

Effects of silage additives on the ensiling characteristics of pulp from bio-refining

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Introduction

Bio-refined pulp is lower in solubles necessary for fermentation compared to the native forage. Application of silage additives may improve ensiling of pulp. **Aim:** To investigate the effects on fermentation pattern and fermentation weight loss (FWL) of adding substrate (sugar or brown juice) and/or an inoculant to pulp.

Methods

- Perennial ryegrass, harvested in late summer 2019 was fractionated using a screw-press (5 t/h). The pulp was rehydrated and fractionated again to obtain pulp for ensiling.
- 5 kg pulp weighed into vacuum bags and additives added.
- Bags were weighed on day 0, 1, 7, 14, 30, and 60 of ensiling to determine FWL.
- Extracts made from silage after weighing on day 60 were analyzed for pH and fermentation products.



Figure 1. Screw-press in bio-refinery.

Treatments of pulp prior to ensiling are:

CON=no addition of additives, **SUG**=addition of sugar (167 g of a 60% solution of sucrose), **LAB**=addition of homofermentative lactic acid bacteria, **S+L**=combination of SUG and LAB, **RBJ**=addition of 3.5 kg raw brown juice, **CBJ**= addition of 298 and 107 g concentrated brown juice to pulp when harvested at early and late maturity stage, respectively.

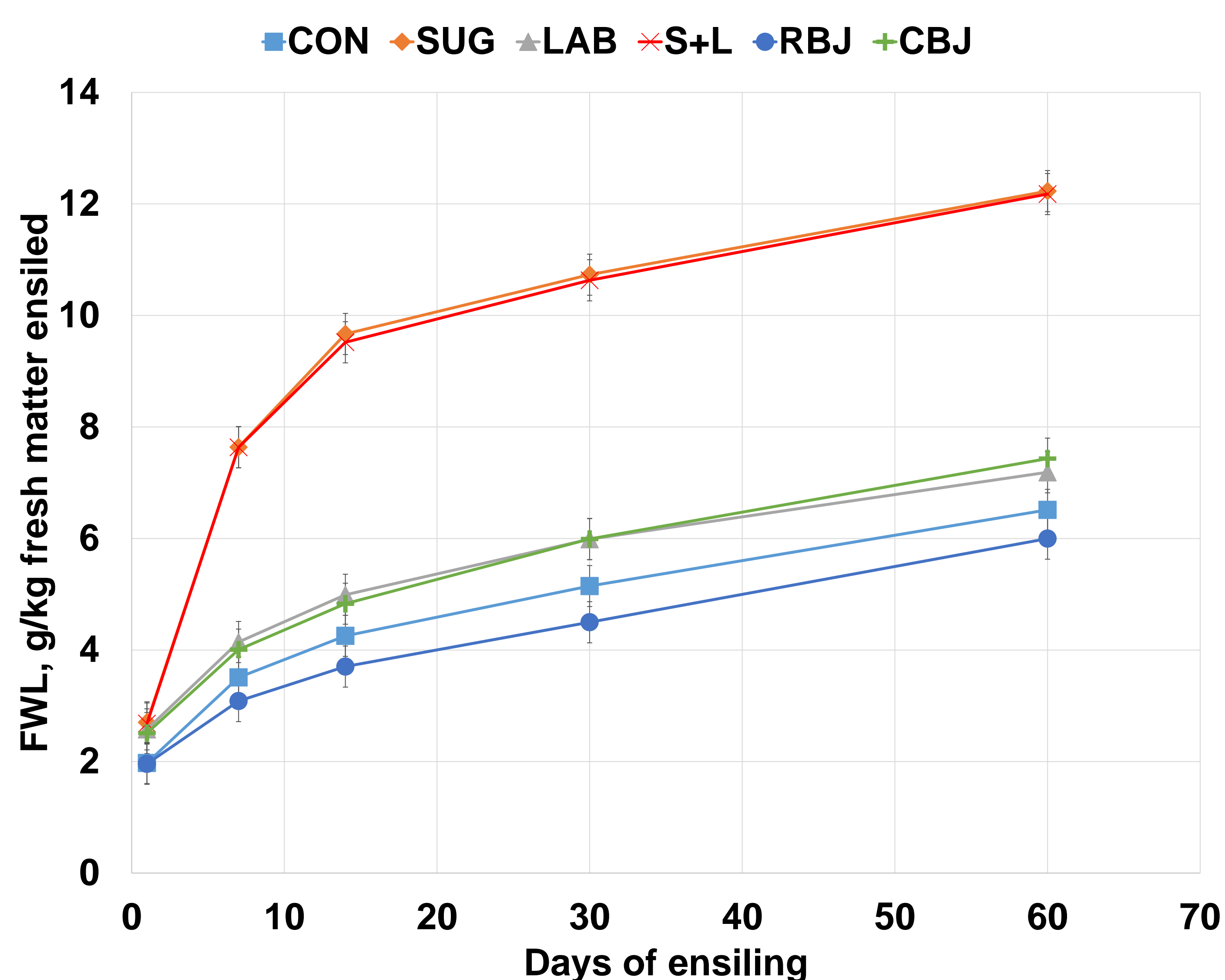


Figure 3. Fermentation weight loss (FWL) of pulp silage subjected to 6 different additive treatments prior to ensiling.

