

# Founder Fodder: High Risk Weeds

By Kathryn Watts

Have you ever heard: “How could my horse have foundered in this paddock? There are just a few weeds.” Or: “But the grass is eaten down and it’s mostly just weeds, so I figured it was OK to let him out longer.” After hearing this far too many times, I started testing weeds that horses are known to eat for Non Structural Carbohydrates (NSC= sugar, starch and fructan) and the results are quite surprising. Some of the tastier weeds can have more sugar and fructan than grass!

Those of us caring for horses with chronic laminitis and other conditions involving carbohydrate intolerance have had to learn about how environmental conditions can cause grass to accumulate sugars, starch and fructan. The sugar and starch cause a rise in glucose and insulin, which sets off those horses with insulin resistance, AKA, Equine Metabolic Syndrome. Fructan can cause upset of microbial populations in the equine hindgut. We learned about how grass stashes away these carbohydrates for extra energy that allows it to be more competitive; giving it the ability to survive drought and cold, and have faster regrowth after dormancy or grazing. Because extra sugar and fructan help grass grow better, plant breeders purposely or inadvertently select for high NSC in their quest to ‘improve’ grass. We learned that sunny days with near freezing nights cause grass to accumulate sugar and fructan, so we limit grazing time or keep our horses in the dry lot when these conditions occur.



Weeds may have more fructan than grass. This pony relishes perennial sowthistle (*Sonchus arvensis*), a weed that contains inulin. Inulin is the same type of fructan being used to induce laminitis for clinical studies.

Nature has also selected for high NSC to create those masters of competition we call ‘weeds’. If high levels of sugars and fructans make plants strong, and weeds are obviously the strongest plants around, it makes sense that weeds may *also* be high in NSC. If grass is overgrazed, or stressed for lack of nutrients, weeds frequently take over our pastures. Mother Nature hates bare ground, and weeds will spring up anytime there is enough water and it’s above freezing. They even grow in our dry lots under conditions where no grass will survive. They often have deep roots and can scavenge for water and nutrients better than shallow rooted grass. Some have the ability to accumulate lots of sugars and fructan just like the more competitive grasses. And just like the high sugar and fructan grasses, grazing animals relish eating them. Weeds that are stressed by drought or frost may also have high levels of nitrates or other toxins. In general, plants with the potential for toxic substances will have higher levels of those toxins when under stress. High levels of sugar mask the flavor of toxins, and may play a part in making toxic weeds more tempting.

### “But it’s just a weed”

Why do we assume that weeds have low nutritional content? Cattle grazers and nutritionists value certain weeds as good forage. What cattle grazers, who need feeds that support weight gain, consider ‘good’, is often what those of us with easy keeper breeds of horses and ponies call Founder Fodder.

	NSC	starch	WSC
Dandelion	27.0	1.3	25.7
Redstem filaree	28.1	4.2	23.9
Red clover	18.1	1.8	16.2
Sweet clover	14.1	3.3	10.8
White clover	11.8	.1	11.7
Mallow	12.8	3.3	9.6
Kochia	12.0	3.6	8.4
Quackgrass	18.1	1.6	16.5
Wild oats	26.4	3.4	23.0

**NSC content of some common pasture weeds**  
% dry matter basis, Single rep, various conditions,  
Center, Colorado,  
Analysis by Equi-Analytical, Ithaca, NY

Dr. Howard Skinner, with University of Pennsylvania does research on alternative forages for cattle, including plantain (*Plantago lanceolata*, and *P. major*), a common weed in lawns and pastures all around the world. He’s looking for nutritious, palatable plants that survive better under long term drought.



He found that plantain that tested 13.5 % dry matter sugar under warm growing conditions went up to 25% sugar when grown under sunny, cool conditions. These levels are right up there with the better ‘improved’ grasses. Plantain is recommended in pasture mixes for fattening cattle (Sanderson, 2003). I have learned a great deal by watching horses graze. I highly recommend it to those of you learning how to manage horses prone to laminitis. I find they like plantain as much as grass, and some animals actually seem to prefer it over grass. Humans with impaired glucose metabolism crave sugar. Do horses and ponies with Equine Metabolic Syndrome also seek out the highest sugar plants available?



