The aim of the study was to evaluate the effect of peppermint essential oil (PE) and non-fiber carbohydrates (NFC) including sucrose (SUC) and starch (STA) on gas production parameters of alfalfa hay (AH). Treatments were AH, AH plus PE (40 and 80 μL/g DM), AH supplemented with SUC or STA at 60 and 90 mg/g DM plus PE (0.0, 40 and 80 μL/g DM). Approximately 0.3 g of each sample (n = 4) was placed in a 100 mL glass syringe containing 40 mL of buffered rumen fluid (buffer to rumen fluid was 2:1). Rumen fluid was obtained from 2 rumen cannulated sheep (body weight = 45 ± 2 kg) before the morning feeding and strained through 4 layers of cheesecloth. Animals were fed 1.5 kg DM alfalfa hay and 0.4 kg DM concentrate (165 g CP/kg DM) per head/day. Syringes were incubated at 39°C and the volume of gas produced were recorded at 2, 4, 8, 12, 24, 36, 48, 72 and 96 h. Data were fitted to an exponential equation of $P = b(1-e^{-ct})$, where $b$ is the volume of gas produced, $c$ is the fractional rate constant of gas production (/h), $t$ is the incubation time (h) and $P$ is the volume of gas produced at time $t$. The gas production parameters of the supplemented samples were compared with AH as control using Dunnett’s test at $P < 0.05$. Supplementation of AH with PE, at both rates applied, reduced the volume of gas produced ($P < 0.05$; 72, 52 and 54 mL/0.3 g DM, respectively), but increased the fractional rate constant of gas production ($P = 0.05$, 0.1, 0.12 and 0.10, respectively). In addition, FE particularly as 40 μL/g DM, reduced ($P < 0.05$) the volume of gas produced from the AH samples supplemented with both SUC and STA. The rate constant of gas produced ($c$) from AH supplemented with SUC and STA at both levels (0.09 and 0.08/h, respectively) was increased ($P < 0.05$) by the adding of FE as 40 and 80 μL/g DM (0.13 and 0.09/h, respectively). It might be concluded that, as 40 or 80 μL/g, caused an alteration in the fermentation potential of AH alone or supplemented with the NFC sources used.

**Key Words:** essential oil, gas production, peppermint

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**M349**  In vitro effect of peppermint (*Mentha piperita*) essential oil and non-fiber carbohydrates on gas production parameters of alfalfa hay.  M. Danesh Mesgaran*1, E. Jani2, A. Vakili3, A. Solaimany2, and H. Jahani-Azizabadi1, 1Dept. Animal Science, Ferdowsi University of Mashhad, Mashhad, Iran, 2Islamic Azad University, Kashmar, Iran.

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**M350**  Effect of fennel (*Foeniculum vulgare*) vulgar essential oil on in vitro gas production parameters of alfalfa hay supplemented with sucrose or starch.  M. Danesh Mesgaran*1, E. Jani2, A. Vakili3, H. Jahani-Azizabadi1, and A. Solaimany2, 1Dept. Animal Science, Ferdowsi University of Mashhad, Mashhad, Iran, 2Islamic Azad University, Kashmar, Iran.

