rch report
Carolina. State University at
h. Department of Crop Science

FORAGE

CROPS VARIETY TESTING

1993

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INTRODUCTION

Evaluation of Forage Crop Varieties in North Carolina

New forage cultivars and hybrids are constantly being released from public and private sources. In addition, forage breeders are continually interested in testing experimentals under various growing conditions. In order to determine adaptability and productivity, it is necessary that these forages be tested under North Carolina growing conditions. The purpose of this publication is to present comparative data on forages tested in North Carolina during 1993.

The varieties tested are classed into three major groups: winter annuals (such as rye, wheat, oats, barley and ryegrass); summer annuals (such as sudangrass, pearl millet, and sorghum-sudan hybrids) and perennial forages (such as alfalfa, orchardgrass, tall fescue, and bermudagrass). All varieties were managed on a multiple-cut system with most varieties being clipped three or more times to simulate rotational grazing or haying conditions. Dry forage yields are reported for all entries tested.

Experimental lines are sponsored through the USDA-ARS, state agricultural experiment stations and privately owned companies. These lines may not be available for farm use. All entries from privately owned companies (experimental lines are commercial varieties) are tested on a fee basis. The Crop Science Department, N. C. State University often enters varieties of interest or proven varieties to be used as standards. All varieties are from certified sources or from sources which would be able to verify origin. This gives assurance as to the purity of the entries tested and that results reported here could be reproduced.

All forage tests were conducted on North Carolina State University Lake Wheeler Road Field Laboratory in 1993. Weather-measuring instruments were located approximately one mile from the test site. Climatological data are listed in the appendix tables.

Most computations and statistical analyses were conducted in the Statistical Laboratory and Computing Center at North Carolina State University. These operations were supervised by Dr. John O. Rawlings and Mrs. Faye Childers. We appreciate their cooperation and assistance.

Determining Differences Between Varieties

In order to decide if true differences exist in a set of varieties being tested, field trials are designed so that statistical procedures can be used to determine whether observed differences are most likely real or due only to chance. Measured differences among varieties can result from influences other than their true genetic character. These random effects which may include variation in soil fertility, moisture, temperature, etc. are always present to some degree. Experimental design and statistics help in deciding whether true differences exist. There is always a chance that an observed difference between varieties will be due to chance alone and not due to true varietal differences. It is up to the experimenter to choose the odds that he is willing to accept. Most experimenters will accept chance odds of 5% or less. In other words, the chance of concluding falsely is about one in twenty.

In this publication the Waller-Duncan L.S.D. (least significant difference) test is used to determine if real differences exist among varieties (chance odds of about 5%). In most tables where yields are presented, the L.S.D. values are listed below each yield column. Yield differences between varieties must exceed the L.S.D. values for the difference to be considered statistically significant. An example of the use of the Waller-Duncan L.S.D. is given below.

Table 1a. Example of use of the L.S.D. value.

Variety	Yield (Lbs/A)
1	1600+
2	1570++
3	1450
4	1410
LSD	50

L.S.D. Waller Duncan K Ratio = 100
+Highest yield.
++Not different from highest yield.

By using the L.S.D. value in the above example, it can be determined that:

a. Variety 1 is not different from variety 2 because the observed difference (30) does not exceed the L.S.D. value of 50.

b. Variety 1 is different from varieties 3 and 4 since the yield difference exceeds the L.S.D. value.

c. Likewise, based on similar comparisons, varieties 3 and 4 are not different, but variety 2 is different from varieties 3 and 4.

In studying the information presented in this publication, it should be emphasized that data collected over several years are a better indication of a variety's potential than single year test results. If one wants to observe data for each harvest for previous years check the publication for those years.

EXPERIMENTAL PROCEDURES

Recommended small-plot techniques and cultural practices were employed on all tests. Fertilization, seeding rates, dates, and other cultural information of a given test are listed in the table which gives dry matter yields by harvest for the current year. Cultural practices of prior years for perennial forages are given in the appendix tables.

The experimental design used for all tests was a randomized complete block with four or five replications (reps). Plots were 20 feet long and three feet wide. Blocks were separated by at least three feet and tests were bordered by material comparable to that included in the

All plots contained three rows nine inches apart. Seeding was accomplished with a specially designed cone planter which was calibrated for each entry. Seeding rates for all tests were adjusted to 100% germination based on tests conducted just prior to planting.

Cool season perennials and winter annuals were sown in September and summer annuals were planted in mid-May.

Plots were harvested with a self-propelled, flail-knife chopper (Carter harvester). It was designed specifically for small plot work with the wheels spaced so the harvest rows and the stubble were not damaged during harvesting.

Each plot was evaluated for weed percentage. When estimated to be greater than 5% of the harvested forage dry matter, weed contribution was subtracted from total herbage weight. Thus, dry forage yields listed in this publication are on a weed-free basis.

Dry yield determination included drying either the whole plot sample or a subsample. When subsampling, dry matter concentration was determined for each variety in two reps and this average was used to adjust for dry matter in the other reps. Dry yield for each variety was determined by multiplying green weight by dry matter concentration for a particular variety. Subsampling was necessary in some cases due to the bulk of green material being handled and a shortage of drying space. Samples were dried in a forced air drier at 130 degrees Fahrenheit for 24 to 48 hours. Moisture remaining in the samples was determined to be from 2 to 4%. Thus, the term "dry forage" as stated in the table refers to oven-dry forage containing 2 to 4% moisture.

