

CONTROL OF CHEAT (BROMUS SECALINUS L.) IN WINTER WHEAT
(TRITICUM AESTIVUM L.) WITH METRIBUZIN [4-amino-6-tert-
butyl-3-(methylthio)-as-triazin-5(4H)one] AND THE
TOLERANCE OF WHEAT CULTIVARS TO METRIBUZIN

by

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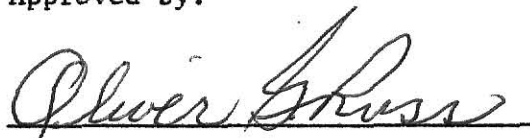
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INTRODUCTION

Plants of cheat (Bromus secalinus L.) are often found growing in the soft red winter wheat (Triticum aestivum L.)(5) and hard red winter wheat (17) producing areas of the United States. The co-existence of cheat with winter wheat and other fall-sown small grains is a result of its winter-annual growth habit. Cheat has a greater tillering capacity than wheat under similar conditions; this trait enables it to be a persistent weed pest in areas where climatic conditions, pest populations and soil environment can reduce wheat stands.

The use of metribuzin [4-amin-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)one] for control of cheat has been reported in the literature since 1978. Differential wheat cultivar tolerance and susceptibility to metribuzin have been documented by many researchers (1, 7, 8, 9, 17, 19, 22, 28). Current state and federal label registrations limit the application of metribuzin in Kansas to 'Eagle', 'TAM W-101', 'TAM 105' and 'Newton' winter wheat cultivars.

The increased interest in minimum tillage and in sustaining continuous winter wheat acreage in Kansas warrants further investigation of metribuzin use for control of cheat and the tolerance to metribuzin of commonly grown winter wheat cultivars in Kansas. The objectives of this study were to (a) evaluate the susceptibility and/or tolerance of 18 winter wheat cultivars treated with metribuzin in the fall and spring, (b) determine the effect of metribuzin applied at two rates on two dates in the fall and applied on two dates at two rates in the spring for control of cheat and to determine

phytotoxicity to five winter wheat cultivars, and (c) determine an effective rate(s) of application for adequate control of cheat and acceptable levels of metribuzin injury based on the results of two years research.

REVIEW OF LITERATURE

The use of metribuzin [4-amino-6-tert-butyl-3-(methylythio)-as-triazin-5(4H)one] for control of cheat in winter wheat is currently labeled for four cultivars in Kansas. Applications are restricted to early fall when the wheat has 2-3 tillers and secondary root growth is at least 2 inches. Early spring applications can be made when the wheat is fully tillered, but prior to jointing. Subject areas reviewed are metribuzin tolerance, metribuzin activity in the soil, the competitive capabilities of cheat and the control of cheat in winter wheat.

METRIBUZIN TOLERANCE

Differential cultivar tolerance to metribuzin has been shown for several crops. Graf and Ogg (10) applied metribuzin postemergent on potato (Solanum tuberosum L.) and observed significant differential cultivar tolerance. Visual symptoms among cultivars were distinctly separated into five groups of potato leaf response. Significant reductions in plant height, vigor and dry weight among susceptible cultivars were reported.

Cultivar tolerance in tomato (Lycopersicon esculentum Mill.) seedlings was studied by Stephenson et al. (24). These researchers found differential cultivar tolerance among direct seeded tomato seedlings. The tolerance of tomatoes to metribuzin increased as seedling age increased.

Differential soybean (Glycine max (L.) Merr.) cultivar tolerance to metribuzin has been determined for a number of cultivars. The cultivars found to be most susceptible to metribuzin injury as

reported by Anderson (2) are 'Tracy', 'Semmes', 'Steele', 'Altona' and 'Vansoy'. Wax (26) observed significant increases in soybean injury to 'Williams' as the application rate was increased from 0.56 kg/ha to 0.84 kg/ha. Also, soybean injury was significantly increased by increasing the depth of incorporation. Wax et al. (27) found that most cultivars tested in soybean types 00 through IV had slight to moderate injury at recommended preplant-incorporated rates of metribuzin. Brecke (4) treated 'Centennial' soybeans with metribuzin at 0.43 and 0.56 kg/ha on the day of planting and for eight consecutive days following planting. Adverse effects on crop growth were not observed at either rate when metribuzin was applied within four days of planting. Smith and Wilkinson (21) proposed that tolerant soybean cultivars may have a greater capacity for metribuzin detoxification. They found the tolerant cultivar 'Bragg' produced a greater amount of a glucose conjugated metabolite of either metribuzin or its catabolites than did the susceptible cultivars Semmes and 'Coker 102'. Thus Smith and Wilkinson are suggesting that N-glucosylation is a possible mechanism of metribuzin detoxification in tolerant soybean cultivars. Hargroder and Rogers (11) concluded that ^{14}C -metribuzin and (or) its ^{14}C -metabolites accumulated in the roots and lower leaves of soybeans. These researchers attributed the relative tolerance of soybeans to the more rapid degradation of metribuzin rather than to relatively susceptible plants. Thorton and Schumann (25) reported that metribuzin was degraded in soybean by deamination to [6-tert-butyl-1,2,4-triazin-3-5-(2H,4H)dione].

Researchers have also found differential tolerance to metribuzin in winter wheat. Runyan et al. (17) observed in greenhouse experiments a reduction of greater than 50% in fresh shoot weight of 'Vona' when metribuzin was applied to the foliage and soil at the beginning of tillering compared to the no treatment. This occurred at all rates of metribuzin applied; plant necrosis occurred in all rates greater than 0.28 kg/ha in the cultivar Vona. In field trials these researchers observed stand reductions greater than 10% resulting from application of metribuzin at 0.6 kg/ha in 'Osage', 'Homestead', 'Sturdy', and 'Triumph 64'. TAM W-101 was the only cultivar in this experiment with an average stand reduction of less than 10% for the two years tested. Percent yield reduction due to metribuzin applications for 15 cultivars over two years was also reported by these researchers. At 0.4 kg/ha metribuzin Vona and 'Lindon' had 50% yield reductions. All other cultivars treated at this rate had no significant yield reductions compared to the check. At 0.6 kg/ha metribuzin Osage, 'Scout 66' and TAM W-101 were the only cultivars with less than 10% yield reduction. TAM W-101 was the only cultivar tested that had less than a 10% reduction in yield when metribuzin was applied at 0.8 kg/ha. All cultivars tested had a yield reduction of 25% or greater when metribuzin was applied at 1.1 kg/ha. Runyan and Peeper (19) treated 16 cultivars at rates adequate for cheat control in the spring when the wheat plants were fully tillered. Triumph 64, Sturdy, Vona, Lindon, 'Pioneer 915A' and 'DeKalb 589' were the most susceptible cultivars to metribuzin injury. These cultivars were found to be tolerant to metribuzin: TAM W-101, Osage, Sage, 'Rall', Larned, Scout 66, 'Payne', Newton, 'Centurk' and 'Lancota'.

Runyan et al. (17) also determined that metribuzin applied in the spring, following the grazing of wheat, was more phytotoxic to both winter wheat and cheat compared to an ungrazed, treated, winter wheat and cheat plot. Unacceptable crop injury was observed by Gigax (9) when metribuzin was applied at 0.42 kg/ha in the spring before full tillering and secondary root development, but prior to jointing, in the cultivars 'Trison', Triumph 64 and 'Wings'. Acceptable levels of winter wheat injury at the same rate were observed in 'Buckskin', Centurk, 'Centurk 78', 'Cheney', Eagle, 'Larned', Newton, 'Parker 76', Payne, 'Rocky', Sage and TAM W-101. Another group of researchers, Ghadiri et al. (8) observed metribuzin injury in Centurk winter wheat at rates of 0.3, 0.4 and 0.6 kg/ha, applied in the spring at full tillering. Winter wheat injury from metribuzin caused a significant yield reduction in the 0.6 kg/ha treatment compared to the untreated check. Stahlman (22) reported significant yield reduction and stand reduction in Eagle winter wheat from metribuzin applied at 0.56 kg/ha in the spring at pre-jointing.

In cheat-free conditions Fischer and Peeper (7) applied metribuzin at 0.42 kg/ha in the fall and spring on three cultivars, TAM W-101, TAM 105 and Newton. Average yields of the three cultivars treated were less than the yield of the untreated check. Wicks (28) observed injury in Centurk winter wheat due to fall applications made approximately two months after planting. Four seedbed preparation methods were studied and metribuzin applied at 0.42 kg/ha showed wheat injury in all four treatments. However, no yield reductions were seen from the herbicide treatments. Alley and Humburg (1) also

treated Centurk winter wheat in the fall with metribuzin at 0.42 kg/ha when the wheat had 2-4 tillers. These researchers reported 20% phytotoxicity to the wheat due to the herbicide treatment.

The effects of metribuzin on wheat protein content and test weight were negligible, as reported by Gigax (9), in which 15 cultivars were treated with metribuzin in the spring at 0.42 and 0.70 kg/ha. Ghadiri et al. (8) observed no significant changes in protein content and volume weight of Centurk winter wheat treated with 0.3, 0.4 and 0.6 kg/ha metribuzin. Fischer and Peeper (7) reported no significant changes in grain test weight of TAM W-101, TAM 105 and Newton winter wheats treated in the fall or spring with metribuzin at 0.42, 0.70 and 0.84 kg/ha.

METRIBUZIN IN THE SOIL

Bailey and White (3) determined that surface acidity within the colloidal system is the most important soil property in determining the extent and nature of adsorption of basic organic compounds. Ladlie et al. (15) found that a greater amount of extractable metribuzin residue was present in a soil having a pH of 6.7 compared to the same soil having a pH of 4.6. These researchers also determined that the leaching of metribuzin following 7.1 cm. of rainfall increased with incremental increases in soil pH. This indicates that as the soil pH increases the adsorption of metribuzin onto soil colloids decreases. Ladlie et al. (14) discovered that movement of metribuzin on soil thin-layer chromatographic plates increased as the soil pH increased. These researchers also discovered a reduction in metribuzin degradation as the soil pH decreased from 6.7 to

4.6 They hypothesized that the decreased rate of metribuzin degradation in acid soils was due to the adsorption of metribuzin by the soil colloids. This is postulated to occur through protonation of the amine group in metribuzin. The protonated form of metribuzin is more readily adsorbed by the negatively charged soil colloid. The degree of protonation increases as the soil pH decreases.

Savage (20) measured metribuzin concentrations in a Bosket very fine sandy loam soil to determine metribuzin persistence. The degradation rate of metribuzin was significantly more rapid when the soil was incubated at 30C compared to 20C. By autoclaving the soil, Savage (20) found the degradation of metribuzin had a high initial rate which decreased after three to four weeks. Edaphic and environmental conditions that favor microbiological activity also favor the degradation of metribuzin.

CHEAT

Cheat grass is described by Hitchcock (12) as an annual or a winter-annual grass which was introduced into the United States from Europe. Hulbert (13) observed that seeds of cheat required a period of cold temperature for flower initiation to occur. Steinbauer and Grigsby (23) found that cheat seed has a dormancy period of four to five weeks immediately after seed maturity. This dormancy can be broken by subjecting the seed to temperatures of 15C or less. Duvel (6) studied the viability of buried cheat seeds and found that they lost their capacity to germinate after 11 months in

the soil. McNeil and Peeper (16) observed that cheat seed at one-inch depth had 92% emergence, seed at two-inch depth had 74% emergence and cheat seed at the four-inch depth had 1.0% emergence. No cheat emerged from the six or eight-inch seed depths. Carter et al. (5) observed that cheat had a greater tillering capacity than winter wheat under similar growing conditions. These researchers also found that cheat yields were reduced greatly when grown in association with winter wheat. However, cheat plants never suffered so severely from competition with winter wheat as to produce no seed at all. The potentiality of cheat to take advantage of available space enables it to persist as a weed pest in winter wheat growing sections of the midwest.

CHEAT CONTROL

Carter et al. (5) suggested that thick stands of winter wheat could possibly keep cheat populations low enough for satisfactory control. But when soil and climatic conditions cause thin wheat stands, cheat plants will have the ability to compete with the wheat. Runyan and Peeper (18) observed a decrease in Bromus species populations, including Bromus secalinus, when a moldboard plow was used as the primary tillage tool. These researchers also determined that cheat infestations did not increase with the use of a semi-dwarf cultivar compared to cheat populations in a standard winter wheat cultivar.

Fischer and Peeper (7) treated TAM W-101 , TAM 105 and Newton with 0.42 kg/ha metribuzin in plots overseeded with cheat. They observed 93%, 91%, 88% and 96% cheat control from applications made October 11, 1979, November 12, 1979, March 5, 1980 and March

20, 1980, respectively. At another location these researchers applied 0.42 kg/ha metribuzin in plots overseeded with cheat and found 95%, 94%, 100% and 51% cheat control. These applications were made on December 19, 1979, March 7, 1980, March 21, 1980 and April 22, 1980, respectively. Gigax (9) observed satisfactory cheat control in winter wheat plots treated with metribuzin at rates of 0.42, 0.56, 0.70, 0.84 and 1.12 kg/ha. Applications of 0.28 kg/ha did not offer satisfactory cheat control.

MATERIALS AND METHODS

Field studies were initiated in the fall of 1980 and repeated the following year near Manhattan, Kansas, at the Ashland Agronomy Research Farm (locations 1, 2 and 3) and at the South-central Experiment Field near Hutchinson, Kansas. The winter wheat cultivars Centurk 78, Newton, TAM W-101, TAM 105 and Vona were planted at location two on October 6, 1980, and September 29, 1981, in a Reading silt loam with a pH of 6.3 and organic matter content of 2.6 percent. These same cultivars were seeded at location three on October 9, 1980, and September 29, 1981, in a Muir silt loam with a pH of 5.7 and organic matter content of 3.5 percent. The Hutchinson study was planted on October 4, 1980, and October 1, 1981, in a Clark Ost silt loam with a pH of 5.9 and organic matter content of 1.8 percent. Cultivars planted at Hutchinson both years were 'Bennett', Buckskin, Centurk 78, Eagle, 'KS 79H69'('Arkan'), 'KS 79H70', 'KS 75210', 'KS 75216', Larned, Newton, Parker 76, Sage, Scout 66, TAM W-101, TAM 105, Trison, Triumph 64, and Vona. These same cultivars were planted at location one on September 28, 1981, in a Muir silt loam with a pH of 6.2 and organic matter content of 3.3 percent. All of the plots were planted with a disc drill.

