Your forage analysis speaks to you, **are you listening?**

Quick tips for evaluating the analysis of a hay crop silage for high-producing cows.

Step 1: Make sure the values on your analysis meet the following criteria

Compare your forage analysis to the information below. If you notice problems, go to step 2.

Parameter	Result & Unit	Parameter	Result & Unit
DRY MATTER		uNDFom120	
Dry matter	See Table 1	uNDFom240	
PROTEINS		**SUGARS & FATS**	
Crude Protein (CP)		HCNS	
Rumen Undegraddable Protein % CP		Water Soluable Carbohydrates	
% soluble Protein CP		Ethanol Soluable Carbohydrates	
N-NH3 (% CP)	**<15 % CP**	Starch	
CP-ADF	**< 10 % CP**	Fat	
CP-NDF		Total Fatty Acids (AGT)	
ENERGY		RUFAL	
TDN 1x (NRC 2001)		C18:1 Oleic	
ENL		C18:2 Linoleic	
ENE		C18:3 Linoleic	
ENG		**MINERALS**	
ME sheep		Total Calcium (Ca)	
Equine Energies		**Total Phosphorus (P)**	**See Table 3***
		Total Potassium (K)	**See Table 3***
FIBERS		**Sulfur (S)**	**≥0, 25 % DM (alfalfa only)***
Acid detergent fiber (ADF)	**~ 30 % DM**	**Ash**	**≤ 10 % DM**
Neutral detergent fiber (NDF)		**FERMENTATION PROFILE**	
aNDFom		Estimated Total Acids	
Lignin		Lactic Acid	
NDFD 30 (% NDF)		**Lactic acid/total acid ratio**	**> 65 %**
NDFD 48 (% NDF)		**Acetic acid**	**< 3 % DM**
NDFDom30 (% NDF)		**Butyric Acid**	**< 0.3 % DM**
NDFDom120 (% NDF)		**pH**	**See Figure 1**
NDFDom240 (% NDF)			

* For minerals, accuracy is increased when they are analyzed using wet chemistry.

Table 1. Recommended range of dry matter by type of storage system.

Storage system	Ideal range of dry matter
Tower silo with top unloading	See Table 2
Tower silo with bottom unloading	40% to 60%
Bunker silo	30% to 40%
Drive-over pile silo	30% to 35%
Tube silo (Ag-Bag)	35% to 40%
Large wrapped bales	45% to 55%

Table 2. Minimum dry matter requirement (%) at harvest to avoid silage effluent for different tower silo sizes.

Height (ft)	Diameter (ft)			
	18	20	24	30
50	30	34	37	38
60	33	37	39	40
70	35	40	41	43

Pitt and Parlange, 1987.

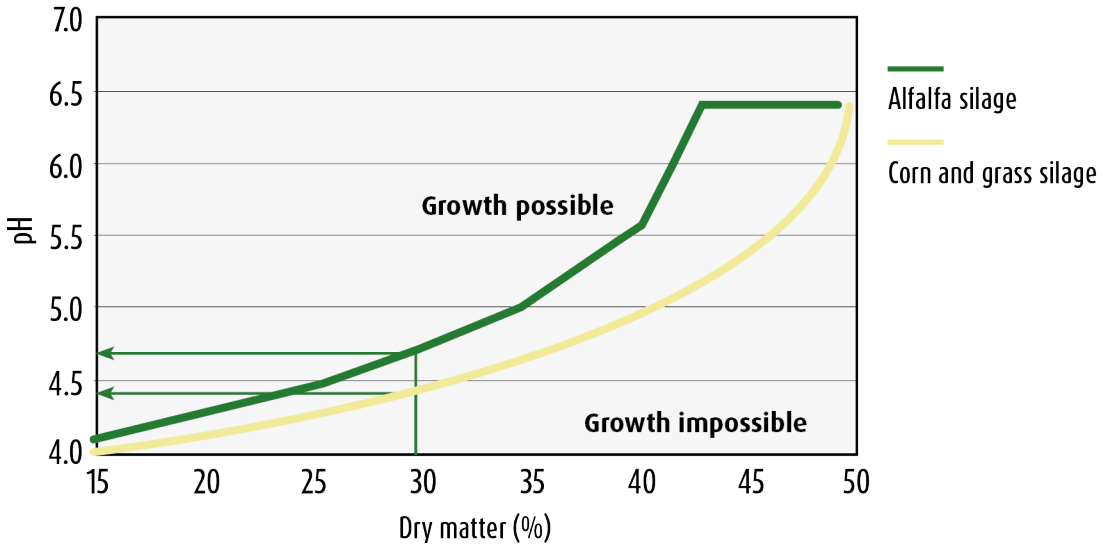
Table 3. Deficiency and adequacy levels for phosphorus and potassium in several forage species.