Table 1. Supplemental information for forage variety test locations.

Location	Cooperating Personnel	Soil	Long Term Average Growing Season (Days)	Long Term Average Annual Rainfall (Inches)
University Research Unit 9 Raleigh, NC East Central Piedmont Wake County Approx. Elev. 400 feet	Wallace Baker Ken Snyder	Appling-Cecil Association Gray Sandy Loam soil red, firm clay subsoils	200	46

Table 2. Names and addresses of agencies sponsoring winter annual forage entries in the 1992-1993 trials.

Sponsor	Address	Brand	Cultivar Designation
Green Seed Company	P. O. Box 29247 Atlanta, GA 30359	Green Seed	Winter King Rye
Carl R. Gurley, Inc.	P. O. Box 995 Princeton, NC 27569	Gurley Gurley Gurley	GI 85 Rye Gurley Grazer 2000 Rye GI 87 Rye
Cascade International Seed Co.	8483 W. Stayton Rd. Aumsville, OR 97325	Cascade	CAS-BRM. S Bromus
Gainey Grain, Inc.	Route 1, Box 92 Laurel Hill, NC 28351	Gainey	SS2-Rye SS2 Cross Rye
N. C. Agriculture Extension Service	Raleigh, NC 27695		NCSU 89 Ryegrass NCSU 90 Ryegrass NCSU 91 Ryegrass Tetrablend 444 Ryegrass Brooks Oat Boone Barley Wakefield Wheat Gulf Ryegrass
Dlf Trifolium	P. O. Box 742 Albany, OR 97321	Dlf Trifolium	Rustmaster Ryegrass
Seed Production, Inc.	P. O. Box 290 Madison, GA 30650	Seed Production	Wintergrazer 70 Rye
Southern States Cooperative	P. O. Box 26234 Richmond, VA 23260	So. States So. States	Wheeler Rye Pastar Rye
University of Florida	Bldg. 107 Gainesville, FL 32611		Florida 80 Ryegrass Surrey Ryegrass
The Wax Company, Inc.	P. O. Box 60 Amory, MS 38821	Wax	Marshall Ryegrass
Willamette Valley	36100 Hwy. 228 Brownsville, OR 97327	Willamette Valley Willamette Valley Willamette Valley	AR-90-300 Ryegrass AR-90-1 Ryegrass AR-92-401 Ryegrass

Table 3. FVT 250 Dry forage yield of rye, wheat, oats, barley and annual ryegrass at North Carolina State University, Lake Wheeler Road Field Laboratory, Wake County, N.C. 1992-93[1]

Brand or Sponsor	Variety	Harvest Dates 11/19	2/3	3/31	4/28	5/27	Total
		Pounds per Acre Dry Forage[2]					
DLF Trifolium	Rustmaster RG	102	834	1918	3103	1236	7193+
Univ. of Fla.	Surrey RG	289	697	1758	2921	1407	7072++
Smith Seed	Tetrablend 444 RG	184	1067	1570	2810	1251	6882++
WVPB	AR-92-401 RG	340	576	1527	2856	1374	6673++
NCSU	Gulf RG	216	1109	1609	2550	1163	6647++
Wax	Marshall RG	90	602	1465	3105	1322	6583++
Univ. of Fla.	Florida 80 RG	340	995	1713	2299	1170	6515++
NCSU	NCSU 90 RG	95	516	1584	2933	1260	6388++
WVPB	AR-90-300 RG	125	721	1563	2749	1230	6388++
NCSU	NCSU 91 RG	140	571	1670	2741	1242	6365
NCSU	NCSU 89 RG	143	515	1583	2747	1322	6309
NCSU	Brooks Oat	561	1858	1040	1718	1128	6305
WVPB	AR-90-1 RG	129	912	1692	2302	1240	6275
Green Seed	Winter King Rye	846	1042	2077	1313	853	6131
Carl R. Gurley	GI 87 Rye	769	1054	1966	1269	816	5874
NCSU	Boone Barley	688	925	1512	1922	791	5837
NCSU	Wakefield Wheat	398	1341	1449	1387	1215	5789
Carl R. Gurley	GI 85 Rye	779	922	2048	1092	885	5727
Gainey Grain	SS2 Cross Rye	1020	1256	1536	1037	851	5701
Seed Production	Wintergrazer 70 Rye	759	865	1992	1137	844	5597
Gainey Grain	SS2 Rye	1056	1669	711	1238	868	5543
Carl R. Gurley	Gurley Grazer 2000 Rye	722	826	1770	1340	880	5538
Cascade	CAS-BRM-S Bromus	127	594	947	2288	1465	5421
Southern States	Wheeler Rye	785	818	1154	1816	720	5294
Southern States	Pastar Rye	657	744	1125	1927	790	5244
Mean of Test		**454**	**921**	**1559**	**2104**	**1093**	**6132**
L.S.D. Waller Duncan K Ratio=100		247	339	227	351	280	822
s.e.		213	283	198	311	227	632
Error d.f.		96	96	96	96	96	96
C.V.		47	31	13	15	21	10

[1]Seeded September 17, 1992 on a Cecil clay loam soil at rate of: Rye - 120 lb/A, Oats - 90 lb/A, Ryegrass - 40 lb/A and Wheat - 120 lb/A. Soil Analysis - pH 5.8, P-I 064, K-I 58, HM% 0.7
Fertilization: Preplant (lb/Acre) 50N, 50 P_2O_5, 50 K_2O; Postplant (lb/Acre) February 6 - 50N, March 31 - 50N, April 29 - 50N

[2]Average of five replications. +Highest yield. ++Not different from highest yield.