In 1980 locations two and three were fertilized with nitrogen and phosphorus at rates of 67 kg/ha and 56 kg/ha, respectively. The Hutchinson study was fertilized in 1980 with 36 kg/ha and 45 kg/ha of nitrogen and phosphorus, respectively. All applications were broadcast with a tractor-mounted fertilizer spreader.

In 1981 locations one, two and three were fertilized with nitrogen and phosphorus at rates of 67 kg/ha and 56 kg/ha, respect-

ively. These applications were knifed in with shanks at 38 cm spacings on center and the knives were set at a depth of 15 cm. The plots at Hutchinson were fertilized in 1981 with nitrogen and phosphorus at rates of 58 kg/ha and 56 kg/ha, respectively. The fertilizer was broadcast with a tractor-mounted fertilizer spreader. The plot areas were fertilized with 33.3 percent ammonium nitrate and 18-46-0 ammonium phosphate. In both years each plot area was tilled by conventional methods for seedbed preparation.

In 1980, locations two and three were overseeded with cheat using a hand-held broadcast seeder. In 1981, locations one, two and three had cheat planted across the entire plot area using a disc drill prior to planting of the wheat.

All plots were sprayed with a compressed air, tractor-mounted, plot sprayer. Three stainless steel flat fan nozzles spaced 51 cm apart and 46 cm from the ground were operated with a spray pressure of 1.2 kg/cm^2 . The herbicide was applied with water at 187 l/ha.

Each plot consisted of six rows that were spaced 20 cm apart. All plots were 9.1 m long except at location two where plots planted in 1981 were 15.2 m long.

The study at locations two and three consisted of a two-way factorial structure consisting of five cultivars treated with 10 herbicide treatments. The experiments were conducted in a split plot design with three replications. The cultivars were assigned at random to the whole plots, and the herbicide treatments were randomly assigned to subplots within the whole plots.

The experiments at Hutchinson and location one consisted of a two-way factorial structure of 18 cultivars treated with three herbicide treatments. The experiments were conducted in a split plot design with three replications. The cultivars were assigned at random to the whole plots, and the herbicide treatments were randomly assigned to subplots within the whole plots. All locations were analyzed using Duncan's Multiple Range Test at a probability level of 0.05; means with the same letter are not significantly different.

Metribuzin application rates and dates for locations two and three in 1980 and 1981 are listed in Table 1. Rates of application of metribuzin and dates for location one for 1981 are listed in Table 2, and the Hutchinson application rates and dates for 1980 and 1981 are listed in Table 3.

Locations two and three were harvested on June 24, 1981, with a modified Massey-Ferguson 35 plot combine. The Hutchinson study was harvested with the same machine on June 18, 1981. In 1982 locations one, two and three were harvested on July 9, July 7 and July 8, respectively, with a modified Model E Gleaner plot combine. The Hutchinson study was harvested with a Hege 125B small plot combine on July 3, 1982.

Data collected at all locations in both years included plant height measurements taken at the dough stage, grain weight, test weight, percent moisture and percent protein. The weight per 1000 kernels was determined at Hutchinson in 1981 instead of the test weight. Near infrared analysis both years determined percent protein content of the grain for all plots at each location. Plots at loca-

tions two and three were visually rated for cheat control.

Ratings for 1981 were made on June 8th. Cheat control ratings for 1982 were made on June 3rd. Cheat ratings were made using a scale of 0 to 10: 0 was equivalent to no control and 10 was equivalent to complete control.

In 1982 a considerable amount of cheat was in the harvested plot samples. The samples were weighed and the cheat was separated from the wheat with a forced air seed cleaner. The wheat sample with the cheat removed was weighed and the cheat weight of each plot was computed for locations one, two and three.

The frequent spring rainfalls in 1982 caused severe lodging at locations one and three. Lodging ratings were made for location one on July 1, 1982. Severe lodging throughout the plot area at location three made individual plots indistinguishable. Consequently, no lodging ratings were made. Ratings were made using a scale of zero percent equivalent to no lodging and 100 percent equivalent to complete lodging. Due to the severity of lodging, no cheat control ratings were made at locations one and three. Rainfall data and soil test information for both years are in Appendix Tables 48-53.

Table 1. Metribuzin application rates and dates for locations two and three.

Rate (kg/ha)	Date
0.28	November 18, 1980
0.28	December 23, 1980
0.42	November 18, 1980
0.42	December 23, 1980
0.28	November 17, 1981
0.28	December 21, 1981
0.42	November 17, 1981
0.42	December 21, 1981
0.42	March 1, 1981
0.42	March 20, 1981
0.56	March 1, 1981
0.56	March 20, 1981
0.42	March 11, 1982
0.42	March 31, 1982
0.56	March 11, 1982
0.56	March 31, 1982

Table 2. Metribuzin application rates and dates for location one.

Rate (kg/ha)	Date
0.42	November 17, 1981
0.56	March 11, 1982

Table 3. Metribuzin application rates and dates for Hutchinson, Kansas.

Rate (kg/ha)	Date
0.42	November 22, 1980
0.42	November 16, 1981
0.56	March 13, 1981
0.56	March 26, 1982

Wheat Tolerance and Cheat Control 1980-1981

Results and Discussion

In 1980 adequate populations of winter wheat were established at locations two and three and near Hutchinson, Kansas. These locations received ample rainfall that provided good early crop growth. Rainfall received following the first fall application of metribuzin was 6.4 cm within 20 days, 0.7 cm of rainfall within four days of the second fall application, 0.9 cm of rainfall within four days of the first spring application and 1.6 cm of rainfall was received within eight days of the second spring application. The Hutchinson study received 3.5 cm of rainfall within 17 days of the fall treatment and 2.4 cm of rainfall within 12 days after the spring treatment. All locations received minimal precipitation through April causing droughty growing conditions.

Typical drought-stressed wheat plant injury symptoms of dark blue-green appearance and erect rolled leaves were present throughout each cultivar at all locations.

A minimal infestation of wheat (soil-borne) mosaic virus was present in isolated areas of locations two and three. Plants growing in the lower, wetter areas of the plots had typical prominent-yellow mosaic patterns in their leaves and were moderately stunted due to the virus. A synergistic effect was present in those plots treated with metribuzin.

At all locations metribuzin injury was easily identified within one month following application. Those plots treated with 0.42 kg/ha in the fall at locations two and three had light to moderate leaf chlorosis. This application resulted in more

chlorosis and was separable from the 0.28 kg/ha application regardless of date of application. Leaf chlorosis was also prevalent after the spring metribuzin applications at locations two, three and Hutchinson. However, differences between metribuzin rates applied on the same date in the spring were not visually detectable.

At locations two and three, Vona had the most severe leaf chlorosis from metribuzin applications. Centurk 78 and Newton had moderate leaf chlorosis; TAM W-101 and TAM 105 had the least amount of leaf chlorosis on those plots treated with metribuzin.

At Hutchinson, Vona had the most severe injury symptoms from the metribuzin treatments. Triumph 64 had less severe leaf chlorosis than Vona and the remaining 16 cultivars had even less leaf chlorosis from the metribuzin treatments. Of the 18 cultivars TAM W-101 and TAM 105 had the least visible leaf chlorosis in the treated plots.

Leaf chlorosis which was evident in all cultivars from both fall and spring treatments of metribuzin diminished when the wheat plants were in the "shooting" or jointing stage.

Vona treated with metribuzin had visible stand reductions at each location.

At location two metribuzin did not significantly affect yield, percent moisture, test weight or plant height (Table 4). There were significant differences in cheat control ratings among metribuzin treatment means. The early fall application of 0.42 kg/ha controlled cheat to a greater extent than any of the other fall treatments. No significant differences in cheat control occurred

among the spring treatments. Among the spring metribuzin treatments only the later spring application of 0.42 kg/ha provided significantly less cheat control from that which the first fall application of 0.42 kg/ha provided.

At location three, yield average over all cultivars was significantly different between the second fall application of 0.42 kg/ha and the second spring application of 0.56 kg/ha (Table 5). All other yields were not significantly higher than all other treatments except for the first spring application of 0.56 kg/ha. Multiple comparisons of treatment means for the remaining cheat control ratings, percent moisture, test weight and plant height measurements are in Table 5.

Interaction effects between the various treatments and five cultivars on yield, percent moisture, test weight, plant height, percent protein and cheat control ratings at both locations are in the appendix.

Yield, percent moisture, test weight and cheat control ratings averaged over the ten treatments for each cultivar at locations two and three are also in the appendix.

Fall-applied metribuzin at 0.42 kg/ha reduced yields of both Vona and Centurk 78 wheat at Hutchinson in 1981 (Table 6). Metribuzin applied in the spring at 0.56 kg/ha decreased the yield in both Parker 76 and TAM 105. The cultivar KS 79H69 had significant reductions in yield from both the fall and spring treatment compared to the yield of the no treatment plot. In all other cultivars tested no significant yield reductions occurred as the result of a metribuzin treatment.

Metribuzin significantly reduced the plant height of five of the 18 cultivars tested (Table 6). The cultivars KS 79H69 and KS 79H70 were affected only by the 0.56 kg/ha treatment applied in the spring. Scout 66, TAM 105 and Parker 76 had significant plant height reductions from both the fall and spring treatments.

Few differences occurred between treatments in percent moisture, weight per 1000 seeds and percent protein in the cultivars tested at Hutchinson (Table 6).

Treatment mean effects analyzed over the 18 cultivars and cultivar mean effects analyzed over all of the treatments at Hutchinson, Kansas on yield, percent moisture, weight per 1000 seeds and plant height are in the appendix.

Table 4. Treatment main effects over all cultivars at location two on yield, percent moisture, test weight, plant height, percent protein and cheat control ratings for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat, ^b Rating
.28 Fall 1st date	2035.0 a	10.8 a	73.1 a	57.3 a	15.6 ab	6.1 de
.42 Fall 1st date	2090.9 a	10.8 a	73.4 a	58.0 a	15.8 ab	9.3 a
.28 Fall 2nd date	2127.9 a	10.8 a	73.1 a	57.3 a	15.3 ab	6.0 e
.42 Fall 2nd date	2043.1 a	10.8 a	73.2 a	56.9 a	15.5 ab	7.0 cde
No Treatment	2069.1 a	10.8 a	73.2 a	58.2 a	15.3 ab	0.0 f
.42 Spring 1st date	1967.1 a	10.7 a	72.8 a	57.0 a	15.8 ab	8.1 abc
.56 Spring 1st date	2006.2 a	10.7 a	73.2 a	58.9 a	15.4 ab	8.8 ab
.42 Spring 2nd date	1849.6 a	10.7 a	73.0 a	56.7 a	15.6 ab	7.4 bcd
.56 Spring 2nd date	1867.0 a	10.8 a	72.6 a	57.6 a	16.0 a	8.4 ab
No Treatment	2132.3 a	10.7 a	72.5 a	59.2 a	15.1 b	0.0 f

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 5. Treatment main effects over all cultivars at location three on yield, percent moisture, test weight, plant height, percent protein and cheat control ratings for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat, Rating ^b
.28 Fall 1st date	1780.2 ab	10.4 a	67.2 bcd	50.9 ab	19.6 abc	7.4 cd
.42 Fall 1st date	1832.2 ab	10.3 ab	68.3 ab	51.8 ab	19.7 abc	9.4 a
.28 Fall 2nd date	1806.2 ab	10.2 ab	67.7 abc	51.4 ab	20.0 ab	8.2 bc
.42 Fall 2nd date	1923.4 a	10.2 ab	68.8 a	52.7 a	19.5 bc	7.7 c
No Treatment	1749.7 ab	10.1 b	66.1 d	51.8 ab	19.5 bc	0.0 e
.42 Spring 1st date	1664.9 bc	10.2 ab	67.0 bcd	51.4 ab	19.9 abc	7.8 c
.56 Spring 1st date	1725.8 ab	10.2 ab	68.1 ab	51.8 ab	19.6 bc	8.8 ab
.42 Spring 2nd date	1693.2 bc	10.3 ab	67.4 bcd	51.8 ab	19.5 bc	6.5 d
.56 Spring 2nd date	1514.9 c	10.1 b	66.5 cd	50.0 b	20.2 a	8.3 bc
No Treatment	1795.3 ab	10.1 b	66.9 bcd	51.9 ab	19.4 c	0.0 e

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 6. Metribuzin treatment mean effects in cultivars at Hutchinson, Kansas on yield, percent moisture, weight per 1000 seeds, percent protein and plant height for 1980-1981.^a

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)		% Mois- ture	Wt/1000 seeds (gm)	% Protein	Plant Height (cm)
TAM W-101	No Treatment	2358.2	a	12.1 a	40.1 a	11.3 a	71.3 a
	.42 Fall	2238.8	a	12.0 a	41.1 a	11.7 a	71.0 a
	.56 Spring	2064.8	a	12.1 a	41.0 a	11.6 a	70.6 a
Scout 66	No Treatment	2010.4	a	12.0 a	35.4 a	11.1 a	91.7 a
	.42 Fall	1488.8	a	12.1 a	35.3 a	10.9 a	89.0 b
	.56 Spring	1630.1	a	11.9 a	35.3 a	11.0 a	87.7 b
Larned	No Treatment	2292.9	a	12.2 a	40.4 a	10.2 b	86.0 a
	.42 Fall	2151.7	a	12.1 a	40.4 a	11.0 a	84.7 a
	.56 Spring	2075.6	a	12.2 a	39.9 a	10.8 ab	85.7 a
Bennett	No Treatment	1999.7	a	11.7 a	33.4 a	11.4 a	77.3 a
	.42 Fall	1858.2	a	11.8 a	33.3 a	11.6 a	77.7 a
	.56 Spring	1923.6	a	11.8 a	33.7 a	11.5 a	76.3 a
Trison	No Treatment	2108.1	a	12.0 a	38.7 a	11.8 a	86.7 a
	.42 Fall	1912.8	a	11.9 b	39.9 a	12.1 a	85.3 a
	.56 Spring	1858.2	a	11.8 b	38.8 a	11.5 a	84.7 a
Newton	No Treatment	2673.5	a	12.1 a	36.7 a	10.2 a	77.0 a
	.42 Fall	2217.0	a	11.9 a	37.3 a	10.9 a	75.0 a
	.56 Spring	2521.3	a	11.9 a	34.2 a	10.7 a	76.7 a
Vona	No Treatment	2923.4	a	12.1 a	32.0 a	10.6 a	70.0 a
	.42 Fall	1706.0	b	11.9 a	30.6 a	11.8 a	67.0 a
	.56 Spring	2108.1	ab	11.9 a	31.1 a	11.6 a	70.3 a
KS 75216	No Treatment	2912.4	a	12.3 a	35.0 a	9.9 b	76.3 a
	.42 Fall	2760.2	a	12.2 a	40.1 a	10.1 ab	76.0 a
	.56 Spring	2716.8	a	12.2 a	35.9 a	10.3 a	76.3 a
KS 79H70	No Treatment	2706.0	a	11.6 a	33.1 a	11.4 b	76.0 a
	.42 Fall	2217.0	a	11.7 a	35.3 a	11.6 ab	72.3 ab
	.56 Spring	2206.0	a	11.6 a	34.0 a	11.9 a	70.3 b
Eagle	No Treatment	1771.1	a	11.9 a	38.2 a	11.7 a	85.0 a
	.42 Fall	1869.2	a	11.8 a	38.5 a	11.8 a	84.3 a
	.56 Spring	1749.8	a	11.8 a	35.3 a	11.9 a	81.7 a

(continued)

Table 6 (continued).

