EFFECTS OF SPITTLEBUG FEEDING ON FORAGE AND ROOT PRODUCTION OF *BRACHIARIA DECUMBENS* AND *BRACHIARIA BRIZANTHA* cv. MARANDU (BRA-000019)[1]

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ABSTRACT - The spittlebug *Zulia entreriana* was used in laboratory feeding tests to evaluate the degree of damage to the foliage and roots of *Brachiaria decumbens* and *Brachiaria brizantha*. Nymphal feeding on *B. decumbens* reduced the weight of foliage by an average of 21% and the roots by 36%; adults reduced the foliage weight by 27% and the roots by 48%. Nymphs and adults feeding on the same plant reduced the foliage weight by an average of 36% and the roots by 50%. The degree of damage was in direct proportion to insect density; the more insects per plant, the greater the amount of damage. In one test, significantly ($P < 0.05$) more new shoots were produced on *B. decumbens* plants that contained a high density of adults. The reduction in root weights due to insect feeding was about $1^{1/2}$ time greater than that for foliage. *Brachiaria brizantha* was less affected by insect feeding than was *B. decumbens*. Weight differences between the control plants and the infested plants were less on *B. brizantha* and plant recovery, once insects were removed, was faster.

Index terms: *Zulia entreriana*, nimphal feeding, adults, insect, plant damage.

EFEITO DA ALIMENTAÇÃO DAS CIGARRINHAS-DAS-PASTAGENS NA PRODUÇÃO DE FORRAGEM E RAÍZES DE *BRACHIARIA DECUMBENS* E *BRACHIARIA BRIZANTHA* cv. MARANDU (BRA-000019)

RESUMO - A espécie de cigarrinha (*Zulia entreriana*) foi usada em teste de alimentação em laboratório com o objetivo de se avaliar o grau de dano na forragem e nas raízes de *Brachiaria decumbens* e *Brachiaria brizantha*. A alimentação das ninfas em *B. decumbens* reduziu o peso da forragem, em média, 21% e das raízes 36%; os adultos reduziram o peso da forragem em 27% e o das raízes em 48%. As ninfas e os adultos que se alimentaram da mesma planta reduziram, em média, o peso da forragem em 36%, e o das raízes, em 50%. O grau de dano foi diretamente proporcional à densidade dos insetos; quanto maior foi o número de insetos por planta, maior o dano. Num teste, a produção de brotos foi significativamente maior ($P < 0,05$) em plantas de *B. decumbens*, que continham alta densidade de adultos. A redução no peso das raízes, em conseqüência da alimentação dos insetos, foi cerca de $1^{1/2}$ vez maior que a verificada na forragem. A *Brachiaria brizantha* foi menos influenciada pela alimentação desses insetos que a *B. decumbens*. As diferenças de peso entre as plantas-testemunhas e as infestadas foram menores em *B. brizantha*, e a recuperação da planta, após a remoção dos insetos, foi mais rápida.

Termos para indexação: *Zulia entreriana*, ninfas, adultos, insetos, alimentação, dano à pastagem.

INTRODUCTION

Some insect species have always been of economic concern on rangelands and pastures in many parts of the world. However, attempts at improving rangelands and pastures by introducing new plant species has often caused additional insect problems. For example, the introduction of the wheatgrasses into the western United States in the 1930's and 1940's has resulted in drastic population increases of black grass bugs which suck nutrients from the plants (Kamm & Fuxa 1977). Genung (1956) also reported the rapid expansion of improved acreages in Florida, causing sucking insects to increase, and grass yield reductions, due to insect feeding, exceeding 50 percent.

This same situation is present in Brazil where two spittlebug species *Zulia entreriana* (Berg) and *Deois flavopicta* (Stal) have successfully adapted to extensive monocultures of introduced grasses of the genus *Brachiaria*. The effect of nymphal feeding is not readily visible but adult feeding results in streaking of leaves, leaf yellowing, and eventually in the browning of entire leaves. Both nymphs and adults occur during the rainy season (October-April) during the time of major forage production. When insect numbers are high, entire pastures can turn yellow or brown as a result of insect feeding. This type of damage has been observed for many years in central Brazil but there is only limited information