Table 4. Dry forage yield of rye, wheat, oats, barley and annual ryegrass at University Research Unit 9, Lake Wheeler Road Field Laboratory, Wake County, N.C.[1]

Brand or Sponsor	Variety	Test Years 1993[2]	1992[3]	1991[4]	Three Year Average[5]
		Pounds Per Acre Dry Forage			
DLF Trifolium	Rustmaster RG	7103+	5408++	5854++	6152
Univ. of Fla.	Surrey RG	7072++	5277++	5906++	6085
Smith Seed	Tetrablend 444 RG	6882++			
WVPB	AR-92-401 RG	6673++			
NCSU	Gulf RG	6647++	5587++	5741++	5992
Wax	Marshall RG	6583++	5783+	5435	5934
Univ. of Fla.	Florida 80 RG	6515++	5414++	6193++	6041
NCSU	NCSU 90 RG	6388++			
WVPB	AR-90-300 RG	6388++	5420++		5904
NCSU	NCSU 91 RG	6365			
NCSU	NCSU 89 RG	6309	5239++	5803++	5784
NCSU	Brooks Oat	6305	4954	3330++	4863
WVPB	AR-90-1 RG	6275	5457++	5788++	5840
Green Seed	Winter King Rye	6131	4531	3123	4595
Carl R. Gurley	GI 87 Rye	5874	4485		5180
NCSU	Boone Barley	5837	3534	2473	3948
NCSU	Wakefield Wheat	5789			
Carl R. Gurley	GI 85 Rye	5727	5132++		5430
Gainey Grain	SS2 Cross Rye	5701			
Seed Production	Wintergrazer 70 Rye	5597	4208	3309	4371
Gainey Grain	SS2 Rye	5543	3602		4573
Carl R. Gurley	Gurley Grazer 2000 Rye	5538	4221	3066	4275
Cascade	CSA-BRM-S Bromus	5421			
Southern States	Wheeler Rye	5294	4487	2825	3782
Southern States	Pastar Rye	5244	3654	3171	4023

[1]Average of five replications. Entries with missing values indicate the cultivar was not tested at that location.
[2]Wake County. See FVT 250, Table 3, page 5.
[3]Wake County. See Ag-49 Crop Science Report 140, 1992 for details on establishment and fertilization
[4]Wake County. See Ag-49 Crop Science Report 135, 1991 for details on establishment and fertilization.
[5]The values are averged only for the years the variety was tested.
+Highest yield. ++Not different from highest yield.

Table 5. Names and addresses of agencies sponsoring summer annual forage entries in the 1993 trials.

Sponsor	Address	Brand	Cultivar Designation
Ciba Seeds	P. O. Box 18300 Greensboro, NC 27407	Ciba Ciba	FP-5 SS FP-6 SS
DeKalb-Pfizer Genetics	1350 Center Drive Suite 201B Atlanta, GA 30338	DeKalb DeKalb	Sudax SX-17 SS Sudax SX-15 SS
Northrup King Co.	P. O. Box 249 Grifton, NC 28530	NK NK	Sordan 79 SS X9232 SS
Pioneer Hi-Bred International	1000 W. Jefferson St. Tipton, IN 46072	Pioneer	855F SS
Southern States Cooperative, Inc.	P. O. Box 26243 Richmond, VA 23260	FFR FFR FFR	120 SS 3-Mil-X PM Mil-Hy 300 PM
U.S. Dept. Agri.	Forage & Turf Res. Unit P.O. Box 748 Tifton, GA 31793	USDA USDA USDA	Tifleaf 1 PM Expt 1 PM Expt 2 PM

SS = Sorghum sudan hybrid, PM = Pearl millet.

Table 6. FVT 251 Dry matter yield of summer annuals on North Carolina State University Lake Wheeler Road Field Laboratory in Wake County, North Carolina[1]

Brand or Sponsor	Variety	Harvest Dates 1993				1993 Total	1992 Total	Two Year Average
		6/28	7/14	8/11	9/21			
		Pounds Per Acre Dry Forage[2]						
DeKalb Sudax	SX-17 SS[3]	2016	1020	1881	1806	6723+	6557++	6640
Southern States	FFR 120 SS	1931	638	2009	1891	6468++		
Ciba Seeds	FP-6 SS	1625	817	1916	1991	6349++		
DeKalb Sudax	SX-15 SS	1703	1084	1521	1820	6128++		
USDA	Tift Exp 1 PM[3]	980	928	1953	2227	6088++	7676+	6882
Southern States	FFR 2113SS	1799	879	1636	1604	5918++	6745++	6332
USDA	Tifleaf 2 PM	1244	929	1668	1984	5825++	7179++	6502
NK	Sordan 79 SS	1847	846	1637	1473	5803++		
NK	X9232 SS	1487	1003	1686	1554	5730++		
Ciba Seeds	FP-5 SS	1501	979	1783	1358	5621		
Pioneer	855F SS	1536	846	1496	1731	5609	6653++	6131
USDA	Tift Exp 2 PM	698	988	1851	2000	5538	6847++	6192
USDA	Tifleaf 1 PM	957	954	1753	1750	5414		
Southern States	Millhy 300 PM	906	936	1603	1741	5186	6966++	6076
Southern States	3-Mil-X PM	983	854	1456	1545	4838	5823	5331
Mean of Test		**1414**	**913**	**1723**	**1765**	**5816**	**6540**	
L.S.D. Waller Duncan K-Ratio=100		419	237	421	409	1012	1444	
s.e.		346	155	264	294	684	975	
Error d.f.		56	56	56	56	56	48	
C.V.		25	17	15	17	12	15	