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)		% Mois- ture	Wt/1000 seeds (gm)	% Protein	Plant Height (cm)
TAM 105	No Treatment	2684.3	a	11.8 a	39.0 a	9.6 b	80.0 a
	.42 Fall	2466.9	b	11.8 a	37.9 a	10.4 a	76.6 c
	.56 Spring	2325.7	b	11.8 a	38.4 a	10.1 ab	78.0 b
Parker 76	No Treatment	2521.0	a	12.4 a	34.8 a	11.0 b	85.6 a
	.42 Fall	2314.9	b	12.3 a	32.4 a	11.9 ab	82.0 b
	.56 Spring	2130.1	b	12.4 a	34.3 a	12.3 a	82.0 b
Sage	No Treatment	2032.2	a	11.9 a	33.7 a	11.5 b	86.6 a
	.42 Fall	2075.6	a	12.0 a	36.4 a	11.5 b	86.6 a
	.56 Spring	1869.2	a	12.0 a	34.8 a	12.2 a	84.6 a
KS 75210	No Treatment	2380.0	a	12.0 a	38.8 a	11.1 a	74.3 a
	.42 Fall	2217.0	a	12.0 a	37.1 ab	11.2 a	74.0 a
	.56 Spring	2379.8	a	11.8 b	35.4 b	11.1 a	75.6 a
KS 79H69	No Treatment	2803.7	a	11.6 a	33.1 a	11.0 b	75.0 a
	.42 Fall	2445.1	b	11.6 a	33.9 a	11.7 a	74.3 a
	.56 Spring	2456.1	b	11.5 a	32.7 a	11.6 ab	72.6 b
Centurk 78	No Treatment	2771.1	a	12.1 a	33.9 a	10.3 a	82.3 a
	.42 Fall	2466.9	b	11.9 a	37.0 a	10.6 a	80.3 a
	.56 Spring	2510.5	ab	11.9 a	33.5 a	10.7 a	80.6 a
Triumph 64	No Treatment	2140.7	a	12.1 a	36.6 a	11.8 a	88.6 a
	.42 Fall	1739.0	a	12.1 a	35.7 a	12.0 a	86.3 a
	.56 Spring	2075.8	a	12.1 a	36.1 a	12.3 a	84.0 a
Buckskin	No Treatment	2129.9	a	11.9 a	33.4 a	10.7 a	89.0 a
	.42 Fall	2423.4	a	11.9 a	33.4 a	10.7 a	89.0 a
	.56 Spring	2303.9	a	11.9 a	35.1 a	10.4 a	89.0 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Wheat Tolerance and Cheat Control 1981-1982

Results and Discussion

In 1981 satisfactory stands of winter wheat were established at locations one, two, three and near Hutchinson, Kansas. Precipitation following planting was sufficient for good crop growth at all locations. Locations one, two and three received 1.9 cm of rainfall within 14 days of the first fall application, 0.8 cm of moisture within 14 days of the second fall application, 5.1 cm of rainfall within eight days of the first spring application and 0.8 cm rainfall within eight days of the second spring application. The Hutchinson study received 2.1 cm of rainfall within 14 days of the fall application and 0.8 cm rainfall within four days of the spring application.

Prolonged snow cover and sub-freezing temperatures caused winter injury to all cultivars at location one. Metribuzin applied in the fall appeared to interact synergistically with adverse climatic factors in terms of wheat injury.

An infestation of wheat (soil-borne) mosaic virus was present at location three on all cultivars but Newton. No synergism with metribuzin treatments was evident.

At location one severe infestations of leaf rust (Puccinia recondita Rob. ex Desm. f. sp. tritici) and powdery mildew (Erysiphe graminis Dc. f. sp. tritici E. Marchal) were present throughout the plot area. No synergistic effect was seen in plots treated with metribuzin.

Locations one and three suffered severe lodging following a storm on June 7, 1982, which had 1.5 cm of rainfall and wind gusts in excess of 100 kilometers per hour. Due to continued rainfall both locations remained lodged through harvest.

Crop injury from metribuzin applications was evident at all locations within one month of the application. Metribuzin rate differences were distinguishable by the amount of leaf chlorosis present. These symptoms appeared on those leaves sprayed and were not transferred through the plant. Levels of severity among cultivars followed the same order as in the 1980-1981 growing season.

Reductions in crop stand were seen at Hutchinson and location one. Both the fall and spring metribuzin applications caused visible stand reductions in Vona and Triumph 64.

At location three the treatment means analyzed over all of the cultivars had 0.42 kg/ha metribuzin first fall application yielding significantly higher than all other treatments. The no treatment plots, 0.28 kg/ha fall second date and both rates applied on the second spring date had significantly lowered yields than the first spring application of 0.56 kg/ha metribuzin. All other treatment yields were statistically equivalent (Table 7). Included in this table are percent moisture, test weight, plant height, percent protein and cheat weight.

Metribuzin treatment mean effects analyzed for each cultivar at location three are in the appendix.

At location two the first fall application of 0.42 kg/ha yielded higher than all other treatments (Table 8). Both rates of metribuzin applied in the spring on the first date and 0.28 kg/ha applied in the fall on the first date increased yields to a greater extent than the remaining six treatments.

Treatment mean cheat control ratings analyzed over the five cultivars at location two ranked 0.42 kg/ha applied in the fall on the first date and 0.56 kg/ha applied in the spring on the first date significantly higher than all other treatments. The remaining cheat control ratings were below acceptable levels of cheat control.

The mean cheat weight measurements correlated inversely with the cheat control ratings (Table 8). This table also includes the percent moisture, test weight, plant height and percent protein measurements analyzed over all of the cultivars at location two.

Analysis of metribuzin treatment mean effects for each cultivar at location one had the fall application of 0.42 kg/ha yielding significantly higher than the no treatment in the cultivars Newton, Parker 76, TAM 105, and Triumph 64 (Table 9). The spring treatment of 0.56 kg/ha had a significantly higher yield than the no treatment in Bennett and Sage. The fall treatment in KS 75210 had a significantly higher yield than the spring treatment, but neither treatment differed statistically from the no treatment. All other cultivars tested at location one had no significant yield differences between treatments.

Percent lodging ratings at location one showed significantly less lodging from the 0.42 kg/ha fall treatment compared to the no treatment in KS 79H69, Larned, TAM W-101 and Sage. There was significantly less lodging after the 0.56 kg/ha spring treatment compared to the no treatment in Eagle, Parker 76 and Triumph 64. All other cultivars at location one had no significant differences in percent lodging ratings between treatments.

At location one the fall plot treated with 0.42 kg/ha had significantly less cheat weight than the untreated plot in KS 79H69, Sage, and Triumph 64. The spring plot treated with 0.56 kg/ha had significantly less cheat weight than the untreated plot in Parker 76, Sage and Triumph 64. In the cultivar KS 79H70 the plot that received no treatment and the spring plot had significantly less cheat weight than did the fall treated plot. All other cultivars at location one had no significant differences between treated and untreated plots in cheat weight measurements (Table 9).

Table nine also includes the treatment means for percent moisture, test weight and percent protein for each cultivar at location one.

Analysis of metribuzin treatment mean effects for each cultivar at Hutchinson gave no significant differences in yields between treatments in any of the 18 cultivars tested (Table 10).

Plant height measurements at Hutchinson gave few differences between treatments in each cultivar. The spring application on

Buckskin significantly reduced the plant height compared to the fall treatment. However, neither treatment differed statistically from the no treatment. A significant plant height reduction from the spring treatment compared to that of the fall treatment occurred in KS 75210. KS 75216 had a significantly lower plant height from the spring treatment compared to the fall application and no treatment. In Parker 76 the fall application and no treatment showed a significant reduction in plant height compared to that of the spring treatment.

There were few differences in percent moisture, test weight and percent protein between treatments in all cultivars at Hutchinson (Table 10).

Table 7. Treatment main effects over all cultivars at location three on yield, percent moisture, test weight, plant height, percent protein, and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Weight (kg/ha)
.28 Fall 1st date	1158.4 ^{bc}	10.8 a	71.4 a	88.3 ab	12.7 ab	262.3 b
.42 Fall 1st date	1360.6 a	10.8 a	71.6 a	89.1 a	12.8 a	253.6 b
.28 Fall 2nd date	1121.5 c	10.8 a	71.7 a	88.0 ab	12.7 ab	266.6 b
.42 Fall 2nd date	1141.0 bc	10.7 a	71.8 a	88.0 ab	12.8 a	305.6 ab
No Treatment	1047.6 c	10.8 a	71.8 a	87.2 b	12.7 ab	277.4 b
.42 Spring 1st date	1149.7 bc	10.7 a	71.3 a	87.6 ab	12.8 a	277.4 b
.56 Spring 1st date	1234.5 b	10.7 a	71.2 a	87.3 b	12.8 a	273.1 b
.42 Spring 2nd date	1093.2 c	10.7 a	71.7 a	85.4 c	12.9 a	270.9 b
.56 Spring 2nd date	1086.7 c	10.7 a	71.6 a	84.7 c	12.9 a	253.6 b
No Treatment	1047.6 c	10.8 a	71.7 a	87.2 b	12.5 b	331.6 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 8. Treatment main effects over all cultivars at location two on yield, percent moisture, test weight, plant height, percent protein, cheat control ratings and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating	Cheat Weight
.28 Fall 1st date	2183.0 c	10.9 abc	74.5 bc	89.5 a	9.7 cd	3.6 c	247.1 cd
.42 Fall 1st date	2468.6 a	11.0 a	74.8 ab	89.2 ab	10.0 bc	7.7 a	176.8 e
.28 Fall 2nd date	1943.0 de	10.9 abc	73.6 de	87.7 abc	9.6 d	0.6 e	365.4 a
.42 Fall 2nd date	2046.1 d	10.8 bc	74.3 bcd	86.9 bc	9.7 cd	2.0 d	286.1 bc
No Treatment	2025.2 de	10.7 c	73.7 de	89.1 ab	9.9 bcd	0.0 e	395.4 a
.42 Spring 1st date	2241.7 bc	10.8 bc	74.8 ab	87.3 abc	10.2 ab	6.6 b	210.7 de
.56 Spring 1st date	2312.1 b	10.9 abc	75.2 a	85.9 c	10.3 a	8.5 a	180.8 e
.42 Spring 2nd date	1939.1 de	10.9 abc	74.1 cd	88.6 ab	9.9 bcd	3.8 c	257.5 bcd
.56 Spring 2nd date	1923.5 e	10.9 abc	74.7 abc	87.3 abc	10.1 ab	5.7 b	205.5 de
No Treatment	1914.4 e	10.9 abc	73.5 e	89.3 ab	9.7 cd	0.0 e	310.8 b

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 9. Metribuzin treatment mean effects in cultivars at location one on yield, percent moisture, test weight, percent protein, percent lodging and cheat weight for 1981-1982.^a

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)	Moisture %	Test Weight (kg/hl)	Protein %	Lodging %	Cheat Weight (kg/ha)
TAM W-101	No Treatment	347.7 a	10.7 a	66.4 a	13.0 a	92.7 a	205.9 a
	.42 Fall	478.1 a	10.5 ab	64.6 a	12.9 a	88.3 b	162.5 a
	.56 Spring	456.4 a	10.4 b	64.6 a	12.1 a	91.0 ab	205.9 a
Scout 66	No Treatment	510.7 a	10.0 a	64.1 a	12.3 a	98.3 a	325.1 a
	.42 Fall	597.7 a	10.5 a	65.9 a	12.9 a	92.0 a	390.2 a
	.56 Spring	489.0 a	10.2 a	65.6 a	13.0 a	97.7 a	270.9 a
Larned	No Treatment	499.9 a	10.5 a	62.7 b	13.6 a	95.7 a	390.2 a
	.42 Fall	543.3 a	10.0 a	63.8 ab	13.7 a	90.0 b	238.4 a
	.56 Spring	619.4 a	10.1 a	65.8 a	13.8 a	92.7 ab	216.7 a
Bennett	No Treatment	499.9 b	10.3 a	63.4 a	13.3 a	93.3 a	314.3 a
	.42 Fall	565.1 ab	10.2 a	64.2 a	13.6 a	86.7 a	260.1 a
	.56 Spring	673.7 a	10.1 a	64.8 a	12.8 a	85.0 a	292.6 a
Trison	No Treatment	521.6 a	10.8 a	66.7 a	12.0 a	93.3 a	205.9 a
	.42 Fall	728.1 a	10.4 a	68.7 a	11.5 a	61.7 a	195.1 a
	.56 Spring	630.3 a	10.3 a	66.9 a	12.2 a	85.0 a	205.9 a
Newton	No Treatment	608.5 b	10.9 a	67.4 a	12.2 a	91.0 a	238.4 a
	.42 Fall	836.7 a	10.7 a	65.9 a	12.6 a	91.7 a	249.3 a
	.56 Spring	728.1 ab	10.8 a	66.5 a	12.7 a	94.3 a	216.7 a
Vona	No Treatment	478.1 a	10.2 a	66.0 a	12.3 a	98.0 a	509.4 a
	.42 Fall	782.4 a	10.3 a	66.8 a	12.9 a	63.3 a	422.7 a
	.56 Spring	565.1 a	10.3 a	65.9 a	12.6 a	91.7 a	260.1 a

(continued)

Table 9 (continued)

