A Clipping Management Study of Two Sudangrass-Sorghum Hybrids, Sudandangrass, and Gahi Millet for Forage Production

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A CLIPPING MANAGEMENT STUDY OF TWO SUDANGRASS-SORGHUM HYBRIDS, SUDANGRASS, AND GAHI MILLET FOR FORAGE PRODUCTION

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Sudangrasses and millets have been used for many years for mid-summer pasturage. They are sometimes planted as emergency crops when failure of some other crop makes a feed shortage probable; however, many farmers in the southeast include these crops in the regular farm rotation for mid-summer forage production. In recent years, several sudangrass-sorghum hybrids have been developed which are suitable for this use. The hybrids have usually been compared with sudangrass and millet in conventional variety tests in which the top growth is removed once or twice a season. These variety tests have usually shown that sudangrass-sorghum hybrid yields are higher than sudangrass cut once or twice a season.

Several investigators (1, 2, 3, 4) have studied the responses of sudangrass and millet to various combinations of stubble heights and stages of maturity when cut. The purpose of the investigations reported herein was to compare the yields of 2 sudangrass-sorghum hybrids with sudangrass and Gahi millet over a rather wide range of cutting treatments.

PROCEDURE

Experiments were conducted in 1961, 1962, and 1964 at the Virginia Forage Research Station near Middleburg to compare the performance of 2 sudangrass-sorghum hybrids, Asgrow Grazer and Dekalb Sudax SX 11, with Gahi-1 millet and Greenleaf sudangrass under 6 cutting treatments.

The plots were planted about May 20 each year and were located on relatively level, Chester silt loam soil. Soil tests indicated a medium level of phosphorus and potassium, with approximately 1% organic matter. Fertilizer was applied prior to the final seedbed preparation. In 1961 application was at the rate of 225 lbs. of N and 100 lbs. each of P_2O_5 and K_2O per acre; in 1962 the rates were reduced to 160 lbs. of N and 60 lbs. each of P_2O_5 and K_2O; in 1964 rates of 150 lbs. of N, 92 lbs. of P_2O_5, and 90 lbs. of K_2O per acre were used.

All varieties were planted with a grain drill at the rate of 30 lbs. of seed per acre in 7" rows. The soil was cultipacked after seeding to assure a firm seedbed. The plot size was 7' x 15' in 1961 and 7' x 20' in 1962 and 1964. A randomized block statistical design with 3 replications was used.

The following 6 cutting treatments were compared with all varieties:

(1) Cut when 48" high to a 4" stubble.
(2) Cut when 48" high to an 8" stubble.
(3) Cut when 34" high to a 4" stubble
(4) Cut when 34" high to an 8" stubble.
(5) Cut when 20" high to a 4" stubble.
(6) Cut when 20" high to an 8" stubble.

Forage was cut when the average height of all plots of a treatment reached the prescribed level. A residual cut at 2" was taken on all plots after the first killing frost. A Gravely cutter bar mower with skids to control cutting height was used to cut all forage samples. A 2-1/2' x 12-1/2' strip was cut in 1961, while a 2-1/2' x 17-1/2' strip was harvested in 1962 and 1964. The forage was dried in a heated, forced-air drier prior to weighing.

RESULTS

The bi-weekly rainfall and temperature records for the periods covered by these experiments are shown in Table 1. Rainfall was relatively plentiful during the 1961 growing season until September; however, in 1962 moisture became limited during the last half of July and drought seriously inhibited plant growth in August and September. The total rainfall in 1964 was slightly less than in 1962, but a timely rain in mid-July provided moisture for the plants at a critical period of the growing season. Thus, yields are much higher for 1964 than for 1962, even though total rainfall for the 2 years is similar.

Data on total forage yield and number of cuttings per season are shown in Table 2. Within a single growing season the total number of cuttings was influenced markedly by height of forage when cut, stubble height, and variety of grass. Generally speaking, if the forage was 34" or 48" high when cut, stubble height had little influence on the total number of cuttings per season. At these stages the growing points in the primary stems were removed by defoliation, regardless of stubble height. New growth originated primarily from basal tillers, while

regrowth from auxiliary buds was of minor importance. Thus, when plants were permitted to grow to 34" or 48", new growth started at a common level near the soil.

When grasses were cut at 20" to an 8" stubble, the growing points were not disturbed and there was a rapid height increase by leaf elongation and additional growing point differentiation. This situation resulted in 7 to 8 cuttings in 1961, 5 to 6 in 1962, and 5 to 7 in 1964.