[1]1993 Cultural Practices Seeded May 24, 1993.
Soil Analysis pH 6.5, P-I 166+, K-I 30, HM% 0.9
Fertilization (lb/acre) May 20, 1993 - 25N, 50 P_2O_5, 50 K_2O, July 2, 1993 - 50N
August 19, 1993 - 50N

[2]Average of five replications.
[3]SS = Sorghum sudan hybrid, PM = Pearl millet.
+Highest yield. ++Not different from highest yield.

Table 7. Names and addresses of agencies sponsoring entries in the 1993 North Carolina Perennial Forage Trials.

Sponsor	Address	Brand	Cultivar Designation
AgraTech Seeds, Inc	P. O. Box 2210 Atlanta, GA 30301	AgraTech	8607 Alfalfa
Agripro Biosciences, Inc.	Route 3	Americas	A l f a g r a z e Alfalfa
	Ames, IA 50010	Americas	Aggressor Alfalfa
		Americas	Apollo Supreme Alfalfa
Allied Seed Cooperative Inc.	1917 E. Fargo Nampa, ID 83687	Allied Seed	Asset Alfalfa
Mike Braxton Seed, Inc.	P. O. Box 308 Ames,IA 50010	Braxton	MBS 2152 Alfalfa
E. F. Burlingham and Sons	P. O. Box 181A Forest Grove, OR 97116	Burlingham	MB 30 Ryegrass
		Burlingham	MB 31 Ryegrass
Ciba Seeds	P. O. Box 18300 Greensboro, NC 27419	Ciba	G2833 Alfalfa
D.S.I.R. Grasslands Division	Private Bag Palmerston North, NZ	NZG	Roa Fescue
		NZG	Matua Rescuegrass
		NZG	Nui Per Ryegrass
		NZG	Pacific Per Ryegrass
		NZG	Puna Chickory
		NZG	Super Nui Per Ryegrass
		NZG	Wana Orchardgrass
Daehnfeldt,Inc.	P. O. Box 947 Albany, OR 97321	Daehnfeldt	Deborah Brome
Dairyland Research	RR 1, Box 129 Clinton, WI 53525	Dairyland	Magnum III Alfalfa
DeKalb-Pfizer	3100 Sycamore Road DeKalb, IL 60115	DeKalb	DK 125 Alfalfa
		DeKalb	DK 135 Alfalfa
FFR Cooperative	4112 E. State Rd. 225 W. Lafayette, IN 47906	FFR	TF 9001 Fescue
Garst Seed Co.	Box 300 Coon Rapids, IA 50058	Garst	Garst 630 Alfalfa
		Garst	Garst 645 Alfalfa
Great Plains Research Co., Inc.	3624 Kildaire Farm Road Apex, NC 27502	Great Plains	Cimarron VR Alfalfa

Table 7. Continued.

Sponsor	Address	Brand	Cultivar Designation
Green Seed Company	P. O. Box 1678 Gallatin, TN 37066	Green Seed Green Seed Green Seed Green Seed	Legacy Alfalfa Cattle Club Fescue Green 89-103 Orchardgrass Shiloh Orchardgrass
N.C. Agricultural Extension Service	N. C. State University Raleigh, NC 27695	NCSU	Bastion Bison Per Ryegrass Johnstone Fescue Ky 31 Fescue Boone Orchardgrass Cajun Fescue Martin Fescue Mozark Fescue Citadel Per Ryegrass Infested Ky 31 Fescue Non-Infested Ky 31 Fescue Rebel II Fescue Triumph Fescue Tetralite Per Ryegrass Bison Per Ryegrass Coastal Bermuda Tifton 44 Bermuda Callie Bermuda Tifton 78 Bermuda Pasto Rico Bermuda Tierra Verde Bermuda Guymon Bermuda Pensacola Bahia Tifton 9 Bahia
Northrup King Company	P. O. Box 885 Grifton, NC 28530	NK NK NK NK	Crockett Alfalfa Fortress Alfalfa Commandor Alfalfa Multiking I Alfalfa
Olsen-Fennell Seeds,	P. O. Box 15028 Salem, OR 97302	Olsen Fennell Olsen Fennell	OFI-OG-4 Orchardgrass OFI-OG-T-88 Orchardgrass
Oregon Orchardgrass Seed Producers Commission	1270 Chemeketa St. Salem, OR 97301	Oregon Oregon	Latar Orchardgrass Paiute Orchardgrass
Pennington Seed Production, Inc.	P. O. Box 290 Madison, GA 30650	Pennington	Penngrazer Fescue

Table 7. Continued.