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on the actual amount of forage lost because of spittlebug feeding. Weaver & King (1954) and Everly (1959) reported on losses to alfalfa and red clover caused by spittlebug feeding in the United States. However, most research emphasis has been on the two-lined spittlebug, *Prosapia bicincta* (Say) which often causes severe damage to "Coastal" bermudagrass, *Cynodon dactylon* (L.) Pers. and other bermudagrass cultivars in the Southeastern U.S. (Beck 1963, Taliaferro et al. 1967, 1969). In Brazil the determination of the amount of damage resulting from spittlebug feeding has received limited attention and only in recent years (Silva 1982, Valério et al. 1982, and Valério 1985). This paper presents the results of laboratory feeding tests designed to evaluate the degree of plant damage caused by the spittlebug *Z. entreriana*. Forage and root reductions due to feeding by both nymphs and adults was determined for two grass species; *Brachiaria decumbens* Stapf., a species considered highly susceptible to spittlebug feeding and *Brachiaria brizantha* (Hochst ex A. Rich) Stapf. cv. Marandu (BRA-000019), a species reported to be resistant (Cosenza et al. 1983 and Nilakhe 1987).

MATERIAL AND METHODS

A total of eight tests where the spittlebug *Z. entreriana* was allowed to feed on plants were carried out in a greenhouse. In two tests (numbers 7 and 8) feeding damage to *B. decumbens* plants was compared to damage to *B. brizantha*. In the other six tests spittlebugs fed on *B. decumbens*. The amount of damage to the above ground portions of the plant and the roots was determined for small nymphs (Instars 1, 2 and 3), medium and large nymphs (Instars 4 and 5), adults, and nymphs and adults feeding together on the same plant. The number of days the insects remained on the plant, the age of the plants, and the number of times plant replicates were harvested following insect removal varied between tests. In test number 1, plants were grown in a nutrient solution, but in all other tests they were grown in soil. In test number six, ten days after the insects were removed from the plants the number of new shoots were counted in all treatments. Testing procedures were similar in all tests and can be described as follows:

1. Grass seeds were germinated in vermiculite and after 14 days were transfered to soil-filled plastic pots 9.5 cm in diameter; one seedling per pot.

2. When the plants were well established and at least 20 cm tall, they were assigned a number. A portable area meter was used to determine the leaf area of each plant and plants with leaf areas that varied greatly from the mean were discarded.

3. Plants were selected randomly for the various treatments. All treatments contained eight plants.

4. The plants to be used in a test were separated into two or more treatments. Each treatment contained enough plants to allow plants to be harvested at intervals following the infestations.

5. Field collected nymphs and adults were used to infest the plants. Nymphs were placed at the base of the plants and observed to insure that they established on the plants. Adults were placed in circular cages of cheesecloth. The cages were secured to the top of the plastic pot with rubber bands and were supported 30 cm above the soil surface by a circular wire. The top was kept closed with a string. Nymphs and adults that died during the infestation period were replaced daily.

6. Plants were harvested at different times during the tests such as the midpoint of the infestation period, at the time the insects are removed from the plants, and at intervals following insect removal. Eight plants of each treatment were harvested at the selected times.

7. Harvesting consisted of removing the plant and soil from the plastic pot and then carefully washing the soil from the roots. The above ground part of the plant was then separated from the roots at the junction of the stem and root system. Both the roots and the above ground part of the plants were dried at 65°C for three days and then weighted.

8. The mean weight of the control plants was compared to the mean weight of plants in the infested treatments. Significance between treatments was determined by using Duncan's Multiple Range Test. The mean decreases in plant weights (% reduction) due to spittlebug feeding was also recorded each time the plants were harvested.

RESULTS AND DISCUSSION

All feeding treatments imposed upon the grass plants reduced foliage and root production as measured either at the time the insects were removed from the plants or at a time interval after insect removal. Weight reductions in both the foliage and roots resulting from adult spittlebug feeding were evident as early as three days after feeding had begun. In general root weights were reduced about $1^{1/2}$ time more than the above ground portion of the plant.

Within the eight tests, a total of 72 weight comparisons (36 for foliage and 36 for roots) were made between insect-free plants and infested plants of *B. decumbens*. For example, usually the first comparison of a test was made at the time the insects were removed from the plants and other comparisons were made at intervals (days) following insect removal. In only three of the 72 comparisons did the infested plants (either foliage or roots) weigh more than the control plants. Of the 72 comparisons, 46 were significantly ($P < 0.05$) different.

A total of 25 weight comparisons were made between insect-free plants and infested plants of *B. brizantha*. Six of these comparisons showed that the infested plant (either foliage or roots) weighted more than the control. Of the 25 comparisons only

ten were significantly ($P < 0.05$) different. Thus spittlebug feeding on *B. brizantha* had a lesser impact than on *B. decumbens*.

