

NAME OF TEST: Blue Panic (Panicum antidotale) improvement, BRVL, 1960  
 OBJECTIVES: (1) To develop lines or varieties with improved leafiness. (2) to study various selection and evaluation procedures in the improvement of Blue Panic.

EXPERIMENTAL PROCEDURE:

Location: Brazos River Valley Lab near College Station

Soil Type: Miller clay

Cultural Practices: All materials, whether seedling or clonal are established as individual plants on 4-foot centers in 40-inch cultivated rows. The area is fertilized each spring with 48-60-0 and top dressed at least one time annually with 40 pounds of nitrogen. The plants are mowed when mature to a 6-inch stubble height.

Plant Materials: A clonal nursery of approximately 250 selected clones is maintained for source material. Seed sources for 1960 progeny studies were from polycross blocks established in 1958 and other sources as follows:

- (1) polycross of 7 clones selected from original source nursery
- (2) polycross of 10 clones selected from open-pollinated seedling progeny of plants in the original nursery. Selection was on the basis of two years of evaluation.
- (3) polycross of 10 clones selected from selfed progeny of the same parent clones as in 2. Selection of these parent clones was based on two years of evaluation.
- (4) Self and open-pollinated seed were obtained from as many as possible of these 27 clones in the clonal nursery in 1958.

Plant Evaluations: After the seedling progeny became well established in late August, 1959, leafiness ratings were made on a scale of 1 to 5 with 1 as best. Two individuals working independently evaluated the plants and the two ratings were then averaged. The seedling progeny were evaluated again in May, 1960, using the same procedure as in 1959. On the basis of the leafiness ratings, 103 plants were selected for detailed analysis of forage components. Further information is given under discussion.

DISCUSSION: Blue Panic seedling progeny of various origins were visually evaluated for leafiness. The seedlings from the polycross in which each parent clone was derived from selfing showed slightly better average leafiness than the closely related polycross of clones derived from open pollination. The mean leafiness of polycross progeny of parents with one generation of selfing was 2.76 while the related polycross of clones from random pollination averaged 2.91. Polycross progeny from original parent clones had an average leafiness rating of 2.94. This would indicate that a generation of selection among O.P. progeny was ineffective.

Some clones whether derived from selfing or random pollination produced considerably better polycross progeny than other clones. At least 5 clones produced polycross progeny averaging 2.5 or better and an additional 6 clones averaged 2.75 or less. These results suggested that an improved polycross

could be produced by combining the better clones from the two sources. This was done during the summer of 1960 and polycross progeny will be evaluated in 1961.

Several of the clones were evaluated by polycross, self and open-pollination progeny performance (Table 1). In general open-pollination progeny performance was poorer than either polycross or self-progeny. Neither polycross nor self-progeny were consistently better than the other. However, polycross progeny performance tended to be better possibly because selfing resulted in some loss of vigor and plant size apparently influenced leafiness ratings. These results suggest that progeny from random pollination are not as reliable for evaluating parents as some type of controlled pollination and certainly not as suitable for advanced generation selection.

#### Blue Panic leafiness evaluation technique

Duplicate leafiness ratings were made on the entire progeny nursery in the fall of the seedling year (1959) and again in the spring of 1960. From these evaluations 60 of the best plants were selected for detailed forage separation studies. An additional 43 plants were included, representing a wide range in leafiness ratings. These 103 plants were harvested at blooming, weighed, total number of stems determined, 25 stems selected at random and weighed. These 25 stems were separated into leaves, stems and heads, dried and reweighed. From these determinations the following agronomic characteristics were calculated: plant yield (vigor), number of stems per plant, weight per stem (stem size), number of leaves per stem, leaf yield, leaf percentage and leaf-stem ratio. A correlation study was made of these factors along with leafiness ratings in 1959 and 1960. The agronomic determinations are presented in Table 2 and the  $r$  values in Table 3.

