, submissions to Expert Committee on Pesticide Use in Agriculture, Research Report (Plant Disease section). 3 abstracts.

PART 3

QUEBEC

Technical Services
Cooperative Federee de Quebec

Personnel: P. Migner, Manager

EXECUTIVE SUMMARY OF 1986 RESULTS, QUEBEC

Results for 1986 will be discussed briefly under the headings of PGR's, fertility, fungicides, seeding rate and cultivar. Trials of winter wheat established in the fall of 1985 were flooded in the spring of 1986 and had to be relocated in the spring. Spring wheat trials were successfully established and yields as high as 7-8 tonnes/ha were achieved.

PLANT GROWTH REGULATORS

All PGR's tested on Max spring wheat reduced plant height and lodging. Greatest reductions occurred with the use of Terpel C at Zadoks 39-43. PGR's causing the greatest height reductions also reduced TKW's. All PGR's tested reduced yield, with the exception of Cerone which resulted in a non-significant yield increase when compared to the untreated check. On Monopol winter wheat, all PGR's tested reduced height from 4 to 7 cm, though these differences were not always significant. PGR's had no significant effect on yield of Monopol. There were no PGR x fertility interactions for winter or spring wheat.

FERTILITY

Increasing the N applied from 0 to 180 kg/ha on Max spring wheat resulted in yield increases of up to 2300 kg/ha. An increase in lodging also resulted. High levels of N also delayed maturity and increased protein content. Source of nitrogen (urea or ammonium nitrate) had no effect on yield. Application of N as a single or split applications also made no difference.

Monopol winter wheat showed no increases in yield when N applied increased from 120 to 220 kg/ha possibly due to high levels of soil nitrogen. TKW was decreased as a result of the higher nitrogen levels.

FUNGICIDES

Increases in yield of up to 1200 kg/ha in Max wheat were observed when fungicides were used. Yield increases were at least partly due to increases in TKW. Single applications of fungicide at Zadoks 25 were not as effective as split applications at Zadoks 30 and Zadoks 45 or 50, regardless of fungicide used. Measureable decreases in the level of septoria and rusts as well as decreased lodging due to strong plants resulted from fungicide application. Yield increases in Max were not always obtained with fungicides though disease control and increases in TKW did result in all instances.

Monopol winter wheat responded to applied fungicide with yield increases of up to 1600 kg/ha. As with spring wheat, 2 applications were more effective than a single application. Lodging was also decreased and TKW increased as a result of applied fungicides.

SEEDING RATE

The effects of increased seeding rates on the yield of Max wheat were quite variable between experiments. In one use, yield increases of up to 1400 kg/ha were obtained with the higher seeding rate. Days to maturity and grain protein were both reduced as well. In another instance, increasing the seeding rate from 300 to 550 seeds/m2 had no significant effect on yield, protein or lodging of Max wheat.

CULTIVARS

Of the two spring wheat cultivars tested, Casavant was the highest yielding under conventional management, while under ICM, Max and Casavant were similar in yield. In the winter wheat large scale trials, Monopol yielded more than Absolvent under all managements.

Cadette was the highest yielding barley cultivar tested under both conventional management and ICM.

ECONOMICS

Large scale spring wheat trials on three farms showed economic returns ranging from $9.19/ha for applications of PGR to $53.08/ha for fungicide applications. On winter wheat results were variable, ranging from no economic return to a high return of 73.21/ha for fungicide application.

Section 1

Spring wheat, small scale trials

COOP-01 - Cultivar * management

Objective: To determine the effect of management practices on cultivars of spring wheat and spring barley

Treatment list

FACTOR A

MANAGEMENT

CONVENTIONAL

	wheat	barley
SEEDING RATE	60 seeds / m (300 pl / m2)	47 seeds / m (235 pl / m2)
ROW WIDTH	12 cm	12 cm
FERTILITY		
ZGS 0	131-59-133	105-58-151
ZGS 30		
ZGS 50		
FUNGICIDES		
ZGS 24	none	none
ZGS 55		
PGR		
ZGS 24	none	none
ZGS 37		
HERBICIDES		
ZGS 21	Pardner/ Hoe-Grass	Pardner/ Hoe-Grass

ICM

	wheat	barley
SEEDING RATE	85 seeds / m (425 pl / m2)	70 seeds / m (350 pl / m2)
ROW WIDTH	12 cm	12 cm
FERTILITY		150-80-210
before seeding		
ZGS 0	50-83-186	50-81-211
ZGS 30	80-0-0 (urea)	100-0-0 (urea)
ZGS 50	50-0-0 (a nitr)	
FUNGICIDES		
ZGS 24	Tilt	Tilt
ZGS 55	Tilt/Bravo	Tilt/Bravo
PGR		
ZGS 24	Cycocel	
ZGS 37		Cerone
HERBICIDES ZGS 21	Pardner/ Hoe-Grass	Pardner/ Hoe-Grass

Tilt (Propiconazole 490 gr/l)	: 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l)	: 1.75 l/ha
Cycocel (Chlormequat chloride 480 gr/l)	: 1 l/ha
Cerone (Etephon 480 gr/l)	: 1 l/ha
Pardner (Bromoxynil 280 gr/l)	: 1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	: 2.5 l/ha
Dithane M-45 (Mancozeb 80%)	: 2.25 kg/ha
Bayleton (triadimefon 50%)	: 450 gr/ha

FACTOR B

CULTIVAR

1- CASAVANT
2- MAX
3- BIRKA
4- OCF-81-248
5- BT-914
6- OC-83-1190
7- OC-83-1219
8- CADETTE

MATERIALS AND METHODS

Two cultivars of spring wheat and six cultivars of spring barley, namely Casavant and Max for the wheats, and Birka, OCF-81-248, BT-914, OC-83-1190, OC-83-1219 and Cadette for the barleys were seeded on May 4 1986, in La Présentation, Québec . The plots were seeded with a Kincaid disk drill, on 12 cm row spacing. The seeding rates used were:

- -Spring wheat under conventional management : 60 seeds/meter
- -Spring wheat under ICM : 85 seeds/meter
- -Spring barley under conventional management: 47 seeds/meter
- -Spring barley under ICM : 70 seeds/meter

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results showed a pH of 6.7, 364 kg/ha P, 585 kg/ha K, 663 kg/ha Mg, 3910 kg/ha Ca; the cation exchange capacity of the soil was of 14.8 meq/gr. In the conventional management plots, we applied prior to seeding (05/02/86), 131 kg/ha of N, 59 kg/ha of P_2O_5 and 133 kg/ha of K_2O for wheat and 105 kg/ha of N, 58 kg/ha of P_2O_5 and 151 kg/ha of K_2O. For the ICM plots, we applied at ZGS 0 (05/09/86) 50 kg/ha of N, 83 kg/ha of P_2O_5 and 185 kg/ha of K_2O for wheat and 50 kg/ha of N, 80 kg/ha of P_2O_5 and 210 kg/ha of K_2O. This fertilizer was broadcast and incorporated , using a mixture of 46-0-0, 18-46-0 and 0-0-60. The ICM plots received additional nitrogen, 80 kg/ha for the wheat and 100 for the barley at ZGS 30 (06/11/86), using urea and 50 kg/ha at ZGS 50 (06/30/86) for the wheat using ammonium nitrate.

Weeds were controlled with an application of Pardner and Hoegrass at rates of 1.2 l/ha and 2.5 l/ha respectively on may 25th (ZGS 21-23). The ICM plots also received applications of Tilt at a rate of .127 kg a.i./ha at ZGS 23-24 (may 29) and applications of Tilt at a rate of .125 kg a.i./ha and Bravo at a rate of .875 kg a.i./ha at ZGS 55 (july 6). To control lodging, Cycocel was applied on wheat at a rate of 1 l/ha on may 29 (ZGS 23-24). On barley, Cerone was applied at the rate of .48 kg a.i./ha on june 22. All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

Main plot size (management) was 5.5 * 8 m. and sub plot size was 5.5 * 1 m.. All treatments were replicated 4 times in a split block design. The statistical analysis was done using the SAS system from the SAS Institute inc.

RESULTS AND DISCUSSION

VARIETY:

Over both managements, Casavant, for wheat, and Cadette, for barley, yielded the most. The differences were not significant in wheat, but were highly significant in barley with Cadette significantly different from OC-83-1219 and OC-83-1190, these two cultivars being significantly different from the last three which were Birka, BT-914 and OCF-81-248. Thousand kernel weight was significantly different between Casavant and Max for the wheats and between OCF-81-248 and the others. Hectoliter weight was significantly different between Max and Casavant while Birka and OCF-81-248 were significantly different from the other barleys. Heading date was significantly different between Casavant and Max; the difference between BT-914, OCF-81-248 and the other varieties of barley was significant. There was no significant differences in plant stands between varieties within one species. Maturity ratings showed that Casavant matured later than Max and that Birka, OCF-81-248 and BT-914 all matured earlier than Cadette, OC-83-1190 and OC-83-1219. There was no significant difference in protein levels in wheat; the protein level for Cadette and OC-83-1219 was significantly lower than for the other varieties of barley.

MANAGEMENT:

The effect of management was not significant for wheat but was significant for barley. The varieties that responded the most to ICM were OC-83-1190 and OC-83-1219; this is due to their long straw and their tendency to lodge. There was significant differences in plant stand; this is due to differences in seeding rates. Germination of the seeds varied with the cultivars from 71% to 90%. Thousand kernel weight was affected significantly by management; except for Max and Cadette, the ICM management program reduced the TKW. It is suspected that the plant growth regulator may have affected negatively the TKW for those varieties. While management did not affect the level of protein in the barley cultivars, it increased significantly the levle of protein in the two wheat varieties.

Table Q-01. Summary of results of trial Coop-01.