Sponsor	Address	Brand	Cultivar Designation
Pioneer Hi-Bred International, Inc.	1000 W. Jefferson St. Tipton, IN 46072	Pioneer	5331 Alfalfa
		Pioneer	5373 Alfalfa
		Pioneer	YAL06 Alfalfa
Southern States Cooperative, Inc.	P. O. Box 26234 Richmond, VA 23260	So. States	Anstar Alfalfa
		So. States	Benchmark Orchardgrass
		So. States	Forager Fescue
		So. States	Haymark Alfalfa
		So. States	Phyter Fescue
		So. States	Hallmark Orchardgrass
		So. States	Resistar Alfalfa
Vista	P. O. Box 1428 Woodland, CA 95695	Vista	VS 9060 Alfalfa
Willamette Seed	P. O. Box 791 Albany, OR 97321	Willamette	Crown Orchardgrass
Willamette Valley	36100 Hyw 228 Brownsville, OR 97327	Willamette Valley	WVPB-FIR-90-1 Per Ryegrass
		Willamette Valley	WVPG-OG-89-19 Orchardgrass
		Willamette Valley	WVPB-OG-89-40 Orchardgrass
		Willamette Valley	WVPB-OG-89-35 Orchardgrass
		Willamette Valley	WVPB-OG-89-309 Orchardgrass
Willamette Valley	36100 Hwy 228 Brownsville, OR 97327	Willamette Valley	WVPB-TF-88-14 Fescue
		Willamette Valley	WVPB-TF-88-B-1

Table 8. FVT 244 Dry forage yields of alfalfa on North Carolina State University Lake Wheeler Road Field Laboratory in Wake County, North Carolina[1]

Brand or Sponsor	Variety	Harvest Dates - 1993						1993 Total	1992 Total	2-Year Average
		5/4	6/7	7/15	8/18	9/23	11/4			
		Pounds Per Acre Dry Forage[2]								
Northrup King	Crockett	5101	3292	801	1162	1351	913	12619+	10877+	11748+
America's Alfalfa	Aggressor	5175	3480	630	1013	1342	813	12453++	10644++	11548++
Green Seed	Legacy	5074	3292	657	1152	1308	854	12338++	10731++	11534++
Garst Seed	Garst 630	4931	3415	738	1165	1356	728	12334++	9687++	11010++
Pioneer Exp.	YAL06	4944	3143	721	1202	1447	755	12212++	9775++	10994++
Allied Seed	Asset	5027	3335	601	1149	1288	718	12118++	9852++	10985++
Dairyland Seed	Magnum III	4952	3309	688	1095	1385	662	12090++	10116++	11102++
Ciba-Geigy	C-G2833	5159	3160	649	1122	1184	638	11912++	10442++	11177++
America's Alfalfa	Apollo Supreme	4986	3280	594	1158	1227	597	11842++	9930++	10886++
Pioneer Variety	5373	5058	3289	561	1088	1194	641	11831++	10010++	10920++
Southern States	Anstar	4883	3167	585	1120	1361	689	11806++	10524++	11165++
Southern States	Resistar	5122	3207	517	851	1219	665	11580++	10320++	10950++
Great Plains	Cimarron VR	4917	3035	597	1025	1189	730	11492++	10749++	11120++
Garst Seed	Garst 645	5032	3116	509	1045	1151	600	11453++	9124	10289
Pioneer Variety	5331	5001	3033	543	942	1242	657	11418++	9929++	10673
DeKalb	DK 125	5016	3119	467	899	1201	704	11407++	9830++	10619
Mike Braxton Seed	MBS 2152	4909	3023	743	1206	1364	972	11399++	9233	10316
Northrup King	Multiking I	4704	3129	619	1067	1213	636	11369++	9855++	10612
Southern States	Haymark	4942	3023	596	966	1207	590	11324++	9756++	10540
Agratech	Agratech 8607	4274	3073	647	1057	1317	908	11276++	9488	10382
Vista	VS 9060	4836	3029	533	1010	1102	716	11225	10297++	10761
Northrup King	Fortress	4724	3001	565	1026	1172	643	11132	9973++	10552
DeKalb	DK 135	4744	3011	537	984	1157	590	11021	10035++	10528
America's Alfalfa	Alfagraze	4836	3040	464	826	1232	526	10923	9971++	10447
Mean of Test		**4897**	**3167**	**607**	**1056**	**1259**	**706**	**11691**	**10048**	**10869**
L.S.D. Waller Duncan K-Ratio=100		536	323	286	286	202	117	1352	1296	909
s.e.		364	209	155	172	132	97	793	757	775
Error d.f.		92	92	92	92	92	92	92	92	184
C.V.		7	7	25	16	11	14	7	8	7

[1]1993 Cultural Practices: Fertilization (lb/acre) February 16 - 50 P_2O_5, 100 K_2O, 3 lb. Boron, 1000 lb. lime
Insect Control (lb/acre a.i.) March 31 0.5 Furadan

[2]Average of five replications. +Highest yield. ++Not different from highest yield.
For earlier years cultural practices, See Appendix Table 2D.

