

ADVANCES IN ALFALFA VARIETY DEVELOPMENT AND TESTING

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Introduction

Alfalfa (*Medicago sativa*) is historically the highest yielding, highest quality forage legume grown in Kentucky. It forms the basis of Kentucky's cash hay enterprise and is an important component in dairy, horse, beef and sheep diets. Over 300,000 acres of alfalfa are grown annually in Kentucky, with state yields averaging between 3 and 4 tons per acre.

The development and testing of alfalfa varieties is a dynamic process that impacts all Kentucky farmers. The Kentucky Alfalfa Variety Testing program was re-started in 1990 and is carried out through the efforts of several people, including Leonard Lauriault, Linda Brown (Western Kentucky University), Garry Lacefield, Paul Vincelli, and John Parr. Alfalfa varieties are being studied for yield in 6 plot studies over 3 locations (Lexington, Bowling Green, and Princeton). Other research being conducted include the effect of aphanomyces root rot on variety yield and persistence and the effect of variety on forage quality.

Variety Development Horizons

Alfalfa breeders are continuing to screen varieties for resistance to the major diseases of alfalfa, as well for yield and persistence and winter hardiness. These will continue to be the flagship qualifications for the success of a new variety of alfalfa. However, other traits are getting attention as well.

Winter Survival, Fall Dormancy, and Yield: Kentucky needs varieties that have at least a "5" winter dormancy rating on the Certified Alfalfa Seed Council scale. Most of our varieties are 3's and 4's, with even some 2's. The lower the number, the greater the winter hardiness. However, excessive winterhardiness can result in premature shutdown of growth in the fall and slow greenup in spring. This effect lowers the yield potential for such a variety. Breeders are working to get varieties that are winterhardy but yet are very productive in fall and spring.

Acid Tolerance: Many soils are not easily limed to near 7 pH and even then the cost may be considerable. Breeding efforts are underway in Georgia to select varieties that are tolerant of more acid soils.

Disease Resistance: In addition to the major diseases of interest to Kentucky (Phytophthora Root Rot, Bacterial Wilt, Fusarium Wilt, and Anthracnose), breeders are also incorporating resistance to Aphanomyces Root Rot (ARR) into new material. This is primarily a disease of areas more north of Kentucky, but ARR has been found in several soils of Kentucky. Research by Vincelli and Lauriault at UK has found that there is a trend for resistant varieties to yield more than ARR susceptible ones, but the effect is not

consistent between cuttings and among varieties. At present, UK does not recommend selecting a variety totally on its' ARR resistance. Research is continuing on this issue.

There is some evidence that there is some varietal resistance to sclerotinia crown and root rot, which is a devastating disease of fall seeded seedling stands of alfalfa. Progress has been slow, but experimental varieties are presently being evaluated in yield trials and in further disease screening to see if the resistance traits hold up.

Forage Quality: Breeders have approached forage quality in several ways, including selecting for improved resistance to leaf diseases, improved quality of alfalfa stems, selection for whole plant digestibility, and selection for the multifoliolate trait. Presently the varieties that are marketed as "high quality" are either multifoliolate or have been selected for whole plant quality. Research at UK and other universities indicates that there is no variety that consistently has significantly higher forage quality. UK research comparing 5 improved quality varieties versus 5 traditional varieties found that when you take the high quality varieties as a whole, they do have lower fiber levels (therefore greater digestibility) than the regular varieties. However, when you consider each variety separately, there is no difference. Research is also continuing on this issue.

Grazing Tolerance: Tolerance to grazing is probably the hottest and newest trait being looked at by breeders. Leading research in this area was conducted at the University of Georgia by Dr. Joe Bouton, and resulted in the release of 'AlfaGraze.' Dr. Bouton and other breeders are presently selecting several current variety materials to severe grazing pressure and some progress is being made. Look for the release of several varieties in the coming years. When evaluating these, look for quotations of actual grazing information.

Selecting an Alfalfa Variety

When choosing a variety, many factors must be considered. A desirable alfalfa variety will be locally adapted, and persistent, winter hardy, resistant to diseases, and available as certified seed, in addition to high-yielding.

Locally adapted and persistent. High yields in variety tests over a range of years and locations within the region are the best indication that a variety is locally adapted and persistent. Good performance in the Kentucky Alfalfa Yield Trials is evidence of local adaptation and persistence.

Winter Hardiness. Each variety has a fall dormancy rating ranging from 1 (very dormant) to 8 (non-dormant). Varieties with lower dormancy ratings are slower to start growing in the spring and stop growing sooner in the fall. Generally alfalfa should have a fall dormancy rating of 2-5 to perform well in Kentucky and have good winter survival. Ratings of 6 and above are not winter-hardy under Kentucky conditions.

