EFFECT OF DIFFERENT INTENSITIES OF CLIPPING ON FORAGE AND GRAIN PRODUCTIONS OF HARD RED WINTER WHEAT

By

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CHAPTER I

INTRODUCTION

Wheat (Triticum spp.) is one of the most widely cultivated of all cereals and one of the most important products of agriculture in the world since it has been the diet food for man in many countries for more than 4,600 years.

Wheat is grown in all temperate countries and in most of the sub-tropical countries of the world, as well as at high elevations in some tropical countries (Leonard and Martin, 1963). In most areas, the crop is grown primarily for grain with pasturage as a secondary consideration. In the southern United States it is widely used for a pasture during the winter months. The young plants contain as much protein as alfalfa hay and are produced during a season when other green forage is limited. However, grazing does not have any apparent injury to the grain crop, unless it is grazed severely over a long period of time or grazed too late in the spring. For making maximum profit from both forage and grain yields of wheat, the time and length of grazing are an important decision in farm management.

The research problem reported here was designed to determine the effect of different intensities of clipping on forage and grain yields of one variety of wheat 'Danne.' The objectives were: (1) to measure the relative effect of various clipping on forage and grain yields, (2) to determine the maximum forage and grain yields as influenced by clipping

intensity, (3) to determine the effect of last clipping date on grain yields, and (4) to determine the correlation of last clipping date and number of clippings on grain yield.

CHAPTER II

REVIEW OF LITERATURE

The effect of pasturing on the subsequent grain yield of cereals has been investigated by a number of workers. Oklahoma workers (1906) reported little or no reduction in the grain yield from judicious pasturing of wheat in winter, when pasturing was not carried beyond March 1. Heavy pasturing or late pasturing reduced the grain yield. Pasturing was beneficial when wheat made an early heavy growth.

Denman and Arnold (1970) indicated that small grain was a high quality forage which produced excellent steer gains, or it could be used to provide needed protein supplements for dry cows by rationing the amount of grazing time on small grains. Protein content of small grain forage was high throughout winter and early spring.

The experiment conducted by Staten and Heller (1949) indicated that the pasture value of winter small grain was so high that livestock farmers might profitably use them entirely for pasture without taking a grain crop. Grain yield was not seriously affected by grazing until the plants reached the jointing stage of growth. Clipping after the jointing stage had the most serious effect on rye and wheat. Yields of barley and oats were less seriously reduced. None of the wheat varieties produced as much forage as the other small grains or ryegrass.

Blount (1957) reported from a four year experiment that wheat and rye produced satisfactory early grazing. During the winter, grazing

should not be too severe at any time. Winter wheat and rye recovered slowly from over-grazing, and the grazing lost during this period may mean the difference in profit and loss.

It was noted by Stansel et al. (1937) that wheat produced a higher yield (6323 lb/acre) than the other small grains at Denton, Oklahoma, and the frequent clipping injured the plant. Therefore, the plants were cut only when they were from four to six inches high instead of at any regular time intervals. The removal of practically all of the leaf surface of the small grains at frequent intervals was probably the cause of the injury to these plants.

A four year study concluded by Elder (1960) indicated that no significant differences were found in the total yearly forage production of small grains clipped at heights of two or four inches. The October production was greater for the two inch clipping height, and the four inch height of clip was more productive during the spring period. It was also found that at the two inch height, clipping every 30 days increased yield 27 percent over the 15 day interval, and small grains were injured severely by early clipping.

Duncan (1961) stated that all small grain varieties studied produced a greater amount of forage at the two inch clipping height than at the four and six inch heights. The forage production of rye was much greater during both the fall and winter period than either wheat, oats, or barley. However, spring production of rye was low when compared with either wheat or barley. The most severe clipping intensity was less injurious to the wheat varieties than any of the crops studied, and grain production of the wheat varieties studied appeared to be only slightly affected, if any, by the more severe clipping intensities.

Clipping management was studied by Holt et al. (1969) who indicated that forage yield may be reduced 20-80 percent by early and frequent pasturing or clipping. Allowing the plant to become well established, six to eight inches high, before grazing begins is particularly important if maximum yields are to be obtained. In general, clipping reduces the potential dry-matter production of small grains. Clipping at ten-day intervals reduced production of the erect variety 48 percent when compared with the 40-day clipping and 58 percent when compared with clipping only at maturity. The reduction in the prostrate variety yield due to frequency clipping was slightly less than for the erect variety.

Washko (1947) stated that time of seeding is an important factor if small grains are to be grazed. In Tennessee, if small grans are seeded by the first week of September, they will not make sufficient growth to permit both fall and spring grazing. Early seedings, however, expose the small grains to certain leaf diseases in the fall. The rye, barley, and oats produced approximately equal amounts of forage in the fall; whereas, the wheat produced the least fall forage. It was found that in the spring the rye furnished the largest amount of forage, the barley and wheat next largest, and the oats the smallest amount. Grazing with sheep as practiced in these studies was detrimental to grain production of all the four small grains. Grazing also reduced plant height and tillering and postponed ripening from four to eight days. However, the height of prostrate varieties was reduced less by grazing than the erect varieties. It was the same with the grain yield; the prostrate types were reduced less than the erect types.

In a study by Sprague (1954) at New Brunswick, N. J. grazing management was undertaken on wheat, rye, and oats for four years with milking

cows. He noted that rye, wheat, and oats yielded forage in approximately a 3, 2, 1 relationship. Grain production was increased by fall grazing and decreased by grazing in spring. This increase was much more pronounced in seasons of cool temperatures, and adequate yield of grain was more closely allied with weight of seed per head than the other morphological characteristics measured. Spring grazing without previous fall grazing reduced the yield of grain severely, and straw yields were much less after spring grazing but were unaffected by fall grazing.

An experiment conducted by Hubbard and Harper (1949) at the Southern Great Plains Field Station, Woodward, Oklahoma indicated that severe clipping on the average produced slightly less forage and appreciably lower grain yields than were obtained from non-clipped checks. To avoid a reduction in grain yield, clipping or grazing should be discontinued when dissection of the stem reveals the developing spike at a height at which it may be lost by clipping or grazing. Cereals were not affected so adversely by severe clipping in favorable as in unfavorable growing seasons. Winter oat and winter barley varieties did not tolerate clipping so well as rye or most of the wheat varieties tested. It was concluded that winter wheat varieties commonly grown in Oklahoma and Texas, moderately clipped until March 5 and 15, produced average yields of approximately 0.75 to 1.75 tons of green forage per acre.