Table 9. FVT 239 Dry forage yield of fescue on Lake Wheeler Road Field Laboratory in Wake County, North Carolina[1]

Brand or Sponsor	Variety	Harvest Dates 1993 4/14	5/17	11/4	1993 Total	1992 Total	1991 Total	Three Year Average
		Pounds Per Acre Dry Forage[2]						
Green Seed	Triumph	2316	2175	2919	7410+	7567++	9891++	8289++
WVPB	TF88-B-1	2008	2458	2825	7291++	7374++	9680	8115++
NCSU	Mozark	2164	2439	2511	7113++	7022	9158	7765++
NCSU	Noninfected KY 31	1466	2936	2675	7078++	5705	7998	6927
FFR	TF 9001	2391	1914	2767	7072++	7143	9880++	8032++
NCSU	KY 31	1272	2793	3004	7069++	6356	8869	7431
NCSU	Infected KY 31	1213	3041	2794	7048++	5889	8120	7019
WVPB	TF 88-14	1185	2990	2844	7019++	6257	8814	7363
Green Seed	Cajun	1904	2203	2876	6983++	7692+	10427+	8367+
NCSU	Johnstone	1501	2862	2608	6971++	6224	5506	7234
NCSU	Martin	2081	2126	2688	6895++	7264++	9295	7818++
Pennington	Penngrazer	1384	2834	2673	6891++	6028	9167	7362
Southern States	Phyter	1664	2339	2782	6785++	5942	9884++	7537
Southern States	Forager	1824	2014	2797	6635++	6785	8398	7273
Green Seed	Cattle Club	1149	3067	2412	6627++	5841	8494	6987
NCSU	Rebel II	917	3185	2477	6579	5184	7163	6309
NZG	Roa	1493	2574	2354	6421	6111	8237	6923
Mean of Test		**1643**	**2585**	**2706**	**6935**	**6493**	**8940**	**7456**
L.S.D. Waller Duncan K Ratio=100		263	325	488	812	439	718	777
s.e.		229	276	293	450	382	608	489
Error d.f.		64	64	64	64	64	64	192
C.V.		14	11	11	6	6	7	7

[1]1993 Cultural Practices Soil Analysis pH 5.7, P-I 048, K-I 26, HM% 0.7
Fertilization (lb/acre) February 16, 1993 - 75N 50 P_2O_5, 50 K_2O, August 19,1993 - 75N
Weed Control (lb/acre a.i.) March 31, 1993 - 0.25 Banvel, 0.75 2,4D
For earlier years cultural practices, See Appendix Table 2A.
[2]Average of five replications.

Table 10. FVT 240 Dry forage yield of orchardgrass on Lake Wheeler Road Field Laboratory in Wake County, North Carolina[1]

Brand or Sponsor	Variety	Harvest Dates - 1993 4/26	6/2	1993 Total	1992 Total	1991 Total	Three Year Average
		Pounds Per Acre Dry Forage[2]					
NCSU	Boone	3701	941	4642+	7154++	6248++	6015+
Southern States	Hallmark	3405	952	4356++	7318+	6002++	5892++
Willamette Valley	OG-89-309	3298	1051	4350++	7039++	5967++	5785++
Green Seed	Shiloh	3395	932	4327++	6496++	6458+	5760++
Southern States	Benchmark	3372	893	4265++	7129++	6016++	5803++
Willamette Valley	OG-89-40	2943	1195	4139++	6477++	5403	5339
Willamette Valley	OG-89-19	2932	1195	4127++	6755++	5281	5388
Willamette Seed	Crown	3074	902	3976	6684++	5540++	5400
Oregon O.G. Comm.	Paiute	2967	947	3914	6292	5527++	5244
Olsen-Fennell	OFI-OG-4	2719	1193	3912	6519++	5143	5192
Olsen-Fennell	OFI-OG-T-88	2857	1029	3886	6751++	5876++	5504
Willamette Valley	OG-89-35	2617	1189	3806	6678++	5414++	5299
Oregon O.G. Comm.	Latar	2693	1058	3751	6163	5928++	5281
Green Seed	Green-89-103	2394	1125	3519	6609++	5349	5159
NZG	Wana	2044	1282	3326	6541++	4433	4767
Mean of Test		**2961**	**1059**	**4020**	**6707**	**5639**	**5455**
L.S.D. Waller Duncan K Ratio=100		499	121	551	1002	952	466
s.e.		402	101	409	565	668	558
Error d.f.		56	56	56	56	56	168
C.V.		14	10	10	8	12	10

[1]1993 Cultural Practices Soil Analysis - pH 5.7, P-I 048, K-I 26, HM% 0.7
Fertilization (lb/acre) February 16, 1993 - 75N, 50 P_2O_5, 50 K_2O, August 19, 1993 - 75N
Weed Control (lb/acre a.i.) March 31, 1993 - 0.25 Banvel, 0.75 2,4D
For earlier years cultural practices, see Appendix Table 2B.
[2]Average of five replications.
+Highest yield. ++Not different from highest yield.

