

# Which Reward? Jade Tuttle, North Carolina Zoo

**Phytoestrogens** are plant-derived xenoestrogens (see estrogen) not generated within the endocrine system but consumed by eating phytoestrogenic plants. Also called "dietary estrogens", they are a diverse group of naturally occurring nonsteroidal plant compounds that, because of their structural similarity with estradiol (17- $\beta$ -estradiol), have the ability to cause estrogenic or/and antiestrogenic effects,[1] by sitting in and blocking receptor sites against estrogen (Wikipedia)

In 2007, a few years after introducing four younger females to a new yard with our 1.2 white rhinos, keepers noticed breeding behaviors had stopped. There was no more chin resting, mounting or breeding. We believed at least one of the females was pregnant but had no way to be certain. As the eager keepers we are, we began diligently conditioning our rhinos for blood collection to try and monitor hormones. We brought them off the 40 acre yard three or four times a week, each animal spending significant time being desensitized to our restraint device and the blood collection process. A pile of loose alfalfa, often mixed with timothy hay to extend the bounty, was presented to each animal as we worked to memorize and perfect the location of the radial veins. And the animals just kept getting fatter....they must be bred!

No. Not one of our females was pregnant. In fact, our bull rhino was no longer viable. Those big round tummies were just too many calories. However, as the commercials say, 'that stubborn belly fat is difficult to lose'.

The herd has been through a lot of changes since 2009 and each one seems to require us to teach them something new. I can't say enough of the team of keepers who tackle anything put before them, from rectal ultrasounds and artificial inseminations to voluntary dental checks and several different researchers requesting various data. Through all of our new training we have been conscientious of what we are using as a reward. There was concern for their weights, their teeth and phytoestrogens, and as the team moved from desensitization/acclimation to more defined behaviors we found a need to improve the timing of the reward. With the understanding that every institution and every individual animal are going to be different, here is a brief summary of what we have worked through.

Tactile rewards are great for secondary re-enforcers and are used as much as possible during any chute work, but not highly motivating for our herd. A good udder rub can keep a rhino motionless, generally with one leg kicked up, for several minutes during an ultrasound but usually isn't enough by itself to call them off the yard. I have heard from several other keepers that use belly scratches for hoof work and other husbandry needs. The benefit, if it works for your animals, is obvious because there is nothing consumed.

Using part of their diet is also a great way to keep from adding extra food. Our herd is on a 'green diet' and only receives 1 scoop= 3lbs. of grain a day which is generally used to shift them back up the 50 ft. hill chute onto exhibit. Our geriatric rhinos have more grain in their diet, and we do use it for chute work such as blood collection or topical treatments. However, the animals learn pretty quickly they can grab a big mouthful and leave the restraint area for several minutes, still happily chewing away on their grain, and come back for another bite. Or they can drag the grain forwards or backwards, generally just out of reach of where we need them. We use timothy pellets in a similar way with our younger, 'dieting', rhinos but the same problems with stationing and the duration of reward arise. The benefit is our animals value the timothy pellets almost as much as their Wild Herbivore diet while nutritionally it is comparable to a good flake of hay, which they don't value very much. (Especially in the summer when the grass is good and green). The pellets are most useful when asked to stay in place in a restraint for longer periods of time, such as a mud bath or public meet and greet, and there are only one or two keepers needed.

Timothy cubes, on the other hand, have become our go-to reward. At about the size of a piece of sidewalk chalk they are nutritionally similar to the timothy pellets but big enough to feed one at a time and still keep the animals' interest. We place a couple on the ground for chute work, toss a small handful into a stall for shifting, and hand feed one at a time for recall or target work outside. For behaviors requiring increments in training it is easier for keepers to optimize their timing with the cubes and they are more manageable in a training pouch or apron as well.

While participating in a diet study we were asked to remove all phytoestrogens, so products with alfalfa or soy were off the table. Now that the study is over, we do use alfalfa on occasion and it remains our most motivating reward but we are conscious of the use. As a legume it is different from most dry hays and is a higher source of not just phytoestrogens but protein (excess nail growth/weight gain) and iron (iron storage disorders) as well. That is why it is kept to a minimum as a big 'jackpot' reward in training new behaviors or treating dire medical needs.

**Vegetables Nutrition Facts**

Raw, edible weight portion. Percent Daily Values (%DV) are based on a 2,000 calorie diet.

Vegetable	Calories	Carb. (g)	Fiber (g)	Fat (g)	Protein (g)	Sodium (mg)	Potassium (mg)	Vitamin A (%DV)	Vitamin C (%DV)	Iron (%DV)
Asparagus (1/2 cup, cooked, 100g)	20	0	0	0	2.5	0	0	0	0	0
Bell Pepper (1/2 cup, sliced, 100g)	25	0	0	0	1.5	0	0	0	0	0
Broccoli (1/2 cup, cooked, 100g)	45	0	0	0	2.5	0	0	0	0	0
Carrot (1/2 cup, sliced, 100g)	30	0	0	0	1.5	0	0	0	0	0
Cauliflower (1/2 cup, cooked, 100g)	25	0	0	0	1.5	0	0	0	0	0
Celery (1/2 cup, sliced, 100g)	15	0	0	0	1.5	0	0	0	0	0
Cucumber (1/2 cup, sliced, 100g)	10	0	0	0	1.5	0	0	0	0	0
Green (String) Beans (1/2 cup, cooked, 100g)	20	0	0	0	2.5	0	0	0	0	0
Green Onion (1/2 cup, sliced, 100g)	25	0	0	0	1.5	0	0	0	0	0
Green Onion (1/2 cup, sliced, 100g)	10	0	0	0	1.5	0	0	0	0	0
Iceberg Lettuce (1/2 cup, sliced, 100g)	10	0	0	0	1.5	0	0	0	0	0
Leaf Lettuce (1/2 cup, sliced, 100g)	15	0	0	0	1.5	0	0	0	0	0
Mushrooms (1/2 cup, sliced, 100g)	20	0	0	0	2.5	0	0	0	0	0
Onion (1/2 cup, sliced, 100g)	45	0	0	0	1.5	0	0	0	0	0
Peas (1/2 cup, cooked, 100g)	110	0	0	0	2.5	0	0	0	0	0
Red Onion (1/2 cup, sliced, 100g)	10	0	0	0	1.5	0	0	0	0	0
Summer Squash (1/2 cup, cooked, 100g)	20	0	0	0	2.5	0	0	0	0	0
Sweet Corn (1/2 cup, cooked, 100g)	90	20	0	0	2.5	0	0	0	0	0
Sweet Potato (1/2 cup, cooked, 100g)	100	0	0	0	2.5	0	0	0	0	0
Tomato (1/2 cup, sliced, 100g)	25	0	0	0	1.5	0	0	0	0	0

*Note: Most vegetables provide negligible amounts of saturated fat, trans fat, and cholesterol.*

U.S. Food and Drug Administration  
October 1, 2008