The reduction in plant weight (foliage and roots) due to different insect stage or feeding combinations is shown in Table 1. Forage reduction by adults was only slightly higher than that recorded for nymphs. Centro Internacional de Agricultura Tropical (1982) stated that adult damage is always more severe than nymphal damage even when the adult population is less than the nymphal population. The report estimated nymphal damage at 76.7% from 560 nymphs/1.25 m^2, adult damage at 83.7% from 39 adults/1.25 m^2, and damage from both nymphs (550/1.25 m^2) and adults (81/1.25 m^2) at 88.7%. However, in the tests reported on here the nymphs were allowed to feed for 16 days in test 1 and 20 days in test 2 compared to adults feeding for 3-7 days. The differences in time spent feeding by the two groups could account for the smaller differences in forage reduction. It appears that nymphal feeding adversely affects plant production even though the feeding effects are not readily visable. It is possible that nymphal feeding depletes the reserves in underground storage organs and photosynthesis assists in providing nutrients to the feeding nymphs that normally would result in plant growth. Beck (1963) reported that nymphal feeding severely damages Coastal bermudagrass in much the same manner as adults. He estimated damage to the foliage by different nymphal densities to range from 23 - 88%. Adults of *Prosapia bicincta* feeding on Coastal bermudagrass cause the leaves to become dry and brown similar to feeding damage by *Z. entreriana* and *D. flavopicta* in Brazil. Taliaferro et al. (1967) stated that reduction in root development in Coastal bermudagrass due to the feeding of *P. bicincta* adults is due primarily to cessation of photosynthesis and other necessary physiological processes, caused by the insect toxin turning the leaves brown and dry. However, in the tests reported on here the greatest reduction (36% for the foliage and 50% for the roots) in the weight of forage plants was due to a combination of nymphs and adults feeding on the same plant. A summary of the feeding on *B. decumbens* by both nymphs and adults is shown in Table 4.

Forage reduction (foliage and roots) to *B. decumbens* plants by different adult densities is shown in Table 2. Generally most workers have reported a higher degree of damage to plant foliage by adults than found in the present study. However, in other studies the feeding period has been longer or the test densities higher. For example, Valério et al. (1982) in a greenhouse study measured the amount of regrowth (above 15 cm) after *Z. entreriana* adults at densities of 5, 10, and 20 had been feeding for twelve days. He reported the percent damage ranged from 70% at five adults/cage to 100% at 20 adults/cage. In a similar study carried out in the laboratory, Valério (1985) reported that reduction in plant growth above 25 cm ranged from 24% at two adults/cage to 91% at eight adults/cage after 45 days of feeding. Percent reduction on plant growth at the base of the plant up to 25 cm ranged from 12% at densities of two and four adults/cage to 36% at eight adults/cage. Valério (1985) also used in general the same experimental design under field conditions and found that forage reduction above 25 cm ranged from 34% at 25 adults/m^2 to 64% at 100 adults/m^2. Forage reduction from the plant base up to 25 cm ranged from 14% at 25 adults/m^2 to 17% at 100 adults/m^2. In this study, foliage reduction ranged from 11% at two adults/plant to 27% at 16 adults/plant.

The effect of spittlebug feeding on root production has received limited attention. Taliaferro et al. (1967) reported, based on greenhouse tests, that feeding damage to about 1/3 of the above ground plant material was sufficient to reduce root production and sod reserves by 50%. Valério (1985), from greenhouse tests found no significant root reduction after 45 or 90 days at densities of two and four adults/cage. However, at 8 adults/cage he reported a 52% reduction in root growth after 45 days and a 53% reduction after 90 days. In this study (Table 2) root reduction averaged 35% at two adults/plant and 52% at 16 adults/plant. However, adults were only on the plant for three days in one test and five days in another test.

Adult spittlebug feeding density also effected the number of new shoots arising from the base of *B. decumbens* plants. In test 6, counts were made of new shoots on 16 plants of each treatment ten days after the spittlebugs had been removed from the plants. The greater the insect density (feeding pressure), the greater the number of new shoots (Table 2). This would indicate that plant survival under intense feeding pressure may be at least in part dependent upon root reserves.