Table 11. FVT 241 Dry forage yield of perennial ryegrass, rescuegrass,chickory and brome on Lake Wheeler Road Field Laboratory in Wake County, North Carolina[1]

Brand or Sponsor	Variety	Harvest Dates 1993 4/20	Harvest Dates 1993 5/28	1993 Total	1992 Total	1991 Total	Three Year Average
		Pounds Per Acre Dry Forage[2]					
NCSU	Tetrlite Per RG	2474	2166	4640+	4868	7655	5798++
NCSU	Bison Per RG	2380	2182	4562++	4886	7343	5671++
NCSU	Bastion Per RG	2722	1568	4290++	3691	6640	4916++
NZG	Super NU1 Per RG	2602	1534	4136++	4264	7151	5258++
NZG	Pacific Per RG	2735	1396	4131++	4833	6513	5232++
NZG	Matua (Rescue)	2051	2019	4071++	4647	9593+	6249+
NZG	Nu1 Per RG	2470	1465	3936	3960	7112	5079++
WVPB	Fir-90-1 Per RG	2247	1671	3918	4100	6857	5032++
Burlingham	MB30 Per RG	2740	1156	3896	4527	7286	5332++
Burlingham	MB31 Per RG	2682	1131	3813	4220	7056	5117++
NCSU	Citadel Per RG	2015	1773	3788	4233	5840	4680++
Daehnfeldt	Deborah Brome	1875	1870	3746	4496	6992	5173++
NZG	Puna Chickory	1217	1588	2805	6300+	8752	6177++
Mean of Test		**2324**	**1655**	**3979**	**4540**	**7292**	**5364**
L.S.D. Waller	Duncan K-Ratio=100	454	314	684	644	784	1736
s.e.		328	231	453	529	661	562
Error d.f.		36	36	36	48	48	132
C.V.		14	14	11	12	9	10

[1]1993 Cultural Practices Soil Analysis - pH 5.7, P-I 048, K-I 26, HM% 0.7
Fertilization (lb/acre) February 16, 1993 - 75N, 50 P_2O_5, 50 K_2O, August 19, 1993 - 75N
Weed Control (lb/acre a.i.) March 31, 1993 - 0.25 Banvel, 0.75 2,4D
For earlier years cultural practices, see Appendix Table 2C.

[2]1993 data average of four replication, 1991 and 1992 data average of five replications. Replication one dropped in 1993 due to crabgrass infestation.

+Highest yield. ++Not different from highest yield.

Table 12. FVT 245 Dry forage yields of bermuda and bahiagrass on Lake Wheeler Road Field Laboratory in Wake County, North Carolina[1]

Variety	Harvest Dates 1993[2] 5/2	6/28	7/29	8/24	1993 Total
	Pounds Per Acre Dry Forage[3]				
Coastal Bermuda	1767	1189	1193	3415	7563+
Tifton 44 Bermuda	1627	1076	1141	3377	7220++
Callie Bermuda	1027	1372	1197	3114	6710++
Tifton 78 Bermuda	1309	1095	948	2465	5817
Laurel Springs Bermuda	1504	618	617	2310	5049
Tifton 9 Bahia	1048	580	940	1919	4487
Pasto Rico Bermuda	178	398	324	1754	2654
Tierra Verde Bermuda	178	265	368	1546	2357
Guymon Bermuda	40	143	308	1471	1962
Pensacola Bahia	28	63	142	256	490
Mean of Test	**871**	**680**	**718**	**2163**	**4431**
L.S.D. Waller Duncan K Ratio=100	445	228	270	668	1352
s.e.	378	197	229	566	1160
Error d.f.	36	36	36	36	36
C.V.	43	29	32	26	26

[1]1993 Cultural Practices Soil Analysis pH 5.6, P-I 094, K-I 60, HM% 1.1

Fertilization (lb/acre) February 16, 1993 50 P_2O_5, 100 K_2O, 1000 Lime, March 31 - 50 N, May 10 - 45N July 2 - 50 N, July 29 - 50N

Weed Control (lb/acre a.i.) March 31, 1993 1.5 AAtrex, 1.0 2,4-D

[2]Considerable growth present in October; was not harvested. Will be burned in Sring of 1994.

[3]Average of five replications.

+Highest yield. ++Not different from highest yield.

Table 13. Biomass: Switchgrass variety/management trial - dry forage yields of switchgrass and tall fescue on Lake Wheeler Road Field Laboratory in Wake County, North Carolina[1]

Variety/ Treatment	1993 Harvest Dates 6/29	11/23	1993 Total
	Pounds Per Acre Dry Forage[2]		
Two Cut Management			
Alamo[3]	2978	4357	7335+
Cave-In-Rock	4033	2802	6835++
Kanlo	3284	3276	6561
Shelter	2713	2088	4801
NC 2-16		895	895
NC 1-16		467	467
Ky 31 Fescue	1630	3180	4810
One Cut Management			
Alamo[3]		5750	5750
Kanlo		5105	5105
Cave-In-Rock		3963	3963
Shelter		3005	3005
NC 2-16		791	791
NC 1-16		518	518
Mean of Test	**2928**	**2784**	**3911**
L.S.D. Waller Duncan K Ratio=100	981	889	1105
s.e.	515	580	724
Error d.f.	8	24	24
C.V. 18	21	19	

[1]1993 Cultural Practices Planted May 22, 1992. NC1-16 and NC2-16 reseeded on June 8, 1993.
1993 Soil Test pH 6.3, P-I 166+, K-I 70, HM% 0.8.
Fertilization (lb/acre) March 31, 1993 - 125 P_2O_5, 125 K_2O; May 10, 1993 - 45N; July 2, 1993 - 50N.
Weed Control (lb/acre a.i.) March 31, 1993 AAtrex 1.5; April 29, 1993 Princep 1.5
Insect Control (lb/acre a.i.) July 20, 1993 Sevin 1.5
[2]Average of three replications.
[3]Two cut treatment in June and November one-cut treatment in November.
+Highest yield. ++Not different from highest yield.

