



Apple Cider Vinegar Supplementation of Goats – Initial Report

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Cooperators:

- Dawn Anderson – Walker
- Kathy Rose – Rockwell City
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http://bit.ly/pfi_livestock

In a Nutshell

- Apple cider vinegar has been long advocated for its health benefits.
- Apple cider vinegar is held to have multiple medicinal purposes, ranging from improved haircoat, to greater milk production and reduced mastitis, to decreased urinary calculi in bucks, to increased doe kids of supplemented dams.
- Three Iowa farms tested treatments of apple cider vinegar supplements in goat production.
- Animals were weighed at the beginning and end of the trial, and total and average daily gains were calculated.
- No great gains were seen, but benefits were observed.

Time Period:

May-September 2013



Doeling goats munch on pumpkins at Kathy Rose's Lyn farm.

Background

Apple cider vinegar (ACV), an acidic fermentation product, has been long advocated for its health benefits. It contains mainly acetic acid, as well as vitamins, mineral salts, some amino acids, polyphenols, and other organic compounds (Johnston and Gaas 2006). While not extensive or replicated in many larger mammals, trials on rodents have found lowered blood pressure after ACV supplementation, perhaps due to changes in calcium absorption, possibly due to pH changes (Kondo et al. 2001).

Among farmers, ACV is held to have multiple medicinal purposes, ranging from improved haircoat, to greater milk produc-

tion and reduced mastitis, to decreased urinary calculi in bucks, to increased doe kids of supplemented dams (Welcome Home Farm 2011, Winter 2012). Some credit is given to the vitamins, minerals, and other nutrients in ACV, though the concentrations are extremely low (Mercola 2009). Meanwhile, farmers report goats enjoying water with some ACV added – perhaps the improved hydration is part of the health benefits (TheGoatSpot 2009).

Acetic acid, the main acid of vinegar, is used by the mammary gland for fat synthesis (Marinez et al. 1976), but it is uncertain whether an animal will willingly consume enough ACV to cause a noticeable increase. In addition, the acid and other compounds are said to correct pH imbalances in the body; again the volume

of ACV required to elicit a change is questionable (Acres USA). In hamsters, a connection has been found between offspring sex and vaginal pH at mating; lower pH towards the end of estrus is correlated with more male births (Pratt et al 1987). While similar observations are made for cattle – more females if bred early – it is not known whether there is a pH difference; and ACV supplementation should theoretically decrease pH (associated with males, at least in hamsters). Practical Farmers, curious about these claims, designed a project to track differences in ACV-supplemented and unsupplemented goats over several months. Come next spring, the sex of the does' kids will be reported as well.

Materials and Methods

Each farmer selected a number of animals for testing, and where practical, divided them into two treatment groups, balancing each group in terms of age, physiological status, and breed. One group was supplemented with apple cider vinegar at rates and frequencies described below (**Table 1**), either by direct oral drenching, addition of ACV to the water, or both.

Depending on animal type, different response variables were tracked. Adult animals were evaluated for body condition score, and weight when possible. Growing, weaned kids were weighed at the start and finish, and each month if possible. Other observations, such as veterinary issues and general health and well-being, were reported.

Results

Dawn Anderson

On Dawn's farm, data were analyzed to compare both ACV-treated vs control, and between the different rates of ACV treatment (**Table 2**). For each month of the trial, she supplemented ACV in different ways. During the first month, animals were given a daily oral drench of the ACV/water mixture; this decreased to three times weekly in month 2; once weekly in month

Variable	Value	Gain (lb)	ADG (lb/d)
Treatment	Control	6.08	0.22
	ACV	4.83	0.19
Period	Overall	5.44	0.20
Age	0-5 months	7.77	0.28
	1-2 years	4.93	0.18
	2+ years	-3.19	-0.07
Sex	Male	8.75	0.31
	Female	4.15	0.16

3; and in month 4 ACV was added to the water but not given to the animals directly. Two animals became ill over the course of the trial (one treated and one not) and were excluded from final analysis. Treatment with ACV alone did not significantly affect animal average daily gain (ADG) over the course of the trial. While some means, particularly those for age and sex, appear very different, the results were so variable that it is impossible to prove there was a treatment difference.

While not statistically significant, animals of different ages had vastly different gains regardless of treatment with ACV or not.

Table 1

Cooperator	Animals in Study	Breed(s)	ACV supplementation frequency	ACV Dose
Dawn Anderson	16 (8 treated, 8 control)	Boer	Month 1: dosed daily; month 2: 3x/wk; month 3: 1x/wk; month 4: ACV in water at 0.25 c/5 gal water	1:1 water:ACV; 1-20cc by age and weight
Kathy Rose	14 (7 treated, 7 control)	Boer, LaMancha, Sable, Nubian	2x/wk	2:1 water:vinegar; 2-4cc by weight
Joanne Peters	19 (14 treated, 5 control)	Boer	constant	1 cup/20 gal water

Younger growing animals (0-5 months old) seem to have gained more weight in total and gained more weight per day than did older animals (over 1 year old). The most mature animals were 2-year old lactating does, who not unexpectedly lost weight due to nutritional demands. While a numerical difference is seen between gains of males and females, it was not statistically significant across ACV-supplemented and unsupplemented animals.