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)	Moisture %	Test Weight (kg/hl)	Protein %	Lodging %	Cheat Weight (kg/ha)
KS 75216	No Treatment	652.0 a	10.6 a	63.9 a	12.7 a	96.0 a	303.4 a
	.42 Fall	760.7 a	10.6 a	64.3 a	12.8 a	95.0 a	303.4 a
	.56 Spring	695.5 a	10.6 a	64.6 a	12.7 a	93.3 a	270.9 a
KS 79H70	No Treatment	988.9 a	9.9 b	68.8 a	13.8 a	88.3 a	162.5 b
	.42 Fall	1228.0 a	10.2 a	69.4 a	13.2 a	85.0 a	292.6 a
	.56 Spring	836.7 a	10.2 a	68.2 a	13.7 a	78.3 a	195.1 b
Eagle	No Treatment	293.4 a	10.4 a	61.4 a	11.9 a	95.3 a	270.9 a
	.42 Fall	391.2 a	10.2 a	63.9 a	12.8 a	93.3 ab	205.9 a
	.56 Spring	391.2 a	10.0 a	62.5 a	12.4 a	91.7 b	270.9 a
TAM 105	No Treatment	575.9 b	10.5 a	67.2 a	12.0 a	93.3 a	205.9 a
	.42 Fall	858.5 a	10.3 a	65.6 a	11.3 a	71.7 a	336.0 a
	.56 Spring	728.1 ab	10.3 a	65.8 a	12.5 a	93.3 a	303.4 a
Parker 76	No Treatment	652.0 b	10.6 a	68.3 b	12.9 a	92.7 a	270.9 a
	.42 Fall	847.6 a	10.7 a	69.2 ab	13.4 a	88.3 ab	260.1 a
	.56 Spring	749.8 ab	10.6 a	69.6 a	11.5 a	86.7 b	184.2 b
Sage	No Treatment	434.6 b	10.7 a	63.4 b	12.8 a	98.3 a	411.8 a
	.42 Fall	597.7 ab	10.2 a	65.5 a	13.9 a	88.3 b	260.1 b
	.56 Spring	630.3 a	10.2 a	65.6 a	14.7 a	86.7 b	216.7 b
KS 75210	No Treatment	945.4 ab	10.9 a	69.4 b	10.9 a	96.0 a	281.8 a
	.42 Fall	1075.8 a	10.7 a	70.8 a	12.3 a	92.7 a	303.4 a
	.56 Spring	880.2 b	10.9 a	69.9 ab	12.0 a	93.3 a	249.3 a

(continued)

Table 9 (continued).

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)	Test		Protein %	Lodging %	Cheat Weight (kg/ha)
			Moisture %	Weight (kg/hl)			
KS 79H69	No Treatment	1032.4 a	10.2 a	68.3 a	13.7 b	90.0 a	281.8 a
	.42 Fall	1358.4 a	10.1 a	70.3 a	14.0 ab	80.0 b	162.5 b
	.56 Spring	1010.6 a	10.2 a	68.7 a	14.4 a	88.3 a	238.4 ab
Centurk 78	No Treatment	695.5 a	10.5 a	68.1 a	12.8 ab	91.7 a	216.7 a
	.42 Fall	695.5 a	10.4 a	67.0 a	12.4 b	91.7 a	249.3 a
	.56 Spring	749.8 a	10.6 a	67.4 a	13.4 a	91.7 a	281.8 a
Triumph 64	No Treatment	641.1 b	10.2 a	64.8 a	12.9 a	97.3 a	411.8 a
	.42 Fall	956.3 a	10.2 a	67.7 a	13.0 a	93.3 ab	227.6 b
	.56 Spring	728.1 b	10.2 a	67.2 a	13.1 a	90.0 b	292.6 b
Buckskin	No Treatment	662.9 a	10.4 a	66.9 a	13.0 a	87.7 a	173.4 a
	.42 Fall	630.3 a	10.3 a	66.5 a	13.2 a	83.3 a	184.2 a
	.56 Spring	597.7 a	10.5 a	64.8 a	13.1 a	81.7 a	184.2 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 10. Metribuzin treatment mean effects in cultivars at Hutchinson, Kansas on yield, percent moisture, test weight, percent protein and plant height for 1981-1982.^a

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	% Protein	Plant Height (cm)
TAM W-101	No Treatment	3564.5 a	10.2 a	72.8 a	11.4 a	82.0 a
	.42 Fall	3390.6 a	10.3 a	73.5 a	11.8 a	83.3 a
	.56 Spring	3521.0 a	10.4 a	74.8 a	11.7 a	81.0 a
Scout 66	No Treatment	3238.4 a	11.0 a	75.9 a	10.7 b	105.7 a
	.42 Fall	2803.7 a	10.8 a	74.3 ab	11.2 ab	107.7 a
	.56 Spring	3162.4 a	10.7 a	73.5 b	11.3 a	106.0 a
Larned	No Treatment	3108.0 a	10.7 a	75.6 a	11.0 a	105.7 a
	.42 Fall	3227.6 a	10.7 a	73.9 a	11.3 a	104.3 a
	.56 Spring	3303.6 a	10.7 a	74.5 a	11.1 a	104.7 a
Bennett	No Treatment	3444.9 a	10.9 a	72.6 a	11.6 a	93.3 a
	.42 Fall	3281.9 a	10.8 a	73.9 a	11.9 a	93.7 a
	.56 Spring	3434.1 a	10.8 a	73.7 a	11.8 a	93.7 a
Trison	No Treatment	3314.5 a	10.7 a	75.2 a	12.0 a	99.3 a
	.42 Fall	3238.4 a	10.7 a	73.9 a	11.7 a	101.0 a
	.56 Spring	3238.4 a	10.6 a	74.5 a	11.6 a	100.0 a
Newton	No Treatment	3542.7 a	10.8 a	74.3 a	10.4 a	90.7 a
	.42 Fall	3368.8 a	10.9 a	73.0 a	10.3 a	86.7 a
	.56 Spring	3488.4 a	10.8 a	74.3 a	10.6 a	88.0 a
Vona	No Treatment	4249.1 a	11.4 a	75.9 a	10.3 a	85.3 a
	.42 Fall	3412.3 a	11.1 a	75.6 a	10.5 a	84.3 a
	.56 Spring	3868.8 a	11.0 a	74.5 a	10.5 a	84.3 a

(continued)

Table 10 (continued).

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	% Protein	Plant Height (cm)
KS 75216	No Treatment	3379.7 a	10.7 a	72.5 a	10.3 a	87.7 a
	.42 Fall	3205.8 a	10.6 a	71.7 a	10.2 a	87.3 a
	.56 Spring	3205.8 a	10.4 a	71.7 a	10.4 a	85.7 b
KS 79H70	No Treatment	3944.8 a	10.5 a	73.1 a	11.8 b	87.7 a
	.42 Fall	3705.7 a	10.4 a	71.9 a	11.9 ab	87.3 a
	.56 Spring	3749.2 a	10.4 a	73.5 a	12.2 a	86.7 a
Eagle	No Treatment	3173.2 a	10.9 a	73.9 a	11.5 a	101.0 a
	.42 Fall	3042.8 a	11.0 a	73.6 a	11.4 a	100.3 a
	.56 Spring	2912.4 a	11.0 a	73.9 a	11.6 a	100.7 a
TAM 105	No Treatment	3912.2 a	11.1 a	76.1 a	10.5 ab	86.7 a
	.42 Fall	3988.3 a	10.9 a	74.9 a	10.8 a	89.7 a
	.56 Spring	3868.8 a	11.0 a	76.2 a	10.4 b	87.7 a
Parker 76	No Treatment	3586.2 a	11.3 a	76.8 a	12.0 a	99.3 b
	.42 Fall	3564.5 a	11.1 a	76.8 a	11.7 a	98.3 b
	.56 Spring	3477.5 a	11.0 a	76.2 a	11.9 a	101.7 a
Sage	No Treatment	3412.3 a	11.0 a	74.3 a	11.7 a	108.7 a
	.42 Fall	3010.2 a	11.0 a	73.2 a	11.5 a	106.7 a
	.56 Spring	3325.4 a	10.9 a	74.8 a	11.7 a	108.3 a
KS 75210	No Treatment	3260.2 a	11.0 a	76.1 a	10.5 a	83.3 b
	.42 Fall	3325.4 a	11.0 a	74.8 a	10.6 a	86.7 a
	.56 Spring	3260.2 a	11.0 a	75.8 a	10.6 a	83.7 b

(continued)

Table 10 (continued).

Cultivar	Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	% Protein	Plant Height (cm)
KS 79H69	No Treatment	3629.7 a	10.0 a	70.5 a	11.4 a	82.0 a
	.42 Fall	3531.9 a	10.1 a	69.0 a	11.7 a	84.0 a
	.56 Spring	3553.6 a	10.2 a	72.3 a	11.8 a	84.7 a
Centurk 78	No Treatment	3673.1 a	11.1 a	74.7 a	10.1 a	101.7 a
	.42 Fall	3531.9 a	11.3 a	76.3 a	10.6 a	102.3 a
	.56 Spring	3586.2 a	11.3 a	74.8 a	10.7 a	101.0 a
Triumph 64	No Treatment	3118.9 a	10.4 a	73.9 a	12.3 b	99.3 a
	.42 Fall	2955.9 a	10.4 a	74.4 a	12.5 ab	99.0 a
	.56 Spring	3010.2 a	10.4 a	74.5 a	12.8 a	100.7 a
Buckskin	No Treatment	3086.3 a	10.5 a	72.8 a	10.7 a	114.0 ab
	.42 Fall	3314.5 a	10.4 a	73.5 a	10.6 a	116.0 a
	.56 Spring	3238.4 a	10.6 a	74.1 a	10.5 a	111.3 b

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

SUMMARY

Applications of metribuzin caused mild chlorosis in all cultivars at each location. Significant reductions in yield due to metribuzin applications occurred only in 1980-1981 in the cultivars Vona and Centurk 78 from the fall treatments, Parker 76 and TAM 105 from the spring treatment and 'KS 79H69' ('Arkan') from both fall and spring treatments. In 1981-1982 no significant reductions in yield occurred from a metribuzin treatment at Hutchinson, Kansas.

The most effective metribuzin treatments for the control of cheat were 0.42 kg/ha applied on the first fall date and 0.56 kg/ha applied on the first spring date of application. In a heavy cheat population, 0.28 kg/ha of metribuzin applied on either fall date was not adequate to control cheat. Neither of the late fall applications provided satisfactory cheat control in a heavy cheat population. Regardless of metribuzin rate applied in late spring to a heavy cheat population, cheat control was inadequate.

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Table 11. Metribuzin treatment mean effects in Newton at location two on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	2010.4 a	10.9 ab	73.9 a	58.6 a	15.6 a	6.3 c
.42 Fall 1st date	1717.0 a	10.8 ab	75.2 a	56.6 a	16.1 a	9.8 a
.28 Fall 2nd date	2206.0 a	10.9 ab	75.2 a	59.6 a	15.1 a	6.4 c
.42 Fall 2nd date	1956.1 a	11.0 ab	75.4 a	56.0 a	16.1 a	9.2 ab
No Treatment	2129.9 a	11.0 ab	74.8 a	60.3 a	15.1 a	0.0 d
.42 Spring 1st date	1706.2 a	10.8 ab	74.5 a	54.3 a	16.4 a	9.3 ab
.56 Spring 1st date	2151.9 a	10.7 b	75.2 a	62.6 a	15.6 a	9.5 ab
.42 Spring 2nd date	1945.3 a	10.7 b	73.9 a	55.6 a	15.5 a	7.6 bc
.56 Spring 2nd date	2293.1 a	11.0 ab	74.5 a	63.6 a	14.5 a	9.0 ab
No Treatment	2314.7 a	11.2 a	74.5 a	65.0 a	14.4 a	0.0 d

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 12. Metribuzin treatment mean effects in TAM W-101 at location two on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	1793.1 a	10.6 a	71.3 a	58.6 a	17.1 a	7.7 abc
.42 Fall 1st date	1662.6 a	10.5 a	69.7 a	56.0 a	17.6 a	9.7 a
.28 Fall 2nd date	1956.1 a	10.5 a	70.7 a	56.6 a	17.5 a	5.2 c
.42 Fall 2nd date	1934.3 a	10.4 a	71.3 a	58.6 a	17.1 a	5.6 bc
No Treatment	1749.5 a	10.5 a	72.2 a	57.0 a	17.4 a	0.0 d
.42 Spring 1st date	1999.6 a	10.5 a	71.3 a	57.6 a	16.7 a	8.0 ab
.56 Spring 1st date	1912.5 a	10.5 a	71.6 a	59.3 a	16.2 a	8.8 a
.42 Spring 2nd date	1695.2 a	10.4 a	70.7 a	56.6 a	17.1 a	8.0 ab
.56 Spring 2nd date	1564.7 a	10.5 a	70.3 a	55.3 a	18.2 a	9.0 a
No Treatment	2010.7 a	10.3 a	70.3 a	59.3 a	16.2 a	0.0 d

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 13. Metribuzin treatment mean effects in TAM 105 at location two on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	2252.5 ab	10.9 a	73.5 ab	58.6 a	14.3 ab	7.7 a
.42 Fall 1st date	2738.4 a	10.8 a	74.8 a	63.6 a	14.0 b	9.3 a
.28 Fall 2nd date	2271.3 ab	10.8 a	72.8 abc	59.3 a	13.7 b	6.5 a
.42 Fall 2nd date	2292.9 ab	10.7 a	72.8 abc	61.6 a	13.9 b	6.3 a
No Treatment	2608.1 ab	10.7 a	73.6 ab	65.3 a	13.6 b	0.0 b
.42 Spring 1st date	1945.1 ab	10.6 a	70.9 c	62.3 a	14.8 ab	8.4 a
.56 Spring 1st date	2358.2 ab	10.6 a	72.3 abc	65.0 a	14.6 ab	8.4 a
.42 Spring 2nd date	2140.9 ab	10.8 a	73.0 abc	61.0 a	14.4 ab	7.6 a
.56 Spring 2nd date	1760.3 b	10.7 a	71.3 bc	60.3 a	15.5 a	7.7 a
No Treatment	2456.1 ab	10.6 a	72.6 abc	64.3 a	14.1 b	0.0 b

