Fine tuning varietal selection for the Mid-South

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There are many new alfalfa varieties that have come on the market each year. In fact, it can be hard keeping up with all the developments. In the following pages I will overview most of the important traits that can be found in new varieties. These include Low Lignin, Roundup Ready®, potato leafhopper resistance, higher quality, resistance to new diseases, and more… Many times I am asked "Are new varieties really worth the cost?" The best way to answer that question is to consider work by Dr. Jimmy Henning where he summarized 24 location years of Kentucky alfalfa yield data and found that the best 5 varieties in each test yielded 0.9 tons/A higher than the checks. Over a 5 year stand life this conservatively translates into more than $400 added profit. New varieties can make a difference! That being said, the most important thing that you should do when you go to your local seed dealer is to be an educated consumer. Review recent variety test results by going to the NEW Kentucky Forage Website at forages.ca.uky.edu and clicking on image labeled "Variety Trials."

For a full list of alfalfa varieties that are currently being marketed in the U.S. see the pull out leaflet in the November 2017 issue of Hay and Forage Grower. This contains all 181 varieties currently on the market and their winter survival, fall dormancy, and their disease and insect resistance ratings. It's published as the "2018 Alfalfa Variety Ratings" by the National Alfalfa and Forage Alliance and can be downloaded from the NAFA website at www.alfalfa.org. In our KY Alfalfa Test reports we provide a summary of resistance to the most common alfalfa diseases, but the list in this leaflet is much more comprehensive. We have included a photocopy of the leaflet at the end of this proceedings article.

Disease Resistance

Alfalfa breeding companies have been extremely successful in improving alfalfa resistance to diseases compared with old varieties like Buffalo. When choosing a variety to plant on your farm in Kentucky look for ones that are Resistant (R) or Highly Resistant (HR) to the following diseases: Bacterial Wilt, Verticillium Wilt, Fusarium Wilt, Anthracnose, Phytophthora Root Rot, and Aphanomyces. With Aphanomyces (a disease that affects seedling alfalfa stands) there are two "races" or strains of the disease. The best protection would be to select for varieties that are resistant to both Aphanomyces Race 1 and Race 2.

Insect Resistance

When you review the NAFA Variety Leaflet you will notice that new alfalfa varieties have resistance rating for many insect pests. The primary one listed that is of concern in Kentucky is potato leafhopper. We rarely have economic damage from pea aphid and the other aphids are only a concern in the alfalfa seed production fields in the western U.S. Of course, the alfalfa weevil can be a significant pest in KY, but there is no genetic resistance to this insect and when damage occurs insecticides are the only method for complete control.

Potato Leafhopper Resistance

Plant breeding companies have continued to make progress in the development of potato leafhopper (PLH) resistant varieties. These varieties not only show high levels of resistance to PLH feeding, but also have good forage production and high levels of disease resistance. The most recently released varieties have been through 4 to 5 stages of improvement since the first varieties came on the market almost 20 years ago. For example, results from a regional trials seeded in Ames, IA and S. Charleston, OH in the showed that the newest PLH resistant varieties yielded 15 to 50% higher than the checks during the seeding year when subjected to PLH feeding. Note: even the most resistant varieties may require an insecticide spray during the seedling year since young plants are the more venerable to damage.

Roundup Ready® Alfalfa

Extensive research shows that Roundup Ready® varieties have excellent tolerance to Roundup, good disease resistance, and good yield potential. Roundup tolerance is definitely a useful trait in alfalfa, but Roundup Ready® varieties are not necessarily superior for other traits. Roundup Ready® varieties will be best used on fields where traditional weed control strategies have been unsuccessful. Some current advertisements promote Roundup Ready® varieties as significantly higher yielding and higher quality. These statements are not untrue, but they are based on the fact that weedy stands are lower yielding and lower quality than clean stands. Therefore, if you keep your existing stands weed free, then you will also produce high yields of high quality forage.