The correlation study shows several interesting comparisons. Plant yield is closely related to the number of stems per plant but not so closely related to stem size or number of leaves per stem. Total plant yield is closely related to leaf yield and to leafiness rating. These results indicate that the leafiness ratings might be largely a function of plant size. Leafiness ratings were made with 1 as best and 5 as poorest, thus the negative correlation values.

The number of stems per plant was closely related to leaf yield and to leafiness ratings. While the number of leaves per stem varied from 9 to 37, most of the plants fell between 20 to 30. The poor relationship of leaves per stem to other characters indicates that this is not an important component either of plant yield, leaf yield or leafiness rating. These results indicate that density of the plant (number of stems) largely determined the plant yield and leaf yield and greatly influenced leafiness ratings.

Leaf percentage was closely related to leaf-stem ratio since essentially the same calculations were used in determining both. Leaf percentage was negatively related to stem weight (size). This would be expected since large stems would make up a disproportionate percentage of the plant weight in comparison with smaller stems.

For this reason, too, leaf percentage based on a leaf-stem separation probably is less important than actual leaf yield per plant or area, or than leafiness ratings.

Leafiness ratings in the fall of the seedling year (1959) showed a fair relationship ( $r=0.660$ ) to ratings the second year. This is significant in that selections based on first year evaluations apparently would be fairly reliable.

This detailed study indicates that leafiness ratings in blue panic could be used for selecting plants with a large number of stems per plant, good production potential and good leaf yield. Such selected plants probably would show no increase in leaf percentage or leaf-stem ratio.. Ratings might be made at the end of the first year provided the plants are well developed, but probably would be more reliable based on both first and second year ratings.

Table 1. Mean progeny leafiness scores for various types of Blue Panic progeny, BRVL, 1960.

Parent clone	Type of Progeny		
	polycross	self	open-pollination
11-19-72	2.51	2.81	2.89
11-19S-27	2.46		
12-10-72	2.77	2.78	2.83
12-10S-10	2.59		3.06
12-19-41	2.83	3.38	
12-19S-11	2.80	2.62	3.02
12-25-11	2.78	3.15	
12-25S-7	2.73	3.07	3.16
14-14-13	3.07		
14-14S-12	2.74	3.10	
19-13-44	3.16		
19-13S-20	3.39		3.86
19-15-43	2.97	3.36	3.32
19-15S-17	2.67	3.18	3.90
20-16-70	3.33		3.55
20-16S-13	3.00		
23-20-59	3.03		3.82
23-20S-50	2.54	2.90	3.36
24-22-64	2.39		
24-22S-69	2.72		
4-26	3.44	3.74	3.62
9-2	3.12	3.10	3.15
12-10	2.98		
12-25	2.82		2.58
14-14	2.24		2.69
19-13	3.01	3.02	3.36
19-16	3.20		3.34
24-22	3.06		2.97