Disease Resistance. In Kentucky, producers should use varieties that have at least an "MR" (moderate resistance) rating to four major diseases of alfalfa: Phytophthora root rot

(PRR), anthracnose (An), bacterial wilt (BW) and fusarium wilt (FW).

Phytophthora root rot is a fungal disease associated with poorly drained soils or excessive rainfall. This disease causes yellowish to reddish-brown areas on roots and crowns that eventually become black and rotten. The topgrowth of infected plants appears stunted and yellow.

Anthracnose, also a fungus, attacks the stems of alfalfa, preventing water flow to the rest of the shoot and causing sudden wilting. These wilted shoots have a characteristic "shepherd's crook" appearance. Anthracnose can also cause a bluish-black crown rot.

Bacterial wilt and fusarium wilt are infections of the water-conducting tissues of alfalfa roots that do not cause any noticeable root rot. These diseases prevent water flow to leaves resulting in wilting of shoots and the eventual death of infected plants. Roots infected with bacterial wilt often have a yellowish-brown discoloration of the inner woody cylinder of the taproot. Fusarium infection can be recognized by brown to red streaks in the inner woody cylinder of the taproot.

Other Diseases and Pests. Tests are currently under way to measure the effect of Aphanomyces root rot (ARR) on alfalfa yields in Kentucky. This disease is known to affect new seedlings but it is still unclear how ARR affects established alfalfa, and what impact, if any, this disease will have on alfalfa production in Kentucky.

Finally, there is no varietal resistance to Sclerotinia crown and stem rot. Although confusing claims exist, at this time no varieties have true genetic resistance to the alfalfa weevil and potato leafhopper. Purported resistance to potato leafhopper is actually resistance to yellowing, commonly called "hopper burn". Incorporating resistance to these and other pests of alfalfa is the goal of alfalfa breeders nationwide.

Certified seed. Buy high quality, certified seed that has high germination and few other crop and weed seed. This information will be on the label. The test date, which indicates when the germination was last tested, must be within the previous nine months. Using certified seed assures that the genetics and performance you are paying for are in the bag. Look for the blue tag, which must be attached to all bags of certified seed. Make sure that seed of the variety will be available when needed.

Description of the Tests

Alfalfa variety tests were established at Lexington (1990 & 1991), Bowling Green (1990 & 1992), and Princeton (1990). The soils at all locations are well-suited to alfalfa in that they are well-drained silt loams (Maury, Pembroke and Crider at Lexington, Bowling Green and Princeton, respectively). Plots are 4 x 15 feet in a randomized complete block design with four replications. In each test, 20 pounds of seed per acre were planted into a prepared seedbed using a disk drill. Current management recommendations for Kentucky for soil fertility and weed and insect control were employed in all tests. Plots were harvested with a sickle-type forage plot harvester. First cuttings in the seedling year are delayed to allow the alfalfa to completely reach maturity as indicated by full bloom, which generally occurs about 80 days after seeding. Otherwise, harvests were taken when the alfalfa was in the bud to early-flower stage. Fresh weights were measured in the field and occasional

subsamples were taken and weighed and oven dried and reweighed to determine percent dry matter.

Results and Discussion

Yield data (on an oven-dry basis) for all tests are reported in Tables 1-6. These tables list the varieties in order from highest to lowest total production (for the life of the test). Yields are given by cutting for 1992 and by year for each year of production.

Statistical analyses were performed on all alfalfa yield data to determine if the apparent differences are truly due to variety or just due to chance. The highest yielding variety in each column is marked with two asterisks (**). Those varieties not significantly different from the highest yielding variety are marked with one asterisk (*). To determine if two varieties are truly different, compare the difference between the two varieties to the Least Significant Difference (L.S.D.) at the bottom of the column. If the difference is equal to or greater than the L.S.D., the varieties are truly different when grown under the conditions at a given location. The Coefficient of Variation (C.V.), which is a measure of the variability of the data, is included for each column of means. Low variability is desirable and increased variability within a study results in higher C.V.'s and larger L.S.D.'s.

With the exception of Princeton, alfalfa yields across the state were about 1 ton/acre higher than 1992. That yield difference is due in part to the October harvest; however, yields of all cuttings, except June, were greater.

The 1990 seeding at Lexington declined visibly during 1992 due to a complex of crown rot organisms. Yields in 1993 reflected stand loss due to that infection. The 1992 seeding at Bowling Green appears to be more susceptible to drought than the area established in 1990. Since there was limited moisture throughout the summer at Bowling Green, regrowth after the August harvest was immeasurable in September.