Morris and Gardner (1958) conducted an experiment in Georgia and found no differences in average forage production among the three cereals when conditions were favorable, but both oats and rye were superior to wheat when fall growth was limited by drouth. Average forage yields for the cereals were approximately 300, 500, and 2,100 lb/acre when clipping was terminated on January 15, February 15, and March 15, respectively.

Rye produced more forage than oats or wheat at all clipping dates, and wheat was the lowest producer. Production of forage up to January 15 varied greatly with seasons due primarily to moisture conditions at time of planting. Grain yields of oats and rye were increased by the higher nitrogen fertilization, but wheat yields were not affected. High nitrogen application was especially effective in maintaining grain yields of oats and rye clipped to mid-February. Clipping to February 15 resulted in only slight decreases in grain yield of all small grains, but extending the clipping period to March 15 reduced grain yields 75 percent or more. Clipping to this date destroyed the young panicle primordia which developed rapidly during winter and early spring.

Finnel (1929 and 1931) in Oklahoma found that grazing up to April 1 did not affect the number of tillers produced by the wheat plant, delay maturity, nor reduce the grain yield, but grazing until April 26 reduced the grain yield. He noted that grazing close at this time seemed to prevent the full development of the heads formed by unbalancing the plant at a critical stage of growth. Grazing until May completely destroyed the young head and required an entirely new growth from the crown and so delayed maturity that the crop was near a failure. He also stated that winter barley yielded 67 percent more pasture on summer followed land and 72 percent more on stubble land than wheat in the fall and winter and winter spring of 1930-31.

Cutler et al. (1949) cited that under very favorable temperature and rainfall conditions in March and April, the clipping treatments covering the period of April 1 to April 20 increased the yield and quality of grain; clipping treatment after this date greatly reduced the yield. Reduction in plant height was directly correlated with delayed

clipping. The clipping treatments with 29 to 31 days in the fruiting period yielded more than those with 24 to 27 days in fruiting period. In early spring (March and April), when the weather conditions in Indiana are very favorable and a rapid growth of plants is stimulated, clipping or pasturing in April may reduce plant height and increase lodging resistance. Clipping or pasturing the winter wheat plant under such unfavorable weather conditions is associated with greatly reduced yields of grain. This agrees with the study of Swanson (1935) who, by his experiments in pasturing winter wheat, stressed the importance of very favorable environmental conditions for growth if wheat yields are not to be reduced by grazing.

From the clipping tests in Stillwater, Oklahoma, Pass et al. (1972) stated that 'Centurk' wheat was the top wheat in producing high forage and high grain yields within three clippings. This variety of wheat was used in a study of Phillips and McMurphy (1974), and it was noted that the October 9 clipping had no detrimental effect on the total forage yield as compared to clipping on December 1. It was found that total forage production increased significantly by not clipping after March 15 and was reduced by clipping on April 14.

The experiment conducted by McMurphy and Tucker (1972) in Oklahoma, indicated that clipping on March 25 severely reduced the spring production of small grains.

Elder and Tucker (1966) in Oklahoma stated that on good Taloka soil rye produced no more forage than barley under high rates of nitrogen and phosphorus applications, but production of rye forage was greater than wheat and barley under lower rates. The 80-40-40 application appeared to be the most economical rate.

In addition, Harper (1953), who studied phosphate fertilization and legume rotation for small grains winter pastures, showed that small grain forage yields doubled or tripled by proper phosphate fertilization and a legume rotation system.

CHAPTER III

MATERIALS AND METHODS

The data were collected during the 1974-75 wheat growing season at the Agronomy Research Station, Stillwater, Oklahoma. The growing season was marked by excessive precipitation. The total season rainfall was 43 inches which was 21 inches more than normal (22 inches). The low temperature during December, January, and February did not kill the wheat plants, but slowed down the growth. For this reason the first clipping date was changed from January 15 to January 29, and the clipping on February 15 was postponed.

The soil is Kirkland silt loam (Udertic paleustoll) which developed from weakly calcareous Permian clay beds and shales; slopes averaging about 1 percent; pH is 6.5. The soil profile is composed of seven layers: A_{1p}, B_{2-1}, B_{2-2}, B_{3}, C_{1}, C_{2}, and C_{3}. This soil has a grayish-brown silt loam surface six to ten inches deep over a dark-grayish brown, blocky, compact claypan becoming browner below 24 inches. Many $CaCO_3$ concretions occur in the lower part. The subsoil is very slowly permeable. Substrata are composed of silty clays and silty clay loams.

The wheat variety used in this study was Danne which is classed as a Hard Red Winter Wheat. Both parents of Danne are of complex pedigree involving Blackhull, Kanred, Florence, and Danne Beardless crossed in various combinations. Danne is similar to the Triumph variety in maturity, test weight, winter hardiness, straw-strength, disease and insect

resistance, but is superior to Triumph in yield. However, the amount of protein content in the grain yield of Danne is less than the Triumph variety.

Field Layout and Characters Evaluated

The experimental design was a randomized complete block in four replications with a factorial arrangement of 16 treatment combinations. These were three different numbers of clipping terminating at five different last clipping dates plus a check which was never clipped. Numbers of clipping were one, two, and three. Last clipping dates studied were February 28, March 17, April 4, April 16, and May 5.

The experiment was planted on October 4, 1974 at a seeding rate of 60 lb/acre. A disc-type drill was used for planting. The soil was fertilized with 200 lb/acre of 18-46-0 (N-P_2O_5-K_2O) fertilizer prior to planting, and 100 lb/acre of 33-0-0 fertilizer on February 15, 1975 as a top-dressing.

Each (replication) consisted of 33 rows, eight inches apart, and ten feet long. Every other row was used as a border which left 16 rows for data collecting. The numbers of each row were random for each plot. Rows one to five were subjected for one clipping treatment; six to ten were subjected for two clipping treatments; and rows 11 to 15 were subjected for three clipping treatments; and row 16 was subjected for no clipping treatment (check). Rows one to 16 were harvested for grain. The area clipped from each row was 3.33 ft^2.

The characters evaluated were: (a) forage yield, and (b) grain yield.

Forage Yield

The forage was clipped approximately two inches above the ground with an electric clipper running on top of a platform made of wooden boards one inch high and five feet long.

The clipping dates are shown in Table 1.

Table 1. Summary of clipping treatments and dates.