Dawn decreased the frequency of ACV dosage every month, and the results are shown in **Table 3**. Across animal age and sex, there were no significant differences between treatments in any month; while individual performance varied, on the whole the two treatments were very similar.

Kathy Rose

Kathy and her farming partner Janet Eggenberger worked with a group of doelings (Feb/March 2013 birth dates). Half were dosed twice weekly with 2-4 cc of a 2:1 water:vinegar mixture. The trial started on June 1 and continued through the end of October. The does were of varying breeds: four Boer, two Lamancha, two Sable, and six Nubian. One of the Lamanchas was added following a state fair in July, but had previously been on ACV. There were originally four Sables, but two died in August after weather changes and the stress of travel to/from another show. When possible, Kathy put equal numbers of does from each breed into each treatment group.

Animals were weighed at the beginning and end of the trial, and total and average daily gains were calculated. No differences were observed between breeds or treatments for weights or gains (**Table 4**).

Kathy also purchased a fecal testing kit, to try and check for parasite loads. However, with the dry summer, parasite levels were quite low in all animals. She also reported that they added ACV to the water buckets of other animal groups, and said that it killed the algae in those tanks. Over the trial, five gallons of ACV were used, costing a total of \$21.85. This comes out to approximately \$0.07/dose.

While the trial didn't show any difference this year, Kathy is going to follow these does into production and see if differences emerge. She plans to continue the project for several more seasons, hopefully also making cider herself or with Joanne's help.

Table 3

Month	Treatment	Gain (lb)	ADG (lb/d)
1	Control	6.30	0.23
	ACV	5.13	0.18
2	Control	6.63	0.24
	ACV	6.36	0.23
3	Control	6.23	0.22
	ACV	6.24	0.22
4	Control	5.14	0.18
	ACV	6.00	0.21

Table 4

Effects of ACV supplementation on Rose farm					
Variable	Value	Starting weight (lb)	Ending weight (lb)	Gain (lb)	ADG (lb/d)
Treatment	control	33.5	53.8	20.3	0.13
	ACV	36.9	57.8	20.9	0.14
Breed	Boer	35.8	58.3	22.5	0.15
	Lamancha	33.8	54.5	20.7	0.13
	Sable	36.5	55.5	19.0	0.13
	Nubian	34.7	55.0	20.3	0.13
Overall		35.1	55.9	20.8	0.14

Joanne Peters

Joanne did not dose her animals directly, but included ACV in their drinking water, from June through September (when she was unable to find a consistent supply of ACV). Animals were weighed in June and in November, and gains were compared.

Two animals were excluded from analysis because incomplete data was available (two mature does). It should also be noted that there were only two bucks, one in each treatment; the treated buck was breeding does during the course of the trial, which is the likely cause of his weight loss. There were neither doelings nor mature does in the no ACV treatment, so no results are available.

The data did show that overall treatment with ACV did not significantly affect any of the measured parameters (Table 5). Because of the limited numbers of bucks and because one gained and one lost weight, this confounded results so there appear to be few differences between bucks and does. Two doelings (treated with ACV) were diagnosed with pneumonia in August; they gained less weight than did the other doeling of the same age, but this did not affect results overall.

Following these animals into the next year and into production should yield more results. Joanne will be continuing the trial, and hopes to work with Kathy to produce ACV to provide a more consistent supply.

Conclusions and Next Steps

While none of the farmers reported striking increases in health and no vast advantages in gain were observed after supplementing with ACV, some benefits were observed. Kathy noted that it is quite inexpensive to purchase, but also looks relatively simple to produce. She liked that it killed algae when used in water tubs, and said that drenching the animals got them accustomed to being handled, so that they are now all quite tame and lead-broke. All producers involved in this trial will track the bred does into the spring, when the gender of their offspring will be recorded. They also wish to repeat the trial again, to get more replicates

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Table 5

Effects of ACV supplementation on Peters farm					
Group	Treatment	Starting weight (lb)	Ending weight (lb)	Gain (lb)	ADG (lb/d)
Bucks	control	118.0	150.0	32.0	0.28
	ACV	175.0	160.0	-15.0	-0.11
Does (all)	control	91.7	123.3	31.7	0.22
	ACV	94.1	134.1	40.0	0.28
Doelings	control	n/a	n/a	n/a	n/a
	ACV	80.3	123.0	42.7	0.30
Yearlings	control	91.7	123.3	31.7	0.22
	ACV	88.4	120.4	32.0	0.23
Mature	control	n/a	n/a	n/a	n/a
	ACV	111.5	159.5	48.0	0.34

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