Owners of chronically laminitic horses in the southwestern desert region of the US have linked laminitis episodes with times when redstem fillaree (*Erodium cicutarium*, Storksbill in other parts of the country) comes up in drylots after fall or winter rains. It's very hairy, has pink blossoms and long pointed seeds.

While this weed has no fructan, it does have tri-saccharides. (Are tri-saccharides digested or fermented in the equine hind gut? Inquiring minds want to know!) I tested redstem fillaree, and found up to 28% sugar! Again, cattle producers value this weed as 'good' forage, although it can contain dangerous levels of nitrate under some conditions, which is toxic to cattle as well as horses.

According to Dr. Jerry Chatterton, co-author of a book on fructan, common dandelions (*Taraxacum officinale*) have far more fructan than grass. I tested dandelions after fall frosts that were 27% dry matter sugar + fructan. *That's* why it makes such good wine! This weed is common in horse pastures all around the world. It is relished by horses.



A German equine researcher told me that they had a lot of laminitis during a drought a few years ago, when dandelions were the only green plants left in the pastures of dried up, brown grass. While drought stressed grass can also have high levels of NSC, we have to question whether the culprit was the dandelions or the grass. We just have to start paying attention to what our horses are eating! I've heard of people bringing dandelions to horses with active laminitis because they

are high in minerals and contain substances considered by herbalists to act as a liver tonic. Perhaps this is one tonic that should be avoided.

The type of fructan found in broadleaved plants is called inulin, while the fructan in grass has a slightly different chemical structure and is called phlein. Certain grasses may have a little inulin type fructan but it is mostly of the phlein type. Inulin extracted from chicory roots is being used in a lot of human foods as a source of fiber. While it wrecks havoc in the equine hindgut, it does good things in the human bowel. Because inulin is easy to come by and inexpensive, while phlein is extremely hard to get and very costly, research on horses is being done with inulin type fructan. Technically, inducing laminitis with inulin, otherwise known as FOS, or fructo-oligosaccharide, may be a better model for implicating common dandelions than it is for grass! Other broadleaf weeds that contain inulin-type fructan are thistles, chicory, ragweed, aster, knapweed, sow thistle, wild onion and garlic (Suzuki, 1993). Horses love to eat thistles. I once watched a pony grazing that sought out and selectively grazed Canadian thistle and plantain over grass.

If you are interested in testing for sugar and starch content of a weed that your horse likes to eat, cut about a half pound of fresh plant material, put it in a zip-lock bag and freeze it within 15 minutes. Send it overnight with a cold pack on a Monday or Tuesday to a lab that does direct analysis for sugar and starch content. I use Equi-Analytical, and it costs \$19.

Let's make controlling high sugar, starch, or fructan weeds part of our pasture management program for laminitis and colic prevention. When your pony is grazing at the crack of dawn (when sugars are lower) for its limited allotment of fresh forage, take a cup of coffee and follow her around. Watch what she chooses to eat. If it's one of these high NSC weeds, get busy and get them out of your pasture. Rotational grazing, timely mowing and a fertilizer and liming program based on soil testing is the best way to control weeds without the use of herbicides. A thick stand of grass, with a dense root system is the best defense against invasion by weeds. When overgrazed, neglected pastures get taken over by high sugar weeds, herbicides may be the only viable option. Your local agricultural extension agent, crop consultant, or commercial pesticide applicator will help you determine the best product for your weed problem.

#### **References:**

Sanderson, M.A., M. Labreuveux, M. H. Hall and G. F. Elwinger. (2003) Nutritive Value of Chicory and English Plantain Forage. *Crop Sci.* 43:1797-1804

Beck, R., (1975) Steer Diets in Southeastern Colorado. *J. Range Man.* 28:48-52

Suzuki M., and N.J. Chatterton, (1993) *Science and Technology of Fructans* CRC Press, Boca Raton, FL.