



Carbohydrate Guide

At Triple Crown, we know that managing your horse's carbohydrate intake can be a challenge. Carbohydrates provide energy and are needed for digestive health, but too many carbohydrates can contribute to colic, Laminitis and other metabolic diseases. High sugar and starch intake can also increase blood glucose and insulin concentration, which could cause Insulin Resistance.

It is a tricky balance. However, knowing the (estimated/average) starch and sugar content of your feed and forage will help you make the best feeding decisions for your horse.

CARBOHYDRATES AT A GLANCE

Carbohydrates- Essential nutrients which include sugars, fibers and starches found in grains and forages that are used as an energy source—either converted to energy or stored. Also known as saccarides and classified by the number of sugar molecules they contain: single, double or multiple.

Simple Sugar- A carbohydrate with one or two sugar molecules (monosaccharides and disaccharides). Includes glucose and fructose; found in different amounts in most plant-based feeds.

Fructan- A carbohydrate made of a short chain of fructose molecules that can't be effectively digested in the small intestine like other nutrients but are fermented by bacteria in the hindgut. They are part of the WSC component and over consumption can lead to laminitis. Found in cool-season grasses.

Starch- A carbohydrate composed of many linked glucose molecules found mainly in grains; mostly digested in the small intestine, where they are broken down and absorbed as glucose (simple sugar). Some starches are resistant to small intestine digestion and are fermented in the large intestine. A typical analysis does not differentiate between the two types. Low starch content generally means little glucose will be absorbed in the small intestine (low glycemic response). This is good for horses that can't handle large blood sugar changes (i.e., insulin-resistant horses). High starch generally means a high glycemic response.

NSC (nonstructural carbohydrates)- A measure of digestible carbohydrates, including simple sugars and fructans; WSC+Starch. Glucose-sensitive horses should be fed a low NSC diet.

WSC (water-soluble carbohydrates)- A measure of water-soluble sugars, including simple sugars and fructans; sometimes called "sugar" on analysis reports. High WSC may indicate high fructan levels in grasses or high simple sugars in non-grass forages and grains.

ESC (ethanol-soluble carbohydrates)- A measure of ethanol-soluble sugars, including mostly monosaccharides and disaccharides (simple sugars). These carbohydrates are a subset of WSC that are primarily digested in the small intestine and give a true glycemic (blood sugar) response. High ESC generally means a feed will generate a high glycemic response (unless there is a high level of fructans in this fraction). Might be helpful for hard-working horses that need lots of energy, but not so good for horses that are sensitive to large blood sugar changes (i.e., insulin resistant horses). However, low ESC does not necessarily mean the feed will have a low glycemic response, because starch could keep it high.

Sources: <https://thehorse.com/119859/carbohydrates-101-for-horses/>; <https://thehorse.com/127958/changing-carbohydrate-evaluations-in-animal-diets/>

VALUES FROM CARBOHYDRATE TESTING SHOULD BE USED AS AN ESTIMATE

Often, horse owners use carbohydrate values to do an exact A to B comparison. However, there is no industry standard for carbohydrate testing which can make evaluating the data difficult. Some companies test in-house while others use outside labs. Some companies use wet chemistry to test values, while others use NIR testing which requires calibrations to be sure that all labs have access to the same data for the equipment to provide consistent results, but not all machines are calibrated in the same way. Some companies list carbohydrate values on a dry matter basis; others list them on an as-fed basis. Some companies use the term "sugar," but don't designate if they mean WSC or ESC. In addition, coefficients of variation (cv) can be associated with carbohydrate analyses. These should account for both sampling and analytical variation. Poor sampling can lead to much larger variation,

None of these methods is "the right way" or "the wrong way," but a quick comparison of just carbohydrate values is most likely not an apples-to-apples comparison. The key is to use carbohydrate values as a guide, not gospel. Triple Crown uses EquiAnalytical and other outside laboratories to complete our nutritional testing. We use both NIR and wet chemistry analytical methods, depending on the information we are obtaining regarding the sample.

WHAT PERCENT SUGAR AND STARCH IS MY HORSE'S DIET?

When feeding horses with metabolic concerns, many people are advised to feed 10% or less NSC. This does not mean that everything you feed your horse must be below 10% NSC. It means that you should keep the horse's overall diet (grain and hay) at an average of 10% NSC. Remember, forage is the largest component of your horse's diet. The 1-2 lb. of feed recommended for a metabolic horse will not make a significant difference in the overall NSC value of a diet. For reference, a 1,000 lb. horse eating 20 lb. of hay per day with a total 10% NSC diet is eating approximately 908 grams of carbohydrates per day.

FEEDING CONSIDERATIONS

Selecting feed/forage with low starch + ESC values can help alleviate symptoms for many horses with conditions such as tying up disease (EPSM, PSSM, RER), developmental orthopedic disease (DOD), Insulin Resistance (IR) Equine Metabolic Syndrome (EMS) and Cushing's Disease (PPID), and horses with "excitable behavior." Also, selecting forages with low NSC values (WSC + Starch) are a more appropriate choice for horses prone to laminitis.