The data on total seasonal dry matter yields reflect significant differences caused by defoliation treatments. Highest yields were obtained when the grasses were allowed to reach 48" before defoliation, except for Grazer in 1961 and 1964, and Sudax SX 11 in 1961, which yielded as well when cut at 34" as at 48". When all data in the 3 experiments were averaged, the grass cut when 34" high yielded 92% as much as that cut at 48", while grass cut at 20" yielded 71% as much as that cut at 48".

On the average, grass cut to an 8" stubble height produced approximately 7% less forage than that cut to 4". This was largely because of the yield contribution of the extra 4" of stubble. That part of the plant is quite dense and makes a contribution of several hundred pounds of dry matter per acre. As mentioned earlier, the extra leaves remaining at the 8" stubble height did not appear to contribute to faster regrowth except at the 20" cutting height.

Asgrow Grazer, Dekalb Sudax SX 11, and Gahi-1 millet produced yields similar for all years tested, while Greenleaf sudangrass produced about 81% as much forage as the other 3 varieties. The yield relationship among the different varieties was quite similar, regardless of the cutting treatment which was imposed upon them.

The daily dry matter production prior to the first defoliation is shown in Table 3. It can be seen that average daily production is quite low during the first 5 or 6 weeks of growth prior to the time the 20" height is reached. During the time the plants are growing from 20" to 34" or 34" to 48", the daily rate of dry matter production is relatively high. This appears to be the reason for the great total yield advantage of the 34" and 48" cutting treatments.

Figures 1 to 3 show the forage distribution of these annual grasses throughout the growing season in 1961, a year of adequate rainfall. Grazer and Sudax are combined in Figure 1 because of close similarity. Only the treatments with 4" stubble heights are shown in these charts. The plots cut from 20" to a 4" stubble 4 or 5 times a year produced a frequent supply of forage; however, the amount available for removal at a given time was relatively small. When any of these forage species was allowed to reach 34" or 48" before cutting, the number of cuttings per season decreased while the yield per cutting increased. Cutting at an 8" stubble height had no significant effect on forage distribution when the grass was cut at the 34" or 48" height. When these grasses were cut from 20" to an 8" stubble, the harvests were frequent in good growing weather but only a few hundred pounds of forage was removed at each cutting.

DISCUSSION

One advantage of the millets, sudangrasses, and sudangrass-sorghum hybrids is that they furnish feed primarily in July, August, and September when most perennial forage species are producing at a low level. For this reason they are valuable in the forage program of many livestock farms. If conventional pastures are stocked heavily enough to use efficiently the flush growth of spring, there is often a severe lack of pasturage in mid-summer. Summer annual grasses can often fill this gap in feed supply.

It can be noted in Table 2 that the use of these grasses is not a complete panacea for mid-summer drought problems. Forage production by these species in 1962, a drought year, was only 50 to 60% as great as the production in 1961. It must be remembered, however, that the production of perennial forage crops is also extremely low under drought conditions. In 1964, which had less total rainfall than 1962 but a better distribution for the growth of these grasses, the yields were 74% as great as in 1961. It has been found that sudangrass and millet seeded during periods of drought will not make satisfactory growth for forage production. If forage is to be available for grazing when needed, these annual grasses must be seeded during the favorable growth periods of late spring.

The forage distribution charts, Figures 1 to 3, indicate these crops can be managed in several ways, depending on the use to which they are put. Efficient removal by grazing requires forage no more

than 20" to 30" tall to prevent large trampling losses. On the other hand, efficient removal by machine for green feeding or ensiling requires a large amount of forage at one time. The forage distribution charts indicate these species can furnish grazing on a rather frequent basis if grazed when 20" to 30" high. The amount of forage present per acre is adequate for efficient removal by grazing animals at this height. On the other hand, if forage to be removed mechanically is allowed to get somewhat taller, 34" to 48", the seasonal production per acre will be greater and the efficiency of harvesting operations will be improved.

The data on total yields and forage distribution indicate that sudangrass-sorghum hybrids, Grazer and Sudax, maintain their yield positions relative to sudangrass and millet, regardless of what cutting treatments they are subjected to. They appear to be worthy of strong consideration as replacements for sudangrass in the mid-summer forage program, because of this yield advantage.

SUMMARY

Experiments were conducted in 1961, 1962, and 1964 at Middleburg, Virginia, to compare the performance of 2 sudangrass-sorghum hybrids with Gahi millet and sudangrass under 6 defoliation treatments. These grasses were cut throughout the season whenever they reached a height of 20", 34", or 48". Two stubble heights, 4" and 8", were compared. The results were:

(1) Asgrow Grazer, Dekalb Sudax SX 11, and Gahi-1 millet produced similar total yields, while Greenleaf sudangrass produced about 81% as much forage as the other grasses.