APPENDIX

Appendix Table 1. Temperature and precipitation for Wake County 1992-1993.

Month	Temperature (°F)						
	Mean	Mean Max.	Mean Min.	Highest	Day	Lowest	Day
1992							
November	53.0			77	3+	17	17+
December	44.0			67	23	18	25
1993							
January	44.6	54.4	34.8	71	6+	23	30
February	40.8	52.7	28.8	68	22	15	26
March	48.5	60.0	36.9	77	11+	15	15
April	57.2	71.4	43.0	80	30	34	18
May	69.1	80.2	58.0	87	29	45	22
June	77.1	88.9	65.4	99	5	51	2
July	79.8	90.2	69.4	99	10	62	31
August	78.2	83.3	63.1	96	30	62	23+
September	73.9	84.2	63.5	96	1	45	30+
October	60.0	71.5	48.5	82	5	34	2
November	52.7	63.6	41.8	84	15	28	29+
December	42.1	53.0	31.3	67	4	14	31

Month	Precipitation				
	Total	Departure from long term mean	Greatest in 24 hours	Day	Number days with precipitation 0.10 inches or over
1992	inches				
November	1.10	-2.30	.61	10	3
December	3.54	.20	.91	29	6
1993					
January	4.76	.92	1.12	8	8
February	2.33	-1.42	.66	12	6
March	6.46	2.37	2.03	4	6
April	4.74	1.43	1.25	6	5
May	3.51	.01	.82	26	7
June	.59	-3.61	.31	5	2
July	2.99	-1.85	.62	8+	7
August	2.91	-1.61	1.84	4	4
September	4.27	.44	1.81	5	5
October	4.32	1.20	2.61	30	7
November	2.84	- .56	1.12	27	4
December	1.99	-1.35	.73	15	5
1993 Total	41.71				

+Also an earlier date or dates.

Appendix Table 2. Cultural practices and fertilization for perennial forages.

A. FVT 239 FESCUE (Wake County)

Seeded September 10, 1990 at rate of 25 lbs/acre in 9-inch rows on a Cecil soil. Soil test report at planting: pH 6.2, P-I 056, K-I 26, HM% 0.7.

Fertilization (lbs/acre)

Date	N	P_2O_5	K_2O	Lime
September 10, 1990	50	50	50	--
February 28, 1990	75	--	--	--
August 27, 1991	75	--	--	--
February 4, 1992	75	50	50	--
Septmber 9, 1992	75	--	--	--

Weed Control (lbs/acre a.i.)

February 4, 1992	1 lb. 2,4-D
June 12, 1992	1 lb. 2,4-D

1993 Soil Test pH 5.7, P-I 166+, K-I 30, HM% 0.9

B. FVT 240 ORCHARDGRASS (Wake County)

Seeded September 10, 1990 at rate of 20 lb/acre in 9 inch rows on a Cecil soil. Soil test at planting: pH 5.6, P-I 142, K-I 81, HM% 0.7.

Fertilization (lb/acre)

Date	N	P_2O_5	K_2O	Lime
September 10, 1990	50	50	50	--
February 28, 1991	75	--	--	--
August 27, 1991	75	--	--	--
February 4, 1992	75	--	--	--
September 9, 1992	75	--	--	--

Weed Control (lbs/acre a.i.)

February 4, 1992	1 lb. 2,4-D
June 12, 1992	1 lb. 2,4-D

1993 Soil Test pH 6.2, P-I 159, K-I 78

C. FVT 241 RYEGRASS (Wake County)

Seeded September 10, 1990 at rate of: Perennial ryegrass 35 lb/acre, rescue 25 lb/acre, and chickory 25 lb/acre in 9 inch rows on a Cecil soil.

Fertilization (lb/acre)

Date	N	P_2O_5	K_2O	Lime
September 10, 1990	50	50	50	--
February 28, 1991	75	--	--	--
August 27, 1991	75	--	--	--
February 4, 1992	75	--	--	--
September 9, 1992	75	--	--	--

Weed Control (lbs/acre a.i.)

February 4, 1992	1 lb. 2,4D
June 12, 1992	1 lb. 2,4D

1993 Soil Test pH 6.2, P-I 092, K-I 58, HM% 0.7

D. FVT 244 ALFALFA (WAKE COUNTY)

Seeded September 5, 1991 at rate of 20 lb/acre on a Cecil soil. Soil test at planting: pH 6.0, P-I 084, K-I 98, HM% 0.7.

Fertilization (lb/acre)

Date	N	P_2O_5	K_2O	Lime	Boron
September 5, 1991	16	96	96	--	3

Insect Control (lb/acre a.i.)

Date	
April 14, 1992	1 lb. Furadan

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- Use tillage methods which reduce erosion and conserve moisture.
- Match crops to capabilities of individual fields.
- Maintain soil productivity by proper use of drainage and nutrients.

To Protect Water Resources

- Match nutrient and pesticide applications to crop needs.
- Use conservation practices (e.g. waterways, field borders, contours, cover crops) to reduce runoff of surface water.
- Plan irrigations to meet crop needs and reduce runoff.

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