	Treatment															
Clipping Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
January 29						x					x	x	x	x		
February 28	x					x	x	x			x		x			
March 17		x					x		x	x	x	x		x	x	
April 4			x					x				x	x			
April 16				x					x					x	x	
May 5					x					x					x	

Rows clipped on May 5 did not produce any grain. The forage samples were oven dried at a temperature of 130 F. Weights were recorded as grams per 3.33 ft^2 plot, after the samples were dried.

Grain Yield

The grain was harvested by hand on June 16, 1975. The weight of grain yield was recorded in grams per 3.33 ft^2 plot.

Statistical Analyses

The statistical analysis of variance for the data collected was analyzed on the Olivette 602 microcomputer of the Agronomy Department, Oklahoma State University. Analyses of variance were performed to determine differences among cuts, last clipping dates, and their interaction. A separate analysis was made for forage and grain yields.

CHAPTER IV

RESULTS AND DISCUSSION

The estimation of forage and grain productions of wheat in the 1974-75 growing season as affected by different number of clipping, and last clipping dates are presented under separate headings for simplicity and convenience of discussion.

Forage Production

Average yield of wheat was 2507 lb/acre in total forage production. The analysis of variance, Table 2, was highly significant between treatments and will be discussed in detail in the later heading.

Table 2. Analysis of variance for forage yield.

Source	df	Mean Square	F
Rep	3	1814.6444	7.4481**
Treatment	14	17740.0666	72.8540**
Error	42	243.5015	

**Significant at 0.01 level of probability

CV = 17.9% $LSD_{(4,0.05)}$ = 22.3 gm/plot = 641 lb/acre

The Effect of Different Numbers of Clipping

In Table 3, the analysis of variance indicated significance between different numbers of clipping used in this study. The average forage yield of one clipping treatment (2830 lb/acre) was 324 lb/acre more than two clipping treatments (2506 lb/acre). It showed that one clipping treatment produced better forage production than two clipping treatments.

The analysis of variance, shown in Table 4, also indicated the same result, highly significant difference among number of clippings. One clipping treatment gave the highest average forage production (3457 lb/acre), two clipping treatments the intermediate (2978 lb/acre), and three clipping treatments the least (2289 lb/acre). It showed that one clipping treatment was superior and two clipping treatments were better than three clipping treatments. It seems that with the larger numbers of clipping, the smaller amount of forage yield was produced.

The Effect of Last Clipping Dates

From Table 3, the analysis of variance indicated highly significant effect of last clipping dates used in the experiment. Averages of forage yields were 471, 827, 2216, 3479, and 6350 lb/acre when the last clipping dates were February 28, March 17, April 4, April 16, and May 5, respectively. It showed that the amount of forage yield was increased when the time of last clipping was extended. F value showed the interaction between each clipping and last clipping dates (Table 3).

The relationship of forage yield in each clipping with five different last clipping dates (Fig. 1, Table 5) showed that the forage yield of one clipping treatment was 295 lb/acre less than two clipping

Table 3. Analysis of variance of forage production as affected by 1 vs 2 cuts and five different last clipping dates.

Source	df	Mean Square	F
Rep	3	1,075.6916	5.3002**
Treatment	9	24,956.1361	122.9663**
Cut	1	1,265.6250	6.2361*
Date	4	54,640,4625	269.2299**
C x D	4	1,194.4375	5.8853*
Error	27	5,479.6750	

*Significant at 0.05 level of probability

**Significant at 0.01 level of probability

CV = 15.4%

$LSD_{(4,\ 0.05)}$ = 20.1 gm/plot = 578 lb/acre

$LSD_{(8,\ 0.05)}$ = 14.6 gm/plot = 421 lb/acre

$LSD_{(20,\ 0.05)}$ = 9.2 gm/plot = 266 lb/acre

Table 4. Analysis of variance of forage production as affected by 1 vs 2 vs 3 cuts and four different last clipping dates.

Source	df	Mean Square	F
Rep	3	1,833.9097	7.1862**
Treatment	11	17,832.3238	69.8765**
Cut	2	6,652,5625	26.0682**
Date	3	52,919.6875	207.3674**
C x D	6	4,015.2291	15.7338**
Error	33	255.1976	

