

# Application of Rose Hip Fruits as Feed Supplement in Animal Nutrition

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**Abstract:** Rose hip (*Rosa canina*) fruits have been used in herbal remedies since ancient times. They are rich in a number of biologically active substances such as vitamins C, B1, B2, PP, K, vitamin E (in seeds), carotene (provitamin A), lycopene, pectin, flavonoids (campferol, quercetin, rutin), potassium, calcium, phosphorus salts. Rose hip seeds oil and residues are of special interest because of high content of linolenic acid. The aim of the current review was to describe the composition and properties of rosehip fruits and the effects of their supplementation to the feed of livestock animals, such as cattle, poultry and swine. Studies in animals prove positive effect in relation to both animal health and productivity in terms of quality and quantity, in cattle (milk and beef), pigs (pork yield and reproductive performance) and poultry (productive performance, egg quality).

**Keywords:** *Rosa canina*, effect, productive performances.

## 1. INTRODUCTION AND OBJECTIVES

The resistance of pathogens to antibiotics as well as their residues in tissues has prompted the scientific community to work on finding new alternative substances that would contribute in improving animals health and growth and their production performances. Also the consumers demands of healthier food and animal welfare contributes to application of natural alternative substances in animal nutrition and in food preservation [1]. This is one of the of the reasons why in recent years the natural sources of antioxidants (plants, herbs) are receiving increasing attention in human and animal nutrition. Among variety of plants bearing anti-oxidative constituents, the rosehip (*Rosa canina*) has been attracting the great interest. Rosehip fruits have been used in herbal remedies since ancient times [2]. They are rich in a number of biologically active substances such as vitamins C, B1, B2, PP, K, vitamin E (in seeds), carotene (provitamin A), lycopene, pectin, flavonoids (campferol, quercetin, rutin), K, Ca, phosphorus salts, Mg, Mn, Na and Fe. All this minerals contribute to enzymes activation in the body [3]. Rosehip seeds oil and residues are of special interest because of high content of linolenic acid.

Results from numerous studies indicated that Rosehip fruits have a lot biological potencies, including anti-inflammatory [4], anti-cancer [5], anti-microbial [6] and anti-oxidant [7]. The high content of vitamin C and total polyphenol, the content of anthocyanin, lycopene

and  $\beta$ -caroten shows antioxidant activity and eliminates free radicals and oxidizing molecules from the organism which are involved in cancer development and possible damage of DNA [3]. In addition to all this potentials consummation of rosehip can help in: pain reduction [8, 9], diabetic [10], and hyperlipidemic treatment [11]. It also demonstrates a neuroprotective, genoprotective [12], anti-obesity [13], skin-whitening [14], and antibiotic resistance reversal activity [15]. Rosehip fruit is exerting a positive influence on the osteoarthritis, anxiety, depression, recognition memory, urinary and reproductive systems disorders, and neutrophil respiratory burst. All this properties are a result of rosehip composition. The macro and micro elements in rosehip fruit influence the absorption of iron in body and biosynthesis of collagen [3]. The authors noticed that richness of linoleic and linolenic acids makes fruits rich source of omega fatty acids which have protective effect over cardiovascular system and can play important role in brain and retinal development. Tekeli [16] emphasised that rosehip fruits can help in reduce the stress in broilers induces by low temperature and in acute phase can decrease the C-reactive protein (CRP), a marker for inflammatory condition in body.

The treatment with rosehip extract can have positive influence in reducing abdominal visceral fat in prebase objects and as a result of that can influence in reducing risks of cardiovascular diseases [13]. This study was designed to evaluate and clarify the known application of rose hip fruits as feed supplement in animal nutrition.

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## EFFECTS OF ROSEHIP FRUIT SUPPLEMENTATION IN RUMINANT NUTRITION

There are several studies conducted to evaluate the influence on productive performances on ruminants and for the mitigate the rumen methane production. One of the studies was carried out to evaluate the ground *Rosa canina* seed at various levels (0%, 5%, and 15%) in barley–soybean-based concentrates offered to Morkaraman male lambs at approximately 8 months of age, on fattening performance, carcass, and meat quality characteristics. The effect of diet on daily weight gain was found statistically significant. The control group had higher daily weight gain than groups fed with 15% of ground *R. canina* seed. The hot carcass and cold carcass weights and dressing percentage values were affected by diets, and group fed with concentrate containing 15% *R. canina* seed had higher carcass weights and dressing percentages than groups fed with concentrate containing 0% and 5% *R. canina* seed. Differences among the groups in terms of leg, rib, and hind shank weights were found highly significant. The lambs nourished with feed containing 15% *R. canina* seed shows significantly higher results compared to the lambs receiving 0% and 5% rosehip seed in feed. Contrary to this findings, there were no significantly different results among these parameters between groups fed with 0% and 5% *R. canina* seed [17] Authors emphasised that, meat colour parameters and pH values were not affected by diets in this study.

The methane production is one of the crucial problems in ruminant's livestock. Rosehip seeds oil and seeds residue, as nutrient sources for livestock are one of the by-products that are interest in order to reduce production cost and methane emission to atmosphere [18]. The authors examined the potential of liquid wild dog rose (*Rosa canina*) seeds oil and solid seeds residue obtained after CO<sub>2</sub> extraction in supercritical conditions to mitigate rumen methane production *in vitro*. They carried out two experiments. In the first one the substrate was comprised of a mixture of meadow hay and barley meal (60:40) for the control diets (CON1 in experiment with oil and CON2 in experiment with residue). The control diets were supplemented up to 5% in dry matter of rose seeds oil and 5% of rose seeds residue. The potential to mitigate methane production was reported only in wild dog rose seeds oil treatment.