The effects of spittlebug feeding on susceptible plants (*B. decumbens*) compared to feeding on resistant plants (*B. brizantha*) is shown in Table 3. Reductions in plant weight due to nymphal feeding

TABLE 1 Mean weight differences (mg) and percent reduction between control plants and infested plants during the time insects are feeding, at the time insects are removed, and after the insects have been of the plants for a certain number of days 1986[1]

Test Test number and treatments	Insect on plants 10 days						Time of insect removal from plants						Ten days after insect removal						Twenty days after insect removal						Average % reduction per treatment	
	Foliage			Roots			Foliage			Roots			Foliage			Roots			Foliage			Roots			Foliage	Roots
	$\bar{X}$	+ - S.E.	% Red.	$\bar{X}$	+ - S.E.	% Red.	$\bar{X}$	+ - S.E	% Red.	$\bar{X}$	+ - S.E	% Red.	$\bar{X}$	+ - S.E	% Red.	$\bar{X}$	+ - S.E	% Red.	$\bar{X}$	+ - S.E	% Red.	$\bar{X}$	+ - S.E	% Red.		
1[2]																										
Small nymphs	–	–	–	–	–	–	136 a	8.53	20	27 a	1.46	21														
Control	–	–	–	–	–	–	171 b	10.32		34 b	1.77														20	21
2[3]																										
Large nymphs	167 a	14.46	13	41 a	1.93	21	307 a	16.10	18	103 a	6.55	20	550 a	43.59	26	172 a	19.00	51								
Control	193 a	12.93		52 b	3.15		374 b	25.40		128 a	10.84		739 b	40.13		350 b	24.61								19	31
3[4]																										
Large nymphs and adults	–	–	–	–	–	–	241 a	12.81	20	107 a	8.73	35	402 a	28.84	30	108 a	16.17	40	422 a	39.18	58	93 a	11.09	75	36	50
Adultos	–	–	–	–	–	–	296 b	19.26	3	107 a	9.31	35	457 a	44.69	21	123 a	13.25	32	758 b	34.04	24	276 b	25.14	24	16	30
Control	–	–	–	–	–	–	301 b	17.81		164 b	20.67		578 b	25.61		180 b	11.33		993 c	40.98		365 c	22.59			
4[5]													Seven days after insect removal													
Adults (A)	–	–	–	–	–	–	963 a	85.70	2	284 a	31.32	8	1044 a	69.56	6	520 a	41.37	6							4	7
Control	–	–	–	–	–	–	982 a	53.29		310 a	13.91		1107 a	98.73		552 a	18.71									
Adults (B)	–	–	–	–	–	–	921 a	80.80	18	268 a	30.58	31	1004 a	75.00	28	621 a	51.94	9							23	20
Control	–	–	–	–	–	–	1126 a	95.09		391 b	22.94		1387 b	81.08		686 a	35.71									

[1] Infestation rate for both nymphs and adults = 2 insects/plant.
Plants = *Brachiaria decumbens;* S.E = Standard error, Means within a column followed by the same letter are not significantly different ($P < 0.05$; Duncan's multiple range test).

[2] Nymphs on plants 16 days; age of plants 30 days.

[3] Nymphs on plants 20 days; age of plants 36 days.

[4] Nymphs on plants 7 days; adults on 3 days; age of plants 43 days.

[5] Adults (A) on plants 4 days, Adults (B) on plants 7 days; age of plants 66 days.

TABLE 2 Mean weight differences (mg) and percent reduction between control plants infested at different adult densities at the time the insects were removed and for certain time periods following insect removal and new plant growth following spittlebug feeding, 1986[1].

Test number and treatments	Time of insect removal from plants						Four days after insect removal						Nine days after insect removal						Fourteen days after insect removal						Eighteen days after insect removal						Av. % reduction per treatment	
	Foliage			Roots			Foliage			Roots			Foliage			Roots			Foliage			Roots			Foliage			Roots			Foliage	Roots
	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*		
5. Control[2]	453 a	22.47		309 a	17.51		447 a	32.86		258 a	14.10		525 a	4.29		268 a	32.94		543 a	27.23		486 a	17.18		515 a	1.45		418 a	32.23			
2 adults/plant	353 ab	44.58	22	150 b	17.51	51	428 a	39.05	4	233 a	39.63	10	473 a	40.55	10	166 b	26.73	38	462 ab	46.93	15	276 b	62.07	43	500 a	9.69	3	278 b	36.03	33	10.8	35.0
4 adults/plant	304 b	33.15	33	180 b	14.29	42	432 a	32.84	3	186 a	18.77	28	442 a	38.32	16	93 c	16.57	65	399 b	63.77	27	196 b	46.29	60	389 b	53.25	24	183 b	39.21	56	20.6	50.2
							Ten days after insect removal						Twenty days after insect removal																			
6. Control[3]	442 a	25.34		202 a	18.62		852 a	24.65		338 a	19.81		1223 a	18.50		333 a	25.48															
4 adults/plant	389 a	33.70	12	65 b	9.68	68	644 b	30.47	24	114 c	14.76	66	1105 b	51.89	10	408 a	24.41	0														
8 adults/plant	376 a	24.48	15	184 a	18.48	9	628 b	35.41	26	236 b	24.97	30	1023 bc	44.39	16	214 b	11.67	36													15.3	44.7
16 adults/plant	352 a	33.15	20	46 b	6.29	77	505 c	37.91	41	66 c	4.71	80	975 c	25.61	20	395 a	40.46	0													19.0	25.0
																															27.0	52.3