	YIELD (KG/HA)	HL WT (KG/HL)	TKW (GR)	HEADING (DAYS)	MATURITY (DAYS)	PROTEIN (%)
MANAGEMENT EFFECT						
ICM	6211	63.7	37.3	45.7	88	11.2
CONVENTIONAL	5916	65	38.8	46.2	86.7	10.7
CULTIVAR EFFECT						
CASAVANT	6251	70.4	38.4	52.2	95.8	13.0
MAX	5719	73.1	33.0	48.4	93.5	13.4
BIRKA	5490	64.8	38.1	46.8	84.9	10.2
OCF-81-248	5275	63.7	34.7	41.0	83.4	10.6
BT-914	5655	61.7	39.7	38.8	82.5	10.7
OC-83-1190	6130	60.5	40.3	47.0	86.1	10.4
OC-83-1219	6455	60.6	40.2	47.0	86.2	9.9
CADETTE	7142	59.6	40.0	46.5	86.7	9.4
MANAGEMENT	ns	ns	*	*	ns	ns
CULTIVARS	*	**	**	**	**	**
MAN * CULT	ns	ns	**	ns	ns	**
C.V.	16.0	1.55	4.06	1.33	1.70	4.38

Table Q-02. Results of trial Coop-01

		YIELD (KG/HA)	DENSITY (KG/HL)		TKW (GR)		PLANTS/ M2
1	CASAVANT	6069	69.55	c	38.1	cd	304
9	CASAVANT	6433	71.175	b	38.75	bc	216
2	MAX	6086	72.875	a	34.25	e	344
10	MAX	5351	73.325	a	31.7	f	288
3	BIRKA	5391	64.275	de	36.3	d	272
11	BIRKA	5588	65.425	d	39.85	abc	240
4	OCF-81-248	5593	62.925	ef	32.725	ef	280
12	OCF-81-248	4956	64.4	d	36.625	d	200
5	BT-914	5794	61.05	g	38.15	cd	264
13	BT-914	5517	62.375	fg	41.25	a	200
6	OC-83-1190	6637	59.775	hi	39.375	abc	256
14	OC-83-1190	5624	61.275	g	41.275	a	208
7	OC-83-1219	6836	59.275	i	39.725	abc	240
15	OC-83-1219	6074	62	fg	40.77	ab	216
8	CADETTE	7234	59.5	i	40.025	abc	200
16	CADETTE	7051	59.675	hi	39.95	abc	150
		n.s.	**		**		
	LSD (.05)	2218.3	1.4531		2.0363		
	COEFF. OF VAR.	16.04	1.7799		4.0841		

Table Q-03. Results of trial Coop-01 (cont.)

	HEADING (DAYS)		MATURITY (DAYS)		PROTEIN (%)	
1 CASAVANT	51.5	b	96	a	13.55	a
9 CASAVANT	53	a	95.5	ab	12.4	b
2 MAX	48	c	93.75	bc	14.05	a
10 MAX	48.75	c	93.25	c	12.775	b
3 BIRKA	46.75	d	85.5	def	10.3	def
11 BIRKA	46.75	d	84.25	fg	10.125	defg
4 OCF-81-248	41	e	84.5	ef	10.575	cde
12 OCF-81-248	41	e	82.25	gh	10.725	cd
5 BT-914	38.25	g	84.25	ef	11.125	d
13 BT-914	39.25	f	80.75	h	10.325	def
6 OC-83-1190	47	d	86.5	ed	10.2	def
14 OC-83-1190	47	d	85.75	def	10.525	cde
7 OC-83-1219	47	d	86.75	d	9.775	fgh
15 OC-83-1219	47	d	85.75	def	10.05	efg
8 CADETTE	46.25	d	86.75	d	9.55	gh
16 CADETTE	46.75	d	86.66	d	9.175	h
	**		**		**	
LSD (.05)	.76114		2.0796		.63479	
COEFF. OF VAR.	1.3108		1.8385		4.4472	

* = significant at the .05 level
** = significant at the .01 level

Treatments 1 to 8 were under ICM
Treatments 9 to 16 were under conventional management

Section 1

Spring wheat, small scale trials

COOP-02- Population * Fungicides

Objective: To determine the effect of different populations and different fungicides on Max spring wheat

Treatment list

FACTOR A

POPULATION

1- 300 seeds / M^2
2- 425 seeds / M^2
3- 550 seeds / M^2

FACTOR B

FUNGICIDES

1- CHECK
2- BAYLETON (ZGS 21)
3- BAYLETON (ZGS 30) / TILT-BRAVO (ZGS 45)
4- TILT (ZGS 31) / TILT (ZGS 55)
5- TILT (ZGS 25) / TILT-BRAVO (ZGS 45)

COMMON TREATMENTS

SEEDING RATE	VARIABLE
ROW WIDTH	12 cm
FERTILITY before seeding	
ZGS 0	50-83-186
ZGS 30	80-0-0 (urea)
ZGS 50	50-0-0 (a nitr)
FUNGICIDES	VARIABLE
PGR ZGS 24	Cycocel
HERBICIDES ZGS 21	Pardner/ Hoe-Grass

Tilt (Propiconazole 490 gr/l) : 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l) : 1.75 l/ha
Cycocel (Chlormequat chloride 480 gr/l) : 1 l/ha

Pardner (Bromoxynil 280 gr/l)	:	1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	:	2.5 l/ha
Dithane M-45 (Mancozeb 80%)	:	2.25 kg/ha
Bayleton (triadimefon 50%)	:	450 gr/ha
Cerone (Etephon 480 gr/l)	:	1 l/ha

MATERIALS AND METHODS

Spring wheat Max was seeded on May 4 1986, in La Présentation, Québec . The plots were seeded with a Kincaid disk drill, on 12 cm row spacing. The seeding rates used were:

1- 300 seeds / M^2
2- 425 seeds / M^2
3- 550 seeds / M^2

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results showed a pH of 6.7, 364 kg/ha P, 585 kg/ha K, 663 kg/ha Mg, 3910 kg/ha Ca; the cation exchange capacity of the soil was of 14.8 meq/gr. We applied at ZGS 0 (05/09/86) 50 kg/ha of N, 83 kg/ha of P_2O_5 and 185 kg/ha of K_2O. This fertilizer was broadcast and incorporated , using a mixture of 46-0-0, 18-46-0 and 0-0-60. The plots received additional nitrogen, 80 kg/ha for the wheat using urea and 50 kg/ha at ZGS 50 (06/30/86) using ammonium nitrate.

Weeds were controlled with an application of Pardner and Hoegrass at rates of 1.2 l/ha and 2.5 l/ha respectively on may 25th (ZGS 21-23). To control lodging, Cycocel was applied at a rate of 1 l/ha on may 29 (ZGS 23-24). All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

Main plot size (population) was 5.5 * 5 m. and sub plot size was 5.5 * 1 m.. All treatments were replicated 4 times in a split block design. The statistical analysis was done using the SAS system from the SAS Institute inc.

RESULTS AND DISCUSSION

POPULATION:

The effect of population was significant, with all levels significantly different from each other. The observed number of plants/m^2 were:

- -300 seeds/m^2 --> 248 plants/m^2
- -425 seeds/m^2 --> 312 plants/m^2
- -550 seeds/m^2 --> 384 plants/m^2

As we increased the population to 550 seeds/m^2, yields increased to reach 7737 kg/ha. Increasing the population showed no significant effect on the hectoliter weight and on the thousand kernel weight. As the population decreased, heading and maturity were delayed significantly. This is probably due to a decrease in available nitrogen per plant as the population increased. The same reason should apply to the significant decrease in protein as the population increased; the protein level for populations 2 and 3 (425 and 550 seeds/m^2) was significantly lower than the protein level for population 1 (300 seeds/m^2). Lodging did not increase significantly with an increase in population. The increase in the populations had no significant effect on disease control.

FUNGICIDES:

The fungicides had a significant effect on yield, hectoliter weight, thousand kernel weight, maturity, lodging and control of two diseases, septoria and rust. Treatments 3, 4 and 5 were significantly better than treatments 1 and 2 on yield; the yield increased by almost 1000 kg/ha. The hectoliter weight increased by 1.28 kg and the thousand kernel weight increased from 30.5 gr. from treatment 1, to 32 gr. for treatment 2, to 33.6 gr for treatments 3,4 and 5. These results are explained by the fact that the disease pressure that we had in 1986 was mostly septoria and that it affects mainly the quality of the kernel. Maturity was delayed with the application of fungicides as the plants remained healthier and alive for a longer period of time. Lodging decreased with the application of fungicides as the plants remained healthier and stronger. Diseases were controlled significantly with the fungicides; the ratings for septoria decreased from 8.04 to 6.42 with treatments 3, 4 and 5 significantly better than the other treatments. The ratings for rust also decreased significantly from 7.13 to 6.25 with treatments 3, 4 and 5 significantly better than treatments 1 and 2.

Table Q-04. Results of trial Coop-02

PLANT DENSITY	FUNG TREATMENT	YIELD (kg/ha)	DENS (Kg/hl)	TKW (gr)	HEADING (days)	MAT (days)	PROT (%)	LODG (1-9)
	1 +	6641	70.55	30.05	51.25	94.00	13.70	2.25
	2 +	7031	70.58	31.82	50.25	92.75	13.60	2.00
300 SEEDS/M2	3 +	7081	71.80	33.62	51.00	95.75	14.25	.75
	4 +	7620	72.05	33.50	51.00	95.50	14.53	1.00
	5 +	7600	71.35	33.00	51.25	95.25	13.70	1.25
	1 +	6785	70.38	30.48	50.50	93.50	13.40	2.00
	2 +	6703	71.10	31.93	49.50	92.75	13.30	2.00
425 SEEDS/M2	3 +	7973	72.55	34.15	49.75	94.75	13.30	.75
	4 +	8004	71.97	34.67	50.00	94.25	13.55	.75
	5 +	7952	72.25	33.50	50.25	94.25	13.45	.75
	1 +	7149	70.70	30.98	49.25	92.00	13.45	2.25
	2 +	7189	71.72	32.25	49.25	92.50	13.22	1.25
550 SEEDS/M2	3 +	8406	72.52	33.90	49.50	93.75	13.75	1.00
	4 +	8093	72.62	33.08	49.25	91.50	13.45	.50
	5 +	7851	72.00	33.55	49.50	93.50	13.75	1.50
Population		*	ns	ns	**	*	**	ns
Fungicides		**	**	**	ns	**	ns	**
Pop * fungicides		ns	ns	ns	ns	ns	ns	ns
Coeff of var.		4.77	1.06	3.27	1.39	1.57	3.20	42.73

Table Q-05. Results of trial Coop-02 (cont.)