Results

- DM concentration was lower in RBJ compared to other treatments (22.7 vs. 37.8 %, respectively).
- FWL was highest when sugar was added (SUG and S+L).
- Lower pH in SUG and higher FWL for SUG and S+L suggested that the initial formation of L-lactate occurred faster compared to CON.
- NH₃-N concentration was lower in SUG and S+L compared to CON, likely caused by a potentially faster production of L-lactate in the initial phase.
- pH was higher and L-lactate was lower in RBJ compared to other treatments, probably caused by the lower DM concentration.



Figure 2. Pulp prior to ensiling.

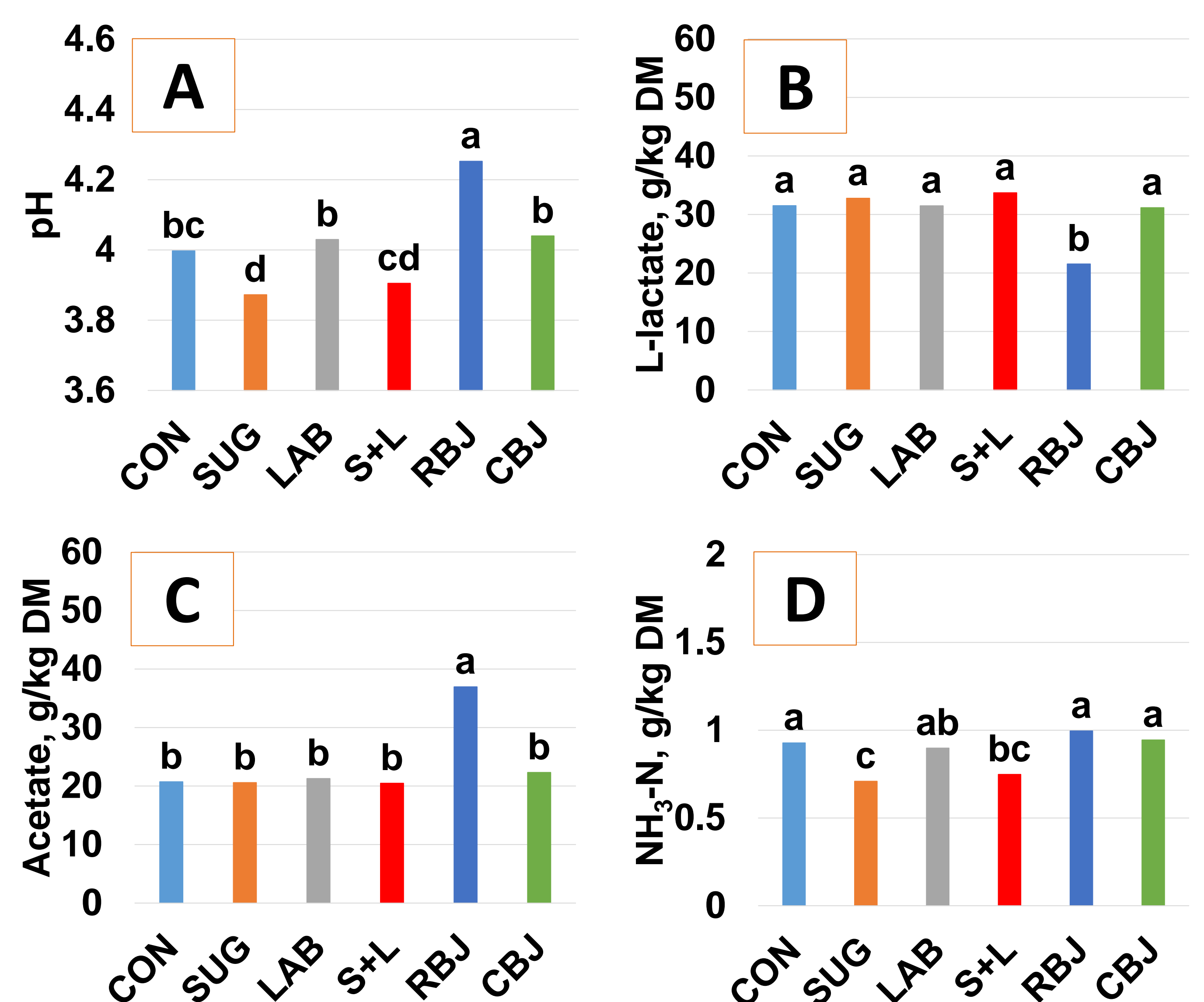


Figure 4. pH (A), L-lactate (B), acetate (C), and NH₃-N concentration (D) in pulp silage subjected to 6 different additive treatments prior to ensiling.

Conclusion

Pulp ensiled well without silage additives. However, it was indicated that substrate for microbial fermentation was the limiting factor for ensiling. Application of raw brown juice cannot be recommended for use on practical farms.