(2) Sudangrass-sorghum hybrids maintained their same relative yielding positions under all defoliation treatments.

(3) When all data were averaged, grass cut at 34" yielded 92% as much as that cut at 48", while grass cut at 20" yielded 71% as much as that cut at 48".

(4) When these grasses were cut at 8" stubble heights, they produced approximately 7% less forage than when cut at 4".

(5) Seasonal forage distribution was markedly influenced by different defoliation treatments. Cutting at 20" resulted in frequent small yields, while cutting at later stages resulted in greater yields at less frequent intervals.

(6) It appears that sudangrass-sorghum hybrids may replace sudangrass because of their greater yielding ability over a wide range of defoliation treatments.

(7) All these grasses offer considerable flexibility for removal by grazing or by mechanical means for green feeding or ensiling.

LITERATURE CITED

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Table 1. Inches of rainfall and average maximum air temperature at Middleburg during the growing seasons of 1961, 1962, and 1964.

Bi-weekly period		Rainfall			Maximum temperature		
		1961	1962	1964	1961	1962	1964
May	1-15	2.24	1.89	0.39	65	71	74
	16-31	0.83	1.74	0.09	65	81	81
June	1-15	3.02	2.75	1.14	81	78	80
	16-30	1.12	1.73	0.25	76	78	87
July	1-15	5.35	1.97	3.43	82	81	85
	16-31	1.78	0.92	0.03	86	80	85
August	1-15	1.35	0.45	1.38	81	82	76
	16-31	1.68	0.10	0.32	81	86	84
September	1-15	0.12	0.81	0.09	85	79	85
	16-30	0.47	0.92	5.43	75	67	74
October	1-15	1.12	0.94	0.82	69	75	63
	16-31	1.58	0.64	1.39	64	61	65
Total		20.66	14.86	14.76			

Table 2. Number of cuttings per year and total dry matter yields in pounds per acre from 4 annual grasses, Middleburg, 1961, 1962, and 1964.

Varieties	Cutting treatments*	1961 No. of cuttings	1961 Total yield	1962 No. of cuttings	1962 Total yield	1964 No. of cuttings	1964 Total yield	Avg. yield 1961,'62,'64
	48-4	3	10708	2	7522	3	7828	8686
	48-8	3	9886	2	5979	4	7612	7826
Asgrow	34-4	4	10669	3	6100	4	8271	8347
Grazer	34-8	4	11191	3	4365	4	7494	7683
	20-4	5	8368	4	3933	5	5882	6061
	20-8	8	7578	5	3116	6	6075	5590
	Average		9733		5169		7194	7365
	48-4	3	11022	2	6735	3	9097	8951
	48-8	3	10602	3	6060	4	9457	8707
Dekalb	34-4	4	10101	3	5409	4	7700	7737
Sudax SX 11	34-8	4	10522	3	4621	5	7204	7449
	20-4	5	9626	4	3797	6	6351	6591
	20-8	7	7362	6	2592	7	5562	5172
	Average		9872		4869		7562	7434
	48-4	2	11416	2	6187	2	7521	8375
	48-8	3	10584	2	6053	3	6994	7877
Gahi-1	34-4	3	9776	3	6834	3	6816	7809
Millet	34-8	3	9457	4	4737	3	7507	7234
	20-4	5	7745	4	4670	5	5154	5856
	20-8	7	8852	6	3493	7	5322	5889
	Average		9638		5329		6552	7173
	48-4	3	8812	2	4937	3	6475	6741
	48-8	3	8696	2	3783	3	7388	6622
Greenleaf	34-4	3	8389	3	4351	3	7089	6610
Sudangrass	34-8	4	7732	3	3838	4	5841	5804
	20-4	4	7015	3	3383	5	5112	5170
	20-8	8	6603	5	2589	7	4824	4672
	Average		7874		3813		6122	5936
	Average yields by cutting treatments							
	48-4		10489		6345		7730	8188
	48-8		9942		5469		7863	7758
	34-4		9736		5674		7469	7626
	34-8		9725		4390		7012	7042
	20-4		8188		3946		5625	5920
	20-8		7598		2948		5446	5331

*First number indicates height of growth (20", 34", or 48") when harvested; second number indicates stubble height (4" or 8").

Table 3. Daily dry matter production of 4 annual grasses at 3 stages in the growth cycle, Middleburg, 1961, 1962, and 1964.