**Significant at 0.01 level of probability

CV = 15.8%

$LSD_{(4,\ 0.05)}$ = 3.0 gm/plot = 662 lb/acre

$LSD_{(12,\ 0.05)}$ = 13.3 gm/plot = 382 lb/acre

$LSD_{(16,\ 0.05)}$ = 11.5 gm/plot = 331 lb/acre

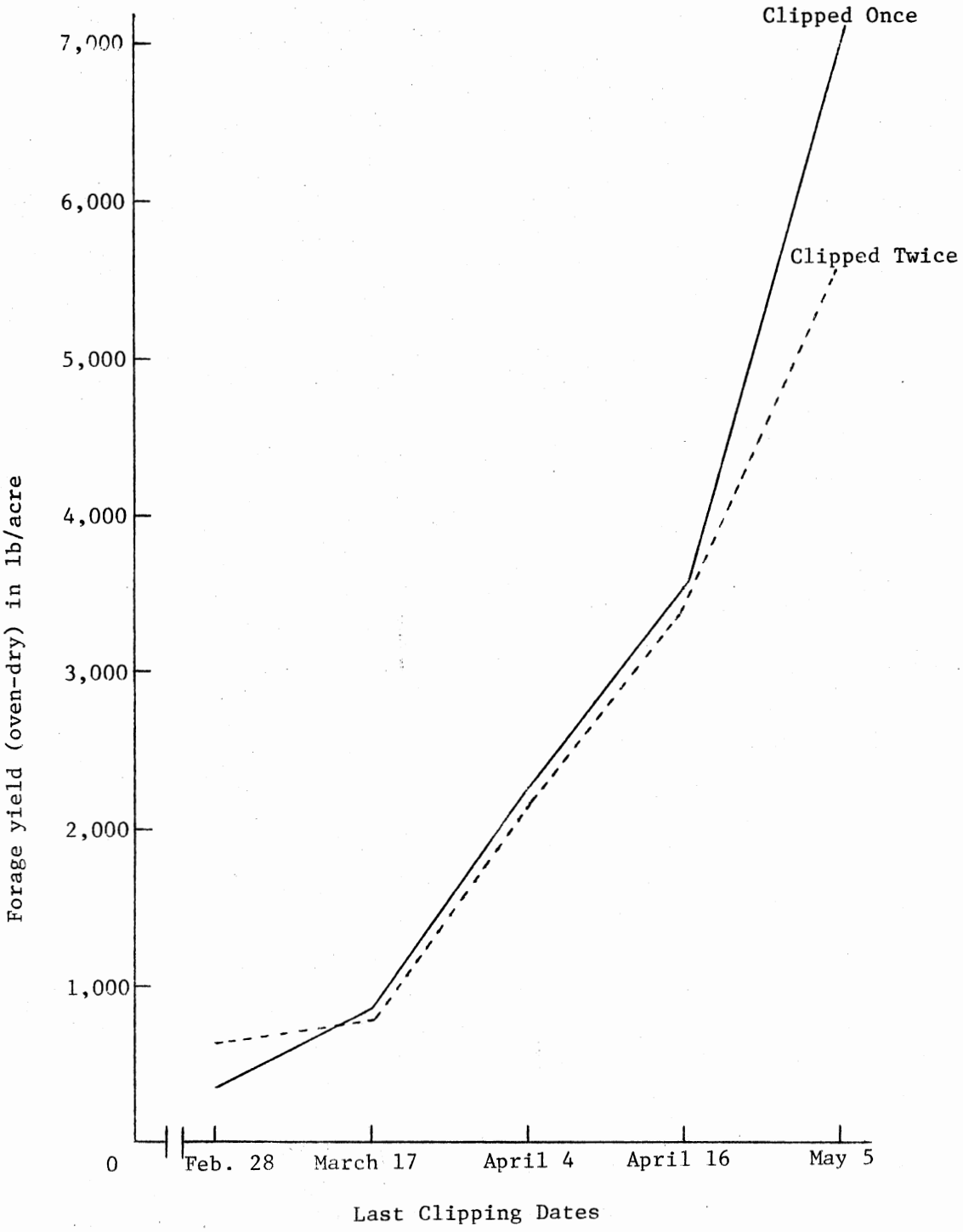

Figure 1. Total forage yield (oven-dry) of Danne wheat as affected by two numbers of clipping and five last clipping dates in (lb/acre) 1974-75 season.

Table 5. Total forage yield (lb/acre) as affected by two numbers of clipping and five last clipping dates of Danne wheat in the 1974-75 growing season.

Last Clipping Date	Total Forage Yield Number of Clipping		
	1	2	Average
February 28	323	618	471
March 17	856	798	827
April 4	2,259	2,173	2,216
April 16	3,598	3,360	3,479
May 5	7,116	5,584	6,350
Average	2,830	2,506	2,668

treatments on February 28, but more than two clippings 58, 86, 238, and 1532 lb/acre when last clipping dates were March 17, April 4, April 16, and May 5, respectively, which one can conclude that the forage yield of one clipping treatment was greater than two clipping treatments.

The analysis of variance, shown in Table 4, indicated the same result as Table 3, highly significant difference among last clipping dates. The forage yield was higher when the last clipping date was later. The averages of forage yields were 851, 2079, 3384, and 5319 lb/acre when last clipping dates were March 17, April 4, April 16, and May 5. There was also a highly significant difference among numbers of clipping within the four different last clipping dates.

Forage yield with four different last clipping date relationships (Fig. 2, Table 6) indicated that the forage yield of one clip was less than three clips, but more than two clips on March 17 last clipping. One clipping treatment produced higher forage yield than two and three clipping treatments, respectively, when the last clipping dates were April 4, April 16, and May 5. One clipping treatment was superior to the other, and the maximum forage yield (7116 lb/acre) was produced by one clipping treatment on May 5.

Grain Production

The check treatment (no clipping) produced an average grain yield of 33.3 bu/acre. Grain yields were found to be highly significant among treatments (Table 7) which will be discussed in detail in the later headings.

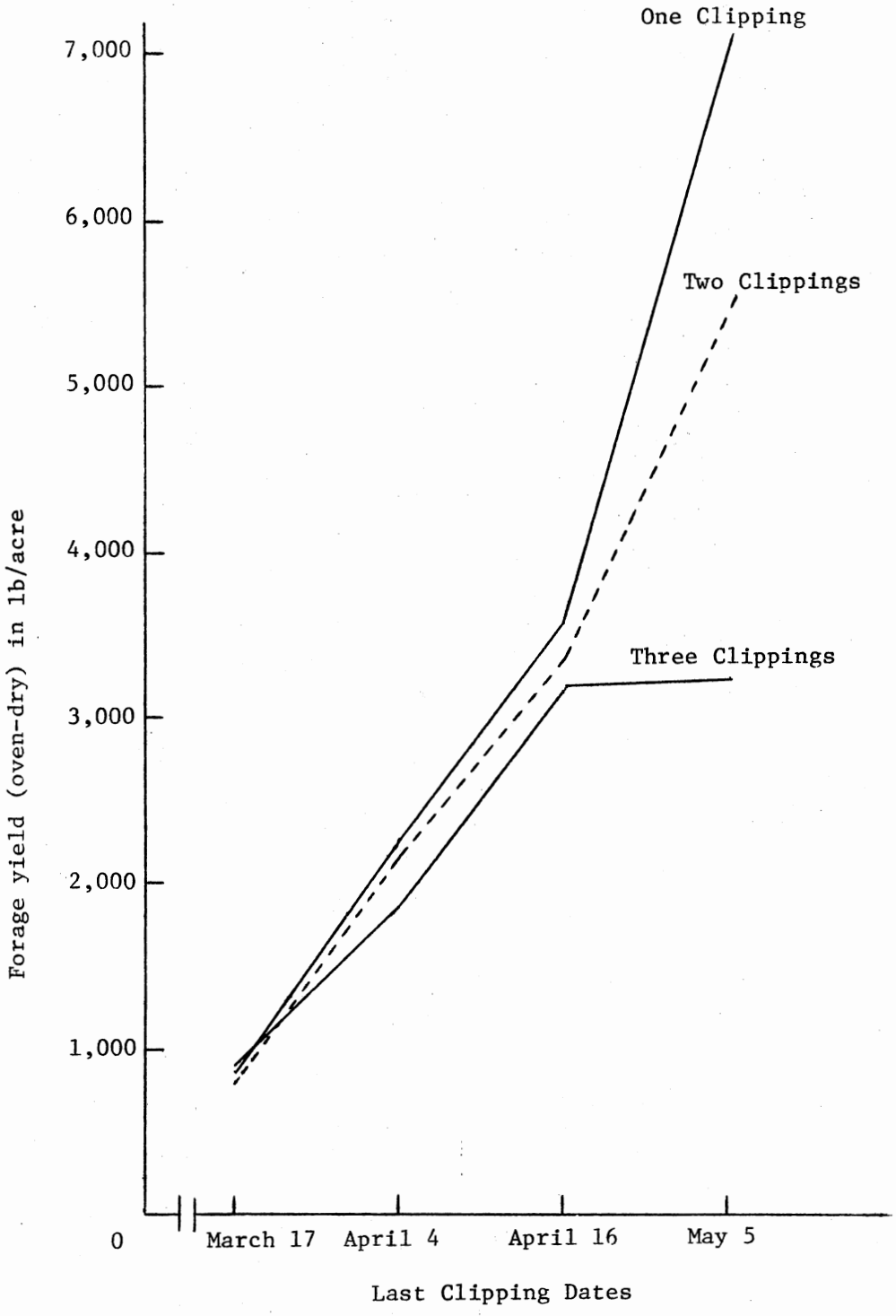

Figure 2. Total forage yield (oven-dry) of Danne wheat as affected by three numbers of clipping and four last clipping dates in (lb/acre) the 1974-75 growing season.