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 14. Metribuzin treatment mean effects in Centurk 78 at location two on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	1706.2 bc	10.7 ab	72.3 a	56.6 ab	16.0 ab	6.9 b
.42 Fall 1st date	1999.7 abc	11.0 a	73.2 a	57.6 ab	15.8 ab	9.7 a
.28 Fall 2nd date	2325.7 a	10.8 ab	73.0 a	60.3 a	14.9 b	7.4 b
.42 Fall 2nd date	2032.2 ab	10.8 ab	72.8 a	57.6 ab	15.7 ab	8.3 ab
No Treatment	1858.4 abc	11.0 a	72.6 a	57.0 ab	15.5 ab	0.0 c
.42 Spring 1st date	1880.2 abc	10.6 b	73.6 a	57.3 ab	15.5 ab	9.8 a
.56 Spring 1st date	1738.7 bc	10.7 ab	73.9 a	55.3 b	15.6 ab	9.7 a
.42 Spring 2nd date	1488.8 c	10.7 ab	73.2 a	53.6 b	16.1 ab	9.1 ab
.56 Spring 2nd date	1619.1 bc	10.7 ab	73.0 a	56.0 ab	16.6 a	8.8 ab
No Treatment	1695.4 bc	10.7 ab	72.6 a	54.0 b	16.1 ab	0.0 c

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 15. Metribuzin treatment mean effects in Vona at location two on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	2412.3 a	10.9 a	74.8 a	54.0 a	15.1 a	2.1 bc
.42 Fall 1st date	2336.4 a	10.9 a	73.6 ab	56.3 a	15.6 a	8.2 a
.28 Fall 2nd date	1880.2 a	11.0 a	73.9 ab	50.6 a	15.3 a	4.5 abc
.42 Fall 2nd date	1999.6 a	10.9 a	73.9 ab	50.6 a	15.1 a	5.3 ab
No Treatment	1999.4 a	10.9 a	73.2 ab	51.3 a	14.9 a	0.0 c
.42 Spring 1st date	2303.9 a	10.9 a	73.6 ab	53.6 a	15.5 a	5.1 abc
.56 Spring 1st date	1869.2 a	11.0 a	73.5 ab	52.3 a	15.3 a	8.7 a
.42 Spring 2nd date	1977.6 a	10.8 a	73.9 ab	56.6 a	15.1 a	4.8 abc
.56 Spring 2nd date	2097.3 a	10.9 a	74.1 ab	53.0 a	15.2 a	7.5 a
No Treatment	2184.4 a	11.0 a	72.3 b	53.6 a	14.9 a	0.0 c

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 16. Cultivar main effects over all treatments at location two on yield, percent moisture, test weight, plant height and cheat control ratings for 1980-1981.^a

Cultivar	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	Cheat ^b Rating
Newton	2043.1 a	10.9 a	74.7 a	53.2 b	4.6 a
TAM W-101	1827.8 a	10.5 b	70.9 c	56.5 ab	7.0 a
TAM 105	2282.4 a	10.7 a	72.7 b	62.1 a	6.0 a
Centurk 78	1834.4 a	10.7 a	73.0 b	59.2 ab	6.7 a
Vona	2106.1 a	10.9 a	73.6 ab	57.5 ab	6.2 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 17. Metribuzin treatment mean effects in Newton at location three on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	1521.6 a	10.1 bc	66.5 a	50.0 a	19.6 ab	6.1 bc
.42 Fall 1st date	1890.8 a	10.5 a	69.7 a	52.0 a	19.5 ab	9.7 a
.28 Fall 2nd date	1814.9 a	10.2 abc	69.6 a	52.3 a	21.3 a	8.0 abc
.42 Fall 2nd date	1586.5 a	10.1 bc	69.1 a	51.3 a	19.6 ab	9.0 ab
No Treatment	1597.3 a	10.0 bc	64.8 a	52.3 a	19.5 ab	0.0 d
.42 Spring 1st date	1630.1 a	10.3 ab	66.8 a	53.0 a	19.8 ab	8.6 ab
.56 Spring 1st date	1499.6 a	9.9 c	68.1 a	51.6 a	19.7 ab	8.6 ab
.42 Spring 2nd date	1891.0 a	10.2 abc	69.4 a	54.6 a	19.2 b	5.3 c
.56 Spring 2nd date	1314.8 a	10.0 bc	66.8 a	50.0 a	21.2 a	8.8 ab
No Treatment	1499.6 a	9.9 c	65.2 a	51.6 a	19.2 b	0.0 d

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 18. Metribuzin treatment mean effects in TAM W-101 at location three on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	Moisture (%)	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Rating ^b
.28 Fall 1st date	1901.8 a	10.3 a	64.5 a	56.6 a	20.5 a	8.6 ab
.42 Fall 1st date	1901.8 a	10.0 a	65.5 a	58.0 a	20.8 a	9.5 a
.28 Fall 2nd date	1869.0 a	10.0 a	65.1 a	58.6 a	20.7 a	7.8 bc
.42 Fall 2nd date	1934.1 a	10.2 a	66.8 a	59.6 a	20.5 a	8.3 ab
No Treatment	1934.3 a	10.0 a	64.2 a	57.6 a	20.5 a	0.0 d
.42 Spring 1st date	1760.3 a	10.0 a	64.6 a	58.0 a	21.2 a	6.5 c
.56 Spring 1st date	1684.4 a	10.0 a	66.1 a	57.3 a	21.0 a	8.6 ab
.42 Spring 2nd date	1803.9 a	10.0 a	65.1 a	59.0 a	20.3 a	7.0 bc
.56 Spring 2nd date	1717.0 a	9.9 a	64.8 a	57.0 a	20.7 a	8.5 ab
No Treatment	1836.4 a	10.0 a	64.6 a	58.3 a	20.4 a	0.0 d

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 19. Metribuzin treatment mean effects in TAM 105 at location three on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	1760.5 ab	10.2 a	67.0 a	46.6 a	19.4 a	7.8 ab
.42 Fall 1st date	1847.4 ab	10.2 a	68.7 a	47.6 a	19.0 ab	9.5 a
.28 Fall 2nd date	1858.4 ab	10.3 a	67.2 a	47.0 a	19.0 ab	8.5 a
.42 Fall 2nd date	2249.6 a	9.9 a	69.0 a	51.6 a	18.5 ab	3.8 c
No Treatment	2054.0 ab	10.1 a	67.8 a	51.3 a	18.5 ab	0.0 d
.42 Spring 1st date	1662.8 b	10.3 a	67.4 a	48.0 a	19.1 ab	8.3 a
.56 Spring 1st date	1869.2 ab	10.1 a	68.1 a	48.0 a	18.8 ab	9.0 a
.42 Spring 2nd date	1728.0 ab	10.3 a	67.4 a	47.0 a	18.9 ab	5.6 bc
.56 Spring 2nd date	1901.8 ab	10.1 a	67.7 a	49.3 a	19.0 ab	7.3 ab
No Treatment	2064.8 ab	10.2 a	68.7 a	49.0 a	18.2 b	0.0 d

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 20. Metribuzin treatment mean effects in Centurk 78 at location three on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981^a.

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	1477.8 bc	10.7 a	66.8 abcd	50.3 abc	20.6 ab	8.3 ab
.42 Fall 1st date	1434.5 bc	10.1 a	68.5 ab	50.3 abc	20.6 ab	9.5 a
.28 Fall 2nd date	1521.4 bc	10.1 a	67.7 abcd	49.3 abc	20.6 ab	8.3 ab
.42 Fall 2nd date	1934.1 a	10.2 a	69.6 a	53.3 a	19.8 b	8.8 ab
No Treatment	1293.3 bc	10.0 a	65.1 d	49.3 abc	20.8 ab	0.0 c
.42 Spring 1st date	1390.9 bc	10.1 a	67.4 abcd	50.0 abc	20.8 ab	7.6 b
.56 Spring 1st date	1488.8 bc	10.2 a	68.1 abc	50.3 abc	20.0 b	9.0 ab
.42 Spring 2nd date	1130.3 c	10.4 a	65.2 cd	47.3 bc	21.4 a	8.3 ab
.56 Spring 2nd date	1130.3 c	10.4 a	66.1 bcd	46.6 c	21.2 a	8.6 ab
No Treatment	1673.6 ab	10.1 a	67.0 abcd	51.3 ab	20.3 ab	0.0 c

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 21. Metribuzin treatment mean effects in Vona at location three on yield, percent moisture, test weight, plant height, percent protein and cheat control rating for 1980-1981.^a

Treatment (kg a.i./ha)	Yield ^b (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating
.28 Fall 1st date	2238.8 a	10.8 a	70.9 a	51.0 ab	18.3 a	6.1 b
.42 Fall 1st date	2086.5 ab	10.6 abc	69.4 a	51.0 ab	18.9 a	9.0 a
.28 Fall 2nd date	1966.9 abc	10.6 abc	69.1 a	49.6 ab	18.7 a	8.3 ab
.42 Fall 2nd date	1912.8 abc	10.6 abc	70.0 a	47.6 ab	18.8 a	8.8 a
No Treatment	1869.2 abc	10.5 abc	68.5 a	48.6 ab	18.3 a	0.0 c
.42 Spring 1st date	1880.2 abc	10.6 abc	69.1 a	48.3 ab	18.9 a	8.0 ab
.56 Spring 1st date	2086.6 ab	10.8 a	70.3 a	51.6 a	18.6 a	9.0 a
.42 Spring 2nd date	1734.5 bc	10.6 abc	70.0 a	51.0 ab	18.1 a	6.5 ab
.56 Spring 2nd date	1510.6 c	10.4 bc	67.2 a	47.0 b	19.1 a	8.5 ab
No Treatment	1901.8 abc	10.3 c	68.7 a	49.3 ab	19.0 a	0.0 c

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 22. Cultivar main effects over all treatments at location three on yield, percent moisture, test weight, plant height and cheat control ratings for 1980-1981.^a

Cultivar	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	Cheat ^b Rating
Newton	1624.6 ab	10.1 ab	67.6 b	49.5 b	6.4 ab
TAM W-101	1834.3 ab	10.0 b	65.1 c	49.8 b	6.8 a
TAM 105	1899.6 a	10.2 ab	67.9 ab	48.5 b	6.0 b
Centurk 78	1447.5 b	10.2 ab	67.2 b	51.9 b	6.4 ab
Vona	1936.6 a	10.6 a	69.4 a	58.0 a	6.5 ab

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 23. Cultivar main effects over all treatments at Hutchinson, Kansas on yield, percent moisture, weight per 1000 seeds and plant height for 1980-1981.^a

Cultivar	Yield (kg/ha)	% Moisture	Wt/1000 Seeds (gm)	Plant Height (cm)
TAM W-101	2220.6 bcde	12.09 cde	40.7 a	71.0 ij
Scout 66	1709.8 f	12.02 cdef	35.3 bcde	89.4 a
Larned	2173.4 bcde	12.14 bc	40.2 a	85.4 bc
Bennett	1927.1 def	11.75 ij	33.5 de	77.1 ef
Trison	1959.7 def	11.92 fgh	39.1 ab	85.5 bc
Newton	2470.6 abc	11.95 efg	36.1 abcd	76.2 efg
Vona	2245.8 bcde	11.99 defg	31.3 e	69.1 j
KS 75216	2796.4 a	12.23 b	37.0 abcd	76.2 efg
KS 79H70	2376.3 abcd	11.64 jk	34.1 cde	72.9 hi
Eagle	1796.7 ef	11.88 ghi	37.3 abcd	83.6 bcd
TAM 105	2492.3 ab	11.81 hi	38.4 abc	78.2 e
Parker 76	2322.0 abcd	12.42 a	33.9 cde	83.2 cd
Sage	1992.3 cdef	12.02 cdef	35.0 bcde	86.0 bc
KS 75210	2325.6 abcd	11.94 fgh	37.1 abcd	74.6 fgh
KS 79H69	2568.3 ab	11.57 k	33.3 de	74.0 gh
Centurk 78	2582.8 ab	12.00 defg	34.8 bcde	81.1 d
Triumph 64	1985.1 def	12.10 cd	36.2 abcd	86.3 b
Buckskin	2285.7 bcd	11.91 fgh	34.0 cde	89.0 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 24. Treatment main effects over all cultivars at Hutchinson, Kansas on yield, percent moisture, weight per 1000 seeds and plant height for 1980-1981.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Wt/1000 seeds (gm)	Plant Height (cm)
0.42 Fall	2142.7 b	11.9 b	36.5 a	79.5 b
0.56 Spring	2161.4 b	11.9 a	35.6 b	81.0 a
No Treatment	2401.0 a	12.0 a	35.9 ab	79.2 b

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 25. Cultivar main effects over all treatments at location one on yield, percent moisture, test weight, percent lodging and cheat weight for 1981-1982.^a

Cultivar	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	% Lodging	Cheat Weight (kg/ha)
TAM W-101	427.4 ef	10.5 abc	65.1 cde	90.6 ab	186.3 ef
Scout 66	532.5 def	10.2 de	65.2 cde	96.0 a	322.5 ab
Larned	554.2 cdef	10.2 de	64.1 de	92.7 ab	279.5 bcdef
Bennett	579.5 cdef	10.2 de	64.2 de	88.3 ab	286.7 bcde
Trison	626.6 cde	10.5 abc	67.4 abcd	80.0 b	200.7 def
Newton	724.4 cd	10.8 a	66.7 abcd	92.0 ab	229.4 bcdef
Vona	608.5 cde	10.3 bcde	66.3 bcde	84.3 ab	394.2 a
KS 75216	702.7 cd	10.6 ab	64.3 de	94.7 a	286.7 bcde
KS 79H70	1017.9 a	10.1 e	68.8 abc	83.9 ab	215.0 cdef
Eagle	358.6 f	10.2 de	62.7 e	93.4 ab	243.7 bcdef
TAM 105	720.8 cd	10.3 bcde	66.1 bcde	86.1 ab	279.5 bcdef
Parker 76	749.8 cd	10.6 ab	69.0 ab	89.2 ab	236.5 bcdef
Sage	554.2 cdef	10.3 bcde	64.8 de	91.5 ab	293.9 bcd
KS 75210	967.2 ab	10.8 a	70.0 a	94.0 a	272.4 bcdef
KS 79H69	1133.8 a	10.2 de	69.1 ab	86.1 ab	222.2 bcdef
Centurk 78	713.6 cd	10.5 abc	67.6 abcd	91.6 ab	243.7 bcdef
Triumph 64	775.2 bc	10.2 de	66.5 abcd	93.5 ab	308.2 abc
Buckskin	630.3 cde	10.4 bcd	66.0 bcde	84.2 ab	179.2 f