	Mean number of new shoots (10 days following insect removal)	
		± SE
16 adults/plant	1.938 a	0.37
8 adults/plant	1.125 b	0.20
4 adults/plant	1.000 b	0.18
Control	.250 c	0.14

[1] S.E. = Standard error. Means within a column followed by the same letter are not significantly different ($P < 0.05$; Duncan's multiple range test).

[2] Infestation time = 5 days on *Brachiaria decumbens;* age of plants 55 days.

[3] Infestation time = 3 days on *B. decumbes;* age of plants 60 days.

* R = reduction.

TABLE 3. Mean weight differences (mg) and percent reduction between control plants and infested plants of *B. decumbens* and *B. brizantha* at the time the insect are removed from the plants and for certain time periods following insect removal, 1986[1]

Test number and treatments	Time of insect removal from plants						Seven days after insect removal				Eleven days after insect removal				Twenty one days after insect removal				Twenty eight days after insect removal				Av. % reduction per treatment	
	Foliage			Roots			Foliage		Roots		Foliage		Roots		Foliage		Roots		Foliage		Roots		Foliage	Roots
	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*	$\bar{x}$	+ - SE	% R*		
7. *Brachiaria decumbens*[2]																								
Control	621 a	62.38		216 a	14.79		1387 a	75.24		366 a	18.53		1709 a	131.84		357 a	18.76		2971 a	121.00		958 a	67.56			
2 adults/paints	552 a	33.94	11	103 b	15.45	52	864 b	108.72	38	282 a	27.81	23	1092 b	125.00	36	368 a	56.54	0	2078 b	232.83	30	648 b	29.05	32			28.8	26.8
Brachiaria brizantha																								
Control	928 a	41.83		509 a	46.93		1115 a	46.26		667 a	59.16		1156 a	36.42		532 a	21.92		1403 a	42.62		1125 a	33.72			
2 adults/plant	891 a	31.75	4	325 b	27.69	36	978 b	30.91	12	604 a	42.70	9	1052 a	32.18	9	609 a	39.53	0	1477 a	31.63	0	1658 a	85.00	6			6.3	12.8
Control	873 a	36.84		374 a	28.01								1063 a	35.19		–	–		1215 a	33.86		488 a	17.69				
2 nymphs/plant	806 a	39.00	8	290 a	29.64	12							1102 a	55.01	0	–	–		1249 a	65.81	0	572 a	48.24	0			2.7	6.0
8. *Brachiaria brizantha*[3]																								
Control	367 a	9.92		243 a	27.90		646 a	25.49		392 a	30.57		833 a	19.59		624 a	61.79		1119 a	37.66		386 a	26.91		1310 a	42.63	485 a	36.40	
3 adults/plant	290 b	11.21	21	119 b	10.79	51	522 b	33.31	19	96 b	10.77	76	680 a	75.28	18	108 b	38.03	83	900 b	42.12	20	537 b	39.48	0	1000 b	82.17	24 470 a	74.36	3	20.4	42.6
Control	705 a	60.25		–	–								1193 a	90.42		–	–												
2 nymphs/plant	548 b	26.88	22	–	–								1012 a	84.82	15	–	–												18.5	–

[1] S.E. = standard error. Means within a column followed by the same letter are not significantly different ($P < 0.05$; Duncan's multiple range test).

[2] Nymphs on plants 10 days, and adults 3 days; age of plant 70 days.

[3] Nymphs on plants 10 days, and adults 4 days; age of plants 50 days.