Table 6. Total forage production (lb/acre) as affected by three numbers of clipping and four last clipping dates of Danne wheat in the 1974-75 growing season.

Last Clipping Date	Total Forage Yield Number of Clipping			Average
	1	2	3	
March 17	856	798	899	851
April 4	2,259	2,173	1,805	2,079
April 16	3,598	3,360	3,194	3,385
May 5	7,116	5,584	2,359	5,319
Average	3,457	2,978	2,289	2,908

Table 7. Analysis of variance of variable grain yield.

Source	df	Mean Square	F
Rep	3	527.9487	16.1253**
Treatment	12	1,079.8942	32.9835**
Error	36	32.7403	

**Significant at 0.01 level of probability

CV = 13.7%

$LSD_{(4,\ 0.05)}$ = 8.2 gm/plot = 3.9 bu/acre

The Effect of Numbers of Clipping

From Table 8, the analysis of variance showed no significant differences between numbers of clipping in regard to total grain production. The average grain yields of one and two clippings were 20.0 and 19.2 bu/acre. It was different from the analysis of variance, shown in Table 9, which showed significant effect of numbers of clipping. The grain yields of one, two, and three clippings were 18.5, 15.5, and 16.3 bu/acre, respectively. One clipping was superior to two and three clippings on grain yields. Compared with the check, one clipping reduced the grain yield about 44 percent, two clippings 53 percent, and three clippings 51 percent.

The Effect of Last Clipping Dates

According to the analysis of variance in Table 8, there was a highly significant effect of last clipping dates on total grain production. Averages of grain yields were 27.3, 23.4, 19.6, and 8.2 bu/acre when last clippings were terminated on February 28, March 17, April 4, and April 16, respectively. It showed that the average of grain yield became less and less when the last clipping date was delayed. In this experiment no plot clipped on May 5 produced any grain yield since clipping at this late date completely destroyed the young heads of the plant. The table also indicated high significance between clippings within four different last clipping dates or interaction, even though, there was no significant effect by numbers of clipping.

The relationship between numbers and last dates of clippings (Fig. 3, Table 10) showed that the average grain yield of one clipping was

Table 8. Analysis of variance of grain yield as affected by 1 vs 2 cuts and four different last clipping dates.

Source	df	Mean Square	F
Rep	3	426.7083	12.4999**
Treatment	7	1,092.4107	32.0008**
Cut	1	28.1250	0.8238
Date	3	2,362.8750	69.2176**
C x D	3	176.7083	5.1764**
Error	21	34.1369	

**Significant at 0.01 level of probability.

CV = 14.3%

$LSD_{(4,\ 0.05)}$ = 8.6 gm/plot = 4.1 bu/acre

$LSD_{(8,\ 0.05)}$ = 6.1 gm/plot = 2.9 bu/acre

$LSD_{(16,\ 0.05)}$ = 4.3 gm/plot = 2.1 bu/acre

Table 9. Analysis of variance of grain yield as affected by 1 vs 2 vs 3 cuts and three different last clipping dates.

Source	df	Mean Square	F
Rep	3	215.0370	8.1160**
Treatment	8	769.3194	29.0359**
Cut	2	128.3611	4.8446*
Date	2	2,900.6944	109.4795**
C x D	4	24.1111	0.9100
Error	24	26.4953	

*Significant at 0.05 level of probability.