Variety	Growth stage Inches in height	Dry matter increase, Lbs. per acre per day 1961	1962	1964	Average
Asgrow Grazer	0 - 20	35	21	30	29
	20 - 34	223	188	45	152
	34 - 48	211	128	132	157
Dekalb Sudax SX 11	0 - 20	37	21	29	29
	20 - 34	135	114	74	108
	34 - 48	409	321	147	292
Gahi-1 millet	0 - 20	36	21	19	25
	20 - 34	363	312	136	270
	34 - 48	456	166	31	218
Greenleaf sudangrass	0 - 20	30	19	15	21
	20 - 34	135	279	84	166
	34 - 48	163	134	168	155

Figure 1. Seasonal distribution of Asgrow Grazer and Dekalb Sudax forage in 1961 when cut at 3 heights. Numbers at top of columns indicate pounds of dry matter produced per acre.

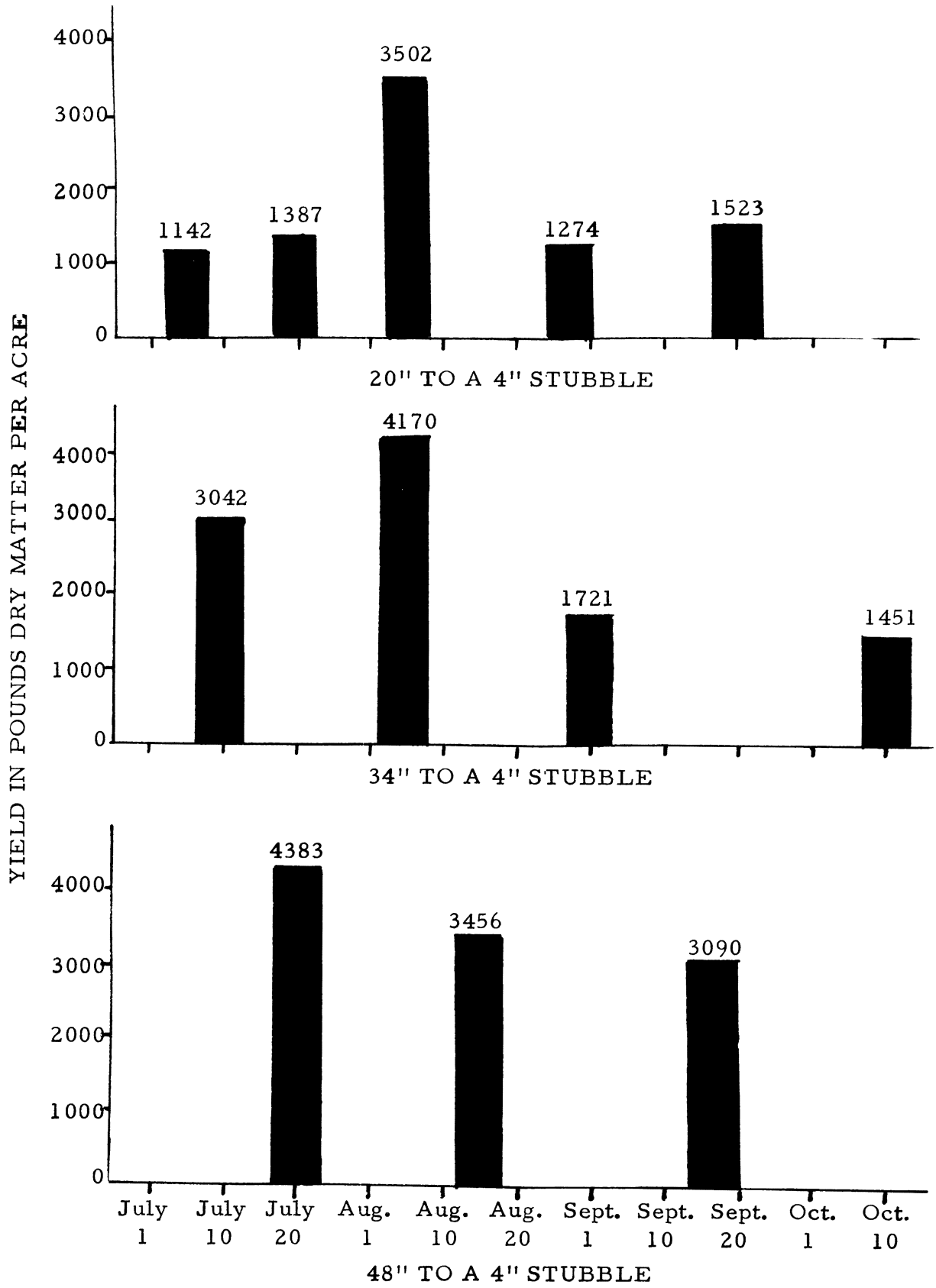

Figure 2. Seasonal distribution of Gahi millet forage in 1961 when cut at 3 heights. Numbers at top of columns indicate pounds of dry matter produced per acre.