Table 2. Blue Panic Selected Plants-Evaluations-1960

Identification		Evaluation										
		1	2	3	4	5	6	7	8	9	10	
Plant No.	Accession	Row- Plant (gms/plant)	Plant yield (gms/plant)	No. Stems Per Plant	Wt. per Stem (gm)	No. leaves per stem	Leaf %	Leaf yield (gms/plant)	Leaf Stem Ratio	Leafiness rating (1960)	Leafiness rating (1959)	Leaf yield (gms/plant) (No.)
1	11-19-72P	1-2	440	61	3.7	28	24.4	107	.53	3.0	3.2	120
2		1-13	400	82	1.8	16	24.7	99	.50	2.5	3.0	72
3		1-14	431	127	1.6	17	26.6	115	.51	2.3	1.0	107
4		1-17	350	66	3.2	30	25.8	90	.48	2.5	2.7	103
5		1-27	704	97	4.4	27	23.8	168	.42	1.5	1.7	182
6		1-28	477	113	2.4	22	26.7	127	.52	2.2	2.2	140
7		1-29	749	116	2.7	26	27.9	209	.60	1.2	1.5	190
8		1-30	1017	107	5.0	22	19.0	193	.38	1.5	2.5	201
9	11-19-720P	2-7	313	73	3.2	28	25.6	80	.41	2.5	3.0	96
10		2-10	336	57	3.4	27	29.3	98	.54	2.5	2.2	105
11		2-15	241	76	2.2	19	27.2	66	.51	3.0	3.5	85
12		2-21	173	31	3.4	21	24.5	42	.40	3.5	3.2	42
13		2-30	813	75	6.0	23	21.4	174	.37	2.0	4.0	168
14	11-19-72S	3-6	127	29	2.9	27	32.6	41	.58	3.5	4.0	49
15		3-22	418	74	3.5	25	23.6	99	.42	2.2	3.0	110
16		3-29	395	73	3.6	22	22.9	90	.40	2.5	2.5	105
17	11-19S-27P	4-1	1081	147	4.2	29	28.4	307	.51	1.0	1.0	318
18		4-12	940	115	5.9	32	25.1	236	.43	1.0	1.7	294
19		4-29	767	105	3.7	29	22.8	175	.39	1.5	1.5	151
20		4-30	840	97	4.9	23	22.9	192	.41	1.7	2.0	194
21	12-10-72P	5-6	645	104	4.3	26	24.7	159	.41	2.3	2.0	183
22	12-10-720P	6-1	177	35	3.0	26	34.5	61	.64	3.3	4.0	67
23		6-8	577	117	3.1	18	28.8	166	.49	2.3	2.0	178
24		6-11	894	93	5.9	37	24.4	218	.42	1.5	2.2	231
25		6-16	404	86	2.4	25	30.5	123	.52	2.5	2.0	110
26		6-19	359	57	5.0	27	19.7	71	.30	3.5	4.0	84
27		6-26	68	6	1.6	9	26.9	18	.45	4.5	4.5	18
28	12-10-72S	7-6	631	87	3.7	26	24.5	155	.43	2.5	2.2	139
29		7-8	636	104	3.2	24	24.7	157	.48	2.3	2.0	162

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Table 2 Continued

30	12-10S-10P	8-15	1049	124	4.5	24	24.6	258	.44	1.5	1.7	243
31		8-30	1017	107	4.8	29	21.6	220	.39	1.5	2.5	201
32	12-10S-100P	9-10	499	85	3.5	27	30.6	153	.56	2.3	1.7	167
33		9-14	468	54	4.2	15	19.0	89	.29	3.8	3.2	66
34		9-21	200	31	2.8	17	23.8	48	.42	4.0	2.5	37
35	12-19-41P	10-7	472	106	1.8	15	28.9	136	.53	2.3	2.2	102
36	12-19S-11P	12-7	518	76	3.8	28	23.8	123	.44	2.5	2.5	125
37		12-10	304	53	3.3	17	28.4	86	.51	4.0	3.0	89
38		12-11	350	70	2.5	14	24.1	84	.45	3.0	3.0	78
39		12-14	695	98	3.2	20	24.5	170	.46	1.5	1.5	141
40		12-19	204	38	2.7	22	25.0	51	.45	4.5	3.2	46
41		12-24	776	73	4.6	25	22.5	175	.41	2.2	1.5	137
42		12-27	962	134	4.2	24	21.9	211	.41	1.2	2.0	230
43	12-19S-11S	14-16	508	112	2.7	21	28.0	142	.55	2.2	2.2	166
44		14-24	400	76	3.3	19	30.5	122	.52	3.0	2.0	130
45		14-25	77	25	2.6	23	23.1	18	.38	4.0	3.0	25
46		14-26	631	102	2.4	17	26.7	168	.44	1.5	1.7	110
47		14-28	536	115	2.0	23	30.7	164	.61	1.5	2.5	143
48		14-29	731	107	2.0	20	22.9	167	.51	1.5	2.5	107
49		14-30	844	121	4.6	34	25.1	212	.45	1.5	2.2	252
50	12-25-11P	15-7	459	99	2.4	24	35.1	161	.64	2.3	2.0	154
51		15-9	581	91	2.8	16	30.1	175	.52	2.5	1.0	135
52		15-17	422	115	1.6	16	24.4	103	.46	2.0	1.2	87
53	12-25-11S	16-13	195	40	3.7	22	24.8	48	.43	4.5	3.7	64
54		16-18	259	36	2.8	15	27.9	72	.49	3.7	3.5	49
55		16-20	259	75	2.3	23	35.7	92	.60	3.0	2.5	105
56		16-26	486	97	2.2	13	24.4	118	.41	2.0	3.0	85
57	12-25S-7P	17-25	704	107	4.0	22	33.1	233	.55	2.0	1.5	235
58		17-28	740	88	5.0	21	19.6	145	.36	1.2	2.2	158
59		17-29	1031	136	3.9	23	28.2	291	.53	1.0	2.7	277
60		17-30	1239	128	5.1	27	23.9	296	.46	1.0	2.2	297
61	12-25S-70P	18-18	327	62	3.6	22	27.8	91	.46	3.0	2.5	104
62		18-19	309	53	4.5	26	22.0	68	.37	3.0	4.0	87
63		18-21	359	47	4.6	24	27.0	97	.43	3.0	3.7	94
64		18-22	445	60	5.0	31	22.6	101	.34	3.0	3.2	103
65	14-14-13P	20-8	431	124	1.9	20	30.0	129	.50	2.3	1.7	119
66		20-17	263	62	3.4	18	26.5	70	.46	3.0	2.7	97
67		20-20	254	38	4.2	26	21.6	55	.38	4.5	3.2	61