The Bowling Green tests are on soils that are naturally infested with both *Phytophthora* and *Aphanomyces* root rot pathogens. In contrast, the Lexington and Princeton tests are on soils that are not infested with detectable levels of either pathogen. Performance of varieties common to all locations continues to be monitored to determine what effect these two pathogens have on yield and stand life. At present, it is not known whether ARR in particular has a negative effect on alfalfa plants and yield after establishment.

Summary

Consistent production of high yields of alfalfa is the result of good variety selection along with the implementation of good management techniques. Soil fertility should be maintained at recommended levels based on soil tests, and pests such as weeds, alfalfa weevil, and potato leafhopper should be controlled using the appropriate cultural and/or chemical methods. Harvesting established stands at the appropriate stage of maturity will produce four to five cuttings annually in Kentucky before mid-September.

TABLE 1. DRY MATTER YIELDS (TONS/ACRE) OF ALFALFA VARIETIES SOWN 18 MAY 1990 AT LEXINGTON, KENTUCKY.

VARIETY	1990	1991	1992	1993 HARVESTS					1993	4-YR
	TOTAL	TOTAL	TOTAL	MAY08	JUN08	JUL13	AUG09	SEP14	TOTAL	TOTAL
GARST630	2.66*	8.40*	3.11*	1.25*	0.63*	1.67*	0.58**	0.80*	4.92*	19.09**
ARROW	2.68*	8.16*	2.83*	1.19*	0.57*	1.73**	0.57*	0.89**	4.95**	18.62*
IMPACT	2.73*	8.21*	2.94*	0.99*	0.55*	1.65*	0.51*	0.79*	4.49*	18.37*
DAWN	2.62*	7.89*	3.24**	1.28**	0.63*	1.66*	0.42	0.76*	4.74*	18.29*
WAMPR	2.79**	8.19*	2.90*	0.87*	0.65**	1.55*	0.46*	0.74*	4.28*	18.15*
AGGRESSOR	2.79**	7.51	3.05*	0.88*	0.61*	1.68*	0.52*	0.75*	4.45*	17.80*
DART	2.62*	7.96*	2.95*	0.84*	0.57*	1.56*	0.50*	0.70*	4.18*	17.70*
MAJESTIC	2.60*	7.75*	2.86*	1.15*	0.59*	1.49*	0.48*	0.64	4.36*	17.57*
BUFFALO	2.61*	7.65*	2.75*	1.00*	0.56*	1.67*	0.47*	0.71*	4.41*	17.41*
APOLLO-SUPREME	2.76*	7.56	2.76*	1.00*	0.54*	1.48*	0.40	0.83*	4.25*	17.33*
DK-135	2.71*	8.45**	2.72	0.84	0.42	1.35	0.39	0.65	3.45	17.33*
5472	2.69*	7.50	2.70	0.97*	0.55*	1.54*	0.54*	0.69*	4.30*	17.18*
TOP-TON	2.53*	7.77*	2.77*	0.99*	0.53*	1.44	0.39	0.64	3.99	17.07*
5373	2.60*	7.53	2.63	0.98*	0.58*	1.40	0.49*	0.80*	4.26*	17.02*
ASSET	2.69*	7.45	2.76*	1.04*	0.49*	1.49*	0.43*	0.62	4.07*	16.96
ALFAGRAZE	2.57*	7.31	2.94*	0.91*	0.49*	1.57*	0.41	0.75*	4.12*	16.94
B-54	2.62*	7.67*	2.91*	0.78	0.38	1.41	0.43*	0.73*	3.73	16.93
RESISTAR	2.51*	7.86*	2.62	0.70	0.43	1.44	0.43*	0.81*	3.82	16.82
ANSTAR	2.67*	7.66*	2.47	0.74	0.42	1.66*	0.52*	0.67	4.01	16.81
WL317	2.68*	7.36	2.53	0.96*	0.51*	1.51*	0.48*	0.67	4.12*	16.69
VOYAGER	2.57*	7.48	2.53	0.86*	0.57*	1.41	0.46*	0.77*	4.07*	16.65
WL320	2.70*	7.35	2.58	0.89*	0.55*	1.44	0.40	0.71*	4.00	16.64
SABRE	2.55*	7.42	2.77*	0.86*	0.50*	1.47*	0.39	0.59	3.81	16.55
BELMONT	2.63*	7.45	2.58	0.83*	0.44	1.47*	0.36	0.60	3.70	16.34
83T27	2.63*	7.40	2.44	0.66	0.42	1.45	0.46*	0.81*	3.80	16.26
CIMARRON-VR	2.73*	7.79*	2.32	0.70	0.42	1.28	0.36	0.62	3.38	16.22
2852	2.71*	7.47	2.30	0.65	0.48*	1.32	0.50*	0.66	3.61	16.09
EXCALIBUR	2.64*	7.71*	2.37	0.86*	0.38	1.15	0.38	0.54	3.31	16.02
89-128	2.75*	6.83	2.43	0.91*	0.55*	1.42	0.38	0.74*	3.99	15.98
LIBERTY	2.72*	6.90	2.24	0.72	0.42	1.41	0.44*	0.66	3.66	15.52
WL225	2.56*	7.06	2.30	0.72	0.37	1.35	0.45*	0.69*	3.58	15.50
SARANAC-AR	2.78*	7.13	2.19	0.55	0.36	1.13	0.36	0.55	2.95	15.05
VS481	2.50*	6.87	2.08	0.66	0.40	1.32	0.38	0.69*	3.44	14.89
HAYMARK	2.36	6.70	2.08	0.77	0.38	1.43	0.35	0.63	3.56	14.71
MULTIKING-I	2.38	6.56	2.15	0.53	0.33	1.30	0.40	0.57	3.13	14.21
MEAN	2.64	7.54	2.62	0.87	0.49	1.47	0.44	0.70	3.97	16.76
C.V., %	8.80	7.78	14.83	37.70	26.05	13.40	26.57	22.35	15.95	8.92
L.S.D., 5%	0.33	0.82	0.54	0.46	0.18	0.28	0.16	0.22	0.89	2.10