GET YOUR CARB CALCULATOR HERE

Use our handy tool to calculate your horse's carbohydrate intake and learn what changing forages or feed can do for your horse:

<https://www.triplecrownfeed.com/carbohydrate-calculator2022/>

TOTAL DIETARY CARBOHYDRATE CALCULATION

Estimated Daily Intake	Enter LBS	Enter %	Enter X	Grams of Carbohydrate
Forage/pasture #1	20	X of WSC = 8.1%	1.82%	785.56
		X of Starch = 1.4%	1.82%	35.08
Forage/pasture #2		X of WSC =		0
		X of Starch =		0
Feed	1	X of WSC = 8.1%	0.02%	35.32
		X of Starch = 1.4%	0.02%	6.172
Other		X of WSC =		0
		X of Starch =		0
Total Pounds	21	WSC/ESC and Starch Avg	1.87%	Gram Total: 856.932
		X Sugar - Starch total:	1.88%	

Key Estimates for Forage Requirements			
Maintenance:	Light Work:	Medium Work:	Heavy Work and Enduring Horses
The daily forage needs required for a horse of weight are equal to 1.5% of his/her body weight. [10-15 pounds per day for a 1,000 pound horse]	Depend on working 3-4 times per week in good condition. The horse for types of riding such as trail riding, western pleasure, and lower level dressage. Forage minimum of 1.5% of body weight. [15 pounds per day for a 1,000 pound horse]	Working 5-6 days per week of a structured conditioning program. Examples of horses in medium work are the following: eventers, jumpers, upper level dressage horses, and polo ponies. This work intensity requires 2% of body weight in forage. It is also suggested to supplement with concentrate to meet calorie needs and ideal body condition. [20 pounds per day for a 1,000 pound horse]	Racehorses and 3-day eventers in training for the competition are examples of the peak of their physical capabilities, and they require the most concentrated forage. These horses require 2.5% of body weight in forage, with a suggested concentrate supplement adjusted to meet calorie needs. [25 pounds per day for a 1,000 pound horse]

Common Equine Forage Carbohydrate Profiles from EquiAnalytical

PASTURES:	ESC	WSC	Starch
Legume Pasture	4.8 - 18.3	5.7 - 15.6	8.24 - 5.1
Mixed/Highly Legume Pasture	5.5 - 11.8	5.8 - 12.5	8.8 - 6.8
Mixed/Highly Grass Pasture	5.5 - 11.8	5.8 - 12.5	8.8 - 6.8
Grass Pasture	3.4 - 18.5	4.4 - 14.2	8 - 5.3
Bromus Grass Pasture	3.7 - 7.8	5.3 - 7.3	8.97 - 5.3
HAYS:			
Legume Hay	5.2 - 8.4	6.3 - 18.3	8.5 - 2.2
Mixed (mostly grass) Hay	4.3 - 3.3	6.2 - 14.8	8.3 - 3.1
Grass Hay	6.5 - 3.4	8.2 - 16	8.2 - 2.2
Bromus/grass Hay	3.5 - 8.8	5.1 - 3.2	8.3 - 5.3
Bromus Hay	4.4 - 18.4	6.5 - 15.2	8.7 - 5.7
OTHER Forages:			
Grass Pellets	4.8 - 3.2	7.1 - 14.8	8 - 5.3
New Zealand Deer Pellet	4.5 - 13.6	14.2 - 18.3	8 - 2.4
Alfalfa Cubes	4.8 - 2.3	5.3 - 18.1	8 - 4.8
Alfalfa Pellets	3.7 - 7.5	5.3 - 3.5	8 - 4.4
Grain/Ferrous Pellets:			
Rice Bran	3.3 - 3.3	4.8 - 18.5	15.7 - 15.8
Oats	5.1 - 3.2	2.8 - 4.1	16.7 - 15.1
Flax	1.3 - 5.7	2.3 - 5.1	8 - 5.8

Pasture Intake Estimation	
* This will vary with pasture quality, quality, and with the amount of time horses are on pasture. However, a 1,000 pound horse would reasonably consume about 1-1.6 pounds per hour.	
24 hours/day:	8.27 lb / hr
3 hours/day:	1.52 lb / hr
6 hours/day:	1.52 lb / hr
9 hours/day:	2.2 lb / hr

* In a 2014 study, researchers at North Carolina State University reported these intakes when analyzing pasture time.

