



University of Zabol
Graduate school
Faculty of Agriculture
Department of Animal Science, Animal Nutrition (Ruminant)

The Thesis Submitted for the Degree of *Ph.D* (in the field of Animal Science)

Determination of nutritive value of *Berberis vulgaris* pomace and its effect on feed intake, blood and ruminal parameters and meat quality of fattening male lambs

Supervisors:

Dr. Mostefa Yosef Elahi

Co-supervisor

Dr. Abdelfattah Z.M. Salem
Dr. Mohamad Hasan Fathi Nasri
Dr. Morteza Karami

Ph.D. Candidate

Vahid Kardan Moghaddam

Winter 2020

Abstract

This study was carried out to evaluate nutritive value of *Berberis vulgaris* pomace (BVP) by *in situ* and *in vitro* experiments and to investigate the effects of replacing alfalfa hay and wheat straw with BVP on Daily feed intake, average daily gain (ADG), *in vivo* digestibility, rumen fermentation and blood metabolites parameters, antioxidant capacity, meat quality and fatty acids (FA) profile. In this experiments, twenty-one Balochi male lambs were used with average body weight of 24.5 ± 4 kg. Three iso-energetic (2/56 Mcal/kg DM) and iso-nitrogenous (140 g/kg DM) diets were randomly assigned to the three groups of 7 lambs each in a completely randomized design for a period of 90 days. The diets were offered ad libitum at a forage to concentrate ratio of 30–70 in which alfalfa hay and wheat straw was replaced by different levels (0, 75 or 150g/kg of dietary DM) of BVP. Diets were offered twice daily. After being fed for 12 weeks, lambs were slaughtered, *longissimus lumborum* (LL) muscle was sampled out, and then meat quality, chemical composition, oxidative stability, colorimeter and fatty acid profiles recorded. The results of this experiments indicated that Addition of BVP did not affect the final body, the dry matter intake (DMI), average daily gain (ADG) or total tract nutrient digestibility ($p > 0.05$). Similarly, diets had no effect ($p > 0.05$) on weight of carcass, commercial cuts and non-carcass components, but linearly increased (L, $p < 0.001$) warm and cold dressing percentage as well as heart weight. Blood metabolites were unaffected by BVP treatment, except for concentration of total protein in plasma, which increased linearly (L, $P < 0.01$) with increasing BVP treatment. Inclusion of BVP linearly decreased ruminal ammonia nitrogen (L, $P < 0.001$) and total protozoal population (L, $P < 0.05$), but did not affect concentrations of total volatile fatty acids (VFA), individual VFA or pH in the rumen ($p > 0.05$). Chemical composition (meat or liver) and quality characteristics meat such as pH, drip loss, cooking loss and shear force were also similar in different treatments ($p > 0.05$). Feeding BVP diets linearly increased the concentrations of vaccenic acid (C18:1 trans-11; $P < 0.001$), rumenic acid (C18:2 cis-9, trans-11 RA; $P < 0.001$) and C18:3 n-3 (α -linolenic acid; $P < 0.001$) and decreased ($P < 0.001$) the ratio of n-6/n-3 in muscle. TBARS levels in lamb meat increased linearly with increasing storage time ($P < 0.05$). Both of these treatments have lower TBARS than the control group ($P < 0.05$). Index of meat chrome (C*) color appeared to increase in BVP containing treatment ($P < 0.05$), whereas color parameters (lightness (L*)-yellowness (b*)-redness (a*)-hue angle (H*)) color not affected by dietary treatments ($p > 0.05$). Addition of BVP to the diet increased (L, $P < 0.05$) total antioxidant capacity (TAC), superoxide dismutase (SOD) and glutathione peroxidase (GSH-Px) activity in the plasma and subsequently decreased ($P < 0.05$) the malondialdehyde concentration in the plasma and *Longissimus lumborum* (LL) muscle compared to the control diet. Also, total antioxidant capacity (TAC) was increased in LL muscle (L, $P < 0.05$) of lambs with inclusion of BVP in diet. The results of this experiment indicated that replacing alfalfa and wheat straw with BVP in the diet did not affect growth performance, carcass traits and nutrient digestibility, while improve the antioxidant capacity, lipid stability and fatty acid profile of lambs.

Keywords: Antioxidant capacity, *Berberis vulgaris* pomace, fatty acid profile, oxidative stability.