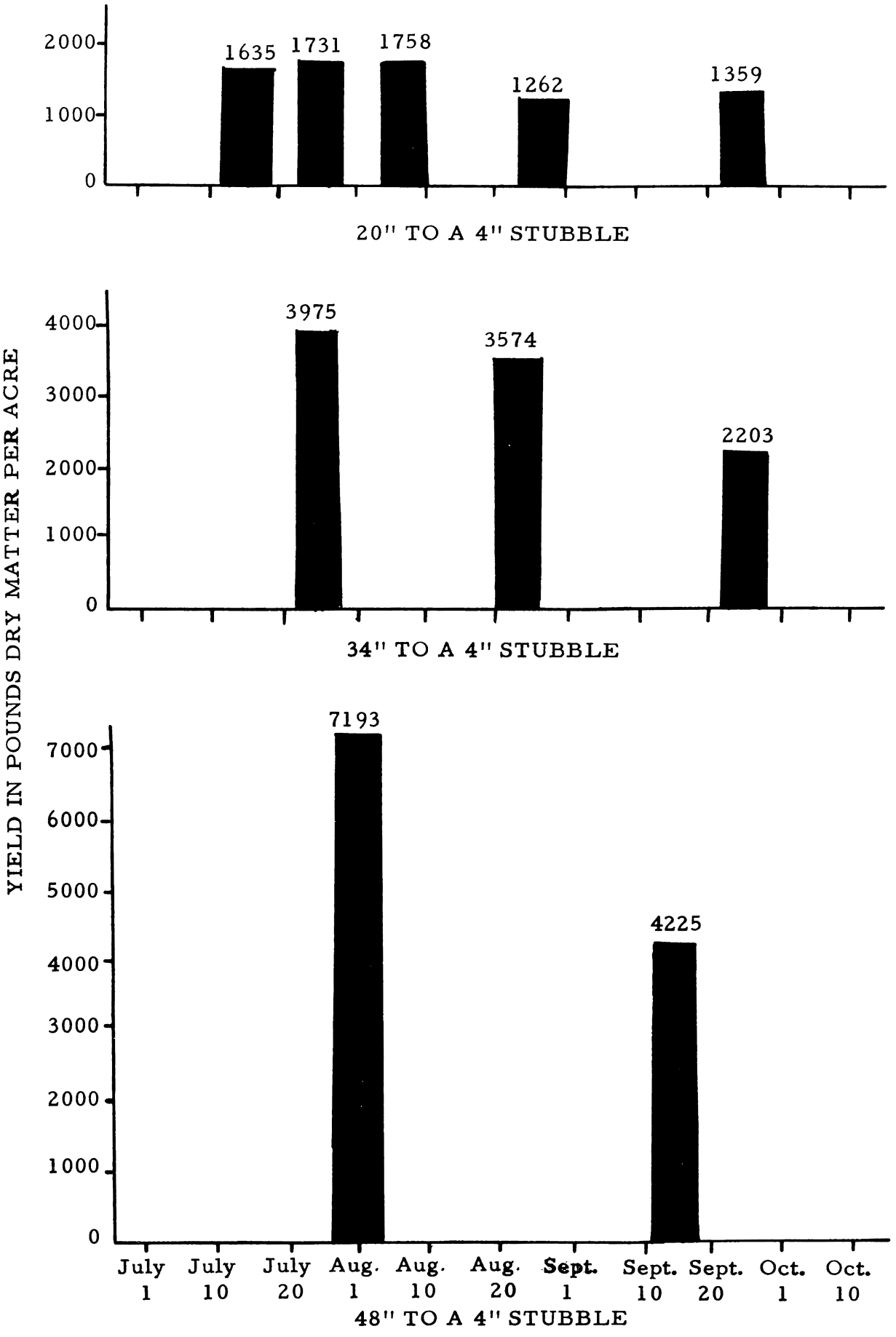

Figure 3. Seasonal distribution of Greenleaf sudangrass forage in 1961 when cut at 3 heights. Numbers at top of columns indicate pounds of dry matter produced per acre.