1990 TOTAL INCLUDES 2 HARVESTS DATED AUG03 AND SEP11.

1991 TOTAL INCLUDES 5 HARVESTS DATED MAY15, JUN18, JUL23, AUG27, AND OCT29.

1992 TOTAL INCLUDES 3 HARVESTS DATED MAY11, JUN16, AND JUL14.

**HIGHEST YIELDING VARIETY IN THE COLUMN.

*NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY IN THE COLUMN BASED ON THE L.S.D.

TABLE 2. DRY MATTER YIELDS (TONS/ACRE) OF ALFALFA VARIETIES SOWN 11 APR 1991 AT LEXINGTON, KENTUCKY.

VARIETY	1991	1992	1993 HARVESTS						1993	3-YR
	TOTAL	TOTAL	MAY08	JUN07	JUL12	AUG09	SEP14	OCT27	TOTAL	TOTAL
ABI-9043	2.57*	5.84	1.82**	0.76**	1.57*	0.65*	2.05*	0.23	7.09*	15.49**
2833	2.68*	6.70**	1.14	0.48	1.36	0.57	2.18*	0.25	5.99	15.38*
MULTISTAR	2.52*	6.05	1.44*	0.60*	1.55*	0.62*	2.26*	0.34*	6.80*	15.37*
DAWN	2.47*	5.39	1.65*	0.65*	1.52*	0.81**	2.44**	0.35*	7.42**	15.27*
AP-8843	2.64*	5.73	1.49*	0.66*	1.56*	0.71*	2.14*	0.31*	6.86*	15.23*
WL320	2.64*	5.79	1.24	0.59*	1.44	0.75*	2.17*	0.44**	6.64*	15.07*
APOLLO-SUPREME	2.76	5.67	1.41*	0.66*	1.50*	0.66*	2.12*	0.28*	6.64*	15.06*
UN-72	2.68*	5.81	1.42*	0.57	1.43	0.52	2.20*	0.36*	6.51*	15.00*
GARST645	2.22	5.98	1.48*	0.62*	1.56*	0.68*	2.18*	0.18	6.71*	14.91*
AGRIMATE	2.77**	5.11	1.32	0.64*	1.59*	0.77*	2.24*	0.37*	6.93*	14.81*
LEGACY	2.62*	5.68	1.53*	0.61*	1.42	0.54	2.12*	0.27	6.50*	14.80*
DK-125	2.51*	5.56	1.61*	0.70*	1.56*	0.61*	1.92*	0.31*	6.71*	14.77*
AGGRESSOR	2.57*	5.39	1.40*	0.68*	1.41	0.70*	2.32*	0.28*	6.79*	14.76*
CROWN-II	2.37*	5.87	1.43*	0.59*	1.42	0.63*	2.05*	0.27	6.39*	14.63*
WAMPR	2.57*	5.41	1.45*	0.67*	1.52*	0.66	2.13*	0.28*	6.61*	14.58*
VENTURE	2.49*	5.47	1.29	0.74*	1.66**	0.61*	1.98*	0.26	6.54*	14.50*
TERMNATOR	2.23	5.22	1.24	0.55	1.39	0.68*	2.32*	0.37*	6.54*	13.99*
WL322HQ	2.18	5.45	1.67*	0.69*	1.29	0.57	1.89	0.24	6.35*	13.99*
AS-G	2.33	5.15	1.44*	0.62*	1.49*	0.54	2.13*	0.24	6.47*	13.95*
LIBERTY	2.70*	4.95	1.27	0.45	1.34	0.67*	2.05*	0.38*	6.17	13.82
BUFFALO	2.41*	5.33	1.15	0.65*	1.41	0.56	1.90	0.24	5.91	13.66
AS-BD	2.37*	5.22	1.31	0.49	1.32	0.57	2.03*	0.32*	6.05	13.65
WL317	2.44*	4.99	1.17	0.57	1.39	0.56	1.89	0.22	5.80	13.23
SARANAC-AR	2.28*	4.78	1.23	0.55	1.39	0.57	1.93*	0.25	5.92	12.97
MEAN	2.05	5.52	1.40	0.62	1.45	0.63	2.11	0.29	6.51	14.54
C.V., %	14.90	10.59	21.91	18.19	9.30	24.94	17.96	39.98	11.75	7.59
L.S.D., 0.05	0.53	0.34	0.43	0.16	0.19	0.22	0.53	0.17	1.08	1.56