The advantages of Roundup Ready® alfalfa are self-explanatory, but let me list a few advantages: Improved likelihood of successful establishment, decreased competition from weeds and/or cover crops, decreased crop injury from herbicides, increased management flexibility, no crop rotation restrictions, decreased herbicide costs, and ease of use. Roundup Ready® alfalfa varieties are available in multiple brands with the same combination of traits available to growers in conventional varieties. In Kentucky we conduct a separate set of experiments comparing Roundup

Ready varieties. The most recent test is shown below in Table 7 from the 2017 Alfalfa Report on the UK forage website forages.ca.uky.edu.

Table 7. Dry matter yields and stand persistence of Roundup Ready alfalfa varieties sown March 31, 2015, at Lexington, Kentucky.[1]

		Percent Stand						Yield (tons/acre)								
		2015		2016		2017		2015	2016	2017						3-year
Variety	FD[2]	Jun 12	Oct 15	Mar 18	Sep 27	Feb 23	Sep 26	Total	Total	May 2	Jun 6	Jul 8	Aug 8	Sep 14	Total	Total
Commercial Varieties-Available for Farm Use																
54R02 RR	4	99	99	98	96	95	95	2.61	7.49	1.63	1.71	1.34	1.06	0.81	6.56	16.66*
55VR08 RR	5	100	100	100	98	97	97	2.42	6.92	1.68	1.77	1.54	1.33	0.79	7.11	16.44*
Ameristand 405T RR	4	99	99	99	97	96	96	2.21	6.87	1.50	1.87	1.55	1.02	0.95	6.91	15.98*
Alfagraze 600 RR	6	99	100	98	95	94	95	2.67	6.55	1.34	1.70	1.19	1.22	0.80	6.25	15.47*
Ameristand 455TQ RR	4	99	98	99	98	96	97	2.06	6.62	1.39	1.98	1.45	1.25	0.68	6.75	15.43*
WL 356HQ RR	4	97	98	98	96	96	96	1.79	7.10	1.54	1.73	1.20	1.02	0.77	6.26	15.15*
Ameristand 433T RR	3	98	99	99	95	94	95	2.13	6.57	1.44	1.67	1.41	0.94	0.63	6.09	14.79*
Alfagraze 300 RR	3	98	99	99	97	96	96	1.64	6.05	1.75	1.70	1.44	1.18	0.74	6.81	14.50*
428 RR	4	97	97	98	96	95	96	1.79	6.35	1.19	1.73	1.35	1.08	0.73	6.08	14.22*
55V06 RR	5	99	99	99	97	96	96	1.61	5.92	1.41	1.60	1.34	1.15	0.70	6.19	13.71*
Mean		98	99	99	96	95	96	2.09	6.64	1.49	1.75	1.38	1.13	0.76	6.50	15.23
CV,%		2	2	2	2	2	2	30.03	15.77	20.93	18.14	16.72	25.45	33.39	12.59	14.42
LSD,0.05		3	2	2	3	2	2	0.91	1.52	0.45	0.46	0.34	0.42	0.37	1.19	3.19

[1] This trial was sprayed with Roundup once in 2015, twice in 2016 and once in 2017.
[2] FD=Fall Dormancy.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Reduced or Low-lignin Alfalfa

Alforex and Forage Genetics International have taken different approaches to developing reduced lignin alfalfa varieties. Alforex developed its Hi-Gest lines by conventional plant breeding methods. Forage Genetics developed HarvXtra by down regulating the pathways of lignin synthesis. In other words, they genetically modified the plant so that it did not produce as much lignin. They then combined the low-lignin trait with the Roundup Ready trait to produce a transgenic variety. HarvXtra is widely available in a number of marketed varieties. For a more complete overview of Low-lignin varieties go to the KY Alfalfa Proceedings article from 2015. It can be downloaded from the UK library at https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1005&context=ky_grazing.

Improved Quality

Many companies have made significant improvements in alfalfa quality over the last 15 years. If you are producing for a market that pays for top quality then a high quality variety may be an option for you. In most case “high quality varieties” have been selected for reduced NDF digestibility. In other words, this refers to how the digestibility of the fiber portion of the plant. Remember though that cutting management is still the most important factor to insure high quality. When comparing varieties advertised for high quality, make sure to compare at the same stage of maturity. Almost without

exception, an alfalfa variety cut at the bud stage will be higher quality than one cut at a bloom stage.