		Rust	septoria
	1 +	7.13	7.63
	2 +	7.25	7.13
300 SEEDS/M2	3 +	6.00	5.88
	4 +	6.13	6.63
	5 +	6.63	6.25
	1 +	7.13	8.63
	2 +	7.25	7.88
425 SEEDS/M2	3 +	6.75	6.50
	4 +	6.63	6.75
	5 +	6.00	6.25
	1 +	7.13	7.88
	2 +	7.25	7.50
550 SEEDS/M2	3 +	6.25	6.50
	4 +	6.63	6.88
	5 +	6.13	6.75
Population		ns	ns
Fungicides		**	**
Pop * fungicides		ns	ns

Section 1

Spring wheat, small scale trials

COOP-03 - Fungicide * fertility

Objective: To determine the effect of fungicides and fertility programs on spring wheat Max

Treatment list

FACTOR A

FUNGICIDES

1- CHECK
2- DITHANE M-45 (ZGS 47 AND 7 DAYS LATER)
3- BAYLETON (ZGS 30) / TILT-BRAVO (ZGS 45)
4- TILT (ZGS 31) / TILT (ZGS 55)
5- TILT (ZGS 25) / TILT-BRAVO (ZGS 45)

FACTOR B

FERTILITY

	SEEDING	ZGS 30	ZGS 45	TOTAL
1-	36	48	36	120
2-	45	60	45	150
3-	54	72	54	180
4-	0	0	0	0

COMMON TREATMENTS

SEEDING RATE	85 seeds / M (425 pl / m2)
ROW WIDTH	12 cm
FERTILITY nitrogen	N-83-185 VARIABLE
FUNGICIDES	VARIABLE
PGR ZGS 24	Cycocel
HERBICIDES ZGS 21	Pardner/ Hoe-Grass

Tilt (Propiconazole 490 gr/l)	: 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l)	: 1.75 l/ha
Cycocel (Chlormequat chloride 480 gr/l)	: 1 l/ha

Pardner (Bromoxynil 280 gr/l)	:	1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	:	2.5 l/ha
Dithane M-45 (Mancozeb 80%)	:	2.25 kg/ha
Bayleton (triadimefon 50%)	:	450 gr/ha

MATERIALS AND METHODS

Spring wheat Max was seeded on May 4 1986, in La Présentation, Québec . The plots were seeded with a Kincaid disk drill, on 12 cm row spacing. The seeding rate used was 85 seeds/meter or 425 seeds/m². The established population was 312 plants/m².

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results showed a pH of 6.7, 364 kg/ha P, 585 kg/ha K, 663 kg/ha Mg, 3910 kg/ha Ca; the cation exchange capacity of the soil was of 14.8 meq/gr. We applied prior to seeding (05/02/86), 59 kg/ha of P_2O_5 and 133 kg/ha of K_2O. The fertilizer was broadcast and incorporated , using a mixture of 18-46-0 and 0-0-60. The plots received the following additional nitrogen:

	SEEDING	ZGS 30	ZGS 45	TOTAL
1-	36	48	36	120
2-	45	60	45	150
3-	54	72	54	180
4-	0	0	0	0

The first and second applications (seeding and ZGS 30) were done with urea (46-0-0) and the last application was done with ammonium nitrate (34-0-0). The application at stage 30 was done on june 11 while the application at stage 47 was done on june 30.

The fungicides were applied with the following schedule:

1- Check
2- Dithane M-45 (ZGS 47 and 7 days later)
3- Bayleton (ZGS 30) / Tilt-Bravo (ZGS 45)
4- Tilt (ZGS 31) / Tilt (ZGS 55)
5- Tilt (ZGS 25) / Tilt-Bravo (ZGS 45)

Treatment 2 was applied at stage 47 (july 1). Treatment 3 was applied at stages 35 (june 19) and 47 (july 1). Treatment 4 was applied at stages 35 (june 19) and 53 (july 4). Treatment 5 was applied at stages 24 (june 3) and 47 (july 1).

Weeds were controlled with an application of Pardner and Hoegrass at rates of 1.2 l/ha and 2.5 l/ha respectively on may 25th (ZGS 21-23). To control lodging, Cycocel was applied at a rate of 1 l/ha on june 3 (ZGS 24). All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

Main plot size (fungicides) was 5.5 * 4 m. and sub plot size was 5.5 * 1 m.. All treatments were replicated 4 times in a split block design. The statistical analysis was done using the SAS system from the SAS Institute inc.

RESULTS AND DISCUSSION

Fungicides:

The fungicides had no significant effect on yield, hectoliter weight, protein and lodging. The fungicides had a significant effect on the thousand kernel weight. Treatments 2, 3, 4 and 5 were significantly higher than treatment 1. This is explained by the effect of the fungicides in preventing the infection by septoria, which affects grain quality. Fungicide treatments 2, 3, 4 and 5 were significantly better in controlling the diseases. It was impossible to evaluate the disease level on treatment N=Ø due to early death of the leaves.

Fertility:

The fertility treatments were significant on yield, protein and lodging. Treatments 1, 2 and 3 (12Ø, 15Ø, 18Ø) were significantly different from treatment 4 (Ø). It is important to note that the yield level achieved with the N=Ø level (5753 kg/ha) suggests that the nitrogen content of the soil was very high (previous crop was sugarbeets). Even thoughwe were not able to identify the optimum level of nitrogen for yield, the results suggests that treatment 3 (18Ø kg/ha) is the optimum level for protein. All treatments were significantly different from each other. Fertility levels also had an influence on lodging, as increased fertility caused more lodging; treatments 1, 2 and 3 were significantly different from treatment 1.

Table Q-06. Results of trial Coop-03

	N (kg/ha)	YIELD (kg/ha)	DENSITY (hg/hl)	TKW (gr)	PROTEIN (%)	LODGING (1-9)	RUST (1-9)	SEPTORIA (1-9)
	120	6768	71.97	33.65	12.45	.25	6.88	7.50
1	150	6879	72.30	33.20	12.87	1.25	7.37	8.00
	180	6941	72.00	32.73	12.95	1.50	7.13	7.50
	0	5764	73.25	34.25	9.90	0.00	----	----
	120	7114	72.80	34.75	12.85	.75	6.25	6.50
2	150	6947	72.67	34.45	13.55	.25	6.00	7.25
	180	6991	73.45	34.42	13.38	.75	6.38	6.50
	0	5691	73.45	35.03	10.25	0.00	----	----
	120	7244	73.45	35.97	12.47	.25	6.50	6.38
3	150	7709	72.30	36.00	12.87	.50	5.89	6.88
	180	7831	72.55	34.95	13.50	.75	6.25	6.38
	0	5496	72.45	36.00	9.85	.25	----	----
	120	7506	72.67	34.52	12.78	.50	6.25	6.75
4	150	7143	72.97	34.70	13.12	1.00	6.13	6.88
	180	7355	72.20	34.92	13.45	1.00	6.63	6.75
	0	5462	72.80	35.23	10.18	0.00	----	----
	120	7339	72.95	35.27	12.35	.75	6.25	6.75
5	150	7461	72.65	35.42	13.07	1.00	6.38	6.38
	180	7487	73.00	33.90	13.70	1.00	6.25	6.38
	0	6353	72.65	34.88	10.90	0.00	----	----
Fung		ns	ns	**	ns	ns	**	**
Fert		**	ns	ns	**	**	ns	ns
Fung * fert		ns	*	ns	ns	ns	ns	ns
C.V.		5.97	.84	2.95	3.17	89.49		

Section 1

Spring wheat, small scale trials

COOP-04 - Fertility * population

Objective: To determine the effect of different fertility programs (rates, timings and sources) and of three populations on spring wheat Max.

Treatment list

FACTOR A

POPULATION

1- 300 seeds / M^2
2- 425 seeds / M^2
3- 550 seeds / M^2

FACTOR B

FERTILITY

	SEEDING	ZGS 30	TOTAL
1-	120 (n)	0	120
2-	120 (u)	0	120
3-	84 (n)	36 (n)	120
4-	84 (u)	36 (u)	120
5-	150 (n)	0	150
6-	150 (u)	0	150
7-	105 (n)	45 (n)	150
8-	105 (u)	45 (u)	150
9-	180 (n)	0	180
10-	180 (u)	0	180
11-	126 (n)	54 (n)	180
12-	126 (u)	54 (u)	180

(u) : urea (46-0-0)
(n) : ammonium nitrate (34-0-0)

COMMON TREATMENTS

SEEDING RATE	VARIABLE
ROW WIDTH	12 cm
FERTILITY	N-83-185
nitrogen	VARIABLE
FUNGICIDES	
ZGS 24	TILT
ZGS 45	TILT/BRAVO
PGR	
ZGS 24	Cycocel
HERBICIDES	Pardner/
ZGS 21	Hoe-Grass

Tilt (Propiconazole 490 gr/l)	: 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l)	: 1.75 l/ha
Cycocel (Chlormequat chloride 480 gr/l)	: 1 l/ha
Pardner (Bromoxynil 280 gr/l)	: 1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	: 2.5 l/ha
Dithane M-45 (Mancozeb 80%)	: 2.25 kg/ha
Bayleton (triadimefon 50%)	: 450 gr/ha

MATERIALS AND METHODS

Spring wheat Max was seeded on May 4 1986, in La Présentation, Québec . The plots were seeded with a Kincaid disk drill, on 12 cm row spacing. The seeding rate used was 85 seeds/meter or 425 seeds/m^2.