1991 TOTAL INCLUDES 4 HARVESTS DATED JUL10, AUG05, SEP09, AND OCT31.

1992 TOTAL INCLUDES 5 HARVESTS DATED MAY11, JUN15, JUL14, AUG13, AND SEP17.

**HIGHEST YIELDING VARIETY IN THE COLUMN.

*NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY IN THE COLUMN BASED ON THE 5% L.S.D.

TABLE 3. DRY MATTER YIELDS (TONS/ACRE) OF ALFALFA VARIETIES SOWN 13 APR 1990 AT BOWLING GREEN, KENTUCKY.

VARIETY	1990	1991	1992	1993 HARVESTS						1993	4-YR
	TOTAL	TOTAL	TOTAL	MAY13	JUN09	JUL14	AUG11	SEP16	OCT25	TOTAL	TOTAL
AGGRESSOR	4.93*	7.24*	5.05*	1.42*	1.19**	1.46*	1.06*	0.79*	0.37	6.28**	23.50**
MAGNUM-III	4.57*	7.30**	5.19*	1.17*	1.12*	1.41*	1.09*	0.90**	0.45*	6.13*	23.20*
GARST630	4.50*	7.18*	4.85*	1.23*	1.11*	1.48*	1.03*	0.79*	0.50**	6.14*	22.67*
5472	4.31	7.08*	4.90*	1.36*	1.12*	1.50**	1.13**	0.68	0.39	6.17*	22.67*
DART	4.80*	6.96*	5.05*	1.13	1.04*	1.40*	0.97	0.69	0.32	5.55	22.36*
ALFAGRAZE	4.60*	7.20*	5.07*	1.17*	1.04*	1.27	1.05*	0.73	0.26	5.53	22.30*
B-54	4.86*	6.71	4.98*	1.10	1.03	1.46*	1.02*	0.69	0.34	5.65	22.20*
ASSET	5.09**	7.19*	4.51	0.93	0.95	1.30	1.02*	0.78*	0.36	5.33	22.11*
5373	4.54*	6.76*	4.89*	1.43**	1.05*	1.32*	1.02*	0.71	0.39	5.93*	22.11*
WL225	4.93*	7.16*	4.61	1.08	0.99	1.33*	0.99	0.69	0.30	5.38	22.08*
DAWN	4.43	6.79*	5.21**	1.18*	1.05*	1.30	1.01*	0.71	0.33	5.58	22.01*
CROCKETT	4.78*	7.09*	4.69	0.97	0.95	1.33*	1.00*	0.74	0.40	5.39	21.95*
APOLLO-SUPREME	4.55*	6.98*	4.73	1.08	0.96	1.32*	1.12*	0.80*	0.33	5.61	21.86
SABRE	4.72*	6.76*	4.69	1.38*	1.03	1.36*	0.95	0.63	0.27	5.62	21.79
MAJESTIC	4.69*	6.90*	4.75	1.15*	1.00	1.27	0.97	0.71	0.30	5.41	21.76
WL320	4.87*	6.98*	4.32	1.08	0.87	1.41*	0.97	0.69	0.35	5.36	21.53
ARROW	4.17	7.03*	4.80	1.07	1.08*	1.27	0.97	0.73	0.34	5.46	21.46
89-128	4.49*	7.01*	4.50	1.04	0.90	1.36*	1.01*	0.66	0.39	5.35	21.35
WL317	4.58*	6.82*	4.32	1.05	0.82	1.30	1.02*	0.75	0.38	5.31	21.03
CIMARRON-VR	4.95*	6.66	4.31	1.12	0.78	1.27	0.94	0.61	0.26	4.98	20.90
2852	4.79*	6.95*	4.11	0.86	0.80	1.27	0.91	0.72	0.35	4.92	20.77
VS633	4.52*	7.02*	4.25	0.90	0.82	1.25	0.95	0.66	0.35	4.94	20.73
HAYMARK	4.64*	6.46	4.19	1.30*	0.88	1.34*	0.94	0.71	0.27	5.43	20.72
BELMONT	4.43	6.60	4.53	1.17*	0.94	1.26	0.85	0.61	0.32	5.15	20.71
WAMPR	4.19	6.94*	4.63	1.08	0.90	1.16	0.86	0.62	0.28	4.92	20.68
RESISTAR	4.04	6.66	4.56	1.16*	0.96	1.27	0.91	0.67	0.31	5.29	20.54
LIBERTY	4.27	6.73	4.24	1.14*	0.85	1.29	1.00*	0.69	0.27	5.24	20.48
ANSTAR	4.36	6.48	4.33	1.29*	0.92	1.15	0.96	0.67	0.26	5.25	20.42
BUFFALO	3.88	6.26	4.26	1.05	0.89	1.23	0.92	0.76	0.31	5.16	19.55
EXCALIBUR	4.79*	6.66	3.56	0.83	0.73	1.11	0.88	0.58	0.23	4.35	19.36
SARANAC-AR	4.42	6.55	4.00	0.87	0.71	1.12	0.86	0.56	0.15	4.26	19.23
MULTIKING-I	3.70	6.22	4.49	1.10	0.82	1.08	0.86	0.57	0.19	4.62	19.03
MEAN	4.54	6.85	4.58	1.12	0.95	1.30	0.98	0.70	0.32	5.37	21.34
C.V., %	9.81	5.94	5.91	19.32	11.83	11.01	10.18	14.51	21.51	8.32	5.20
L.S.D., 0.05	0.63	0.57	0.38	0.30	0.16	0.20	0.14	0.14	0.10	0.63	1.56

