ESTABLISHMENT OF COWPEAS IN A BERMUDAGRASS SOD

F. M. Rouquette, Jr., G. R. Smith, M. J. Florence,
C. L. Gilbert, and R. P. Gillespie

SUMMARY

'Iron and Clay' cowpeas were seeded at four rates into a well-established 'Coastal' bermudagrass sod that had been treated with either Gramoxone or untreated. Cowpeas were direct drilled at seeding rates of 0, 50, 100, or 150 lbs/ac into both treated and untreated bermudagrass. Bermudagrass dry matter production was suppressed by chemical treatment and by cowpea seeding rate. Cowpea yields were influenced primarily by bermudagrass sod treatment, and secondarily by seeding rate. Both sod treatment and seeding rate had positive impacts on cowpea forage production. Cowpea leaf contained about 21% protein; whereas, cowpea stem contained nearly 9% protein. Percentage protein of cowpea plant parts was not affected by treatments. Protein levels in the bermudagrass, however, increased with increasing seeding rate of cowpeas which suggested some direct transfer of nitrogen from cowpeas to bermudagrass. Data from this one-year trial suggested that cowpeas may be successfully grown in a bermudagrass sod provided that the competitive nature of the grass for moisture and light can be reduced for a brief period.

INTRODUCTION

Cowpeas have traditionally been used as both a livestock feed and as a green manure crop in a multiple cropping system. During the past 30 to 35 years, hybrid bermudagrasses have been established to numerous acreages in the lower South and Southeastern U.S. Thus, the use of cowpeas on these permanent pasture areas has been essentially non-existent. The soil and climatic conditions of East Texas are ideal for growth of cowpeas and for bermudagrass. Seldom, if ever, are these two summer crops grown together. The objectives of this study, therefore, were to ascertain the influence of a chemical desiccant on bermudagrass, and multiple seeding rates of cowpeas on the establishment, dry matter production, and nitrogen content of bermudagrass-cowpea forage.

PROCEDURES

'Iron and Clay' cowpeas were direct drilled into a well-established Coastal bermudagrass sod that had either been sprayed with Gramoxone at 1 qt/ac or not sprayed. The plot design was a split block with herbicide treatment serving as main blocks and cowpea seeding rates serving as subplots. Cowpeas were sod-seeded at 0, 50, 100, or 150 lb/ac into each of four replications with individual seeding rate plot size of 5 ft. x 20 ft. Cowpeas were planted on June 19, 1989, and harvested on August 16, 1989. The bermudagrass sod was shredded to a 2-in stubble prior to planting. The plot area was fertilized with 300 lbs/ac of 6-24-24 (N-P_2O_5-K_2O) at planting.

Forage plots were harvested with a sickle-type hand mower and separated into cowpea and bermudagrass components before weighing. The harvested area was weighed and a subsample taken for cowpea leaf:stem separations and subsequent protein analyses of both the bermudagrass and the cowpeas. Data were analyzed with appropriate SAS procedures and the SNK multiple range test was used to detect differences between treatments.

RESULTS AND DISCUSSION

The most difficult period that affects the success rate of growing an annual legume in a bermudagrass sod is during establishment of the annual forage. We chose a time (June 16) when bermudagrass had potentially high growth rates in which to assess the impact of a chemical desiccant and cowpea seeding rate on establishment and subsequent dry matter production of cowpeas. Total bermudagrass plus cowpea forage yield during a 58-day, single harvest period was approximately 4400 lbs/ac (Table 1) and was not affected ($P>.48$) by the chemical desiccant treatment. The bermudagrass-cowpea components, however, were significantly affected by the Gramoxone application. Bermudagrass yields were reduced ($P<.01$) from 4218 to 3177 lbs/ac as a result of the chemical desiccant. In sharp contrast, cowpea dry matter production was increased ($P<.01$) about 9-fold from 150 to 1318 lbs/ac due to the chemically treated bermudagrass. At the time of harvest, cowpeas ranged from 2 to 3 feet in height and exhibited the ability to make sufficiently rapid growth to produce a canopy cover above the bermudagrass. The unsprayed bermudagrass obviously competed for soil moisture and space (light) that severely restricted successful establishment and growth of the cowpeas.

Cowpea seeding rate and the interaction of seeding rate and bermudagrass sod treatment had significant ($P<.01$) impact on both grass and cowpea production (Table 2). Bermudagrass yields in the non-treated area ranged from 4654 lbs/ac on the non-seeded plots to 3702 lbs/ac on the plots seeded at 150 lbs/ac cowpeas. Thus, there was approximately a 25% reduction in bermudagrass yield at the 150 lb seeding rate of cowpeas. Bermudagrass yield in the chemically treated areas was reduced by nearly 50% by the 100 and 150 lb seeding rate of cowpeas. Yield of cowpeas was influenced by seeding rate in both treated and untreated bermudagrass sod. In the untreated sod, cowpea production increased nearly 10-fold from 46 lbs/ac in the 50 lb/ac seeding rate plots to 442 lbs/ac in the 150 lb/ac seeding rate plots. In the chemically desiccated sod, there was a doubling of cowpea yield by seeding either 100 or 150 lbs/ac as compared to the 50 lb/ac rate. Cowpea yields from the 50 lb/ac seeding rate were improved more than 20-fold from 46 lbs/ac to 1032 lbs/ac as a result of chemically desiccating the bermudagrass sod. Although the magnitude of yield improvement was only 5-fold in the 150 lb/ac seeding rate plots, the total production of cowpea forage increased from 442 to 2280 lbs/ac due to the chemical treatment.

