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Cedar: Turning Wood into Feed

Who knew?

Many ancient poets depict Texas with rolling hills, grassy plains, tall pine forests, and intense terrain. In 1532, Cabeza de Vaca carved a trail in southern Texas. His "Relacíon" illustrates a picture completely different than the modern day Rio Grande Valley. Yes, the landscapes have altered drastically over the last century, and for this we owe a great thanks to the wicked, predatory cedar tree.

In Texas today, farmers, ranchers, and rangeland stewards all wage a war against this predator to make their living. Of their toughest obstacles is the genus *Juniperus*. It's safe to say that juniper trees are one of the biggest pests to the agricultural world. It's capability to resist drought, livestock, and some management practices doesn't make the situation any better. How is mankind, and thus rangeland stewards, supposed to till soil and "punch" cattle on land draped in mean, green cedar trees?

When it comes to fighting cedar, we face several disadvantages. First juniper trees have a fond tendency to find normally drier areas and tap deep into the only true source of water, groundwater. This allows them to thrive tremendously across western Texas. According to Texas A&M's Dr. Fred Smeins, cedar trees guzzle up to 35 gallons of water per day, twice the amount of the general oak tree (Patoski). Mesquite, cactus, and juniper combined slurp 10 million acre-feet of water per year in Texas ("WATER"). In addition, cedar is a stress-tolerant, hard to kill

shrub. Found throughout the tree are hydrocarbons, called essential oils, which are flammable, hence the name volatile oils ("Isoprenoid"). Therefore, vast amounts of cedar pose a threat to the land due to wildfire.

I once heard a man say, "God gave us mesquite, cedar, cactus, and brush for a reason. There has to be a sustainable purpose for these plants besides cutting them down and leaving them to rot." Though cedar may appear detrimental, it also possesses many benefits that we can utilize to our own advantage. The nutritional content of cedar may be useful to agriculturalists: Crude protein is 7.1%, Neutral detergent fiber is 37.8%, and Total Digestible Nutrients are up to 63% (Huston et al). Juniper trees also contain a substance called tannic acid, which is soluble in the water found throughout the tree. Condensed tannins have anthelmintic properties, meaning they are used to control parasites (Langlois).

With that being said, what better way to utilize this resource than to feed it to livestock. However, the problem that remains are the hydrocarbons found in cedar trees (Taylor et al.). Over the years, plants have evolved to produce volatile oils as a defense mechanism against grazing animals (Riddle et al). Due to post-ingestive feedback, a ruminant learns to avoid the foliage (containing monoterpenoid or essential oils) they ate, averting animals' eating behavior later on (Provenza). These hydrocarbons, when consumed, inhibit the microbial activity in the rumen (Oh et al). The rumen's microbes are important because they are the agents that break down cellulose, the protective layer of plant cells that act as a defense against certain digestive processes (in humans).

In order to get rid of such oils, as initial research has shown, drying ground cedar increases palatability compared to freshly ground cedar (Taylor et al). Charles Taylor harvested several branches of Blueberry and Ashe juniper, air-dried half of them, and course ground them

in a hammer mill (Taylor et al.). The ground fiber was fed to Angora goats in a cottonseed meal, sorghum grain supplement, and alfalfa hay diet. Wet cedar (i.e. cedar that was not dried) was shown to decrease diet consumption when percentages of the wet cedar increased. However, dried cedar did not affect the animal's eating behaviors except at high levels of redberry juniper.

According to Travis Whitney and James Muir, when juniper is fed in a particular way, it increases the digestive performance of the ruminant. Whitney and Muir fed rations of three different diets to Rambouillet lambs. The diets consisted of cottonseed hull (controls), air-dried and ground juniper leaves, and a mixture of equal amounts of cottonseed hulls and juniper leaves. Compared to the controls, the juniper alone had greater overall nutrient composition and nutritive value. It also had greater total digestible nutrients and less NDF and ADF (neutral detergent fiber and acidic detergent fiber). However, average daily gain in Juniper alone was less than both, the controls and the mixture diets. This was interpreted mainly due to monoterpenoid oil intake suggested by Riddle et al. Of course, juniper may serve as an effective roughage source in lamb feedlot rations, but, it reduces intake, and thus, could possibly reduce growth rates.

Mr. Whitney, an expert animal nutritionist of San Angelo, claims that growing lambs performed better when he replaced half of the cottonseed hulls with juniper leaves (Thomas). Also, ruminants eat more juniper leaves when fed a supplemental protein than when offered energy supplements (Launchbaugh et al.). Taylor and associates used juniper oil as a feed restraint in Angora goat rations. They found that when goats were given higher rates of juniper oil, they ate greater amounts of alfalfa hay. This suggests that potential "cedar feeders" would be wise to mix juniper with a feed ration containing supplemental protein, cottonseed hulls, and free choice alfalfa hay.

Also according to Mr. Whitney in an interview with Heather Thomas of Sheep Industry News, he notes:

> We are working with Cedar Beetle (Concan, Texas), a company that has been commercially removing brush from properties for the past 50 years. This company and several other outfits who grind brush and make mulch and chips have shown interest in our Wood to Feed Program. Economic estimates show that trees can be harvested, chipped, hammer milled and sold profitably at $130 per dry ton. This is comparable to cottonseed hulls and much cheaper than hay.

Comparing this cost estimate of a 75 lbs. bag of hammer milled to a 75 lbs. bale of coastal hay, it would be six times cheaper than a $40 bale of coastal hay. On top of that, Whitney also states "If even just 25 percent of the traditional roughage sources currently fed was to be replaced with ground juniper, more than 433,000 tons of ground juniper or mesquite would be needed each year, as a rough estimate." (Thomas).