## EFFECTS OF ROSEHIP FRUIT SUPPLEMENTATION IN SWINE NUTRITION

The physiological properties of the *Rosaceae* fruits are due mainly to their high content of phenols, which

have biochemical activities, such as antioxidative, antimutagenic and anticarcinogenic effects [19]. The fruits contain vitamins and minerals, the whole complex bestowing them a high nutritive value [20]. Untea [21] reported the results of an experiment conducted on weaned piglets, which monitored comparatively the effects of a dog rose (*R. canina*) supplement over copper and zinc elimination through faeces. The 10% reduction of the dietary premix and the use of 3% supplemental dog rose preparation, decreased by 13.45% and 4.93%, respectively, the amounts of Cu and Zn eliminated through the faeces; no significant differences in animal performance was noticed between the two groups.

Yordanova [22] reported that in the tested nutrition scheme that used supplement of flour from nettle and rosehip does not affect the main indicators of sperm quality (volume, density and motility) in boars from Danube White breed, on the contrary it decreases the percentage of pathological spermatozoa for 14.56% and also insignificantly affects decreasing the percentage of agglutination.

## EFFECTS OF ROSEHIP FRUIT SUPPLEMENTATION IN POULTRY NUTRITION

Regarding the rosehip supplement as feed additive, there are studies conducted to established the acts as antioxidants, anti-inflammatory, antimicrobial, anti-tumour etc. in poultry production. Tekeli [16] reported that utilisation of rosehip fruit (*Rosa canina*) which is used as a source of vitamin C in broilers under cold stress on performance, improved live weight measured in the groups supplemented with 10 and 20 g/kg rosehip. Increased dose of rosehip (30 g/kg) significantly decreased live weight ( $P < 0.01$ ). The use of rosehip in the rations of cold-stressed broilers significantly affected the levels of T3 hormone, Na, cholesterol, RBC, HCT and HGB ( $P < 0.05$ ). T3 hormone level significantly increased in the group with 20 g/kg rosehip supplementation. Cholesterol level significantly decreased in the groups supplemented with 10 and 20 g/kg rosehip compared to the group with 30 g/kg rosehip supplementation. Similarly, the levels of blood hematocrit parameters RBC, HCT and HGB were detected to be lower in the groups with rosehip supplementation ( $P < 0.05$ ). With respect to colour parameters, redness\*, yellowness\* ( $P < 0.001$ ), hue and chroma values of thigh meat and lightness\* ( $P < 0.001$ ), yellowness\* ( $P < 0.001$ ), hue and chroma values of breast meat were significantly affected by the treatments ( $P < 0.05$ ). The findings of the current study

revealed that oxidative stress in broilers induced by cold weather conditions can be reduced by use of rosehip in broiler rations [16] Kaya [23] reported that dietary rosehip seed (RS) supplementation into layer diets at different levels (basal diet + 10% and +15% ground rosehip seeds) increased the feed consumption and egg yield ( $p < 0.05$ ), and decreased the damaged egg ratio, and there is beneficial increasing of yolk colour, shell thickness and shell weight ( $P < 0.05$ ). Rose hip is richest in total tocopherols, mainly because of an obvious richness in the  $\gamma$ -form compared with the other natural additives [24]. Loetscher [25] tested the effect of four plants rich with antioxidants (rosemary leaves, rosehip fruits, chokeberry pomace and entire nettle) as feed additives for broilers and laying hens and their impact on the oxidative stability of final products (meat and eggs). The results showed that 25 g/kg feed of rosehip significantly slowed the lipid oxidation in broiler meat. The antioxidant effect of rosehip in poultry diets is very important in order to delay or inhibit the oxidation of other substances by inhibiting the initiation or propagation of oxidative chain reactions [26].

Grigorova [27] conducted a study to evaluate the influence of rosehip supplementation on egg production, egg morphological characteristics, yolk lipid oxidation and some blood parameters of laying hens. The experiment was carried out with laying hens divided in two groups – control and experimental. The diet of experimental hens was supplemented with 0.5% dried and milled fruits of rosehip. Rosehip fruits supplementation to the layers diet for a period of 40 days had not significant effect on their final live body weight, egg productivity and egg morphological characteristics during the experimental period. However, the triglycerides level in the blood serum as well as yolk malondialdehyde (MDA) level significantly decreased during egg storage for 30 days in the fridge ( $p < 0.05$ ) and during 30 days on room temperature ( $p < 0.01$ ). The use of 0.5% rosehip fruits leads to a significant increase in egg yolk pigmentation ( $p < 0.001$ ).

Rosehip was proposed as an alternative to antibiotics because of its possibility to control the oxidative stress in broiler chicks. Rosehip has an antibacterial potential against some microorganisms and some strains of *Staphylococcus aureus*, *Bacillus cereus*, *Yersinia enterocolitica*, *Klebsiella pneumoniae*, *Salmonella typhimurium* [28]. This findings are important because bacteria can cause serious poultry diseases. The microbial effects of rosehip are result of the composition (vitamin C, tocopherols, tannins, fatty

acids, minerals, carotenoids and phenolic compounds) [3].

## CONCLUSIONS

The present studies of rosehip supplementation in animal nutrition show the relevance and consequences of positive effect in relation to both animal health and productivity in terms of quality and quantity, in cattle (milk and beef), pigs (pork yield and reproductive performance) and poultry (productive performance, egg quality). The fact that livestock and humans share the same fundamental biology and metabolic pathways supports the belief that animal well-being (reducing oxidative stress by proper managing) the rosehip may also provide benefits to the final consumer. The positive effects of rosehip as a supplement on animal health status and production performances deserve further investigations.

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