**Significant at 0.01 level of probability.

CV = 14.7%

$LSD_{(4,\ 0.05)}$ = 7.5 gm/plot = 3.6 bu/acre

$LSD_{(12,\ 0.05)}$ = 4.3 gm/plot = 2.1 bu/acre

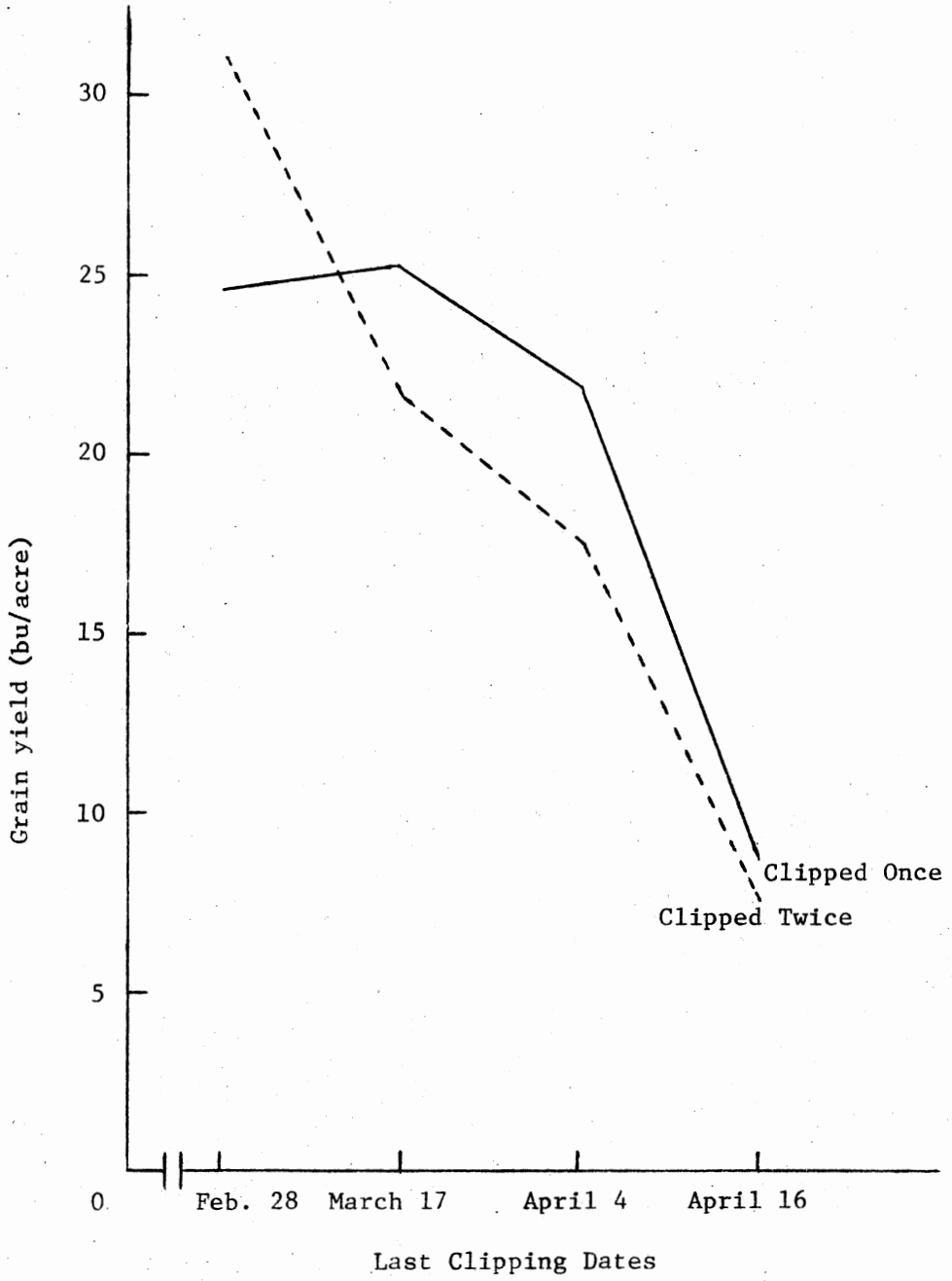

Figure 3. Average of grain yield (bu/acre) of Danne wheat as affected by two numbers of clipping and four last clipping dates in 1974-75 growing season (Control yield of no clip = 33.3 bu/acre). $LSD_{0.05}$ = 3.9 bu/acre.

Table 10. Average of grain yields (bu/acre) as affected by two numbers of clipping and four last clipping dates of Danne wheat in the 1974-75 growing season.

Last Clipping Date	Grain Yield Numbers of Clipping 1	2	Average
February 28	24.6	30.1	27.3
March 17	25.2	21.6	23.4
April 4	21.8	17.4	19.6
April 16	8.7	7.7	8.2
Average	20.0	19.2	19.6

increased when last clipping date was changed from February 28 to March 17, and decreased when the last clipping dates were later than March 17 (April 4 and April 16). Grain yield average of two clippings was reduced when last clipping dates were later than February 28 (March 17, April 4, and April 16). In fact, the treatments that were clipped on May 5 did not produce any grain yield at all. Most of the workers who did this kind of experiment indicated that under favorable weather there was no effect on grain yield in regard to last clipping date before March 1, but clipping after this date seriously reduced grain yields. However, grain clipped twice indicated the same result with the former works but not with grain clipped once, since there was a reduction of grain yield when last clipping date was terminated on February 28.

High significance among last clipping dates was shown in the analysis of variance (Table 9). However, there was no interaction of clippings and last clipping dates. The average yields of grain were 22.9, 19.1, and 8.5 bu/acre when last clipping was terminated on March 17, April 4, and April 16, respectively. Reduction in grain yield is directly correlated with delayed clipping, since clipping to this date destroyed the young panicle primordia which developed rapidly during early spring.

The relationship of each clipping with last clipping dates (Fig. 4, Table 11) indicated that at March 17 last clipping, clipped one, two, and three times produced 25.2, 21.6, and 21.9 bu/acre of grain yields, respectively. One clipping was superior to two and three clippings. The results were the same on April 4, but different on April 16, since clipped three times was superior to the others. It showed that at any of last clipping dates the grain yields were highest, intermediate, and

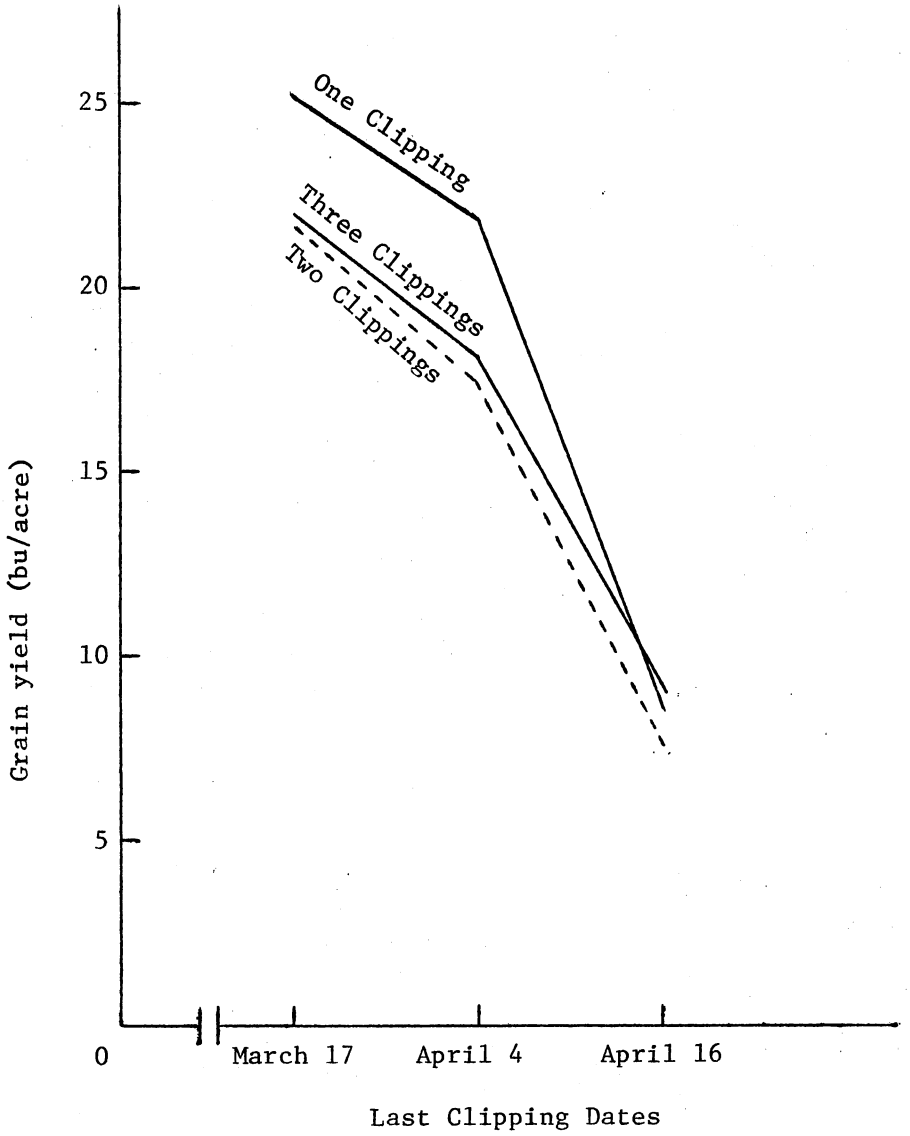

Figure 4. Average of grain yield (bu/acre) of Danne wheat as affected by three numbers of clipping and three last clipping dates in the 1974-75 growing season.

