

Abstract

Ensiling Unsalable Vegetables with Crop Sorghum to Produce High Quality Feed †

Daniel L. Forwood ^{1,2,*}, Kristian Hooker ², Eleonora Caro ^{2,3}, Yuxin Huo ², Devin Holman ⁴, Alex V. Chaves ² and Sarah J. Meale ¹

¹ School of Agriculture and Food Sciences, Faculty of Science, The University of Queensland, Gatton, QLD 4343, Australia; s.meale@uq.edu.au

² School of Life and Environment Sciences, Faculty of Science, The University of Sydney, Camperdown, NSW 2006, Australia; khoo5013@uni.sydney.edu.au (K.H.); eleonora.caro@unito.it (E.C.); yhuo2517@sydney.edu.au (Y.H.); alex.chaves@sydney.edu.au (A.V.C.)

³ Department of Agricultural, Forestry and Food Science, University of Turin, 10124 Torino, Italy

⁴ Lacombe Research and Development Centre, Agriculture and Agri-Food Canada, Lacombe, AB T4L 1W1, Canada; devin.holman@canada.ca

* Correspondence: d.forwood@uq.edu.au

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Abstract: Vegetables regarded as unsalable at processing often undergo disposal into landfill, threatening food security and increasing emissions through decomposition. Ensiling vegetables with forage crops is a suggested method of waste reduction that could also double as a livestock feed. Carrot or pumpkin, ensiled at 0%, 20% or 40% DM with crop sorghum, and with or without a second-generation silage inoculant were assessed for nutritive composition, organic acid profiles, aerobic stability and in vitro rumen fermentation characteristics. Silage was sampled after 70-days ensiling for nutrient composition, 14-day aerobic stability, organic acid profiles and microbial diversity. Sorghum ensiled with carrot or pumpkin at 20% or 40% DM increased crude fat ($P \leq 0.01$) and decreased ($P \leq 0.01$) silage surface temperature upon aerobic exposure compared to the control. Bacterial communities analyzed through 16S rRNA gene sequencing linearly increased ($P \leq 0.01$) in diversity as vegetable proportion increased in the silage; dominated by *Lactobacillus* species. Upon assessment in vitro, there was an increase ($P \leq 0.04$) in in vitro digestibility and some CH₄ parameters (% CH₄, and mg CH₄/g DM), with no effect ($P \geq 0.17$) on remaining CH₄ parameters (mL CH₄/g DM, mg CH₄/g DMD), gas production or pH. However, increasing vegetable proportion decreased acetic and increased propionic acid concentrations respectively, decreasing A:P ratio and total VFA as a result ($P \leq 0.01$). Results from this study indicate including carrot or pumpkin at 20% or 40% DM in a sorghum silage can produce a highly digestible, microbially diverse and energy-rich livestock feed whilst acting as a method of waste diversion of considerable environmental benefit.

Keywords: unsalable vegetables; silage production; microbial profiling

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