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 26. Treatment main effects over all cultivars at location one on yield, percent moisture, test weight, percent lodging and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	% Lodging	Cheat Weight (kg/ha)
.42 Fall	774.0 a	10.4 a	66.7 a	85.3 c	258.0 ab
.56 Spring	675.5 b	10.4 a	66.4 ab	89.5 b	236.5 b
No Treatment	613.4 c	10.5 a	66.0 b	93.8 a	286.7 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 27. Metribuzin treatment mean effects in Newton at location two on yield, percent moisture, test weight, plant height, percent protein, cheat control rating and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Rating	Cheat Weight (kg/ha)
.28 Fall 1st date	2249.5 b	11.3 a	74.9 ab	90.3 a	9.4 b	4.7 cd	214.6 cde
.42 Fall 1st date	2529.9 a	11.2 a	75.8 a	91.7 a	9.7 ab	8.5 ab	123.5 e
.28 Fall 2nd date	1910.4 c	11.0 a	74.5 ab	89.3 a	9.8 ab	1.0 ef	396.7 a
.42 Fall 2nd date	1858.3 c	11.1 a	74.4 ab	86.0 a	9.4 b	1.2 ef	266.6 bcd
No Treatment	1936.5 c	11.0 a	75.0 ab	89.7 a	10.0 a	0.0 f	383.6 ab
.42 Spring 1st date	2288.6 b	11.0 a	75.2 ab	90.3 a	10.0 a	6.3 bc	221.1 cde
.56 Spring 1st date	2327.8 b	11.2 a	75.8 a	87.3 a	10.2 a	8.8 a	208.1 cde
.42 Spring 2nd date	1949.6 c	11.1 a	74.8 ab	90.3 a	9.8 ab	3.2 de	299.1 abc
.56 Spring 2nd date	1838.7 c	11.2 a	75.3 ab	88.0 a	9.8 ab	6.5 bc	175.5 de
No Treatment	1877.8 c	11.1 a	73.1 b	89.7 a	9.8 ab	0.0 f	370.6 ab

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 28. Metribuzin treatment mean effects in TAM W-101 at location two on yield, percent moisture, test weight, plant height, percent protein, cheat control rating and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Rating ^b	Cheat Weight (kg/ha)
.28 Fall 1st date	2256.0 b	10.6 ab	75.0 a	84.3 a	10.2 cd	2.8 d	188.6 b
.42 Fall 1st date	2556.0 a	10.8 a	74.7 a	81.7 a	10.5 bcd	8.3 a	188.6 b
.28 Fall 2nd date	1949.6 d	10.5 ab	73.2 b	84.3 a	10.1 d	0.2 e	416.2 a
.42 Fall 2nd date	2197.3 bc	10.6 ab	74.8 a	81.0 a	10.2 cd	1.3 de	214.6 b
No Treatment	2073.5 cd	10.6 ab	74.4 ab	85.0 a	10.2 cd	0.0 e	299.1 ab
.42 Spring 1st date	2308.2 b	10.6 ab	74.8 a	82.7 a	10.8 ab	5.5 bc	273.1 b
.56 Spring 1st date	2340.8 b	10.7 a	74.8 a	83.3 a	10.7 abc	7.5 ab	208.1 b
.42 Spring 2nd date	1988.7 d	10.8 a	73.7 ab	84.3 a	10.4 bcd	3.2 cd	266.6 b
.56 Spring 2nd date	2053.9 cd	10.4 b	74.3 ab	83.7 a	11.0 a	5.3 bc	214.6 b
No Treatment	2008.2 d	10.7 a	74.3 ab	85.3 a	10.0 d	0.0 e	234.1 b

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 29. Metribuzin treatment mean effects in TAM 105 at location two on yield, percent moisture, test weight, plant height, percent protein, cheat control rating and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	Moisture (%)	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating	Cheat Weight (kg/ha)
.28 Fall 1st date	2249.5 b	10.8 ab	74.4 abcd	90.7 a	9.9 a	3.3 de	312.1 ab
.42 Fall 1st date	2647.3 a	10.9 a	74.5 abc	89.0 a	9.8 a	8.1 ab	221.1 b
.28 Fall 2nd date	1832.2 c	10.8 ab	73.7 bcd	90.0 a	9.8 a	1.2 ef	253.6 ab
.42 Fall 2nd date	2321.2 b	10.7 ab	74.4 abcd	88.7 a	10.1 a	2.7 ef	364.1 ab
No Treatment	2086.5 bc	10.5 b	73.4 d	91.0 a	10.2 a	0.0 f	409.7 a
.42 Spring 1st date	2164.7 b	10.8 ab	74.5 abc	87.3 a	9.8 a	6.3 abc	221.1 b
.56 Spring 1st date	2653.8 a	10.9 a	75.4 a	86.7 a	10.1 a	8.9 a	221.1 b
.42 Spring 2nd date	2106.1 bc	10.9 a	74.7 ab	89.0 a	9.9 a	3.7 cde	201.6 b
.56 Spring 2nd date	2093.0 bc	10.7 ab	74.7 ab	89.0 a	10.1 a	5.7 bcd	214.6 b
No Treatment	1793.1 c	10.5 b	73.5 cd	88.7 a	10.0 a	0.0 f	279.6 ab

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 30. Metribuzin treatment mean effects in Centurk 78 at location two on yield, percent moisture, test weight, plant height, percent protein, cheat control rating and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating	Cheat Weight (kg/ha)
.28 Fall 1st date	1910.4 c	11.1 a	73.9 abc	99.0 ab	9.3 c	2.5 c	279.6 bcd
.42 Fall 1st date	2256.0 ab	11.1 a	74.4 ab	101.7 ab	10.1 ab	7.0 b	156.0 de
.28 Fall 2nd date	2021.3 bc	11.2 a	73.2 c	95.7 b	9.5 bc	0.3 d	416.2 a
.42 Fall 2nd date	1962.6 c	10.9 a	73.7 bc	100.0 ab	9.4 c	3.5 c	279.6 bcd
No Treatment	1930.0 c	10.9 a	73.0 c	98.0 ab	9.5 bc	0.0 d	390.2 ab
.42 Spring 1st date	2360.4 a	10.9 a	74.7 ab	96.7 ab	10.2 a	7.7 ab	169.0 de
.56 Spring 1st date	2256.0 ab	10.9 a	74.8 a	95.7 b	10.2 a	9.6 a	104.0 e
.42 Spring 2nd date	1812.6 c	10.8 a	73.9 abc	99.7 ab	9.9 abc	5.7 b	260.1 bcd
.56 Spring 2nd date	1799.6 c	11.0 a	74.3 ab	97.7 ab	9.7 abc	5.8 b	188.6 cde
No Treatment	1917.0 c	10.8 a	73.2 c	102.3 a	9.8 abc	0.0 d	318.6 abc

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 31. Metribuzin treatment mean effects in Vona at location two on yield, percent moisture, test weight, plant height, percent protein, cheat control rating and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating	Cheat Weight (kg/ha)
.28 Fall 1st date	2249.5 ab	10.7 b	74.4 abc	83.3 a	9.8 abc	4.5 abc	240.6 bcd
.42 Fall 1st date	2353.8 a	11.0 ab	74.8 ab	82.0 ab	9.8 abc	6.8 a	195.1 cd
.28 Fall 2nd date	2001.7 abc	11.1 a	73.7 cd	79.0 ab	9.1 cd	0.5 d	344.6 bc
.42 Fall 2nd date	1890.9 bc	10.9 ab	74.1 bcd	79.0 ab	9.4 bcd	1.5 cd	305.6 bcd
No Treatment	2099.5 abc	10.7 b	73.2 d	82.0 ab	9.7 abc	0.0 d	494.2 a
.42 Spring 1st date	2086.5 abc	10.7 b	74.8 ab	79.3 ab	10.2 ab	7.0 a	169.0 d
.56 Spring 1st date	1982.2 bc	10.8 ab	75.2 a	76.7 b	10.4 a	7.7 a	162.5 d
.42 Spring 2nd date	1838.7 c	10.9 ab	74.0 bcd	79.7 ab	9.7 abc	3.2 bcd	260.1 bcd
.56 Spring 2nd date	1832.2 c	11.0 ab	74.8 ab	78.3 ab	9.9 abc	5.0 ab	234.1 bcd
No Treatment	1975.6 bc	11.1 a	73.6 cd	80.7 ab	8.7 d	0.0 d	351.1 b

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^bCheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 32. Cultivar main effects over all treatments at location two on yield, percent moisture, test weight, plant height, percent protein and cheat control ratings for 1981-1982.^a

Cultivar	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat ^b Rating	Cheat Weight (kg/ha)
Newton	2076.7 a	11.1 a	74.3 a	89.3 a	9.8 b	4.0 a	262.3 a
TAM W-101	2173.2 a	10.6 b	74.4 ab	83.6 bc	10.4 a	3.4 a	249.4 a
TAM 105	2194.7 a	10.7 ab	74.3 ab	89.0 b	10.0 ab	4.0 a	266.6 a
Centurk 78	2022.6 a	11.0 ab	73.9 b	98.6 a	9.7 b	4.2 a	253.7 a
Vona	2031.1 a	10.9 ab	74.3 ab	80.0 c	9.7 b	3.6 a	275.2 a

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

^b Cheat Control Rating: 0 = No Control; 10 = Complete Control.

Table 33. Metribuzin treatment mean effects in Newton at location three on yield, percent moisture, test weight, plant height, percent protein and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Weight (kg/ha)
.28 Fall 1st date	1467.1 b	11.1 a	73.9 a	97.7 ab	12.3 ab	200.7 ab
.42 Fall 1st date	1847.4 a	11.2 a	73.6 a	97.7 ab	12.2 ab	157.7 b
.28 Fall 2nd date	1521.4 b	11.0 a	73.6 a	96.3 ab	12.2 ab	179.2 ab
.42 Fall 2nd date	1630.1 ab	10.9 a	73.2 a	98.0 a	12.2 ab	286.7 a
No Treatment	1543.1 b	11.1 a	73.0 a	96.3 ab	11.9 b	265.2 ab
.42 Spring 1st date	1477.9 b	11.1 a	72.6 a	95.0 b	12.3 ab	243.7 ab
.56 Spring 1st date	1608.3 ab	11.1 a	72.3 a	97.0 ab	12.2 ab	193.5 ab
.42 Spring 2nd date	1358.4 b	11.1 a	73.4 a	95.3 ab	12.5 a	193.5 ab
.56 Spring 2nd date	1401.8 b	10.9 a	72.8 a	95.7 ab	12.4 ab	215.0 ab
No Treatment	1369.2 b	11.1 a	73.5 a	96.0 ab	12.2 ab	236.5 ab

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 34. Metribuzin treatment mean effects in TAM W-101 at location three on yield, percent moisture, test weight, plant height, percent protein and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	Moisture (%)	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Weight (kg/ha)
.28 Fall 1st date	880.2 b	10.7 a	71.2 ab	77.3 b	12.8 a	157.7 a
.42 Fall 1st date	1086.7 a	10.7 a	70.7 ab	81.3 a	12.9 a	200.7 a
.28 Fall 2nd date	869.3 b	10.9 a	72.3 a	77.0 b	12.7 a	236.5 a
.42 Fall 2nd date	815.0 b	10.6 a	71.9 a	77.7 b	12.9 a	258.0 a
No Treatment	771.5 b	10.7 a	71.6 ab	78.0 b	12.8 a	150.5 a
.42 Spring 1st date	858.5 b	10.7 a	72.2 a	80.0 ab	12.6 a	157.7 a
.56 Spring 1st date	901.9 ab	10.6 a	70.1 b	79.3 ab	12.9 a	200.7 a
.42 Spring 2nd date	869.3 b	10.7 a	71.4 ab	78.3 b	12.9 a	179.2 a
.56 Spring 2nd date	869.3 b	10.6 a	71.6 ab	77.3 b	13.0 a	150.5 a
No Treatment	695.5 b	10.7 a	71.7 ab	77.7 b	12.7 a	179.2 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 35. Metribuzin treatment mean effects in TAM 105 at location three on yield percent moisture, test weight, plant height, percent protein and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Weight (kg/ha)
.28 Fall 1st date	1206.2 ab	10.5 b	70.1 ab	86.3 ab	12.8 a	286.7 b
.42 Fall 1st date	1304.0 a	10.4 b	70.1 ab	88.3 a	12.9 a	279.5 b
.28 Fall 2nd date	1130.2 ab	10.6 ab	69.5 b	85.0 abc	12.7 a	365.6 ab
.42 Fall 2nd date	1151.9 ab	10.6 ab	71.0 ab	84.7 abc	12.9 a	322.5 ab
No Treatment	999.8 b	10.8 a	71.6 a	84.3 abc	12.7 a	279.5 b
.42 Spring 1st date	1217.1 ab	10.3 b	69.4 b	86.0 abc	12.9 a	286.7 b
.56 Spring 1st date	1391.0 a	10.6 ab	70.1 ab	85.7 abc	12.7 a	286.7 b
.42 Spring 2nd date	1108.4 ab	10.5 b	70.0 ab	82.3 bc	13.1 a	322.5 ab
.56 Spring 2nd date	1228.0 ab	10.6 ab	70.9 ab	82.0 c	12.8 a	308.2 ab
No Treatment	1119.3 ab	10.6 ab	70.5 ab	84.7 abc	11.9 b	408.6 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 36. Metribuzin treatment mean effects in Centurk 78 at location three on yield, percent moisture, test weight, plant height, percent protein and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Weight (kg/ha)
.28 Fall 1st date	1065.0 a	10.9 a	71.9 a	98.7 a	13.0 a	286.7 ab
.42 Fall 1st date	1097.6 a	10.9 a	72.3 a	96.3 ab	13.3 a	258.0 ab
.28 Fall 2nd date	1195.4 a	10.8 a	71.9 a	99.7 a	13.1 a	301.0 ab
.42 Fall 2nd date	1173.6 a	10.7 a	72.3 a	97.0 ab	13.1 a	379.9 a
No Treatment	1108.4 a	10.7 a	71.7 a	97.7 a	13.3 a	329.7 ab
.42 Spring 1st date	1228.0 a	10.7 a	71.4 a	98.0 a	13.1 a	279.5 ab
.56 Spring 1st date	1162.8 a	10.7 a	72.2 a	96.7 ab	13.2 a	222.2 b
.42 Spring 2nd date	1217.1 a	10.6 a	72.3 a	94.0 b	13.1 a	308.2 ab
.56 Spring 2nd date	999.8 a	10.7 a	72.3 a	93.7 b	13.2 a	258.0 ab
No Treatment	1173.6 a	10.8 a	70.9 a	98.0 a	13.2 a	401.4 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 37. Metribuzin treatment mean effects in Vona at location three on yield, percent moisture, test weight, plant height, percent protein and cheat weight for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)	% Protein	Cheat Weight (kg/ha)
.28 Fall 1st date	1173.6 b	10.8 ab	71.9 a	81.3 ab	12.8 a	351.2 abc
.42 Fall 1st date	1467.1 a	11.0 a	72.3 a	82.0 a	13.0 a	351.2 abc
.28 Fall 2nd date	891.1 bcd	10.8 ab	71.9 a	82.0 a	12.8 a	236.5 c
.42 Fall 2nd date	934.5 bcd	10.7 ab	72.3 a	82.7 a	12.7 a	265.2 bc
No Treatment	815.0 d	10.6 b	71.7 a	79.7 abc	12.9 a	344.1 abc
.42 Spring 1st date	967.2 bcd	10.8 ab	71.4 a	79.0 abc	12.9 a	401.4 abc
.56 Spring 1st date	1108.4 bc	10.7 ab	72.2 a	78.0 abc	13.0 a	444.4 a
.42 Spring 2nd date	912.8 bcd	10.6 b	72.3 a	77.0 bc	12.9 a	329.7 abc
.42 Spring 2nd date	934.5 bcd	10.7 ab	72.3 a	75.0 c	13.1 a	322.5 abc
No Treatment	880.2 cd	10.7 ab	70.9 a	79.7 abc	12.7 a	422.9 ab

