STANDARD TEST TO CHARACTERIZE ALFALFA CULTIVAR TOLERANCE TO INTENSIVE GRAZING WITH CONTINUOUS STOCKING

Test accepted: August 1998 **Test updated:** June 2022
Test authors: J. H. Bouton and S. R. Smith, Jr.

The procedures described in this standard test rely on overgrazing to prevent escapes and separate entries and are not meant to be used as grazing recommendations for producers.

PLANT CULTURE

Establishment......................Land preparation, liming, fertilization, and pest control for establishment and maintenance are the same as those used for any alfalfa yield or performance trial. All entries to be tested, plus a grazing tolerant and intolerant check, are sown at the normal planting date for alfalfa in replicated sward plots (simulate planting with a cultipak seeder) at 15-20 kg ha^{-1} within a grazing paddock (range 0.5 to 1.5 ha). A minimum of 1.5 X 4.5 m plots with 6 replications is recommended. The actual test should be surrounded on all sides by at least 7.5 m of a border area between the test and any fence used to confine the animals. Drinking water, mineral boxes, supplement feeders, and any shade for the animals should all be located on the same end of the paddock and away from the actual plots.

Grazing ....Plants are allowed to reach an early flowering stage before grazing begins. After initial stands are determined, the test is exposed to intensive, continuous stocking by beef cattle (entire paddock area constantly grazed to a stubble height of 5 to 7.5 cm) for the entire grazing season (normally 120 days). **USE A CHEMICAL BLOAT PREVENTATIVE DURING GRAZING**. Never use less than 2 animals per paddock (this reduces behavior problems associated with a single animal). If total forage supply becomes insufficient for a maintenance diet, then feed hay as a supplement.

Measurements .... Approximately 7-10 days after an initial hay harvest or graze down, initial stand measurements are made. The most common method is to count plants or crowns in small quadrats within each plot. A minimum of 90 plants m^{-2} are required for adequate initial stands of each entry. Stands of the tolerant and intolerant checks should be monitored throughout the grazing season. When the tolerant and intolerant checks separate from each other in a statistically significant manner (*P<0.05*) and are within their acceptable ranges, then grazing can cease. Within 10-14 days after grazing has ceased, stand measurements are made similar to the initial measurements on all entries.

Data Interpretation ....If initial stands are not significantly different among entries, then use only final stand data to compare entries to the checks. If initial stands are significantly different among entries, then both final stands and % survival must be used for comparisons. An entry must, at a minimum, show significantly (p<0.05) better final stands (and % survival if initial stands are different) than the intolerant check and be no different from the tolerant check in order to claim a grazing tolerance (T) rating (Table 1).

Subsequent Year Grazing..If checks do not significantly separate during the first grazing season, another season of grazing will be required. In the subsequent year, initial stand measurements are made again. **IF INITIAL STANDS ARE DEPLETED FOR EITHER THE TOLERANT OR INTOLERANT CHECKS DUE TO WINTER-KILL OR OTHER FACTORS, THEN THE TEST CAN NOT BE USED FOR A SECOND SEASON**. If initial stands are similar to where they were at the end of the previous season, then grazing can commence as before.

Table 1. Example of plant counts.

Variety (Type*)	Initial	Final	Survival**
	plants m^{-2}		%
Variety A (T)	111.9	54.8	48.9
Variety B (I)	112.9	19.4	17.2
Variety C (T)	106.5	55.9	52.5
Variety D (I)	118.4	54.8	46.3
Variety E (I)	116.2	40.9	36.2
Checks			
Alfagraze (T)	125.9	67.8	53.8
Apollo (I)	97.9	31.2	31.8
LSD (5%)	20.4	17.2	16.4
Test Mean	109.8	51.6	46.9
CV (%)	16.5	30.0	30.3

*T=grazing tolerant; I=grazing intolerant.
**Survival = Final plant counts/Initial plant counts X 100.

CHECK CULTIVARS

Approximate Expected Tolerance.

	Final Stands	Range		Survival**	Range
	plants m^{-2}			%	
Tolerant	60	40-82	**Tolerant**	44	29-60
Alfagraze (D/SD)*			Alfagraze (D/SD)		
AmeriGraze 702 (ND)			AmeriGraze 702 (ND)		
ABT 805 (ND)			ABT 805 (ND)		
Intolerant	20	5-38	**Intolerant**	18	3-38
Apollo (D/SD)			Apollo (D/SD)		
5432 (D/SD)			5432 (D/SD)		
CUF 101 (ND)			CUF 101 (ND)		

*D/SD=Recommended checks to compare dormant and semi-dormant entries;
ND=Recommended checks to compare nondormant entries.
**% Survival = Final plant counts/Initial plant counts X100.

ALTERNATIVE METHOD

When plots are established as drilled rows, then determining percentage initial and final stands can also be used instead of plant counts. An entry must, at a minimum, show significantly (*P<0.05*) better final stands than the intolerant check and be no different from a tolerant check in order to claim grazing tolerance. This method is still in development and more data will be needed to obtain expected tolerances for the checks.

REFERENCES

1. Smith, S.R., Jr., J.H. Bouton, A. Singh, and W.P. McCaughey. 2000. Development and evaluation of grazing tolerant cultivars: A review. Can. J. Plant Sci. 80:503-512.

2. Smith, S.R., Jr., J.H. Bouton, and C.S. Hoveland. 1989. Alfalfa persistence and regrowth potential under continuous grazing. Agron. J. 81:960-965.

3. Smith, S.R., Jr., and J.H. Bouton. 1993. Selection within alfalfa cultivars for persistence under continuous stocking. Crop Sci. 33:1321-1328.

4. Pedreira, C.G.S., V.J. Silva, M.D.C. Ferragine, J.H. Bouton, F. Tonato, L Otani, and D.C. Basto. 2020. Validating the NAAIC alfalfa grazing tolerance standard test and assessing physiological responses to grazing in a tropical environment. Crop Sci. 60: 1702– 1710.

Table 2. Example of alternate method.

Variety (Type*)	Initial	Final
	%	
Variety A (T)	96	86
Variety B (I)	94	56
Variety C (T)	96	65
Variety D (I)	88	25
Variety E (I)	90	51
Checks		
Alfagraze (T)	96	75
Apollo (I)	92	47
LSD (5%)	*NS*	*17*
Test Mean	*94*	*64*
CV (%)	*9*	*12*

*T=grazing tolerant; I=grazing intolerant.