* R = reduction.

TABLE 4. Summary of statistical comparisons between control and infested treatments in tests shown in Tables 1, 2 and 3.

Insect group	Insect density	Infestation time	Number of comparison	Number not significant	Number significant	Percent reductions from tests that were significant	Average % reduction	Combined averages according to nymphs adults or combination
				(*B. decumbens*)				
Nymphs (instars 1,2 + 3)	2/plant	16 days	Foliage 1	0	1	20	20	Foliage roots
			Roots 1	0	1	21	21	21 36
Nymphs (instars 4 + 5)	2/plant	20 days	Foliage 2	0	2	18 26	22	
			Roots 2	1	1	51	51	
Adults	2/plant	3-7 days	Foliage 16	10	6	21 24 28 38 36 30	30	
			Roots 16	6	10	35 32 24 31 52 32 51 38 43 33	37	
Adults	4/plant	3-5 days	Foliage 8	3	5	33 27 24 24 10	24	
			Roots 8	2	6	42 65 60 56 68 66	60	27 48
Adults	8/plant	3-5 days	Foliage 3	1	2	26 16	21	
			Roots 3	1	2	30 36	33	
Adults	16/plant	3-5 days	Foliage 3	1	2	41 20	31	
			Roots 3	1	2	77 80	79	
Nymphs + adults	2 nymphs/plant + 2 adults/plant	Nymphs - 7 days Adults - 3 days	Foliage 3	0	3	20 30 58	36	36 50
			Roots 3	0	3	35 40 75	50	
				(*B. brizantha*)				
Nymphs (instars 3,4 + 5)	2/plant	10 days	Foliage 6	4	1	22	22	22 –
			Roots 2	2	0		–	
Adults	2/plant	3 days	Foliage 4	3	1	12	12	
			Roots 4	3	1	36	36	19 62
Adults	3/plant	4 days	Foliage 5	1	4	21 19 20 24	21	
			Roots 5	2	3	51 76 83	70	

were much lower on *B. brizantha* plants than on *B. decumbens* plants. Out of seven comparisons (Table 4) of differences due to nymphal feeding on *B. brizantha*, only one was significantly ($P < 0.05$) different. One half of the comparison of plant weight (foliage and roots) due to adult feeding on *B. brizantha* were not significant ($P > 0.05$) (Table 4). There also was a tendency for infested plants of *B. brizantha* to equal or surpass the weight of the control plants after the insects were removed. This did not usually happen with the infested plants of *B. decumbens*.

From the available evidence it appears that both foliage and root production of *B. decumbens* can be drastically reduced by spittlebug feeding. The degree of reduction while dependent upon several factors is certainly effected by insect density, insect stage, and the duration of insect feeding. In central Brazil at the start of the rainy season, nymphal feeding occurs for about a two-month period prior to the appearance of large populations of adults. This is followed by 6-7 months when both nymphs and adults are feeding on available forage. During heavy infestations it is likely that all plants are fed upon by both nymphs and adults over this extended period of time. Spittlebug-free pasture are rare in central Brazil, thus production seldom reaches its potential. Since spittlebug feeding does reduce available forage and root development then prolonged periods of feeding can be expected to be detrimental to future productivity and stand persistance.

CONCLUSIONS

1. The average weight reduction of the foliage and roots of *B. decumbens* due to spittlebug feeding was as follows: nymphs (foliage 21%, roots 36%), adults (foliage 27%, roots 48%) and nymphs plus adults (foliage 36%, roots 50%).

2. Forage reductions due to adult feeding were evident as early as three days from the time the insects began to feed.

3. Reductions in root weights due to insect feeding was about $1^{1/2}$ time greater than reductions to the above ground plant portion.

4. In general, damage was in direct proportion to insect density. Foliage reduction ranged from 11% at two adults/plant to 27% at 16 adults/plant. Root reduction averaged 35% at two adults/plant.

5. Differrences in plant weights beetwen control plants and infested plants due to spittlebug feeding were less on *B. brizantha* plants than on *B. decumbens* plants. More comparisons in plant weights were significantly ($P < 0.05$) different in the *B. decumbens* treatments than in the *B. brizantha* treatments. Thus *B. brizantha* was less affected by spittlebug feeding. *Brachiaria brizantha* recovered more rapidly from spittlebug feeding than did *B. decumbens*.

6. Significantly ($P < 0.05$) more new shoots were produced on *B. decumbens* plants that had been fed on by high densities of adults.

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