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results showed a pH of 6.7, 364 kg/ha P, 585 kg/ha K, 663 kg/ha Mg, 3910 kg/ha Ca; the cation exchange capacity of the soil was of 14.8 meq/gr. We applied at ZGS 0 (05/09/86) 83 kg/ha of P_2O_5 and 185 kg/ha of K_2O for wheat. This fertilizer was broadcast and incorporated , using a mixture of 46-0-0, 18-46-0 and 0-0-60. The plots received additional nitrogen, under the following protocol:

	SEEDING	ZGS 30	TOTAL
1-	120 (n)	0	120
2-	120 (u)	0	120
3-	84 (n)	36 (n)	120
4-	84 (u)	36 (u)	120
5-	150 (n)	0	150
6-	150 (u)	0	150
7-	105 (n)	45 (n)	150
8-	105 (u)	45 (u)	150
9-	180 (n)	0	180

10-	180 (u)	0	180
11-	126 (n)	54 (n)	180
12-	126 (u)	54 (u)	180

(u) : urea (46-0-0)
(n) : ammonium nitrate (34-0-0)

Weeds were controlled with an application of Pardner and Hoegrass at rates of 1.2 l/ha and 2.5 l/ha respectively on may 25th (ZGS 21-23). The plots also received applications of Tilt at a rate of .127 kg a.i./ha at ZGS 23-24 (may 29) and applications of Tilt at a rate of .125 kg a.i./ha and Bravo at a rate of .875 kg a.i./ha at ZGS 55 (july 6). To control lodging, Cycocel was applied on wheat at a rate of 1 l/ha on may 29 (ZGS 23-24). All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

Main plot size (population) was 5.5 * 12 m. and sub plot size was 5.5 * 1 m.. All treatments were replicated 4 times in a split block design. The statistical analysis was done using the SAS system from the SAS Institute inc.

RESULTS AND DISCUSSION

Population:

All treatments were non-significant. The average head count for the three levels of population is as follows:

- 300 seeds/m² --> 248 pl/m² 699 heads/m²
- 425 seeds/m² --> 312 pl/m² 774 heads/m²
- 550 seeds/m² --> 392 pl/m² 922 heads/m²

Fertility:

The fertility treatments were significant on heading, protein and lodging. As expected, an increase in the nitrogen level delayed maturity; the level of protein was also affected by an increase in the nitrogen fertility, as was lodging. The effect of source (ammonium nitrate or urea) and split applications (1 or 2 applications of nitrogen) were non significant on all parameters measured.

Section 1

Spring wheat, small scale trials

COOP-05 BASF- PLANT GROWTH REGULATORS

Objective: To determine the effect of different plant growth regulator treatments on spring wheat max.

Treatment list

1	CHECK	
2	CCC +	(.345 kg a.i./ha, ZGS 23-30)
3	CCC +	(.46 kg a.i./ha, ZGS 23-30)
4	CCC +	(.69 kg a.i./ha, ZGS 23-30)
5	CCC +	(.92 kg a.i./ha, ZGS 23-30)
6	CCC	(.69 kg a.i./ha, ZGS 23-30)
7	TERPAL C	(.46 kg a.i./ha, ZGS 33-37)
8	TERPAL C	(.69 kg a.i./ha, ZGS 33-37)
9	TERPAL C	(.46 kg a.i./ha, ZGS 39-43)
10	TERPAL C	(.69 kg a.i./ha, ZGS 39-43)
11	CERONE	(.36 kg a.i./ha, ZGS 39-43)

CCC + = CYCOCEL WITH CITOWETT PLUS AT .05%v/v

MATERIALS AND METHODS

Spring wheat Max was seeded on May 12 1986, in La Présentation, Québec . The plots were seeded with a Kincaid disk drill, on 12 cm row spacing. The seeding rate used was 85 seeds/meter or 425 seeds/m^2.

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results showed a pH of 6.7, 364 kg/ha P, 585 kg/ha K, 663 kg/ha Mg, 3910 kg/ha Ca; the cation exchange capacity of the soil was of 14.8 meq/gr. We applied prior to seeding (05/02/86), 162 kg/ha on N, 59 kg/ha of P_2O_5 and 40 kg/ha of K_2O. The fertilizer was broadcast and incorporated , using a mixture of 46-0-0, 18-46-0 and 0-0-60.

Weeds were controlled with an application of Pardner and Hoegrass at rates of 1.2 l/ha and 2.5 l/ha respectively on may 25th (ZGS 21-23). The plant growth regulators were applied with the following schedule:

- -treatments 1 to 6 were applied on june 10 1986
- -treatments 7 and 8 were applied on june 21 1986
- -treatments 9 to 11 were applied on june 25 1986

An application of the fungicide Bravo was done on august 4 1986, at the rate of 2 l/ha. All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

Plant counts were done on may 30 1986 by counting the plants in row 3-4-5 on a lenght of 1 meter. The head counts were done on august 19 1986 in the same rows as the plant counts. The lodging ratings were done just prior to harvest. Plot size was 1 * 4 m.. All treatments were replicated 4 times in a randomized completes block design. The statistical analysis was done by BASF.

RESULTS AND DISCUSSION

All treatments reduced plant height significantly, with treatment 10 (Terpal C .69 kg a.i./ha, ZGS 39-43) having the biggest effect. The least effective treatment in reducing plant height was treatment 11 (Cerone .36 kg a.i./ha, ZGS 39-43). All treatments, except treatment 11 (Cerone) decreased yields and hectoliter weights. Thousand kernel weight was reduced significantly by treatments 4, 6, 7, 8, 9 and 10; treatment 11 was significantly higher than treatment 1 (check).

Table Q-09. Results of trial Coop/Basf-05

TREAT	HEADS /M2	KERNELS /HEAD	TKW	HL weight	YIELD KG/HA
1	477	30.1	26.5 b	72.2 b	4703 ab
2	530	27.6	25.4 ab	70.3 a	4278 a
3	511	27.8	25.5 ab	70.2 a	4388 a
4	524	29.6	24.8 a	70.1 a	4195 a
5	550	29.1	25.7 ab	70.2 a	4428 a
6	519	24.5	25.2 a	70.4 a	4390 a
7	522	27	24.7 a	70.5 a	4265 a
8	520	26.3	24.5 a	70.3 a	4340 a
9	508	24.8	25.3 a	70.5 a	4365 a
10	513	27.4	25 a	70.7 a	4318 a
11	510	28.9	28 c	72.6 b	5050 b
	ns	ns	**	**	*
LSD (.05)	113.9	10.6	1.78	1.90	77.64

Table Q-10. Results of trial Coop/Basf-05 (cont.)

	PLANT HEIGHT	LODGING AT ZGS 87 AREA	LODGING AT ZGS 87 DEGREE
1	97.7 g	96.3	35.0
2	86.5 ef	87.5	41.3
3	86.3 ef	93.8	40.0
4	84.8 f	77.5	41.3
5	82.6 cde	52.5	40.0
6	84.5 def	57.5	42.5
7	80.5 cd	56.3	46.3
8	77.0 ab	42.5	40.0
9	79.4 bc	92.5	40.0
10	72.9 a	32.5	47.5
11	88.2 f	87.5	31.3
	**		
LSD (.05)	6.44		

ZGS 23-30= 06/10/86
ZGS 33-37= 06/21/86
ZGS 39-43= 06/25/86
ZGS 87 = 08/13/86

An application of the fungicide Bravo was done on august 4 1986, at the rate of 2 l/ha. All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

Plant counts were done on may 30 1986 by counting the plants in row 3-4-5 on a lenght of 1 meter. The head counts were done on august 19 1986 in the same rows as the plant counts. The lodging ratings were done just prior to harvest. Plot size was 1 * 4 m.. All treatments were replicated 4 times in a randomized completes block design. The statistical analysis was done by BASF.

RESULTS AND DISCUSSION

All treatments reduced plant height significantly, with treatment 10 (Terpal C .69 kg a.i./ha, ZGS 39-43) having the biggest effect. The least effective treatment in reducing plant height was treatment 11 (Cerone .36 kg a.i./ha, ZGS 39-43). All treatments, except treatment 11 (Cerone) decreased yields and hectoliter weights. Thousand kernel weight was reduced significantly by treatments 4, 6, 7, 8, 9 and 10; treatment 11 was significantly higher than treatment 1 (check).

Table Q-09. Results of trial Coop/Basf-05

TREAT	HEADS /M2	KERNELS /HEAD	TKW	HL weight	YIELD KG/HA
1	477	30.1	26.5 b	72.2 b	4703 ab
2	530	27.6	25.4 ab	70.3 a	4278 a
3	511	27.8	25.5 ab	70.2 a	4388 a
4	524	29.6	24.8 a	70.1 a	4195 a
5	550	29.1	25.7 ab	70.2 a	4428 a
6	519	24.5	25.2 a	70.4 a	4390 a
7	522	27	24.7 a	70.5 a	4265 a
8	520	26.3	24.5 a	70.3 a	4340 a
9	508	24.8	25.3 a	70.5 a	4365 a
10	513	27.4	25 a	70.7 a	4318 a
11	510	28.9	28 c	72.6 b	5050 b
	ns	ns	**	**	*
LSD (.05)	113.9	10.6	1.78	1.90	77.64

Table Q-10. Results of trial Coop/Basf-05 (cont.)

	PLANT HEIGHT	LODGING AT ZGS 87 AREA	LODGING AT ZGS 87 DEGREE
1	97.7 g	96.3	35.0
2	86.5 ef	87.5	41.3
3	86.3 ef	93.8	40.0
4	84.8 f	77.5	41.3
5	82.6 cde	52.5	40.0
6	84.5 def	57.5	42.5
7	80.5 cd	56.3	46.3
8	77.0 ab	42.5	40.0
9	79.4 bc	92.5	40.0
10	72.9 a	32.5	47.5
11	88.2 f	87.5	31.3
	**		
LSD (.05)	6.44		

ZGS 23-30= 06/10/86
ZGS 33-37= 06/21/86
ZGS 39-43= 06/25/86
ZGS 87 = 08/13/86

Section 2

Winter wheat, small scale trials

The original winter wheat experiment was winter killed in march 1986; the field situated in La Présentation, Québec, was flooded and froze. The ice cover remained for 14 days. Except for one replicate of the cultivar trial, all plants were killed.