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 38. Cultivar main effects over all treatments at location three on yield, percent moisture, test weight, plant height and percent protein for 1981-1982.^a

Cultivar	Yield (kg/ha)	Moisture %	Test Weight (kg/hl)	Plant Height (cm)	Protein %	Cheat Weight (kg/ha)
Newton	1522.5 a	11.0 a	73.2 a	96.5 a	12.2 c	215.0 b
TAM W-101	861.5 d	10.7 bc	71.4 b	78.4 c	12.8 b	186.3 b
TAM 105	1185.6 b	10.5 c	70.3 c	84.9 b	12.7 b	315.4 a
Centurk 78	1142.1 b	10.8 b	71.0 bc	97.0 a	13.1 a	301.0 a
Vona	1008.4 c	10.7 b	71.9 b	79.6 c	12.9 ab	344.1 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 39. Cultivar main effects over all treatments at Hutchinson, Kansas on yield, percent moisture, test weight and plant height for 1981-1982.^a

Cultivar	Yield (kg/ha)		% Moisture	Test Weight (kg/hl)	Plant Height (cm)
TAM W-101	3492.0	cdef	10.3 fg	73.6 bcde	82.1 h
Scout 66	3068.2	gh	10.8 abcde	74.5 abcd	106.4 b
Larned	3213.1	fgh	10.7 abcdef	74.7 abcd	104.8 bc
Bennett	3387.0	defg	10.9 abcd	73.4 cde	93.5 e
Trison	3263.8	defgh	10.6 abcdefg	74.5 abcd	100.1 d
Newton	3466.7	def	10.8 abcde	73.9 bcde	88.4 f
Vona	3843.4	ab	11.1 ab	75.3 abc	84.6 fgh
KS 75216	3263.8	defgh	10.6 abcdefg	71.9 ef	86.8 fg
KS 79H70	3799.9	abc	10.4 efg	72.8 de	87.2 fg
Eagle	3042.8	h	11.0 abc	73.7 bcde	100.6 cd
TAM 105	3923.1	a	11.0 abc	75.7 ab	88.0 fg
Parker 76	3542.7	bcdef	11.1 ab	76.7 a	99.7 d
Sage	3249.3	efgh	11.0 abc	74.1 bcde	107.8 b
KS 75210	3281.9	defgh	11.0 abc	75.6 abc	84.5 fgh
KS 79H69	3571.7	bcde	10.1 g	70.7 f	83.5 gh
Centurk 78	3597.1	bcd	11.2 a	75.3 abc	101.6 cd
Triumph 64	3028.3	h	10.4 efg	74.3 bcd	99.6 d
Buckskin	3213.1	fgh	10.5 cdefg	73.5 cde	113.7 a

^a Means with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 40. Treatment main effects over all cultivars at Hutchinson, Kansas on yield, percent moisture, test weight and plant height for 1981-1982.^a

Treatment (kg a.i./ha)	Yield (kg/ha)	% Moisture	Test Weight (kg/hl)	Plant Height (cm)
.42 Fall	3327.8 b	10.7 a	73.7 a	95.4 a
.56 Spring	3400.2 ab	10.7 a	74.3 a	94.9 a
No Treatment	3479.9 a	10.8 a	74.3 a	95.1 a

^aMeans with the same letter are not significantly different using Duncan's Multiple Range Test at the 0.05 probability level.

Table 41. Analysis of variance of the treatment main effects over all cultivars at location three on yield, percent moisture, test weight, plant height, percent protein cheat control ratings for 1980-1981.

Source	d.f.	Mean Square					Cheat Rating
		Yield (kg/ha)	% Moisture	Test Weight	Plant Height (cm)	% Protein	
Rep.	2	10450240.3	0.87	163.22	987.68	40.01	1.43
Cult.	4	1286461.5	1.26	41.51	435.50	27.06	2.86
Trt.	9	182087.4	0.10	6.72	7.73	1.17	182.65
Trt. x Cult.	36	81796.8	0.06	1.70	7.04	0.55	2.67
Error	90	68670.8	0.06	1.97	6.64	0.54	1.61

Table 42. Analysis of variance of the treatment main effects over all cultivars at location two on yield, percent moisture, test weight, plant height, and percent protein cheat control ratings for 1980-1981.

Source	d.f.	Mean Square					Cheat Rating
		Yield (kg/ha)	% Moisture	Test Weight	Plant Height (cm)	% Protein	
Rep.	2	200823.2	0.01	1.30	951.68	2.85	3.33
Cult.	4	1111001.5	0.97	34.98	327.41	31.81	24.99
Trt.	9	146466.7	0.03	0.81	10.87	1.11	174.69
Trt. x Cult.	36	151446.3	0.03	0.99	19.17	0.81	3.02
Error	90	192596.6	0.03	0.84	22.57	0.87	3.07

Table 43. Analysis of variance of the treatment mean effects in cultivars at Hutchinson, Kansas on yield, percent moisture, weight per 1000 seeds, percent protein and plant height for 1980-1981.

Cultivar	Source	d.f.	Mean Square				Plant Height (cm)
			Yield (kg/ha)	% Moisture	Wt/1000 seeds	% Protein	
TAM W-101	Rep.	2	87268.5	0.10	5.40	0.06	12.33
TAM W-101	Trt.	2	65335.5	0.01	1.00	0.13	0.33
TAM W-101	Error	4	19566.1	0.002	0.76	0.03	1.66
Scout 66	Rep.	2	25650.8	0.13	1.36	0.35	15.44
Scout 66	Trt.	2	218338.3	0.01	0.01	0.04	12.44
Scout 66	Error	4	60314.6	0.01	0.56	0.11	0.61
Larned	Rep.	2	144922.7	0.01	80.20	0.03	34.77
Larned	Trt.	2	36490.1	0.01	0.20	0.50	1.44
Larned	Error	4	85835.5	0.004	0.53	0.07	3.94
Bennett	Rep.	2	158194.9	0.05	0.24	0.003	3.44
Bennett	Trt.	2	15036.3	0.001	0.09	0.03	1.44
Bennett	Error	4	22089.5	0.002	0.24	0.25	1.27
Trison	Rep.	2	659697.6	0.04	0.49	0.24	24.11
Trison	Trt.	2	51794.5	0.03	1.21	0.30	3.11
Trison	Error	4	27011.6	0.002	0.61	0.17	7.44
Newton	Rep.	2	301280.7	0.07	40.64	1.04	1.77
Newton	Trt.	2	162054.6	0.02	8.29	0.39	3.44
Newton	Error	4	62780.5	0.01	7.18	0.21	2.27
Vona	Rep.	2	62752.4	0.10	1.62	0.61	2.11
Vona	Trt.	2	1154254.5	0.01	1.43	1.31	10.11
Vona	Error	4	217306.4	0.006	1.44	0.35	16.11
KS 75216	Rep.	2	69999.5	0.06	21.64	0.10	5.44
KS 75216	Trt.	2	31650.0	0.003	21.92	0.10	0.11
KS 75216	Error	4	46904.0	0.01	11.99	0.01	3.61
KS 79H70	Rep.	2	263944.2	0.06	7.30	0.10	5.44
KS 79H70	Trt.	2	244655.3	0.007	3.78	0.20	24.77
KS 79H70	Error	4	51509.4	0.01	3.22	0.04	3.11
Eagle	Rep.	2	145996.3	0.01	15.56	0.59	9.00
Eagle	Trt.	2	12175.7	0.001	9.48	0.04	9.33
Eagle	Error	4	9870.4	0.01	7.16	0.10	3.83

(continued)

Table 43 (continued).

Cultivar	Source	d.f.	Mean Square				Plant Height (cm)
			Yield (kg/ha)	% Moisture	Wt/1000 seeds	% Protein	
TAM 105	Rep.	2	141836.9	0.04	60.31	0.14	16.81
TAM 105	Trt.	2	97883.0	0.001	0.90	0.40	8.44
TAM 105	Error	4	19936.5	0.006	5.18	0.09	0.00
Parker 76	Rep.	2	286596.1	0.05	14.10	0.97	5.77
Parker 76	Trt.	2	114723.2	0.01	4.90	1.34	13.44
Parker 76	Error	4	16431.3	0.01	4.24	0.21	2.27
Sage	Rep.	2	562228.5	0.05	55.31	0.27	16.33
Sage	Trt.	2	35514.6	0.007	5.51	0.46	4.00
Sage	Error	4	11799.1	0.007	7.90	0.07	3.33
KS 75210	Rep.	2	114872.9	0.01	3.42	0.03	0.33
KS 75210	Trt.	2	26536.1	0.02	8.67	0.01	2.33
KS 75210	Error	4	26616.6	0.004	0.84	0.14	1.66
KS 79H69	Rep.	2	4373.1	0.09	0.94	0.35	4.33
KS 79H69	Trt.	2	124755.3	0.01	1.09	0.38	4.33
KS 79H69	Error	4	6489.4	0.01	0.42	0.07	0.16
Centurk 78	Rep.	2	211166.9	0.07	64.68	0.17	13.44
Centurk 78	Trt.	2	81208.3	0.02	11.45	0.12	3.44
Centurk 78	Error	4	14672.0	0.01	2.62	0.04	0.77
Triumph 64	Rep.	2	90175.7	0.12	1.66	0.04	2.33
Triumph 64	Trt.	2	129499.9	0.00	0.65	0.16	16.33
Triumph 64	Error	4	31983.8	0.01	0.92	0.24	4.66
Buckskin	Rep.	2	1887.6	0.20	8.41	0.004	4.33
Buckskin	Trt.	2	65335.5	0.001	3.00	0.08	0.00
Buckskin	Error	4	52186.8	0.001	3.97	0.12	1.33

Table 44. Analysis of variance of the treatment main effects over all cultivars at location three on yield, percent moisture, test weight, plant height, percent protein and cheat weight for 1981-1982.

Source	d.f.	Mean Square					
		Yield (kg/ha)	% Moisture	Test Weight	Plant Height (cm)	% Protein	Cheat Weight (kg/ha)
Rep.	2	49070.8	0.05	0.96	222.44	0.50	74459.59
Cult.	4	1822678.3	1.02	21.31	2412.54	3.38	138438.17
Trt.	9	133834.8	0.04	0.43	25.97	0.17	8794.08
Trt. x Cult.	36	31441.5	0.03	0.64	5.68	0.08	6659.98
Error	90	17727.6	0.03	0.60	3.87	0.06	4716.18

Table 45. Analysis of variance of the treatment main effects over all cultivars at location two on yield, percent moisture, test weight, plant height, percent protein, cheat control rating and cheat weight for 1981-1982.

Source	d.f.	Mean Square					
		Yield (kg/ha)	% Moisture	Test Weight	Plant Height (cm)	% Protein	Cheat Rating Weight (kg/ha)
Rep.	2	467601.2	0.19	0.08	632.66	0.95	29766.63
Cult.	4	192148.3	1.05	2.05	1494.62	2.68	3162.91
Trt.	9	554079.8	0.07	2.69	22.71	0.81	85579.47
Trt. x Cult.	36	49752.9	0.04	0.26	6.36	0.20	8161.65
Error	90	20282.2	0.03	0.34	9.26	0.14	5638.74

Table 46. Analysis of variance of the treatment mean effects in cultivars at location one on yield, percent moisture, test weight, percent protein, percent lodging and cheat weight for 1981-1982.

Cultivar	Source	d.f.	Mean Square					Cheat Weight (kg/ha)
			Yield (kg/ha)	% Moisture	Test Weight	% Protein	% Lodging	
KS 79H70	Rep.	2	62829.5	0.20	0.40	0.52	544.44	2466.94
KS 79H70	Trt.	2	116683.4	0.10	0.61	0.31	77.77	13744.43
KS 79H70	Error	4	42988.6	0.01	0.80	0.08	111.11	1409.68
Centurk 78	Rep.	2	66018.2	0.21	5.41	0.95	100.00	4581.47
Centurk 78	Trt.	2	2952.5	0.02	0.44	0.70	0.00	3171.79
Centurk 78	Error	4	12518.6	0.02	1.02	0.14	0.00	2995.58
Parker 76	Rep.	2	73694.8	0.17	3.62	2.22	105.44	0.00
Parker 76	Trt.	2	28698.4	0.003	0.68	2.69	28.77	6696.00
Parker 76	Error	4	4074.4	0.05	0.12	2.20	3.77	881.05
TAM 105	Rep.	2	34485.3	0.04	1.84	0.65	102.77	2466.94
TAM 105	Trt.	2	59995.1	0.07	1.40	1.09	469.44	13744.43
TAM 105	Error	4	14644.4	0.01	2.04	1.04	111.11	7224.63
TAM W-101	Rep.	2	472.4	0.12	5.97	3.85	92.33	26901.49
TAM W-101	Trt.	2	14644.4	0.05	1.87	0.69	14.33	1879.58
TAM W-101	Error	4	10747.1	0.01	1.44	0.85	2.66	2760.63
Eagle	Rep.	2	60585.6	0.02	20.93	11.02	58.77	4581.47
Eagle	Trt.	2	9566.1	0.08	3.00	0.56	10.11	4229.05
Eagle	Error	4	3188.7	0.05	1.23	1.66	2.11	10925.06
Larned	Rep.	2	34367.2	0.04	4.32	1.04	90.77	3171.79
Larned	Trt.	2	10983.3	0.21	4.52	0.04	24.11	26784.02
Larned	Error	4	10806.2	0.06	0.85	0.08	2.44	5638.74
Sage	Rep.	2	52436.6	0.03	4.22	0.91	55.11	4346.53
Sage	Trt.	2	32950.0	0.26	2.90	1.74	119.44	31482.97
Sage	Error	4	6200.2	0.09	0.37	1.40	18.44	3994.11
Trison	Rep.	2	134752.8	0.48	9.26	8.13	233.33	5051.37
Trison	Trt.	2	32005.2	0.19	2.48	0.29	808.33	117.47
Trison	Error	4	11101.4	0.16	1.47	1.34	416.66	2055.79
KS 75216	Rep.	2	196401.4	0.11	17.49	0.87	5.44	13744.43
KS 75216	Trt.	2	8975.6	0.004	0.18	0.01	5.44	1057.26
KS 75216	Error	4	19604.7	0.04	0.59	0.07	2.94	13215.80

(continued)

Table 46 (continued).