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Table 2 Continued

68		20-26	354	52	3.3	26	22.6	80	.40	3.5	3.2	69
69		20-28	400	131	2.3	20	22.9	92	.37	2.0	3.0	115
70		20-29	622	170	2.0	15	28.7	179	.49	1.7	1.7	170
71	14-14S-12P	21-3	463	70	4.0	25	23.6	109	.41	2.5	2.0	115
72		21-25	495	83	3.4	30	25.6	127	.53	2.0	1.7	149
73	19-15-43P	26-21	400	80	2.6	17	26.8	107	.52	2.0	2.7	109
74	19-15S-17P	29-1	622	92	3.2	21	27.2	169	.54	1.8	1.5	158
75		29-7	636	82	5.2	29	27.9	177	.47	2.0	2.0	203
76		29-17	717	92	4.0	26	21.1	151	.37	2.2	1.5	136
77		29-18	617	92	5.0	20	30.1	186	.47	2.5	1.7	217
78		29-30	581	123	2.9	24	28.8	167	.52	1.7	1.5	187
79	20-16S-13P	34-8	431	101	3.0	22	30.6	132	.45	2.5	2.2	137
80	23-20S-50P	37-2	490	84	4.2	27	33.0	162	.58	2.3	1.2	205
81		37-3	640	97	3.8	24	18.3	117	.31	2.3	2.7	116
82		37-20	790	97	6.7	26	22.9	181	.36	2.0	1.2	237
83		37-25	341	93	2.1	15	34.0	116	.63	2.2	1.7	123
84	24-22-64P	40-6	418	100	1.9	19	24.4	102	.44	2.2	2.2	84
85	24-22S-69P	41-15	767	175	2.7	24	31.8	244	.51	1.7	2.5	245
86		41-24	735	125	4.2	28	31.0	228	.55	1.7	1.7	285
87	9-2P	45-21	504	65	3.6	15	18.8	95	.37	2.2	2.5	86
88		45-24	463	94	3.0	25	31.8	147	.54	3.0	2.2	154
89		45-29	513	91	3.9	23	24.4	125	.45	2.2	2.0	160
90		45-30	908	73	6.2	22	19.6	178	.32	2.2	2.5	146
91	9-2S	47-24	313	98	2.8	21	29.8	93	.51	2.5	2.2	141
92	12-25P	49-18	568	92	4.4	19	28.7	163	.45	2.5	2.5	180
93	12-250P	50-5	1103	149	3.3	30	36.8	406	.65	1.3	2.5	316
94		50-15	867	127	4.0	27	30.1	261	.50	2.0	2.5	264
95		50-16	808	154	2.8	26	32.0	259	.58	2.2	2.0	253
96	14-14P	51-1	1389	188	3.6	19	25.6	356	.44	1.2	0	301
97		51-5	894	128	3.2	28	27.7	248	.48	1.2	0	195
98		51-6	863	111	5.2	26	20.3	175	.35	1.2	0	204
99		51-9	1012	162	4.2	30	31.2	316	.50	1.2	0	343
100		51-30	858	179	2.9	22	25.4	218	.41	1.5	0	215
101	14-140P	52-6	935	114	3.6	24	25.8	241	.47	1.2	0	192
102		52-7	540	85	3.7	18	22.0	119	.39	1.7	0	122
103	12-10S-100P	9-2	554	70	4.5	22	28.4	157	.49	4.0	3.5	154