	Phosphorus (% DM)		Potassium (% DM)	
	Deficiency[1]	Adequacy[2]	Deficiency[1]	Adequacy[2]
Grasses				
Reed canary grass	0.21	0.29	1.4	2.5
Smooth bromegrass	0.25	0.30	2.0	2.7
Orchard grass	0.18	0.24	2.0	2.6
Tall fescue	0.24	0.34	2.2	2.8
Timothy grass	0.20	0.28	1.4	2.0
Kentucky bluegrass	0.18	0.28	1.5	2.0
Perennial ryegrass	0.28	0.36	2.1	2.8
Legumes				
Birdsfoot trefoil	0.24	0.32	1.6	2.1
Alfalfa	0.25	0.35	1.6	2.7
White clover and alsike clover	0.25	0.34	1.5	2.3
Red clover	0.24	0.44	1.8	2.4

Adapted from Bruulsema, 2000.

[1] Levels lower than these values will result in yields below 80-90% of the yield potential.

[2] At these levels, yields will be equal to or above 90% of the yield potential. A level above the adequacy level can lead to luxury consumption without toxicity.



Adapted from Muck et al., 2003.

Figure 1. Critical pH to stop the development of clostridia.

Step 2: Identify the problem and find solutions

Indicator	Problems & Impact	Solutions to prevent the problem
Non-optimal ADF	• Forage too immature → Decreased yield and persistence of grasslands • Forage too mature → Increased ration cost	✓ Adjust the cutting stage
Non-optimal dry matter	• Forage too wet → Risk of silage effluent and poor fermentation • Forage too dry → Risk of heating	✓ Review DM evaluation before harvest
Ash >10% of dry matter	Silage contamination by soil → Decreased forage nutritional value and risk of poor fermentation	✓ Cut at a height of 10 cm (4 in) ✓ Use flat blades on rotary mowers ✓ Make large swaths (≥80% of the cutterbar) ✓ Adjust the tedder and rake as well as the speed ✓ Avoid sun rakes ✓ Adjust harvesting equipment as well as its speed

N-NH3 ≥15% of crude protein	Non-optimal fermentation and degradation of protein quality → Loss of dry matter, lower nutritional value, less palatable forage	✓ Ensure more than 28 days between manure application and harvest ✓ Lower soil contamination ✓ Harvest at a recommended dry matter content based on the storage system ✓ Maximize forage sugar content (no rain, large swaths [≥80% of the cutterbar], chop length, rapid silo closure, etc.) ✓ Check silo sealing ✓ Use an inoculant containing homofermentative bacteria
Lactic acid/total acid ratio ≤65%	Non-optimal fermentation → Loss of dry matter, lower nutritional value, less palatable forage	✓ Harvest at a recommended dry matter content based on the storage system ✓ Maximize forage sugar content (no rain, large swaths [≥80% of the cutterbar], chop length, rapid silo closure, etc.) ✓ Check silo sealing ✓ Use an inoculant containing homofermentative bacteria
Acetic acid ≥3% of dry matter	Non-optimal fermentation → Loss of dry matter, lower nutritional value, less palatable forage	✓ Harvest at a recommended dry matter content based on the storage system ✓ Maximize forage sugar content (no rain, large swaths [≥80% of the cutterbar], chop length, rapid silo closure, etc.) ✓ Check silo sealing ✓ Use an inoculant containing homofermentative bacteria
Butyric acid ≥0.3% of dry matter	Non-optimal fermentation → Loss of dry matter, lower nutritional value, less palatable forage, risk to animal health*	✓ Ensure more than 28 days between manure application and harvest ✓ Lower contamination by soil ✓ Harvest at a recommended dry matter content based on the storage system ✓ Maximize forage sugar content (no rain, large swaths [≥80% of the cutterbar], chop length, rapid silo closure, etc.) ✓ Check silo sealing ✓ Use an inoculant containing homofermentative bacteria
pH above the critical pH for stability	Unstable silage → Silage quality deterioration over time	✓ If forage was ensiled less than 21 days ago, take another sample after fermentation ✓ Use silage as soon as possible

CP-ADF ≥10% of crude protein	Forage heating and degradation of protein quality → Loss of dry matter, lower nutritional value, less palatable forage, risk to animal health (mycotoxins)	✓ Verify compaction ✓ Ensure quick closure of the silo ✓ Check silo sealing ✓ Increase the removal rate ✓ Evaluate the uniformity of the silo face ✓ Use an appropriate additive if needed (*L. buchneri*, propionic acid, etc.)
Phosphorus (P) too low	Indicator of phosphorus deficiency → Non-optimal yield	✓ Consult your fertilization advisor
Potassium (K) too low	Indicator of potassium deficiency → Non-optimal yield	✓ Consult your fertilization advisor
Sulphur (S) too low (alfalfa only)	Indicator of sulphur deficiency → Non-optimal yield and crude protein content	✓ Consult your fertilization advisor

* Too much butyric acid in the ration can reduce animal performance, in addition to causing health problems such as ketosis.

If your silage contains too much butyric acid, you need to calculate how much the animals are getting per day. Lactating cows should ingest a maximum of 50 g/day of butyric acid, and dry and transition cows should ingest a maximum of 20 g/day. However, ideally, butyric acid should be avoided for these animals as it can significantly interfere with transition.

If your ration provides too much butyric acid, you should see if it's possible to dilute, or even eliminate, the bad forage. Another strategy is to allow the forage to air out for 12 hours before serving. This reduces the amount of butyric acid by approximately 50% as it volatilizes into the air.

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