1990 TOTAL INCLUDES 4 HARVESTS DATED JUN26, AUG10, SEPO6, AND OCT30.

1991 TOTAL INCLUDES 6 HARVESTS DATED MAY02, JUN05, JUL11, AUG16, SEP12, AND OCT30.

1992 TOTAL INCLUDES 5 HARVESTS DATED MAY14, JUN17, AUG10, AND SEP11.

**HIGHEST YIELDING VARIETY IN THE COLUMN.

*NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY IN THE COLUMN BASED ON THE 5% L.S.D.

TABLE 4. DRY MATTER YIELDS (TONS/ACRE) OF ALFALFA VARIETIES SOWN 14 APR 1992 AT BOWLING GREEN, KENTUCKY.

VARIETY	1992	1993 HARVESTS					1993	2-YR
	TOTAL	MAY12	JUN09	JUL14	AUG11	OCT25	TOTAL	TOTAL
LEGACY	4.47*	1.87*	1.26*	1.20**	1.16**	0.46*	5.95**	10.42**
APOLLO-SUPREME	4.80**	1.71	1.27*	1.08*	1.10*	0.40*	5.56*	10.36*
MAGNUM-III	4.36*	1.83*	1.23*	1.01*	1.12*	0.43*	5.63*	9.98*
MULTISTAR	4.39*	2.07**	1.25*	0.91	0.88*	0.45*	5.56*	9.95*
5373	4.24*	1.65	1.29*	1.05*	0.98*	0.47**	5.44*	9.68*
AGGRESSOR	4.03*	1.79*	1.23*	1.09*	1.01*	0.45*	5.57*	9.60*
ZENITH	4.03*	1.89*	1.20*	1.11*	0.90*	0.44*	5.55*	9.58*
CIMARRON-VR	4.22*	1.69*	1.11	1.07*	0.95*	0.44*	5.25*	9.48*
WEBFOOT-MPR	4.06*	1.74*	1.25*	1.10*	0.96*	0.36	5.40*	9.46*
89-30	4.37*	1.62	1.11	1.00*	0.87*	0.43*	5.02	9.39*
2852	4.15*	1.78*	1.13	1.09*	0.81*	0.38*	5.18*	9.34*
DK133	4.12*	1.63	1.17*	1.00*	0.87*	0.41*	5.08	9.19
MULTIKING-J	4.30*	1.86*	1.10	0.83	0.76	0.33	4.88	9.18
ASSET	3.61	1.81*	1.25*	1.13*	0.92*	0.41*	5.51*	9.12
DAWN	3.83	1.89*	1.23*	0.89	0.90*	0.35	5.27*	9.09
GARST630	3.60	1.64	1.30*	1.03*	1.07*	0.42*	5.46*	9.07
5454	3.39	1.76*	1.34**	1.12*	0.95*	0.46*	5.64*	9.03
SARANAC-AR	4.33*	1.72	1.12	0.76	0.74	0.32	4.67	8.99
CROWN-II	3.76	1.79*	1.27*	0.92	0.71	0.33	5.01	8.77
A9008	3.60	1.84*	1.24*	0.92	0.80*	0.35	5.15	8.75
CF-EDGE	3.78	1.72	1.21*	0.94	0.76	0.34	4.98	8.75
FORTRESS	3.54	1.69	1.15	1.04*	0.93*	0.40*	5.21*	8.75
WAMPR	3.48	1.62	1.15	1.00*	0.96*	0.41*	5.14	8.62
STINE-9227	3.87	1.53	1.18*	0.87	0.72	0.32	4.62	8.49
DART	3.45	1.64	1.21*	0.97	0.85*	0.36	5.04	8.49
RESISTAR	3.75	1.64	1.14	0.93	0.65	0.35	4.71	8.46
WL322HQ	3.70	1.62	1.08	0.91	0.80*	0.34	4.75	8.45
DOMINATOR	3.83	1.66	1.05	0.82	0.68	0.40*	4.60	8.43
TRIDENT	3.51	1.66	1.22*	0.85	0.69	0.33	4.74	8.25
BUFFALO	3.40	1.44	1.06	0.93	1.02*	0.27	4.72	8.12
ARC	3.55	1.45	0.92	0.77	0.63	0.27	4.04	7.60
MEAN	3.92	1.72	1.18	0.98	0.88	0.38	5.14	9.06
C.V., %	14.92	14.44	10.81	16.14	30.16	20.63	10.91	9.24
L.S.D.,0.05	0.82	0.35	0.18	0.22	0.37	0.11	0.79	1.18

1992 TOTAL INCLUDES 3 HARVESTS DATED JUL15, AUG10, AND SEP11.