Grazing Tolerance

Americas Alfalfa and other companies have released a number of grazing tolerant varieties during the last 25 years. Grazing tolerance has been combined with traffic tolerance to provide further benefits from dual purpose alfalfa plantings. If you are planning to pasture your alfalfa stand for much of the growing season, then consider planting a grazing tolerant variety. Before planting, consult variety test bulletins that show variety differences to grazing tolerance. In Kentucky, go to forages.ca.uky.edu, click on “Variety Trials” and look at the Alfalfa Grazing Tolerance Reports from the last few years. The summary page of how varieties have performed over time is at the end of each report and in the “2017 Long Term Summary of Kentucky Forage Variety Trials.”

New Traits: Bloat Resistance, By-pass Protein, Pharmaceuticals, etc…

A tremendous amount of research is taking place on the development of biotech or genetically engineered alfalfa varieties. These include the development of bloat resistant alfalfa through the expressive of tannins. Low levels of tannins would also allow to have improved by-pass protein. Progress is being made on “low lignin alfalfa” that will result in improved fiber digestibility. The USDFRC estimates that a 10% increase in cell wall digestibility (from lower lignin) would increase milk and beef production by $350 million/yr and reduce manure production by 2.8MM tons/yr. Companies are developing biopharmaceutical products using alfalfa as the protein production platform. In other words, alfalfa is genetically engineered to produce pharmaceuticals which are later extracted from the plant material. Although tannin containing alfalfa continued to be developed, it is unclear when varieties containing this trait will be on the market.

Fall Dormancy and Winter Survival

Fall dormancy (FD) is a relative measure of the ability of alfalfa to survive the winter. The lower the FD number, the less the variety grows in the fall, therefore the more carbohydrate reserves that are translocated to the root system for winter. In Alaska growers would plant a FD 1 varieties, in North Dakota FD 2 varieties are popular, in Wisconsin many FD 3 varieties are planted, and so forth until you get to southern CA (and there are no cold temperatures) and FD 9 and 10 varieties are commonly planted. Alfalfa varieties in the fall dormancy (FD) range of 3, 4 and 5 are best adapted to Kentucky. Rarely do we have a winter where FD 3 would be required, so our standard recommendation is to plant FD 4 varieties. You can observe though in our variety tests that most winters FD 5 varieties show good winter survival and produce

some additional yield in the fall over FD 4 varieties. Many companies test their varieties for actual winter survival and provide a winter survival rating. Notice though that the winter survival rating system only goes from 1 to 6 and the fall dormancy rating systems goes from 1 to 11, so these two scales cannot be directly compared.

Varieties Adapted to Kentucky

It's essential that you plant varieties that have performed well in Kentucky. Our forage variety testing program is one of the most extensive in the country. Each year we publish an individual Alfalfa Report that contains up to date information on the yield and persistence of individual varieties. At the end of this of this report is a summary of how all the alfalfa varieties that have been tested in Kentucky over the last 15 years have performed. See table 14 below.

continued

Table 14. Summary of Kentucky alfalfa yield trials 2000-2017 (yield shown as a percentage of the mean of the commercial varieties in the test).