The alternate site was a farmer's field which had survived winter and showed a plant density which was uniform and near 425 seeds/m^2. The plots were picketed and the alleys mowed according to the alternate protocol which was less elaborate than the original protocol. A good part of the information is missing since the farmer did not have all the information available.

Section 2

Winter wheat, small scale trials

RC-01- Fungicides

Objective: To determine the effectiveness of fungicides in controlling diseases in winter wheat.

Treatment list

Fungicides

1- Check
2- Bayleton (ZGS 30)
3- Bayleton (ZGS 30) / Tilt-Bravo (ZGS 45)
4- Tilt (ZGS 25) / Tilt-Dithane (ZGS 45)
5- Tilt (ZGS 37) / Tilt (ZGS 55)

COMMON TREATMENTS

ROW WIDTH	20 cm
FERTILITY	
before seeding	
ZGS 0	40-80-100
ZGS 21	80-0-0 (urea)
ZGS 30	30-0-0 (urea)
ZGS 45	30-0-0 (urea)
FUNGICIDES	VARIABLE
PGR	
ZGS 30	Cycocel
HERBICIDES	none

Tilt (Propiconazole 490 gr/l)	: 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l)	: 1.75 l/ha
Cycocel (Chlormequat chloride 480 gr/l)	: 2.5 l/ha
Pardner (Bromoxynil 280 gr/l)	: 1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	: 2.5 l/ha
Dithane M-45 (Mancozeb 80%)	: 2.25 kg/ha
Bayleton (triadimefon 50%)	: 450 gr/ha

MATERIALS AND METHODS

Winter wheat Monopol was seeded in the fall of 1985, in Verchères, Québec . The field was seeded with conventional disk drill, on 20 cm row spacing. The observed final population was 425 plants/m^2.

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results are not known. Fertilizer was applied prior to seeding; 40 kg/ha of N, 40 kg/ha of P_2O_5 and 100 kg/ha of K_2O. The fertilizer was broadcast and incorporated , using a mixture of 46-0-0, 18-46-0 and 0-0-60.

The plots were established using a randomized complete block design. The plots were 3m * 5 m and replicated three times; only the middle 1 meter was harvested. All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

RESULTS AND DISCUSSION

The treatments were non significant on all parameters except for disease ratings for powdery mildew. Treatments containing two applications of fungicides were significantly better than treatment 2 which contained only one application of Bayleton. Treatment 2 was significantly better than treatment 1 (check). The precision of this trial was penalized by the variability in the established stand and by the weed pressure; we were not able to apply a post-emergence herbicide since the stage of development of the plant was later than those prescribed by the labels.

Table Q-11. Results of trial RC-01

FUNGICIDES	YIELD (Kg/ha)	DENSITY (Kg/hl)	TKW (gr)	HEIGHT (cm)	LODGING (1-9)	MOISTURE (%H2O)
1	3284	72.67	34.63	98.33	4.33	12.37
2	3686	72.93	35.23	99.00	4.33	12.50
3	4250	74.17	37.23	98.67	3.67	12.93
4	4795	74.8	39.07	99.00	2.67	13.27
5	4958	75.3	39.73	98.67	1.67	12.67
fungicide effect	ns	ns	ns	ns	ns	ns

Table Q-12. Results of trial RC-01 (cont.)

	POWDERY MILDEW (1-9)	SEPTORIA (1-9)
1	6.00	2.67
2	4.33	2.33
3	2.67	2.00
4	1.00	1.33
5	1.00	1.33
	**	ns

Section 2

Winter wheat, small scale trials

RC-02-Plant growth regulator * fertility

Objective: To determine the effect of different levels of nitrogen fertility and their interaction with plant growth regulators in winter wheat.

Treatment list

FACTOR A

Plant growth regulator

1- Check
2- Cycocel (3.0 l/ha ZGS 30)

FACTOR B

	ZGS 0	ZGS 21	ZGS 30	ZGS 45	total
1-	40	80	0	0	120
2-	40	80	25	25	170
3-	40	80	50	0	170
4-	40	80	50	50	220
5-	40	80	100	0	220

nitrogen applications at stages 30 and 45 were done using ammonium nitrate (34-0-0)

COMMON TREATMENTS

ROW WIDTH 20 cm

FERTILITY
ZGS 0 40-80-100
ZGS 21 80-0-0 (urea)
ZGS 30 variable
ZGS 45 variable

FUNGICIDES
ZGS 30 BAYLETON
ZGS 45 TILT/BRAVO

PGR variable

HERBICIDES none

Tilt (Propiconazole 490 gr/l) : 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l) : 1.75 l/ha
Cycocel (Chlormequat chloride 480 gr/l) : 2.5 l/ha

Pardner (Bromoxynil 280 gr/l)	:	1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	:	2.5 l/ha
Dithane M-45 (Mancozeb 80%)	:	2.25 kg/ha
Bayleton (triadimefon 50%)	:	450 gr/ha

MATERIALS AND METHODS

Winter wheat Monopol was seeded in the fall of 1985, in Verchères, Québec . The field was seeded with conventional disk drill, on 20 cm row spacing. The observed final population was 425 plants/m².

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results are not known. Fertilizer was applied prior to seeding; 40 kg/ha of N, 40 kg/ha of P_2O_5 and 100 kg/ha of K_2O. The fertilizer was broadcast and incorporated , using a mixture of 46-0-0, 18-46-0 and 0-0-60.

The plots were established using a randomized complete block design. The plots were 3m * 5 m and replicated three times; only the middle 1 meter was harvested. All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

RESULTS AND DISCUSSION

Plant growth regulator:

There were no significant effect of plant growth regulator on the parameters evaluated. The precision of this trial was penalized by the variability in the established stand and by the weed pressure; we were not able to apply a post-emergence herbicide since the stage of development of the plant was later than those prescribed by the labels.

Fertility:

The fertility treatments had a significant effect on thousand kernel weight, height and lodging. Plants in treatments 2, 3 and 4 were significantly shorter than plants in treatments 1 and 5. The thousand kernel weight of treatments 2, 3, 4 and 5 was significantly lower than treatment 1. The lodging ratings showed that treatments 1 and 4 were significantly lower than treatments 2, 3 and 5.

The interpretation of these results must be done very carefully. Since the nitrogen was applied by the farmer using a conventional fertilizer spreader, it is possible that the distribution of the nitrogen be unequal; this might explain the discrepancies in the results.

Table Q-13. Results of trial RC-02

	YIELD (Kg/ha)	DENSITY (kg/hl)	TKW (gr)	HEIGHT (cm)	LODGING (1-9)	MOISTURE (%H2O)
PGR EFFECT						
without pgr	4584	74.65	39.21	105.8	3.2	13.19
Cycocel 3 l/ha	4723	74.50	38.73	101.6	2.6	13.17
FERTILITY EFFECT						
1	4634	74.68	40.22	105.00	1.50	13.57
2	4618	74.98	38.75	102.33	3.33	12.87
3	4444	73.63	37.55	102.50	4.17	13.40
4	4905	75.17	39.83	103.67	1.67	13.23
5	4666	74.40	38.50	105.00	3.83	12.83
PGR	ns	ns	ns	ns	ns	ns
FERTILITY	ns	**	**	ns	**	ns
PGR * FERT	ns	ns	ns	ns	ns	ns

Section 2

Winter wheat, small scale trials

RC-03-Plant growth regulator * fertility

Objective: To determine the effect of different levels of nitrogen fertility and their interaction with plant growth regulators in winter wheat.

Treatment list

FACTOR A

Plant growth regulator

1- Check
2- Cycocel (3.0 l/ha ZGS 30)
3- Cycocel (2.5 l/ha ZGS 30) / Cycocel (0.5 l/ha ZGS 31)
4- Cerone (1 l/ha ZGS 38)
5- Cycocel (2.5 l/ha ZGS 30) / Cerone (1 l/ha ZGS 38)

FACTOR B

	ZGS 0	ZGS 21	ZGS 30	ZGS 45	total
1-	40	80	0	0	120
2-	40	80	25	25	170
3-	40	80	50	50	220

nitrogen applications at stages 30 and 45 were done using ammonium nitrate (34-0-0)

COMMON TREATMENTS

ROW WIDTH	20 cm
FERTILITY	
ZGS 0	40-80-100
ZGS 21	80-0-0 (urea)
ZGS 30	variable
ZGS 45	variable
FUNGICIDES	
ZGS 30	BAYLETON
ZGS 45	TILT/BRAVO
PGR	variable
HERBICIDES	none

Tilt (Propiconazole 490 gr/l) : 0.3 l/ha
Bravo (Chlorothalonil 500 gr/l) : 1.75 l/ha

Cycocel (Chlormequat chloride 480 gr/l)	: 2.5 l/ha
Pardner (Bromoxynil 280 gr/l)	: 1.2 l/ha
Hoe-grass (Diclofop-methyl 284 gr/l)	: 2.5 l/ha
Dithane M-45 (Mancozeb 80%)	: 2.25 kg/ha
Bayleton (triadimefon 50%)	: 450 gr/ha
Cerone (Ethephon 480 gr/l)	: 1 l/ha

MATERIALS AND METHODS

Winter wheat Monopol was seeded in the fall of 1985, in Verchères, Québec . The field was seeded with conventional disk drill, on 20 cm row spacing. The observed final population was 425 plants/m^2.

The previous crop was sugarbeets and the land had been cultivated and harrowed prior to seeding. Soil test results are not known. Fertilizer was applied prior to seeding; 40 kg/ha of N, 40 kg/ha of P_2O_5 and 100 kg/ha of K_2O. The fertilizer was broadcast and incorporated , using a mixture of 46-0-0, 18-46-0 and 0-0-60.

The plots were established using a randomized complete block design. The plots were 3m * 5 m and replicated three times; only the middle 1 meter was harvested. All fungicides and PGR were applied in a 220 l/ha spray volume using a hand held CO_2 sprayer at a pressure of 2.4 bars and at 2 km/h.