Table 11. Average of grain production (bu/acre) as affected by three numbers of clipping and three last clipping dates of Danne wheat in the 1974-75 growing season.

Last Clipping Date	Grain Yield Numbers of Clipping			
	1	2	3	Average
March 17	25.2	21.6	21.9	22.9
April 4	21.8	17.4	18.1	19.1
April 16	8.7	7.7	9.1	8.5
Average	18.5	15.5	16.3	16.8

smallest when numbers of clipping were 1, 3, and 2, respectively. From this point, the serious reduction of grain yield happened when clipping was made after March 17.

The Effect of Last Clipping Dates on Forage and Grain Yields

The relationship of forage and grain yields as affected by no clipping (check) and four different last clipping dates, shown in Fig. 5, and Tables 12 and 13, indicated that the wheat which was not clipped produced the highest grain yield (2000 lb/acre). Grain yield was reduced when clipping was started. The grain yield reductions were 31, 43, 74, and 100 percent when last clippings were made on March 17, April 4, April 16, and May 5, respectively. Forage yields were increased when last clipping dates were extended. Maximum forage yield was produced when the last clipping was May 5, and the April 16, April 4, and March 17 last clipping dates produced 64, 39, and 16 percent, respectively, of the maximum (Table 12). The highest yield of forage was 5319 lb/acre when last clipping was made on May 5, but the plant did not produce any grain yield, since the young heads of the plants were completely destroyed. It would appear that any date or number of clippings reduced the grain yield; the later the time of clipping the higher the yield of forage, and the reduction of grain yield increased when the time of clipping was extended.

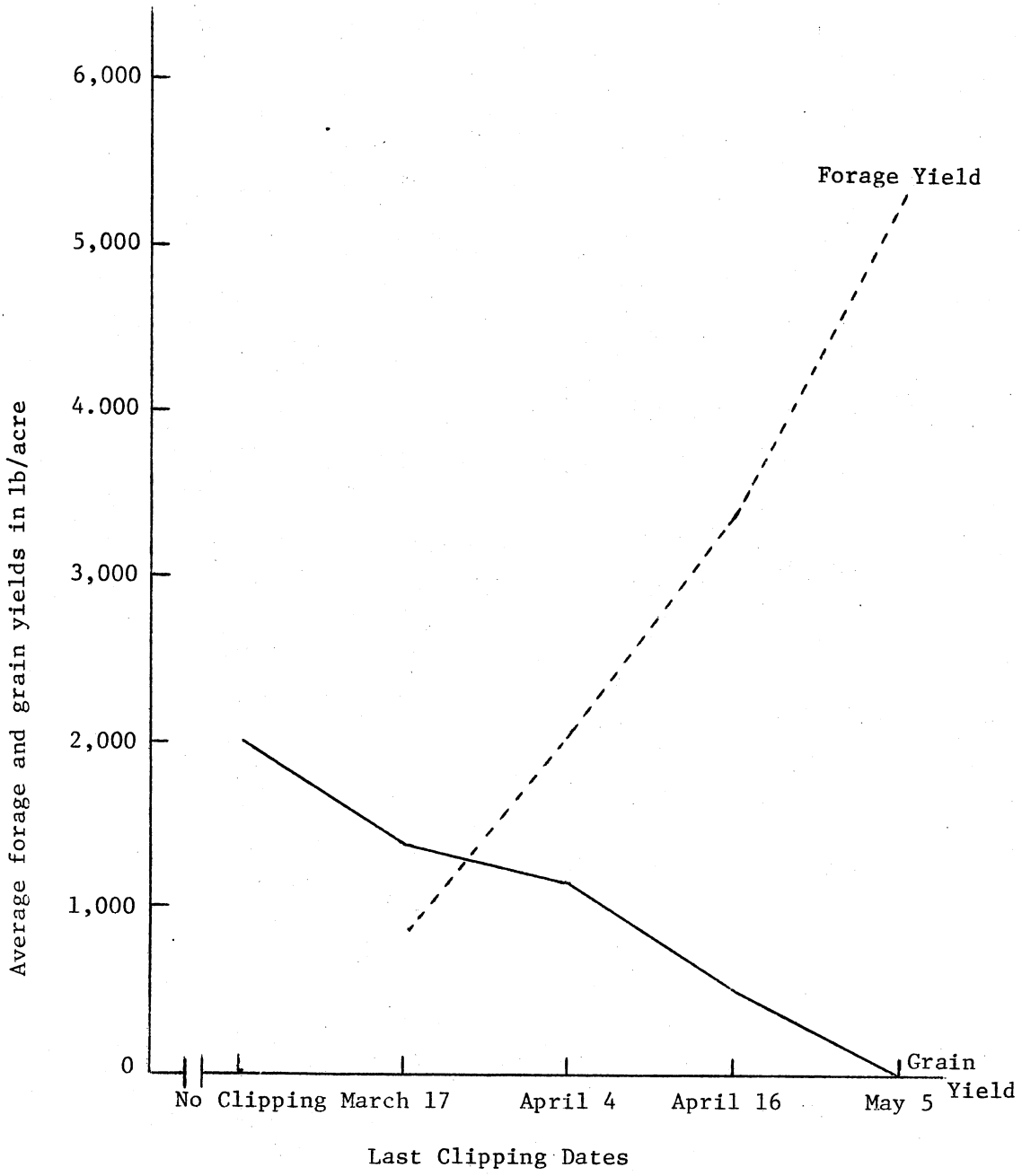

Figure 5. Average of forage and grain yields of Danne wheat as affected by four different last clipping dates and no clipping (check) in 1974-75 growing season.