**HIGHEST YIELDING VARIETY IN THE COLUMN.

*NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY IN THE COLUMN BASED ON THE 5% L.S.D.

TABLE 5. DRY MATTER YIELDS (TONS/ACRE) OF ALFALFA VARIETIES SOWN 22 AUG 1990 AT PRINCETON, KENTUCKY.

VARIETY	1991	1992	1993 HARVESTS						1993	3-YR
	TOTAL	TOTAL	MAY12	JUN10	JUL15	AUG12	SEP15	OCT27	TOTAL	TOTAL
RESISTAR	5.61**	4.63**	1.29*	0.80	1.52	0.39*	0.59*	0.37*	4.96*	15.19**
GARST630	5.09*	4.46*	1.40*	1.03**	1.62*	0.49**	0.62**	0.47**	5.63**	15.18*
5472	5.14*	4.41*	1.31*	0.92*	1.52	0.40*	0.54*	0.41*	5.10*	14.65*
2852	4.98*	4.49*	1.52**	0.76	1.61*	0.39*	0.50*	0.32	5.11*	14.57*
ASSET	5.38*	4.48*	1.07*	0.73	1.60*	0.36	0.48*	0.35	4.59*	14.45*
ARROW	5.10*	4.34*	1.25*	0.84*	1.54	0.41*	0.53*	0.31	4.88*	14.32*
WAMPR	5.00*	4.44*	1.21*	0.88*	1.37	0.38*	0.48*	0.35	4.67*	14.12*
CIMARRON-VR	5.16*	4.24*	1.24*	0.70	1.63*	0.34	0.49*	0.28	4.69*	14.09*
AGGRESSOR	4.96*	4.40*	1.24*	0.84*	1.35	0.35	0.52*	0.35	4.66*	14.02*
WL317	4.60	4.36*	1.26*	0.70	1.92**	0.37	0.49*	0.30	5.04*	13.99*
ANSTAR	5.08*	4.32*	1.10*	0.73	1.58*	0.36	0.53*	0.28	4.58*	13.97*
ALFAGRAZE	4.29	4.50*	1.29*	0.81	1.63*	0.38*	0.48*	0.17	4.76*	13.55*
MAJESTIC	4.96*	4.13*	1.21*	0.76	1.39	0.37	0.45	0.23	4.42	13.51*
WL225	4.96*	3.98*	1.15*	0.77	1.39	0.35	0.52*	0.32	4.50	13.44*
BUFFALO	4.67	4.08*	1.08*	0.76	1.29	0.39*	0.56*	0.35	4.42	13.17*
DAWN	4.71	4.03*	1.12*	0.72	1.52	0.33	0.50*	0.23	4.42	13.16*
5373	4.79*	3.98*	1.28*	0.75	1.33	0.30	0.42	0.31	4.39	13.16*
APOLLO-SUPREME	4.61	3.99*	1.13*	0.77	1.23	0.37	0.47*	0.28	4.24	12.84*
WL320	4.77	3.63	1.08*	0.66	1.57	0.36	0.43	0.32	4.42	12.82*
DART	4.71	4.05*	0.96	0.68	1.34	0.33	0.41	0.27	3.98	12.75*
HAYMARK	4.89*	3.74	0.96	0.64	1.49	0.30	0.38	0.24	4.01	12.64
LIBERTY	4.15	4.01*	1.08	0.57	1.79*	0.31	0.42	0.25	4.41	12.56
83T27	4.33	3.95*	0.84*	0.74	1.42	0.35	0.49*	0.38*	4.21	12.49
B-54	4.32	3.87*	1.00	0.74	1.53	0.30	0.36	0.24	4.17	12.36
SARANAC-AR	4.68	3.80	1.00	0.52	1.44	0.25	0.39	0.17	3.77	12.25
BELMONT	4.50	3.63	1.10*	0.62	1.33	0.27	0.39	0.29	4.00	12.12
LEGEND	4.48	3.71	0.83	0.58	1.36	0.28	0.49*	0.24	3.77	11.97
SABRE	3.64	3.40	0.99	0.63	1.41	0.28	0.39	0.19	3.89	10.93
EXCALIBUR	4.55	3.17	0.51	0.28	1.32	0.22	0.33	0.13	2.79	10.51
MEAN	4.76	4.08	1.12	0.72	1.48	0.34	0.47	0.29	4.43	13.26
C.V., %	12.44	14.01	30.23	21.82	17.04	24.64	25.30	30.93	17.52	13.02
L.S.D., 0.05	0.83	0.80	0.48	0.22	0.36	0.12	0.17	0.12	1.09	2.45

