

## Apple Cider Vinegar in Poultry

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### ABSTRACT

Apple Cider Vinegar is made by fermentation of liquid obtained by crushing and squeezing apples which controls bacteria, algae, improves digestion and metabolism in poultry birds. Yeast and bacteria are used to start the alcoholic fermentation process. In Unani medicine it is prescribed as an expectorant, coagulant, digestive and as an ointment. It also contains anticoccidial effects, boosts immunity against viral diseases, kills bacteria and reduce stress levels.

### History and Introduction

Hippocrates (father of medicine), for wound healing, used vinegar 1<sup>st</sup> time in 400 B.C. Avicenna (father of Unani medicine) prescribed vinegar as an expectorant, coagulant, digestive, and an ointment for skin infections and burns. In 1822, it is discovered that *Acetobacter aceti* is responsible for vinegar formation. Apple cider vinegar contains 5% acetic acid, 94% water, and 1% carbohydrates. ACV is a rich source of phenolic compounds which prevent cancer, boost immunity, and maintain good health. Its use decreases the level of stress and is used as an antidepressant.

### Composition

ACV is made from apples by crushing and squeezing its liquid. Yeast and bacteria are used to start the fermentation (alcoholic) of the liquid. During this process, sugars are converted into alcohol. This fermentation process will continue, and alcohol will be converted into vinegar by *Acetobacteracetic*. It has a sour taste due to malic acid and acetic acid. Vinegar contains vitamins, minerals, amino acids, polyphenolic compounds, and organic acids.

Table 1: nutritional composition of ACV

Ingredients	Quantity
Calcium	7 mg/100g
Iron	0.2 mg/100g
Magnesium	5 mg/100g
Phosphorus	8 mg/100g
Potassium	73 mg/100g
Zinc	0.04 mg/100g
Sodium	5 mg/100g
Carbohydrates	0.93 g/100g
Acetic acid	50.9 g/L
Citric acid	0.02 g/L
Formic acid	0.28 g/L
Lactic acid	0.38 g/L
Malic acid	3.56 g/L
Succinic acid	0.27 g/L
Fructose	6.83 g/L
Acetoin	0.21 g/L
2,3-butanediol	0.37 g/L
Ethanol	1.03 g/L
Ethyl acetate	0.14 g/L

### Disease Control

Coccidiosis is a common poultry disease caused by *Eimeria* (protozoa). There are 2 types of Coccidiosis: Caecal and intestinal. Emaciation, poor growth, pale mucus membrane, poor production, sometimes diarrhea, and blood in droppings are the clinical signs of intestinal coccidiosis [1]. Thick wall oocysts of *Eimeria* are present in fecal material. ACV when given 13ml per liter of drinking water it shows anticoccidial effects [2]. It decreases the number of oocytes in droppings of birds, increase anti-oxidative status, increases nutrient absorption, decreases bacteria, and is also helpful in recovery from vent gleet. ACV is also used for prevention from worms [3] and owns antibacterial activities against Gram-negative and Gram-positive bacteria; shows 100% bactericidal activities against *S. aureus* and *E. coli* and bacteriostatic against *E. coli*.

Research shows that the use of ACV in poultry decreases the concentration of malondialdehyde in blood. Lipid peroxidation occurs in stored chicken eggs which can be prevented by using ACV in drinking water and feed [4]. ACV acidifies proventriculus which creates a less conductive environment for *Macrorhabdus ornithoptera* (Fungus). Intestinal microbes in which are beneficial in digestion, absorption, and metabolism while others compete

for nutrition with the host; both microbes can be balanced by using ACV. Using 3.75% of ACV shows a positive response in the healing of wounds infected by bacteria due to its antibacterial properties. When antibiotics and ACV are used in equal amounts it will lead to rapid wound healing. If 1 tablespoon of vinegar is added per gallon of drinking water, it reduces algae growth [5].

The antibacterial activities of ACV play an important role in maintaining the immunity of chickens. It contains organic acids which are used as antibacterial agents and increases the acidity of the gastrointestinal tract which increases the metabolism of fats, nutrients, and minerals. Increasing degradation of phosphorus, amino acids, and fats leads to low blood lipid levels which causes improvement in immunity. The use of ACV results in immunity against ND and IBD [6].

### Role in Digestion

Crop impaction is caused by crop blockage which occurs when stored feed cannot move toward the esophagus. It usually occurs in free-range birds which have access to grass, hay, and other material which they cannot digest. ACV supports grass digestion and has flushing effects when 0.1% ACV (contains 6% acetic acid) is used in drinking water [7]. It is also believed that ACV helps in controlling diarrhea and reduces intestinal and fecal odor. It lowers digestive tract pH which contributes to controlling pathogens by changing their environment and helps in protein assimilation and breakdown of fats and minerals. Increases digestive tract efficiency and improves absorbance of nutrients.

### Conclusion

When Apple Cider Vinegar is used in feed or drinking water it boosts immunity against ND and IBD, prevents crop impaction, kills bacteria, shows anticoccidial effects, reduces stress, and improves digestion and metabolism.

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