Correlations of Blue Panic individual plant evaluations, 1960

	Stems/ plant	Wt/ stem	Leaves/ stem	Leaf %	Leaf yield	Leaf-stem ratio	Leafiness ratings	
							1960	1959
Plant yield	.752**	.481**	.358**	-.117	.932**	-.081	-.809**	-.563**
Stems/plant		.037	.138	.206*	.815**	.204*	-.799**	-.658**
Wt/stem			.543**	-.398**	.321**	-.495**	-.199*	-.044
Leaves/stem				.017	.361**	.003	-.283**	-.112
Leaf %					.215*	.890**	.005	-.103
Leaf yield						.205*	-.772**	-.579**
Leaf-stem ratio							-.091	-.108
Leafiness 1960								.660**

NAME OF TEST: Improvement of *Panicum coloratum* and related Panicums, College Station, 1960.

OBJECTIVES: (1) to determine the cytology and breeding behavior of *Panicum coloratum* and related species. (2) to select desirable plant growth types and stabilize this characteristic in synthetic varieties.

EXPERIMENTAL PROCEDURE:

Location: Agronomy Farm, College Station, Texas

Soil type: Lufkin fine sandy loam

Plant material: From an open-pollinated seedling nursery established in 1956, individual plants were selected in 1957 for plant type, vigor and leafiness. Three plant types were selected: tall, decumbent and intermediate. Plants representing each type were moved into isolated crossing blocks in the spring of 1958. Seed from these crossing blocks were harvested in 1958 and used to establish a polycross progeny nursery in the spring of 1959. Identity of seed from each parent clone was maintained in order to relate progeny to parents for various characteristics.

The seedling nursery established in 1959 consisted of 10-plant plots, 4 replications, with a parent clone at the end of each plot. The crossing blocks included the following numbers of parent clones: tall, 10; decumbent, 12; intermediate, 15.

Plant type was rated visually as 1 = decumbent and 5 = tall.

RESULTS: The decumbent type was found to parent clones of at least three different chromosome numbers, thus it was not evaluated in 1960.

The polycross progeny of clones selected for intermediate and upright growth habit were evaluated in the seedling year and again in 1960. The polycross progeny of upright selections had an average rating of 3.53 for growth type while the intermediate progeny averaged 2.96. These values are based on ratings at two different times. The spread between the two groups, 0.57, is slightly greater than in 1959. Both the 1959 and 1960 evaluations indicate that one generation of selection resulted in shifting the mean to some extent with an indication that type fixation may be accomplished rather rapidly.

The polycross progeny were evaluated also for leafiness, spring recovery and apparent seed production potential. While the parent clones were selected for general desirability, the progeny were not as uniform for these characteristics as for plant type. Thus, a second cycle of selection seems necessary for these characteristics.