Cowpeas were separated into leaf and stem-petiole components to assess leaf:stem ratios and percent protein of each plant part. In general, cowpeas were 60% leaf and 40% stem. There was a slight deviation of this ratio (54:46) in the 100 lb/ac seeding rate plots, but this change was not thought to be of biological significance. Percent protein of cowpea leaf was 21% (Table 3) and was not influenced by either seeding rate or bermudagrass treatment. Cowpea stems contained only 8.9% protein and were likewise unaffected by any of the treatments. Both visual observations and protein content of bermudagrass plots suggested some direct transfer of nitrogen from the cowpeas to the grass sod. Protein content of bermudagrass grown alone was 5.1%; whereas, bermudagrass grown in association with either 100 or 150 lb/ac seeding rate of cowpeas was 6.5 and 6.7 ($P<.02$), respectively.

Calculations were made to quantify the production of protein (lbs/ac) by combining dry matter yields and percent protein (Table 4). Total protein of bermudagrass was unaffected by seeding rate ($P>.65$) and was approximately 220 lbs/ac. However, the chemically desiccated bermudagrass produced less ($P<.01$) total forage protein than that of the non-treated bermudagrass (181 *vs* 253 lbs/ac). Total forage protein from cowpea leaf, stem, and leaf + stem exhibited similar trends in that forage from the 150 lb/ac seeding rates had more total protein than the 50 and 0 lb/ac seeding rates. By combining grass and cowpeas into a total protein production value, the plots seeded to 150 lb/ac cowpeas yielded nearly twice ($P<.01$) as much total protein as the non-seeded plots (422 *vs* 228 lb/ac).

Results of this single year trial indicated that cowpeas may be successfully grown in an actively growing bermudagrass sod during the summer months.

However, total cowpea production was influenced primarily by sod treatment and rate of seeding. In addition, there appeared to be an active transfer of nitrogen from the cowpeas to the companion bermudagrass. The objectives of this study were met with a single harvest date. Certainly, additional defoliation schedules would impact both total and multiple harvest yields. Late summer regrowth of cowpeas in this study was impaired by severe drought conditions and the defoliation of plots by whitetailed deer. Since cowpeas are palatable to deer, this crop may be considered as a wildlife feed source. Some potential management practices to ensure success with this cropping system may include: (1) early planting of cowpeas (May to early June); (2) mechanical disturbance or chemical desiccation of bermudagrass sod; (3) non-nitrogen fertilizer; (4) single harvest of forage if for hay or silage; (5) for multiple harvests, attention should be given to stubble height and rainfall patterns.

TABLE 1. BERMUDAGRASS, COWPEA, AND TOTAL FORAGE YIELD AS INFLUENCED BY A CHEMICAL DESICCANT TREATMENT TO THE SOD

Forage Yield	Untreated	Chemical Desiccant
	----------lbs/ac----------	
Bermudagrass	4218 a*	3177 b
Cowpea	150 a	1318 b
Total	4368 a	4495 a

*Means in the same row followed by a different letter are statistically different (P<.01).

TABLE 2. FORAGE PRODUCTION AS INFLUENCED BY SEEDING RATE

	Cowpea Seeding Rate			
Forage Yield	0	50	100	150
	---lbs/ac---			
BERMUDAGRASS	4396 a*	3997 a	3384 b	3012 b
Untreated	4654	4282	4232	3702
Treated	4137	3712	2536	2322
COWPEA	0 c	539 b	1037 ab	1361 a
Untreated	0	46	112	442
Treated	0	1032	1962	2280
TOTAL	4396 a	4536 a	4421 a	4373 a

*Means in the same row followed by a different letter are statistically different (P<.01).

TABLE 3. PERCENT PROTEIN OF BERMUDAGRASS AND COWPEA FORAGE

	Cowpea Seeding Rate (lb/ac)			
Protein	0	50	100	150
	---%---			
Bermudagrass	5.1 b*	5.6 ab	6.5 a	6.7 a
Cowpea Leaf	0 b	21.2 a	21.0 a	21.6 a
Cowpea Stem	0 b	8.9 a	8.9 a	8.8 a

*Means in the same row followed by a different letter are statistically different (P<.01).

TABLE 4. TOTAL PROTEIN PRODUCTION FROM BERMUDAGRASS AND COWPEA FORAGE

	Cowpea Seeding Rate			
Total Protein	0	50	100	150
	lbs/ac			
Bermudagrass	228 a	227 a	217 a	197 a
Cowpea	0 c	97 b	176 ab	226 a
Pea Leaf	0 c	82 b	141 ab	182 a
Pea Stem	0 b	15 b	35 a	44 a
Grass + Pea	228 c	324 b	393 ab	422 a