Table 12. Average of forage yields (lb/acre) as affected by four different last clipping dates and no clipping of Danne wheat in the 1974-75 growing season.

Treatment	Cut	Last Clipping Date	Total Forage Yield	Average
2	1	March 17	856	
7	2	March 17	798	851
11	3	March 17	899	
3	1	April 4	2259	
8	2	April 4	2172	2079
13	3	April 4	1805	
4	1	April 16	3598	
9	2	April 16	3359	3384
14	3	April 16	3194	
5	1	May 5	7116	
10	2	May 5	5584	5319
15	3	May 5	3258	
16	-	Check	-	-

Table 13. Average of grain yields (lb/acre) as affected by four different last clipping dates and no clipping of forage of Danne wheat in the 1974-75 growing season.

Treatment	Cut	Last Forage Clipping Date	Grain Yield	Average
2	1	March 17	1511	
7	2	March 17	1295	1374
11	3	March 17	1317	
3	1	April 4	1310	
8	2	April 4	1043	1147
13	3	April 4	1087	
4	1	April 16	525	
9	2	April 16	460	511
14	3	April 16	547	
5	1	May 5	0	
10	2	May 5	0	0
15	3	May 5	0	
16	-	Check	2000	2000

CHAPTER V

SUMMARY AND CONCLUSIONS

A study to determine the effect of different intensities of simulated grazing on forage and grain production of Hard Red Winter Wheat was conducted in the fall of 1974 and spring of 1975 at the Agronomy Research Station located in Stillwater, Oklahoma.

In this study one variety of wheat 'Danne' was used. The seeding rate was 60 lb/acre. A randomized complete block design in four replications with a factorial arrangement of 16 treatment combinations was used in this study. These were three different numbers of clipping terminating at five different last clipping dates plus a check which was never clipped. Numbers of clipping were one, two, and three. Last clipping dates studied were February 28, March 17, April 4, April 16, and May 5.

From the results the following conclusions are presented:

1. Forage yields of 'Danne' wheat were found to be significant among dates of harvest, clipping intensities, and interaction. The maximum forage production was produced when harvesting was made only one time and late in spring.

2. Grain yields were found to be significantly reduced by the later clipping dates. The maximum grain yield was produced when clipping was never made.

3. Any date or intensity of forage clipping treatment caused a

reduction in grain yield. The loss was smaller when the double clipped was made and earlier in spring.

4. Later or more frequent harvesting caused a serious reduction in grain yield. In this study, clipping on May 5 completely destroyed the grain yield.

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APPENDIXES

Table 14. Forage production (oven-dry) in (lb/acre) the 1974-75 growing season of Danne wheat variety. Kirkland silt loam, Stillwater.

Treatment	Forage Yield Harvest Dates 1-29	2-28	3-17	4-4	4-16	5-5	1974-75 Total Forage Yield
1	0	323	0	0	0	0	323
2	0	0	856	0	0	0	856
3	0	0	0	2,259	0	0	2,259
4	0	0	0	0	3,598	0	3,598
5	0	0	0	0	0	7,116	7,116
6	374	244	0	0	0	0	618
7	0	525	273	0	0	0	798
8	0	568	0	1,605	0	0	2,173
9	0	0	978	0	2,382	0	3,360
10	0	0	921	0	0	4,663	5,584
11	295	266	338	0	0	0	899
12	288	0	568	914	0	0	1,770
13	331	251	0	1,223	0	0	1,805
14	259	0	597	0	2,338	0	3,194
15	0	0	835	0	2,187	237	3,259
16	0	0	0	0	0	0	0

Forage production was averaged from four replications.

Table 15. Grain production in (bu/acre) the 1974-75 growing season of Danne wheat variety. Kirkland silt loam, Stillwater.

Treatment	Last Clipping Date	Number of Clip	Average Grain Yield
1	February 28	1	24.6
2	March 17	1	25.2
3	April 4	1	21.8
4	April 16	1	8.7
5	May 5	1	0
6	February 28	2	30.1
7	March 17	2	21.6
8	April 4	2	17.4
9	April 16	2	7.7
10	May 5	2	0
11	March 17	3	21.9
12	April 4	3	20.9
13	April 4	3	18.1
14	April 16	3	9.1
15	May 5	3	0
16	--	0	33.3

Grain production was averaged from four replications.

Table 16. Forage (lb/acre) yield of Danne wheat at three different clipping intensities in each of four replications.

Treatment	Cut	Forage in lb/acre oven dried Replications			
		1	2	3	4
1	1	172	201	489	431
2	1	748	1036	921	719
3	1	1381	2561	2676	2417
4	1	2964	3569	3828	4029
5	1	6274	7656	7627	6908
6	2	518	777	431	748
7	2	546	1324	777	546
8	2	1612	1842	2043	3195
9	2	2820	3828	3252	3540
10	2	5440	6447	4720	5728
11	3	345	949	1093	1208
12	3	1381	1266	1727	2705
13	3	949	2820	1698	1755
14	3	2676	2331	3885	3885
15	3	2820	3310	3569	3338

Table 17. Grain yield (bu/acre) of Danne wheat as affected by three different clipping intensities in each of four replications.

Row	Cut	Grain yield in bu/acre Replications			
		1	2	3	4
1	1	15.8	24.0	28.8	29.7
2	1	19.2	24.0	28.3	29.3
3	1	18.2	23.5	21.5	23.9
4	1	9.5	8.6	7.1	9.5
5	1	0	0	0	0
6	2	23.0	29.3	33.1	35.0
7	2	19.2	18.7	19.2	29.3
8	2	14.9	16.3	14.4	23.9
9	2	4.8	5.8	8.6	11.5
10	2	0	0	0	0
11	3	18.7	21.1	24.5	23.5
12	3	17.3	20.6	22.5	23.0
13	3	18.2	20.1	14.9	19.2
14	3	7.7	8.6	9.6	10.5
15	3	0	0	0	0
16	0	24.5	34.5	35.5	38.8

Table 18. Total precipitation of the 1974-75 wheat growing season at Agronomy Research Station, Stillwater, Oklahoma.

Month	Precipitation	Normal	Departure from Normal
October	7.87	2.78	+ 5.09
November	5.86	1.85	+ 4.01
December	2.17	1.34	+ 0.83
January	3.03	1.16	+ 1.87
February	1.43	1.35	+ 0.08
March	3.07	1.86	+ 1.21
April	1.65	2.86	- 1.21
May	13.13	4.62	+ 8.51
June	4.80	4.24	+ 0.56
Total	43.01	22.06	20.95

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