RESULTS AND DISCUSSION

Plant growth regulator:

There were no significant effect of plant growth regulator on the parameters evaluated. The precision of this trial was penalized by the variability in the established stand and by the weed pressure; we were not able to apply a post-emergence herbicide since the stage of development of the plant was later than those prescribed by the labels.

Fertility:

There were no significant effect of plant growth regulator on the parameters evaluated. The precision of this trial was penalized by the variability in the established stand and by the weed pressure; we were not able to apply a post-emergence herbicide since the stage of development of the plant was later than those prescribed by the labels.

Table Q-14. Results of trial RC-03

		YIELD (Kg/Ha)	DENSITY (Kg/Hl)	TKW (gr)	HEIGHT (cm)
PGR EFFECT	1	4395	74.36	39.14	103.78
	2	4532	73.96	38.82	99.11
	3	4365	72.79	37.17	96.11
	4	4719	74.78	39.92	99.56
	5	4596	73.84	38.64	95.00
FERT EFFECT	1	4558	74.33	40.05	98.20
	2	4489	73.74	38.27	97.33
	3	4516	73.76	37.91	100.6
PGR		ns	ns	ns	ns
FERTILITY		ns	ns	ns	ns
PGR * FERTILITY		ns	ns	ns	ns

Section 3

Large scale, wheat trials

Objective: To evaluate the feasability of ICM at the farm level. All treatments are done with farm equipment. The farmer is asked to participate in the execution of the treatments. These trials were conducted on 6 farms.

Treatment list

1- Check			
2- PGR	Cycocel	(2.5 l/ha ZGS 30 in winter wheat)	
		(1.0 l/ha ZGS 30 in spring wheat)	
3- Fungicides	Tilt	(ZGS 30)	(Spring wheat)
	Tilt-Dithane	(ZGS 55)	
	or		
	Bayleton	(ZGS 30)	(Winter wheat)
	Tilt-Dithane	(ZGS 55)	
4- Complete program	(Treatment 2 + Treatment 3)		

MATERIALS AND METHODS

Monopol winter wheat and Max spring wheat was planted in the fall of 1985 and the spring of 1986. The seeding was done with conventional seed drills equipped with tramline attachements. The rates used were:

-Monopol : 190 kg/ha
-Max : 212 kg/ha

The plots were 11 meters wide (one tramline) by 100 meters long. The width of the spray was 10 meters.The plots were layed out in a randomized complete block design. The fertility was the same for all treatments:

	spring	winter
total	187	210
ZGS 0	95	20
ZGS 21	--	84
ZGS 30	46	53
ZGS 45	46	53

The fertilizers were applied broadcast, using conventional fertilizer spreaders. The left side of the right tramline was harvested with one combine pass. Each treatment was then weighed with a transportable weighwagon.

RESULTS AND DISCUSSION

Spring wheat:

There were three sites where spring wheat max was tested. The results obtained were variable.

-The first farm (ferme HOKA, ST-CESAIRE) showed no significant increases in yield to management. The level of management on that farm was already high and the addition of treatments 2, 3 and 4 did not improve on that mangement.

On an economic standpoint, there was an economic return of $9.19 to the application of treatment 2, even though the increase in yield was not significant.

-The second farm (ferme LABRECHE, RAWDON) showed significant increases to management. Treatment 3 was significantly higher than treatments 1, 2 and 4. The decrease in yield noted in treatment 2 is explained by the spraying of the PGR at the wrong rate (2.5 l/ha instead of 1.0 l/ha) and at a very late stage (ZGS 33). The fungicides increased yields significantly, while the complete treatment was affected by the same late application of the high rate of the PGR.

Treatment 3 was economical, showing a return of $53.08. The other treatments were not economical.

-The third farm (ferme GROSS, ST-CUTHBERT) showed significant increases in yield with all treatments. The increases in yield were of 1449 kg/ha between treatment 4 and treatment 1.

These increases were all economical with treatment 4 showing a return of $39.66.

Winter wheat:

Winter wheat was tested on 3 sites. Again the results are variable

-The first test and second test (ferme LEFEBVRE I and II, ST-CHARLES-SUR-RICHELIEU) showed significant increases with the different treatments. Site no 1 showed a significant increase with treatment 3 and 4. These increases were of 856 kg/ha. Site no 2 also showed significant increases, treatments 3 and 4 showing significantly higher yields. The differences in yield were of 515 kg/ha.

On site 1, treatments 3 and 4 were economical, with treatment 3 showing the better return. On site 2, the treatments were not economical.

-The second site (ferme LOUIS HEBERT, ILE D'ORLEANS) showed an increase in yield, for winter wheat ABSOLVENT, of 1729 kg/ha, going from 3168 kg/ha for treatment 1 to 4897 kg/ha for teatment 4. There were no increases in yield for the winter wheat MONOPOL. We were not able to analyse statistically the results for the second site.

The treatments 2, 3 and 4 were economical for winter wheat ABSOLVENT while they were not for winter wheat MONOPOL.

-The third site showed variable results. Treatment 3 had the best results with yields of 4313 kg/ha. We were not able to analyse statistically the results for the second site.

Treatment 3 was economical with a return of $73.21.

Table Q-15. Yield results of farm scale trials

	TR 1	TR 2	TR 3	TR 4	
FERME HOKA	5146	5230	5146	5419	
FERME LABRECHE	2741	2331	3308	3056	*
FERME GROSS	5767	6449	6906	7209	*
FERME LEFEBVRE I	3810	3630	4492	4660	*
FERME LEFEBVRE II	4133	4141	4648	4745	*
FERME LS HEBERT M	5512	4267	5499	5907	
FERME LS HEBERT A	3169	3703	4502	4897	
FERME GAUTHIER	3491	2990	4313	3320	

Table Q-16. Economical returns of farm scale trials

	TR 1	TR 2	TR 3	TR 4
FERME HOKA		$9.19	($54.65)	($19.43)
FERME LABRECHE		($16.65)	$53.08	($11.45)
FERME GROSS		$38.83	$28.57	$39.66
FERME LEFEBVRE I		($41.62)	$29.32	$19.88
FERME LEFEBVRE II		($41.62)	($2.41)	($43.77)
FERME LS HEBERT M		($41.62)	($100.26)	($65.62)
FERME LS HEBERT A		$180.32	$165.74	$186.38
FERME GAUTHIER		($41.62)	$73.21	($141.62)

Section 4

Meteorological data

Winter

Average temperatures were under normal with periods of very cold and warm temperatures in january and march. Snow cover almost disappeared in january and there was above average rainfall in early march.

April was warm with record high temperatures for the month. There was also 20% more sunshine than average during april. Rainfall was below average, at less than 50% of average. The month of may was cloudy and rainy. There was only 60-80% of the average sunshine, and rainfall was at 150% than average. There was a hailstorm on the 29^{th}.

Summer was cold with temperatures 1 to 4 °C below average. The amount of rainfall was again above average in june. July was cold and cloudy; sunshine was at 80-90% of average. There was an above average rainfall. The month of august was cold; sunshine was below average and the amount of rainfall was at 150% of average.

September was cold and rainy with rainfall at 150% of average and sunshine at 75-90% of average.

ENVIRONNEMENT CANADA SOMMAIRE METEOROLOGIQUE POUR LA SAISON 1986
ET L'ECART/POURCENTAGE DE LA NORMALE DE 10 ANS.

REGION NO.6 STATIONS UTILISEES = 28 27 29 37 75 85 91 133 136

		TEMPERATURE MOYENNE	TEMPERATURE MINIMUM	DEGRES JOURS SEUIL 5	UNITES THERMIQUES MAIS EFFECTIVES	PLUIE (MM)
AVRIL	1-10	5.5(3.6)	-6.5	16(8)	0(0)	26(67%)
	11-20	7.6(1.6)	-3.5	46(17)	0(0)	12(51%)
	21-30	11.6(3.4)	-8.0	116(51)	0(0)	7(25%)
MAI	1-10	8.2(-1.9)	-6.0	157(38)	5(1)	33(129%)
	11-20	14.5(1.0)	1.0	252(48)	158(14)	31(124%)
	21-31	16.4(.5)	4.5	377(53)	362(22)	50(144%)
JUIN	1-10	14.3(-1.3)	-3.5	470(35)	520(-4)	24(94%)
	11-20	15.5(-2.9)	1.0	576(6)	699(-45)	34(106%)
	21-30	16.6(-2.2)	2.5	692(-16)	893(-76)	60(199%)
JUILLET	1-10	17.7(-2.4)	3.0	819(-40)	1104(-106)	21(66%)
	11-20	18.9(-2.5)	4.5	957(-64)	1328(-139)	36(103%)
	21-31	20.3(.1)	8.0	1125(-63)	1601(-136)	65(139%)
AOUT	1-10	20.2(-.1)	11.0	1277(-64)	1854(-130)	66(171%)
	11-20	19.4(.9)	6.5	1422(-55)	2093(-115)	10(35%)
	21-31	14.9(-3.0)	2.5	1531(-83)	2278(-165)	74(206%)
SEPT.	1-10	14.6(-1.2)	.5	1628(-101)	2445(-181)	42(114%)
	11-20	12.2(-1.3)	.5	1699(-119)	2567(-211)	42(109%)
	21-30	12.6(1.1)	-1.5	1775(-108)	2699(-167)	48(132%)
OCTOBRE	1-10	8.6(-.9)	-3.5	1814(-116)	2755(-157)	26(74%)
	11-20	7.9(1.5)	-6.0	1846(-106)	2755(-159)	11(36%)
	21-31	6.4(.6)	-7.5	1872(-105)	2755(-159)	30(129%)

TEMPERATURE MOYENNE = MOYENNE DECADAIRE DES (TMAX+TMIN)/2 DE CHAQUE JOUR ET L'ECART A LA NORMALE.
TEMPERATURE MINIMUM = MINIMUM ABSOLUE DE LA DECADE.
DEGRES-JOURS SEUIL 5 = CUMUL DEPUIS LE 1ER AVRIL ET L'ECART A LA NORMALE.
UNITES THERMIQUES MAIS = CUMUL ET L'ECART A LA NORMALE (CUMUL A PARTIR DE LA DATE DE DEPART NORMALE MOINS UN ECART-TYPE JUSQU'AUX PREMIERS GELS).
PLUIE = HAUTEUR DE PLUIE DECADAIRE ET LE POURCENTAGE DE LA NORMALE.