1991 TOTAL INCLUDES 5 HARVESTS DATED MAY02, JUN16, JUL10, AUG14, AND SEP11.

1992 TOTAL INCLUDES 5 HARVESTS DATED MAY14, JUN18, JUL16, AUG12, AND SEP10.

**HIGHEST YIELDING VARIETY IN THE COLUMN.

*NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY IN THE COLUMN
BASED ON THE 5%

L.S.D.

TABLE 6. DRY MATTER YIELDS (TONS/ACRE)
OF
ALFALFA VARIETIES SOWN 23 APR 1993 AT
PRINCETON, KENTUCKY.

VARIETY	1993 HARVESTS		1993 TOTAL
	JUL15	OCT26	
AS-BG	1.01*	0.48**	1.49**
ZENITH	1.06**	0.42*	1.48*
MULTIKING-I	1.06**	0.37*	1.43*
GA-AG-MP	1.00*	0.40*	1.40*
APOLLO-SUPREME	0.98*	0.38*	1.36*
FORTRESS	0.93*	0.42*	1.35*
ARCHER	0.88*	0.46*	1.34*
CRYSTAL	0.91*	0.38*	1.29*
LEGACY	0.83*	0.45*	1.28*
SARANAC-AR	0.90*	0.33	1.23*
ICI631	0.88*	0.35	1.23*
ARC	0.87*	0.33	1.20*
A9109	0.83*	0.35	1.18*
AGGRESSOR	0.77*	0.39*	1.16*
GA-AG-MP1	0.88*	0.26	1.14*
ICI645	0.80*	0.32	1.12*
2852	0.74*	0.37*	1.12*
5454	0.77*	0.34	1.11*
DAWN	0.76*	0.34	1.09*
DART	0.74*	0.35	1.09*
DOMINATOR	0.73*	0.36	1.09*
BUFFALO	0.78*	0.30	1.09*
WL323	0.71	0.38*	1.09*
5373	0.76*	0.33	1.08*
MULTISTAR	0.77*	0.31	1.08*
WAMPR	0.68	0.40*	1.07*
GA-AG-MPG	0.76*	0.27	1.03
RESISTAR	0.69	0.33	1.02
DK-133	0.64	0.36	1.00
MEAN	0.83	0.36	1.19
C.V., %	29.54	23.05	25.58
L.S.D., 0.05	0.34	0.12	0.43

**HIGHEST YIELDING VARIETY IN THE
COLUMN.

*NOT SIGNIFICANTLY DIFFERENT FROM THE
HIGHEST YIELDING VARIETY IN THE COLUMN
BASED ON THE 5% L.S.D.