DISCUSSION: Twenty-five intermediate type plants and 28 upright plants were selected on the basis of plant type, leafiness, spring recovery, time of maturity and seed production. The chromosome number of each of these plants will be determined and those with the same chromosome number will be progeny tested in 1961.

Plant type ratings of Kleingrass polycross progeny from clones selected for intermediate and upright growth habit, College Station, 1960.

Parent Identification	Plant type class (1 = decumbent, 5 = upright)									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	
			Intermediate Type							
322-1I-7			3	5	15	4	2	2		
322-6-2	1		3	10	10	2				
322-6-7			3	1	4					
322-6-9				5	15	8				
322-9-5				2	14	5	4	2		
322-11I-4			2	3	10	2				
322-11I-54			2	3	10	6	1			
324-2-2			3	6	18	5	1			
324-4-2		1	2	5	18	6	3			
324-4-8		1	1	5	18	7	1			
324-11I-7		2		7	15	7	3			
327-4-7			2	3	17	3				
327-10-7		1	5	5	16	6	1			
396-10I-7				4	13	3				
Pan 11-2			3	3	7	3	2			
<b>Total</b>	<b>1</b>	<b>5</b>	<b>29</b>	<b>67</b>	<b>200</b>	<b>67</b>	<b>18</b>	<b>4</b>		

			Upright Type						
32-1I-1			1	3	9	7	2		
322-9I-1			1	10	9	6	2	2	
322-9I-4				9	18	6	2	1	
322-9I-5				7	13	9	5	2	
322-11I-3				2	8	17	6	2	
322-11I-5		1	3	8	11	6			
322-11I-9		1	2	6	10	7	2		
324-11I-6			2	11	11	14	1	1	
327-4-10			1	16	4	12	3		
Bulk-11I-9		1		7	21	9			
<b>Total</b>			<b>3</b>	<b>12</b>	<b>85</b>	<b>123</b>	<b>85</b>	<b>19</b>	<b>6</b>

Leafiness ratings of Kleingrass polycross progeny from clones selected for intermediate and upright growth habit, College Station, 1960.

Parent Identification	Leafiness rating (1 = most leafy)								
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Intermediate Type									
322-11-7	3	2	5	9	6	1	2	1	1
322-6-2	1	2	3	2	3	2	3		1
322-6-7		1	3	2	4		4		2
322-6-9	1	1	2	5	8	6	4		3
322-9-5		1	1	9	6	5	3		2
322-11I-4		1	1	3	3	1	2	5	1
322-11I-54			2	2	8	1	9	1	
324-2-2	1	2	11	5	11	5	2		2
324-4-2	3	3	3	9	9	4	4		1
324-4-8	2	6	4	2	8	6	4		1
324-11I-7	1	2	4	7	12	4	1		
327-4-7		1	4	3	9	3	4	1	1
327-10-7			3	8	5	1	3	1	
396-10I-7	1	2	4	5	7	6	5	1	3
Pan 11-2		1	3	3	4	2	4		1
<b>Total</b>	<b>13</b>	<b>25</b>	<b>53</b>	<b>74</b>	<b>102</b>	<b>47</b>	<b>54</b>	<b>10</b>	<b>19</b>
Upright type									
322-11-1		2	3	4	4	4	4		1
322-9I-1	1	4	6	4	7	3	5		
322-9I-4	4	4	8	4	10	4	2		
322-9I-5		2	5	10	12	2	4		
322-11I-3		2	9	4	9	5	3	2	
322-11I-5		1	2	2	7	6	7	3	3
322-11I-9	1		3	6	6	6	5	2	2
324-11I-6		3	4	7	13	4	5	1	1
327-4-10	2	2	12	7	7	4	2		
Bulk 11I-9	1	2	7	8	8	6	3		1
<b>Total</b>	<b>9</b>	<b>22</b>	<b>59</b>	<b>56</b>	<b>83</b>	<b>44</b>	<b>40</b>	<b>8</b>	<b>7</b>