The aim of the present study was to evaluate the effect of fennel essential oil (FE) on gas production parameters of alfalfa hay (AH) and AH supplemented with sucrose (SUC) or starch (STA). Treatments were AH, AH plus FE (40 and 80 μL/g DM), AH supplemented with SUC or STA at 60 and 90 mg/g DM plus FE (0.0, 40 and 80 μL/g DM). Approximately 0.3 g of each sample was placed in a 100 mL glass syringe containing 40 mL of buffered rumen fluid as 2:1 (n = 4). Rumen fluid was obtained from 2 rumen cannulated sheep (body weight = 45 ± 2 kg) before the morning feeding and instantly strained through 4 layers of cheesecloth. Animals were fed 1.5 kg DM alfalfa hay and 0.4 kg DM concentrate (165 g CP/kg DM) per head/day. Syringes were incubated at 39°C and the volume of gas produced was recorded at 2, 4, 8, 12, 24, 36, 48, 72 and 96 h. Statistical analysis was conducted using SAS (2009) procedure. Gas production data were fitted to an exponential equation of $P = b(1-e^{-ct})$, where $b$ is the volume of gas produced, $c$ is the fractional rate constant of gas production (/h), $t$ is the incubation time (h) and $P$ is the volume of gas produced at time $t$. The gas production parameters of the supplemented samples were compared with AH as control using Dunnett’s test at $P < 0.05$. Supplementation of AH with FE, at both rates applied, reduced the volume of gas produced ($P < 0.05$; 72, 52 and 54 mL/0.3 g DM, respectively), but increased the fractional rate constant of gas production ($P = 0.05$, 0.1, 0.12 and 0.10, respectively). It might be concluded that PE at 40 μL/g DM of PE, caused a significant decrease ($P < 0.05$) for those treatments (0.06 and 0.05, respectively). It was concluded that PE at the both applied rates had a potential to alter the fermentability of AH and AH supplemented with the NFC sources.

**Key Words:** essential oil, gas production, peppermint

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**M351**  Effect of individual and mixed natural tree extracts on in vitro ruminal fermentation profiles in sheep.  F. S. Jimenez-Peralta1, A. Z. M. Salem*1,4, H. Ammar2, M. Ronquillo3, and P. B. Albharran1, 1Autonomía del Estado de México, Centro Universitario UAEM-Temascaltepec, Estado de México, C.P. 51300, México, 2École Supérieure d'Agriculture de Mognare, Zaghouan, 1121 Mognare, Tunisia, 3Universidad Autónoma del Estado de México, Facultad de veterinaria, Toluca, Mexico, 4Alexandria University, Department of Animal Production, Faculty of Agriculture (El-Shaty), Egypt.

Extracts of 2 tree leaves species [*Salix babilonica* (SB) and *Leucaena leucocephala* (LL)] and their mixture (SBLL, 1:1, v/v) rich in secondary metabolites (ESM, 10 g DM/80 mL of solvent), were in vitro evaluated on ruminal fermentation pattern in 4 levels of 0, 0.6, 1.2, and 1.8 mL extract/g DM of TMR (50:50 forage/concentrate diet). Animals used for the extraction of rumen liquid (RL) for the in vitro incubations were allocated into 2 experimental groups (8 animals/group): control (CG) and treated (TG) group. Animals of CG were fed daily on TMR, while those of TG were fed on the same TMR and drenched a daily oral dose of SBLL (30mL/animal) for 60 d. Concentrations of secondary metabolites (SM) in terms of total phenolics (TP), saponins (SAP) and aqueous fraction (AF, lectins, polypeptides and starch) were examined in each tree extract and gas production was recorded at different incubation times (2, 4, 6, 8, 10, 12, 24, 48 and 72 h) of TMR with different extracts levels. Short chain fatty acids (SCFA), in vitro organic matter degradability (IVD) and metabolizable energy (ME) were estimated. As compared with SB, extracts of LL had higher TP, SAP and AF (i.e., 24, 14 and 116 versus 15, 6 and 74 g/kg DM, respectively). For both animal groups, increasing the extracts dose until 1.8 mL/g DM improved ($P < 0.05$) the ruminal fermentation activities of TMR with increasing the extracts dose until 1.8 mL/g DM in ether TG or CG, probably due to a higher extracts -soluble sugars. However, higher fermentation activities were observed in SB than LL and SBLL extracts. Ruminal fermentative activities of TMR were reduced by more than 50% in TG versus to CG during all the incubation times, except the first 2 h. In conclusion, administration of SBLL during 60 d to animals did not enhance the ruminal fermentation activities of TMR in sheep. Individual extracts-rich in secondary metabolites at 1.8 mL/g DM, in particular SB extracts, had the most potential on ruminal microorganism’s activities and may serve as an alternate to antibiotics and ionophores as a growth promoter of weaned lambs.

**Key Words:** extracts, secondary metabolites, in vitro fermentation, sheep
Author Index

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