Another advantage is that cedar contains condensed tannins. Many livestock producers implement deworming medicines into their livestock regularly. Though they prove to inhibit microbial activity as essential oils do, tannins have shown decreased parasitic quantities in ruminants that have consumed them. Paolini and associates did a study on the effects of condensed tannins on goats infected with *Haemonchus contortus*. Their results were not as expected; however, the tannins appeared to have reduced the fertility and egg excretion of female (*Haemonchus contortus*) worms.

The benefits are endless; commercial juniper harvesting programs would remove 4.2 million trees per year (Thomas). As Mr. Whitney feeds his livestock ground cedar, in the meantime, he is removing cedar from his land. Water is conserved, soil improves, and land is

restored. Rangeland quality has always been a major priority of rangeland stewards. Producing a quality nutritional product from juniper, while renovating rangelands, may seem impossible. However, when handled correctly, it can open several doors to opportunity and benefit. Above all, the good Lord weaves virtuous good into some of his most impractical creations.

Works Cited

"A&M Professors Study Cedar's Drinking Habits." Houston Chronicle. Hearst Newspapers LLC, 19 July 2005. Web. 14 Jan. 2014. <http://www.chron.com/news/houston-texas/article/A-M-professors-study-cedar-s-drinking-habits-1524960.php>.

"Can Feeding Locally-available Plant Material Rich in Tannins Reduce Parasitic Burden in Ruminants and Hence Improve Their Productivity?" DFID. Gov.uk, n.d. Web. 14 Jan. 2014. <http://r4d.dfid.gov.uk/Project/2235/>.

"The Chemistry of Essential Oils, and Their Chemical Components." The Chemistry of Essential Oils. Esoteric Oils CC and Sallamander Concepts (Pty) Ltd, 2 Dec. 2013. Web. 14 Jan. 2014. <http://www.essentialoils.co.za/components.htm>.

"Deterpe-what? The Role of Terpenes in Essential Oils." Healing the Lands. N.p., 26 June 2012. Web. 14 Jan. 2014. <http://freedomwithessentialoils.wordpress.com/2012/06/26/deterpe-what-the-role-of-terpenes-in-essential-oils/>.

Goodwyn, Wade. "Texas Rancher An Unlikely Environmentalist." NPR. NPR, 2 Feb. 2010. Web. 14 Jan. 2014. <http://www.npr.org/templates/story/story.php?storyId=123068681>.

Huston, J.E., B.S. Rector, L.B. Merrill and B.S. Engdahl. 1981. Nutritional Value of Range Plants in the Edwards Plateau Region of Texas. Texas A&M Exp. Sta. Bull. #B-1357. Texas A&M University, College Station, Tex.

"Isoprenoid." The Free Dictionary. Farlex Inc., 2010. Web. 14 Jan. 2014. <http://encyclopedia2.thefreedictionary.com/Terpene>.

Langlois, Cherie. "Deworming Demystified." Hobby Farms.com. I-5 Publishing LLC, 2013. Web. 14 Jan. 2014. <http://www.hobbyfarms.com/livestock-and-pets/parasites-in-livestock-14987.aspx>.

Launchbaugh, Karen, Charles A. Taylor, Erika Straka, and Robert Pritz. Juniper as Forage: An Unlikely Candidate. Texas Natural Resources Server. Texas A&M AgriLife Extension, 2014. Web. 14 Jan. 2014. <http://texnat.tamu.edu/library/symposia/juniper-ecology-and-management/juniper-as-forage-an-unlikely-candidate/>.

Oh, H. K., T. Sakai, M. B. Jones, and W. M. Longhurst. 1967. Effect of Various Essential Oils Isolated from Douglas Fir Needles upon Sheep and Deer Rumen Microbial Activity. Appl. Microbiol. 15:777–784.

Paolini, V., J. P. Bergeaud, C. Grisez, F. Prevot, Ph. Dorchies, and H. Hoste. "Effects of Condensed Tannins on Goats Experimentally Infected with Haemonchus Contortus." Veterinary Parasitology 113 (2003): 253-61. Print.

Patoski, Joe. "The War on Cedar." Texas Monthly. Texas Monthly, Dec. 1997. Web. 14 Jan. 2014. <http://www.texasmonthly.com/content/war-cedar?fullpage=1>.

Sharpe, Patricia. "Texas Monthly WWW Ranch: Read Me. Texas." Texas Monthly WWW Ranch: Read Me. Texas. Texas Monthly, 1998. Web. 22 Jan. 2014. <http://pollen.utulsa.edu/cedar.html>.

Taylor, Charles A., J. E. Huston, N. E. Garza, T. D. Brooks, and R. A. Moen. "Use of Juniper as a Supplemental Feed Limiter." Sheep and Goat, Wool and Mohair Report PR-5222 (1994): 31-33. Print.

Thomas, Heather S. "Wood to Feed Program Gets Most Out of Juniper Trees." Sheep Industry News. American Sheep Industry Association, 1 Dec. 2013. Web. 14 Jan. 2014. <http://sheepindustrynews.org/?page=site/text&nav_id=35e876a88fc77b4e4643187e71473e29&archive_id=>.

"WATER CONSERVATION AND MANAGEMENT CEDAR AND MESQUITE - BRUSH CONTROL." Scenic Hills Nursery -- Oak Wilt Specialists in the Texas Hill Country. Scenic Hills Nursery, n.d. Web. 14 Jan. 2014. <http://www.oakwilt.com/waterconservation.html>.

Whitney, T. R., and J. P. Muir. "Redberry Juniper as a Roughage Source in Lamb Feedlot Rations: Performance and Serum Nonesterified Fatty Acids, Urea Nitrogen, and Insulin-like Growth Factor-1 Concentrations." Journal of Animal Science 88.4 (2010): 1492-502. Print.