TRIPLE CROWN PRODUCT ESTIMATED CARBOHYDRATE VALUES*

TRIPLE CROWN HORSE FEED	% WSC AVERAGE RANGE	% ESC AVERAGE RANGE	% STARCH AVERAGE RANGE	AVG. STARCH + AVG. ESC RANGE	% NSC=g/lb. WSC+STARCH=NSC RANGE
Perform Gold	<u>7.7</u> 7.0-9.7	<u>5.6</u> 4.4-6.4	<u>9.7</u> 9.4-13.2	<u>15.3</u> 12.3-16.2	<u>17.4%=78.99g</u> 15.5-18.5
Senior Gold	<u>7.8</u> 6.5-8.5	<u>5.4</u> 4.7-6.8	<u>3.6</u> 3.5-5.7	<u>9.0</u> 8.2-15.0	<u>11.4%=51.75g</u> 10.0-15.3
Balancer Gold	<u>8.5</u> 7.7-8.7	<u>6.4</u> 6.2-7.1	<u>7.8</u> 7.0-8.0	<u>14.2</u> 13.2-15.1	<u>16.3%=74.00g</u> 14.7-16.7
Senior Active+	<u>4.9</u> 4.4-5.1	<u>3.8</u> 3.3-4.5	<u>8.1</u> 7.0-9.5	<u>11.9</u> 10.3-14.0	<u>12.9%=58.57g</u> 11.4-14.6
Senior	<u>8.3</u> 7.0-9.0	<u>5.3</u> 4.7-6.7	<u>6.4</u> 4.5-7.5	<u>11.7</u> 9.2-14.2	<u>14.7%=66.73g</u> 11.5-16.5
Complete	<u>12.0</u> 11.0-14.5	<u>8.8</u> 8.5-10.5	<u>11.5</u> 11.7-13.8	<u>20.3</u> 15.4-22.0	<u>23.5%=106.69g</u> 21.9-27.0
Growth	<u>12.2</u> 10.2-13.2	<u>10.5</u> 9.5-12.5	<u>12.4</u> 11.8-13.8	<u>22.9</u> 15.4-24.0	<u>24.6%=111.68g</u> 19.7-25.1
Balancer	<u>8.0</u> 7.6-9.8	<u>7.2</u> 6.8-8.8	<u>3.1</u> 2.2-4.1	<u>10.3</u> 9.0-13.0	<u>11.1%=50.39g</u> 9.8-14.4
Lite	<u>4.8</u> 3.6-5.6	<u>4.2</u> 2.5-4.5	<u>5.3</u> 4.4-8.6	<u>9.5</u> 5.5-13.1	<u>10.1%=45.85g</u> 8.0-14.5
Low Starch	<u>5.1</u> 5.0-7.1	<u>3.1</u> 1.3-4.7	<u>9.9</u> 8.7-10.7	<u>13.0</u> 10.0-15.4	<u>15.0%=68.10g</u> 12.2-16.4
Naturals Pelleted	<u>7.3</u> 5.7-7.7	<u>7.0</u> 4.7-7.7	<u>14.8</u> 14.0-17.0	<u>21.8</u> 19.0-24.2	<u>22.1%=100.33g</u> 19.7-24.7
Safe Starch® Fortified Forage	<u>8.1</u> 8.0-9.8	<u>4.5</u> 3.8-6.1	<u>1.8</u> 0.2-2.2	<u>6.3</u> 4.0-8.3	<u>9.9%=44.94g</u> 7.2-10.0
StressFree® Fortified Forage	<u>8.6</u> 6.3-8.9	<u>6.6</u> 5.4-6.7	<u>1.1</u> 0.8-1.3	<u>7.7</u> 5.2-8.0	<u>9.7%=44.03g</u> 8.1-10.2
Premium Alfalfa Forage Blend	<u>8.7</u> 7.3-9.9	<u>8.0</u> 6.4-9.8	<u>4.7</u> 3.1-6.1	<u>12.7</u> 9.5-15.5	<u>13.4%=60.83g</u> 10.7-15.8
Premium Grass Forage	<u>8.7</u> 8.4-10.4	<u>6.1</u> 3.8-6.4	<u>2.1</u> 0.2-2.6	<u>8.2</u> 4.0-9.0	<u>10.8%=49.03g</u> 7.2-11.3
Naturals Timothy Balance® Cubes	<u>8.0</u> 6.0-8.0	<u>6.7</u> 5.7-6.7	<u>2.0</u> 1.5-2.0	<u>8.7</u> 7.2-9.7	<u>10.0%=45.40g</u> 7.5-10.0
Naturals Alfalfa Cubes	<u>8.0</u> 4.8-8.5	<u>6.3</u> 4.7-6.7	<u>3.0</u> 1.3-3.3	<u>9.3</u> 8.0-11.0	<u>11.0%=49.94g</u> 8.1-12.8
Naturals Alfalfa-Timothy Cubes	<u>8.2</u> 5.5-8.7	<u>6.5</u> 4.4-6.7	<u>3.8</u> 2.4-4.6	<u>10.3</u> 6.8-11.3	<u>12.0%=54.48g</u> 7.3-13.3
Naturals Golden Ground Flax	<u>4.0</u> 3.8-4.6	<u>3.8</u> 2.4-4.5	<u>3.9</u> 0.10-4.6	<u>7.7</u> 3.4-8.8	<u>7.9%=35.86g</u> 3.6-8.9
Naturals Rice Bran	<u>7.9</u> 7.2-8.3	<u>6.3</u> 6.2-7.5	<u>21.2</u> 20.8-24.8	<u>27.5</u> 22.1-29.7	<u>29.1%=132.11g</u> 24.1-29.5

*Estimated values determined by summarizing analysis of multiple sample results conducted by EquiAnalytical and other outside laboratories using both NIR and wet chemistry analytical methods