Tableau n° 2

GELS PRINTANIERS ET AUTOMNALS — REGION: 6 - ST-HYACINTHE — SAISON: 1986

Station	Date du dernier gel du printemps 86	Date moyenne du dernier gel du printemps (1)	Dernier gel à 0°C ou moins	Dernier gel à -1°C ou moins	Dernier gel à -2°C ou moins	Date du premier gel d'automne 86	Date moyenne du premier gel d'automne (1)	Premier gel à 0°C ou	Premier gel à -1°C ou	Premier gel à -2°C ou	Période sans gel 86 (jours)	Période sans gel moyen(1) (jours)	Ecart (jours)
St-Hyacinthe 2	03 juin	09 mai	03/06	04/05	04/05	10 oct.	01 oct.	10/10	10/10	10/10	129	144	-15
St-Hubert A	03 juin	05 mai	03/06	04/05	04/05	07 oct.	02 oct.	07/10	10/10	10/10	126	149	-23
Farnham	03 juin	13 mai	03/06	04/05	04/05	10 oct.	27 sept.	10/10	10/10	10/10	129	136	-7
St-Nazaire	03 juin	09 mai	03/06	03/06	04/05	27 sept.	21 sept.	27/09	27/09	10/10	116	134	-18
Sabrevois	03 juin	-	03/06	04/05	04/05	10 oct.	-	10/10	10/10	10/10	129	-	
St-Amable	03 juin	-	03/06	03/06	03/06	10 oct.	-	10/10	10/10	10/10	129	-	
Marieville	03 juin	-	03/06	04/05	04/05	07 oct.	-	07/10	07/10	10/10	126	-	
Fleury	03 juin	15 mai	03/06	03/06	04/05	27 sept.	21 sept.	27/09	27/09	10/10	116	120	-12
Ste-Madeleine	03 juin	-	03/06	04/05	04/05	27 sept.	-	27/09	10/10	10/10	116	-	

Date moyenne du dernier gel du printemps de la région

1986	Moyenne (1)
03 juin	10 mai

Date moyenne du premier gel d'automne de la région

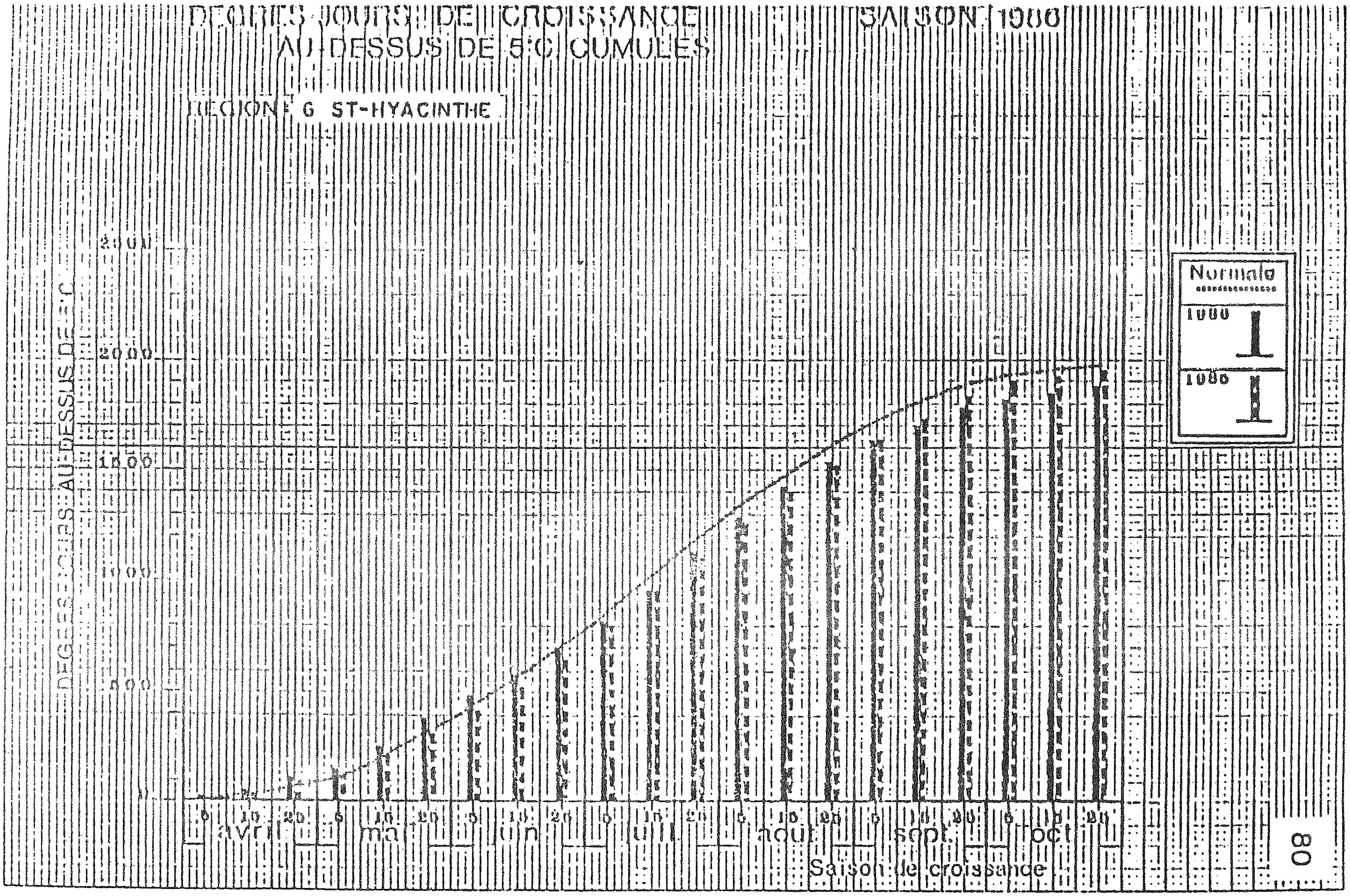
1986	Moyenne (1)
05 oct.	26 sept.