		Variety Characteristics[1]						Lexington								Princeton						Bowling Green[2]		Eden Shale	Mean[6] (# trials)
			Disease Resistance[3]					00[4,5]	02	04	06	08	11	12	15	01	05	08	09	11	13	03	06	03	
Variety	Proprietor	FD	Bw	Fw	An	PRR	APH	5yr[7]	5yr	5yr	7yr	6yr	6yr	5yr	3yr	4yr	5yr	5yr	6yr	4yr	3yr	3yr	4yr	4yr	
Optimus	Brett Young Seeds		HR	HR	HR	HR	HR														98				–
PerForm	Dairyland Research	4	HR	HR	HR	HR	HR				106														–
PGI 459	Producers Choice	4	HR	HR	HR	HR	R					102													–
Phirst	UniSouth Genetics	4	HR	HR	HR	HR	R										105						102		104(2)
Phoenix	Southern States	5	HR	HR	HR	HR	R			113	99	102		106				101		94			96		102(7)
Radiance HD	Ampac Seed/Cisco	4	HR	HR	HR	HR	HR							101					105	103					103(3)
Radiant-AM	Ampac Seed	4	HR	HR	HR	HR	HR				97														–
Rebound 5.0	Croplan Genetics	4	HR	HR	HR	HR	HR					103							103				108		104(3)
Rebound 6.0	Croplan Genetics	4	HR	HR	HR	HR	HR						104							101					103(2)
Regal	Great Plains	5	HR	HR	R	HR	MR															103		94	99(2)
Reward II	PGI Alfalfa	4	HR	HR	R	HR	R									99	103					94		103	100(4)
Saranac AR (certified)	Public	4	MR	R	HR	LR	–	93	87	77	85	86	91	98	97	92	95	88	92	82	97	99	89	95	91(17)
Summer Gold	Beck's Hybrids	4	HR	HR	HR	HR	HR			107															–
TripleTrust 450	ABI Alfalfa	5	HR	HR	HR	HR	HR										100						105		103(2)
TripleTrust 500	Central Farm Supply	5	HR	HR	HR	HR	HR						108												–
USG 681HY	UniSouth Genetics	6	HR	HR	HR	HR	–											113							–
Vernal	Public	2	R	MR	–	–	–		93								95								94(2)
Withstand	Southern States	4	HR	HR	HR	HR	HR				100	90		96				100		87			114		98(6)
WL 319HQ	W-L Research	3	HR	HR	HR	HR	HR		108																–
WL 327	W-L Research	4	HR	HR	HR	HR	HR		105																–
WL 338SR	W-L Research	4	HR	HR	HR	HR	HR		101																–
WL 343HQ	W-L Research	4	HR	HR	HR	HR	HR				101	110						100							104(3)
WL 348AP	W-L Research	4	HR	HR	HR	HR	HR																99		–
WL 354HQ	W-L Research	4	HR	HR	HR	HR	HR													115					–
WL 357HQ	W-L Research	5	HR	HR	HR	HR	HR			123							106					101		106	109(4)
WL 363HQ	W-L Research	5	HR	HR	HR	HR	HR					105	103						105						104(3)
4m76	FFR/Sou. St.	4.7	HR	HR	R	HR	R		116																–
4030	Brett Young Seeds	4	HR	HR	HR	HR	HR							103											–
5-star	Croplan Gen.	5	R	HR	R	R	R															97		99	98(2)
53H92	Pioneer	3	HR	HR	HR	HR	HR						95												–
54Q32	Pioneer	4	HR	HR	HR	HR	HR						99												–
54V46	Pioneer	4	R	HR	HR	HR	R																	99	–
55V48	Pioneer	5	HR	HR	HR	HR	HR						102												–
55V50	Pioneer	5	HR	R	Hr	HR	HR							111							105				108(2)
54V54	Pioneer	4	HR	HR	HR	HR	HR	98	94							105									99(3)
54V56	Pioneer	–	–	–	–	–	–															98			–
6400HT	NEXGROW	4	HR	HR	HR	HR	HR			108												96			102(2)
6415	NEXGROW	4	HR	HR	HR	HR	HR										103						105		104(2)
6417	NEXGROW	4	HR	HR	HR	HR	HR					105													–
6420	NEXGROW	4	HR	R	HR	R	HR		106																–
6422Q	NEXGROW	4	HR	HR	HR	HR	HR						112						102						107(2)
6530	NEXGROW	5	HR	HR	HR	HR	HR															92			–
6552	NEXGROW	5	HR	HR	HR	HR	HR					105													–

[1] Variety characteristics: FD=fall dormancy, Bw=bacterial wilt, Fw=fusarium wilt, An=anthracnose, PRR=phytophthora root rot, APH-aphanomyces root rot. Information provided by seed companies.
[2] The Bowling Green test is on soil infested with phytophthora and aphanomyces root rots.
[3] Disease resistance: S=susceptible, LR=low resistance, MR=moderate resistance, R=resistance, HR=high resistance.
[4] Year trial was established.
[5] Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in forage yield between varieties. To find actual yields, look in the yearly report for the final year of each specific test. For example, the Lexington trial planted in 2008 was harvested for six years, so the final yield report would be "2013 Alfalfa Report" archived in the KY Forage website at www.uky.edu/Ag/Forage.
[6] Mean only presented when respective variety was included in two or more trials.
[7] Number of years of data.