Cultivar	Source	d.f.	Mean Square					Cheat Weight (kg/ha)
			Yield (kg/ha)	% Moisture	Test Weight	% Protein	% Lodging	
KS 79H69	Rep.	2	70978.5	0.04	1.65	0.40	86.11	4581.47
KS 79H69	Trt.	2	113849.0	0.004	1.71	0.33	86.11	10925.06
KS 79H69	Error	4	49366.0	0.16	0.41	0.03	11.11	1233.47
Triumph 64	Rep.	2	142193.2	0.003	2.08	0.40	29.77	10690.11
Triumph 64	Trt.	2	79481.7	0.00	4.20	0.01	40.44	26196.65
Triumph 64	Error	4	7026.9	0.05	2.37	0.73	3.94	2232.00
KS 75210	Rep.	2	47122.1	0.06	4.82	0.25	22.33	4346.53
KS 75210	Trt.	2	29761.3	0.03	0.99	1.65	9.33	2232.00
KS 75210	Error	4	6200.2	0.11	0.19	1.41	5.16	6813.48
Buckskin	Rep.	2	127903.0	0.005	10.70	0.07	982.11	822.31
Buckskin	Trt.	2	3188.7	0.04	2.23	0.03	28.77	117.47
Buckskin	Error	4	1417.2	0.12	1.74	0.15	10.44	1174.73
Bennett	Rep.	2	119163.5	0.01	16.12	0.58	108.33	19148.22
Bennett	Trt.	2	23147.7	0.02	0.86	0.48	58.33	2232.00
Bennett	Error	4	3661.1	0.05	2.74	0.63	16.66	5403.79
Vona	Rep.	2	13817.7	0.04	5.14	1.07	358.33	36064.45
Vona	Trt.	2	73694.8	0.004	0.43	0.30	1022.33	48046.78
Vona	Error	4	43933.4	0.07	0.57	0.14	366.66	12276.01
Scout 66	Rep.	2	6731.7	0.02	6.95	10.88	36.00	7870.74
Scout 66	Trt.	2	9920.4	0.14	1.75	0.41	36.33	10690.11
Scout 66	Error	4	11337.6	0.10	1.90	0.44	36.33	6813.48
Newton	Rep.	2	157428.1	0.20	6.61	1.24	57.33	5051.37
Newton	Trt.	2	39091.3	0.01	1.14	0.21	9.33	822.31
Newton	Error	4	6849.8	0.05	1.20	0.50	30.16	2232.00

Table 47. Analysis of variance of the treatment mean effects in cultivars at Hutchinson, Kansas on yield, percent moisture, test weight, percent protein and plant height for 1981-1982.

Cultivar	Source	d.f.	Mean Square				Plant Height (cm)
			Yield (kg/ha)	% Moisture	Test Weight	% Protein	
Triumph 64	Rep.	2	197110.0	0.82	0.87	0.26	22.33
Triumph 64	Trt.	2	20667.6	0.00	0.17	0.14	2.33
Triumph 64	Error	4	85859.1	0.01	2.66	0.02	3.66
Parker 76	Rep.	2	232776.4	0.09	4.33	0.42	12.11
Parker 76	Trt.	2	9920.4	0.04	0.25	0.10	8.77
Parker 76	Error	4	39681.8	0.13	1.20	0.07	0.44
KS 75216	Rep.	2	28816.5	0.02	1.45	0.41	20.11
KS 75216	Trt.	2	30233.7	0.05	0.30	0.02	3.44
KS 75216	Error	4	28107.9	0.04	1.47	0.01	0.44
Larned	Rep.	2	66018.2	0.32	1.86	0.32	55.11
Larned	Trt.	2	29170.8	0.00	1.35	0.09	1.44
Larned	Error	4	16238.8	0.04	1.55	0.08	2.94
Eagle	Rep.	2	71214.7	0.20	1.87	0.004	43.00
Eagle	Trt.	2	51019.4	0.01	0.02	0.03	0.33
Eagle	Error	4	15943.5	0.03	1.05	0.09	1.33
Newton	Rep.	2	157310.0	0.44	1.58	0.38	94.77
Newton	Trt.	2	23738.2	0.005	1.00	0.08	12.44
Newton	Error	4	18423.7	0.06	0.60	0.02	9.94
TAM W-101	Rep.	2	99322.6	0.04	5.08	0.003	22.11
TAM W-101	Trt.	2	24564.9	0.04	1.75	0.12	4.11
TAM W-101	Error	4	6849.8	0.06	4.78	0.07	2.61
Buckskin	Rep.	2	35902.6	0.30	4.57	1.31	27.44
Buckskin	Trt.	2	40508.5	0.03	0.85	0.03	16.44
Buckskin	Error	4	44760.1	0.04	0.76	0.01	2.94
Vona	Rep.	2	577630.3	0.28	0.11	0.27	64.33
Vona	Trt.	2	526610.8	0.10	0.98	0.02	1.00
Vona	Error	4	202247.4	0.07	0.29	0.01	4.83
Trison	Rep.	2	29170.8	0.13	4.33	0.03	5.77
Trison	Trt.	2	5786.9	0.004	0.85	0.12	2.11
Trison	Error	4	12518.6	0.009	0.98	0.08	6.77

(continued)

Table 47 (continued).

Cultivar	Source	d.f.	Mean Square				Plant Height (cm)
			Yield (kg/ha)	% Moisture	Test Weight	% Protein	
TAM 105	Rep.	2	151286.9	0.19	1.50	0.88	7.00
TAM 105	Trt.	2	10983.3	0.01	0.88	0.12	7.00
TAM 105	Error	4	24623.9	0.01	0.86	0.01	8.00
Centurk 78	Rep.	2	49247.9	0.34	0.58	0.60	69.33
Centurk 78	Trt.	2	15234.9	0.04	1.60	0.25	1.33
Centurk 78	Error	4	102747.5	0.03	1.08	0.20	3.66
KS 79H70	Rep.	2	344499.6	0.08	0.04	0.44	17.44
KS 79H70	Trt.	2	48657.4	0.01	1.14	0.14	0.77
KS 79H70	Error	4	27222.2	0.01	0.67	0.01	1.77
KS 75210	Rep.	2	166167.6	0.59	1.36	0.30	40.11
KS 75210	Trt.	2	4251.6	0.001	0.86	0.01	10.11
KS 75210	Error	4	31710.0	0.007	2.98	0.11	0.44
KS 79H69	Rep.	2	360088.9	0.28	7.69	0.98	27.11
KS 79H69	Trt.	2	7912.7	0.01	5.34	0.14	5.77
KS 79H69	Error	4	53086.2	0.05	5.95	0.35	3.11
Bennett	Rep.	2	283559.7	0.17	2.06	0.21	12.11
Bennett	Trt.	2	24919.2	0.01	0.88	0.09	0.11
Bennett	Error	4	38914.1	0.003	1.36	0.10	5.94
Sage	Rep.	2	27989.8	0.37	0.33	0.21	30.77
Sage	Trt.	2	134200.4	0.003	1.08	0.05	3.44
Sage	Error	4	75643.4	0.008	0.29	0.49	11.11
Scout 66	Rep.	2	172308.8	0.30	0.86	0.23	76.77
Scout 66	Trt.	2	161679.8	0.07	2.72	0.28	3.44
Scout 66	Error	4	237677.6	0.03	0.32	0.06	1.44

Table 48. 1980-1981 growing season precipitation records at locations two and three.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1					.53			.05	
2									.10
3									
4						.38		.72	.15
5									.04
6									
7			.44						
8			2.06					.40	
9			.24						
10					.40		.13		
11					.60		.30	1.76	1.20
12								.15	
13									
14	.09	.11						.16	
15	1.14								.92
16	.88		.03						
17									
18								1.55	
19								1.00	
20							1.10		
21									.68
22					.03				
23									
24	.34		.20						
25						.14			
26			.08					.92	.64
27	.42								2.05
28	.56					.50			
29									
30				.07					.07
31									
Total	3.43	.11	3.05	.07	1.56	1.02	1.53	6.71	5.85

Table 49. 1980-1981 growing season precipitation records at
Hutchinson, Kansas.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1					.21				
2						.10			
3									
4						.56		.28	.72
5						.06		.18	.02
6									
7			.40			.20			
8			1.00					.74	
9			.08					2.62	
10								.33	
11							.02		.07
12									
13								.65	
14		.02					.05		
15									.86
16	.78		.06				.07	.05	
17								.51	
18						.10		.13	
19				.01			.73		
20							.59		
21							.01		
22									.46
23			.07					.24	.01
24									
25						.86			
26								.05	
27	.48							.01	
28	.03								
29						.27	.02	.42	
30				.02				.25	.81
31									
Total	1.29	.02	1.61	.03	.21	2.15	1.49	6.46	2.95

Table 50. 1981-1982 growing season precipitation records at locations one, two and three.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		2.69	.50						.65	2.26
2		.12		.08						
3	.01	.01		.04	.04	.02			.02	
4	1.34	.53		.18					.15	
5		.11			.27		.26			
6								1.15		
7									.60	
8		.73					.03			
9		.31			.32				.60	
10										
11										
12	.25				.35			1.20		1.50
13				.11						
14	.07		.02			.02		.20	.15	.45
15						.86			.90	
16					.01	.49				
17	.49		.18					.76	.06	
18					.18					
19						.62	.11			
20										
21			.01					.62		
22				.07					.52	1.15
23				.45					1.70	
24										
25	.12					.17	.02	.65	.64	
26	.03							.02		
27								.15		
28							.15	.10	.60	
29							.63	1.00		
30		.76		.20		.06	.01			
31	.02									
Total	2.33	5.26	0.71	1.13	1.17	2.24	1.21	5.85	6.59	5.36

Table 51. 1981-1982 growing season precipitation records at
Hutchinson, Kansas.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1	.07	1.43	.11					.01	.01	.34
2		.52			.18				.59	
3	.03	.26		.05	.37				.10	
4	.47	.13			.01	.03			.42	
5		.01			.20					
6								.91		.21
7										
8		.82					.01		.41	
9	.01	.51			.23					.82
10	.03									.02
11									1.68	
12	.60				.18			1.43		.01
13	.02		.01					.39		
14	.02		.01			.82		.18		.25
15	.51					.38		.50	.52	
16	.53			.05	.02	.04		1.15		
17	.50				.01			.82		
18								.04	.40	
19						.05				
20										
21									.04	
22			.02	.18					.15	.45
23										.12
24						.04			.42	
25	.51					.16	.02		.01	
26	.27									
27						.16			.56	
28						.08	.17		.02	1.20
29							.02			.19
30		.84		.40		.07	.02			
31										
Total	3.57	4.52	0.15	0.68	1.18	1.83	0.24	5.43	5.33	3.61

Table 52. 1980-1981 soil test report at locations two, three and Hutchinson, Kansas.

Location	Soil Texture	pH	Organic matter %
Two	Reading silt loam	6.3	2.6
Three	Muir silt loam	5.7	2.4
Hutchinson, Kansas	Clark-Ost silt loam	5.8	1.7

Table 53. 1981-1982 soil test report at location one, two, three and Hutchinson, Kansas.

Location	Soil Texture	pH	Organic matter %
One	Muir silt loam	6.2	3.3
Two	Reading silt loam	6.3	2.6
Three	Muir silt loam	5.7	3.5
Hutchinson, Kansas	Clark-Ost silt loam	6.0	1.9

CONTROL OF CHEAT (BROMUS SECALINUS L.) IN WINTER WHEAT
(TRITICUM AESTIVUM L.) WITH METRIBUZIN [4-amino-6-tert-
butyl-3-(methylthio)-as-triazin-5(4H)one] AND THE
TOLERANCE OF WHEAT CULTIVARS TO METRIBUZIN

by

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AN ABSTRACT OF A MASTER'S THESIS

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Effects of metribuzin [4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)one] on 18 winter wheat (Triticum aestivum L.) cultivars and cheat (Bromus secalinus L.) control with metribuzin in five cultivars were studied in 1980-1981 and 1981-1982.

A fall treatment of 0.42 kg/ha and a spring treatment of 0.56 kg/ha were applied to 18 cultivars on a Clark Ost silt loam soil to determine the susceptibility of the wheat cultivars to metribuzin in both growing seasons. The 18 cultivars were also planted on a Muir silt loam in 1981 with cheat seed drilled across the plots to test for cheat control.

Two rates of metribuzin (0.28 and 0.42 kg/ha), applied on two dates in the fall and two rates of metribuzin (0.42 and 0.56 kg/ha), applied on two dates in the spring were tested in five cultivars on a Muir silt loam and a Reading silt loam soil to determine acceptable rates and dates of metribuzin application for control of cheat. In the first year cheat seed was broadcast by hand over the plots and a mediocre cheat population developed. The second year cheat seed was drilled across the plots and a heavy cheat population developed.

In the 18 cultivars significant reductions in yield occurred only in 1980-1981 in the cultivars; 'Vona' and 'Centurk 78' from the fall treatment, 'Parker 76' and 'TAM 105' from the spring treatment and 'KS 79H69' ('Arkan'), from both fall and spring treatments. In 1981-1982 no significant reductions in yield occurred from a metribuzin treatment in any of the cultivars. Due to severe lodging in the cheat control study with 18 cultivars no definite conclusions can be made.

The most effective metribuzin treatments for the control of cheat were 0.42 kg/ha applied on the first fall date and 0.56 kg/ha applied on the first spring date of application. In a heavy cheat population, 0.28 kg/ha of metribuzin applied on either fall date was not adequate to control cheat. Neither of the late fall metribuzin rates provided satisfactory cheat control in a heavy cheat population. Regardless of metribuzin rate applied in late spring to a heavy cheat population, cheat control was inadequate.