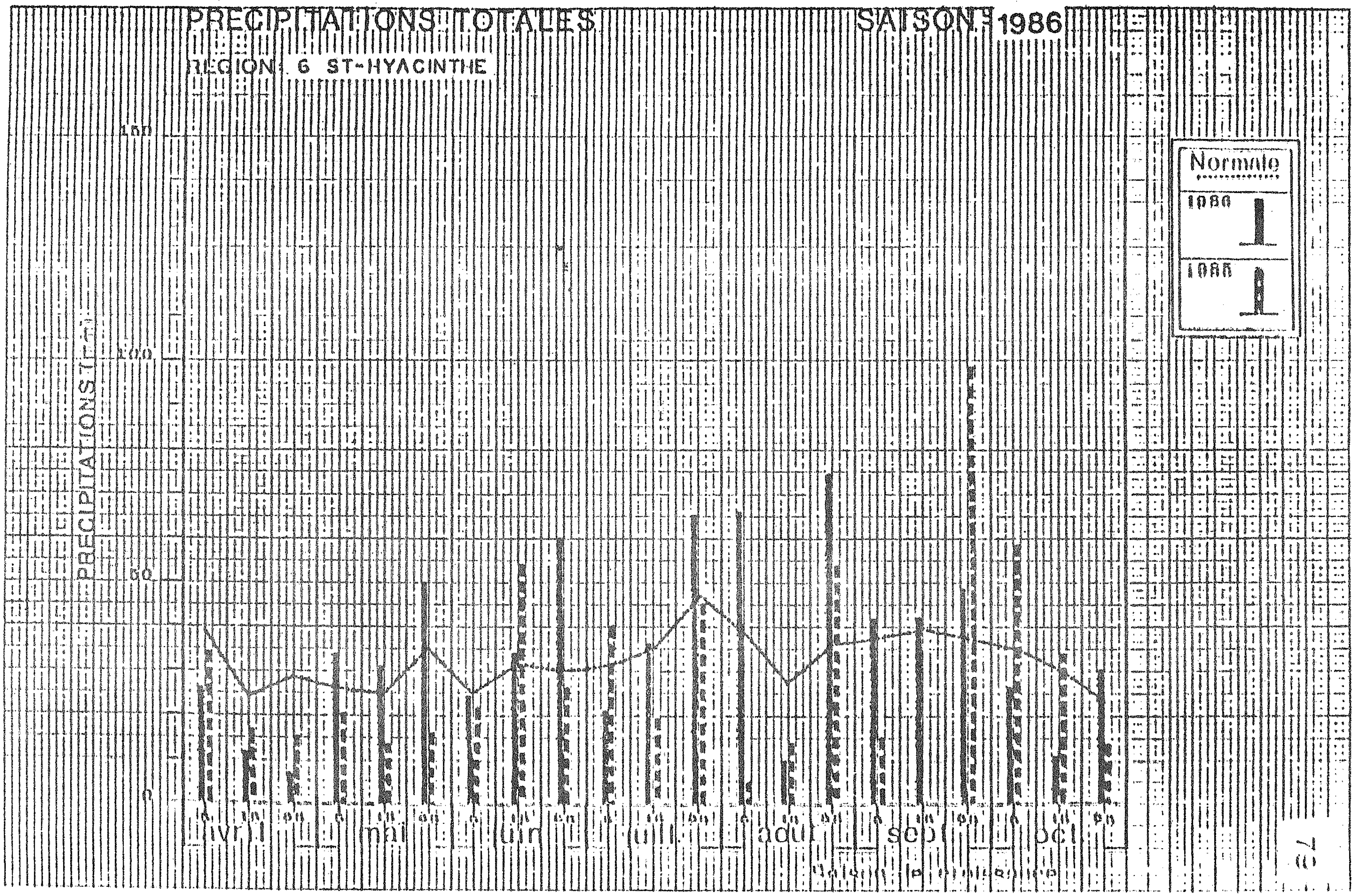
Moyenne régionale

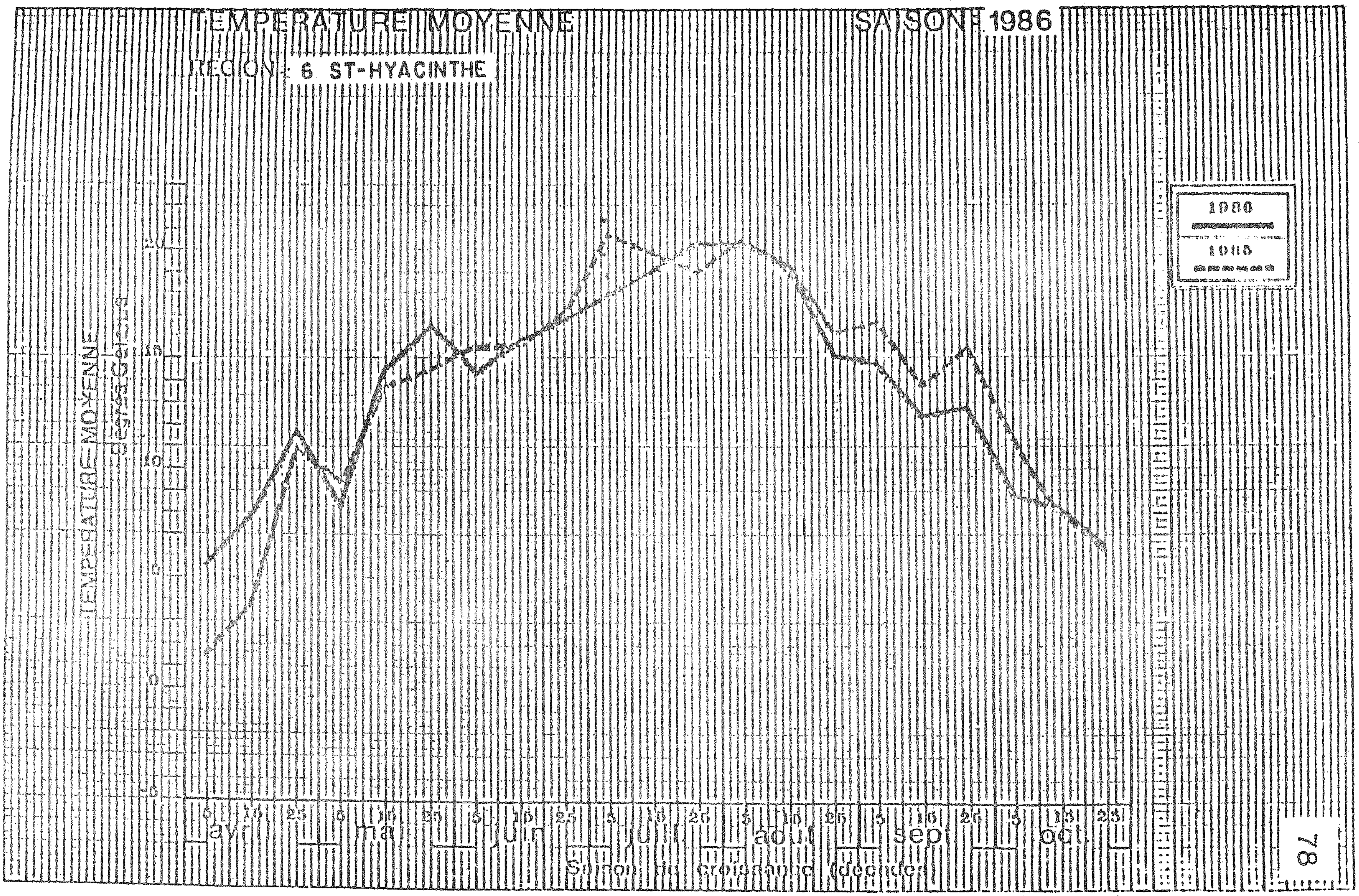
(2)	124		
(3)	123	138	-15

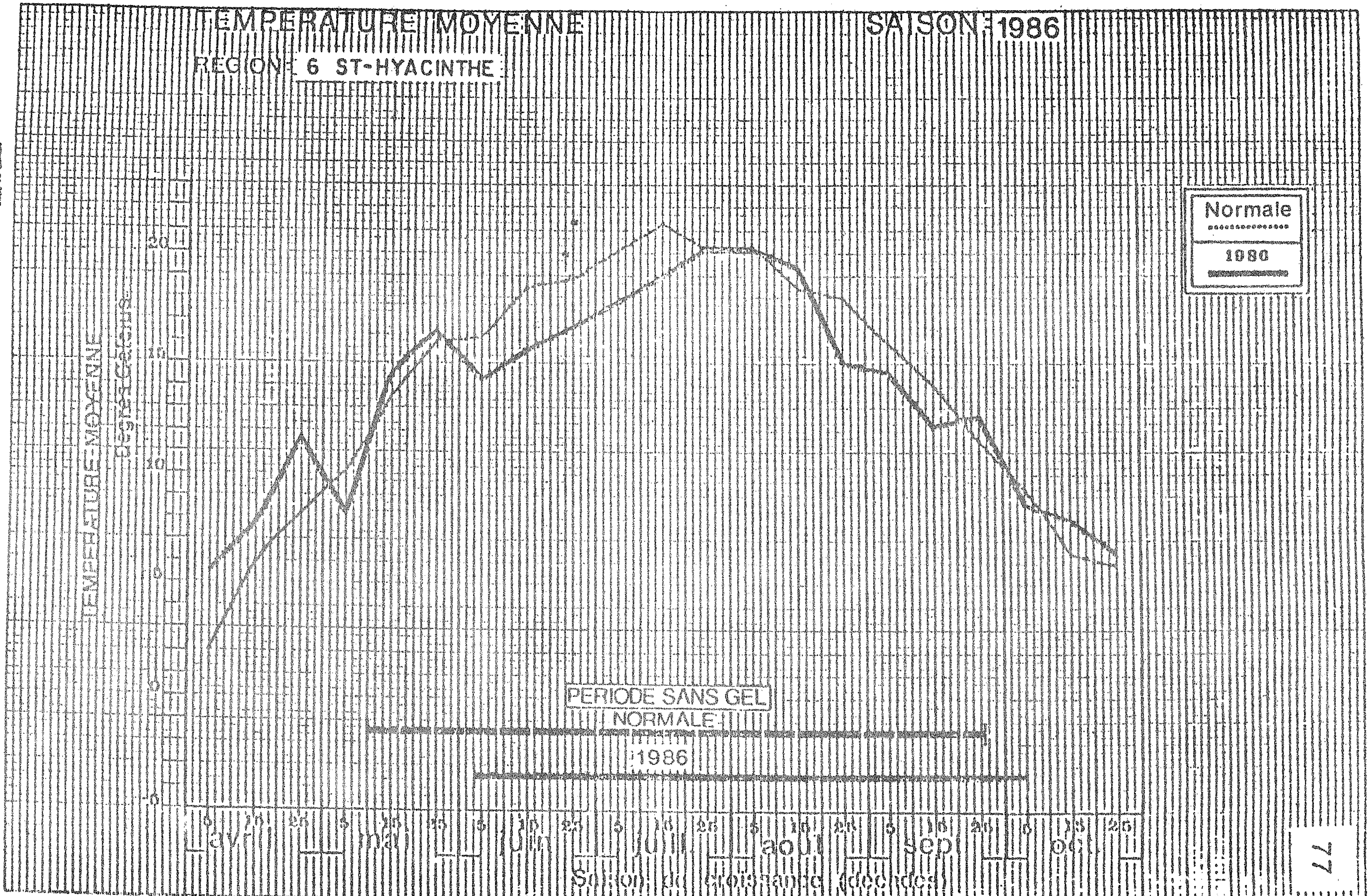
(1) Valeurs moyennes fondées sur la période d'enregistrement allant de 1951 à 1980.

(2) Toutes les stations
(3) Stations avec normales de 30 ans seulement.


DEGRES JOURS DE CROISSANCE SAISON 1980
AU DESSUS DE 5°C CUMULES
REGION 6 ST-HYACINTHE
DEGRES-JOURS AU-DESSUS DE 5°C
2000
1500
500
Normale
1980
avril
mai
juin
juil.
aout
sept.
oct.
Saison de croissance
80


PRECIPITATIONS TOTALES
SAISON 1986
REGION 6 ST-HYACINTHE
PRECIPITATIONS
150
100
50
0
Normale
1986
1985
avril
mai
juin
juil
août
sep
oct
79


TEMPERATURE MOYENNE
SAISON: 1986
REGION: 6 ST-HYACINTHE
78
1986
TEMPERATURE MOYENNE
degrés Celsius
15
10
5
0
-5
avril
mai
juin
juil
aout
sept
oct


TEMPERATURE MOYENNE
SAISON: 1986
REGION: 6 ST-HYACINTHE
Normale
1986
TEMPERATURE MOYENNE
Degrés Celsius
20
15
10
5
0
-5
-10
PERIODE SANS GEL
NORMALE
1986
avril
mai
juin
juil
aout
sep
oct
Saison de croissance (decades)
77

Section 5

Extension activities

Field days:

Coopérative Fédérée de Québec,
- -technical representatives, july 19
  attendance 225
- -CFQ sales representatives, june 19, july 17
  attendance 25

Local cooperatives
- -12 different visits in july 1986
  attendance 540 farmers

Government agencies
- -Conseil des productions végétales du Québec
  Cereal expert comittee, july 3
  attendance 35
- -Weed tour
  CPVQ, july 1986
  attendance 15

Canada Grains Council
- -Intensive wheat management tour
  attendance 19

Special visitors
- -Union Carbide, attendance 3
- -Ciba Geigy, attendance 4
- -Dr. Angus F MacKenzie, MacDonald College
- -Carl Stewart, Agriculture Canada
- -David Rourke, Canada Grains Council