A study was conducted to conserve fresh tomato wasted by agro-industry through silage. Tomato was mixed with 1 of 4 additives (3% of additive, DM basis): cane molasses (M), brewer’s yeast (Y), a mix 1:1 of M and Y (M:Y), or no additive (C). After a 140 days period of silage, pH and chemical composition of silages were measured. The pH was greater (P<0.05) in C followed by Y, M:Y and M, but all treatments observed suitable pH levels to sustain silage conditions. The dry matter, ash, ether extract, neutral detergent fiber and acid detergent fiber contents were similar (P>0.05) among treatments; however, crude protein content was greater (P<0.05) in Y and M:Y treatments. It is concluded that fresh tomato can be ensiled for 140 days preserving its chemical composition even without the use of additives, but addition of brewer’s yeast with or without cane molasses improves the crude protein content of the silage.
The present experiment was conducted to evaluate the pH and chemical composition of tomato silage with or without the addition of cane molasses, brewers yeast or a mixture of both. The pH values obtained during the trial were within the optimal range for silages (2.5-4.5) during 60 days. Moreover, the addition of poultry litter or wheat straw did not reduce the pH. The chemical composition of the tomato silages is shown in Table 1. Brewer's yeast addition (Y) increased CP content (P<0.01) in relation to control (23.3% vs 21.9%, respectively), which agrees with Hadjipanayiotou (1994), who added 10% of poultry litter or wheat straw to a tomato silage during 90 days, reported similar pH as in tomato silage during the initial 3 days and after 56 days of silage.

Results and Discussion

The pH of the silage with the different additives is shown in Figure 1. It presented differences (P<0.01), with higher pH values for C (4.6) and Y (4.5), followed by the M:Y (4.3) and M (4.2) treatments. Addition of molasses decreased pH, which is in agreement with other studies (Evers and Carroll, 1998; Islam et al., 2001; Abarghochi et al., 2011). The pH in C and Y treatments was sustained for the 7 days post silage; however, the M and M:Y treatments showed the lowest pH values from 7 to 28 days in the M:Y treatment and from 14 to 42 days in M. Thereafter a slight increment and stabilization of the pH value after 84 days was observed. All the pH values obtained during the trial were within the optimal range for silages (Rooke and Hatfield, 2003). Megias et al. (2008), in a whole tomato silage, obtained a lower pH average (mean of 4.1) compared with this study (4.4). Yusufo et al. (2009) ensiled tomato pomace and corn stalks during 60 days and reported that the pH decreased as the fermentation period was longer. However, Hadjipanayiotou (1994) reported a higher pH in tomato pulp (5.0) as compared with fresh tomato (4.2) after ensiling during 60 days; moreover, the addition of poultry litter or wheat straw did not reduce the pH. For their part, Ziaei and Molaei (2010) reported a pH of 4.5 when they added 5 or 10% (as feed basis) of wheat straw in a tomato paste silage during 90 days. Weiss et al. (1997), upon addition of 6 or 12% (DM basis) of tomato pomace to a corn plant silage, reported similar pH as in tomato silage during the initial 3 d and after 56 days of silage.
lar (P>0.05) across the silage periods (Table 1), which contrasts with the results reported by Megias et al. (2008), who added formic acid, salt or beet pulp in tomato silages and observed greater DM and CP levels after 30 days. In addition, Yusufu et al. (2009) mention that CP and ADF increased (P<0.05) as fermentation time was prolonged in a tomato pomace and corn stalk mix ensiled during 60 days. Hadjipanayiotou (1994) fermented tomato pulp without additives during 60 days and reported a larger CP level for silage (24.2%) as compared with the fresh one (21.6%). He also reported a lower (P<0.05) DM content after ensiling (20.7% in fresh vs 17.2% in the silage). Horticulture byproducts generate high quantity of effluents during silage because of their high water content, which may increase the dry matter concentration (Martinez-Teruel et al., 2007). In this study the PVC microsilage containers were sealed and therefore no effluents were lost during the process.

**Conclusions**

Fresh tomato can be ensiled for 140 days preserving its chemical composition even without the use of additives, but addition of brewer’s yeast with or without cane molasses improves the CP content of the silage.

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**TABLE I**

**CHEMICAL COMPOSITION OF TOMATO SILAGE AT DIFFERENT SILAGE PERIODS AND ADDITIVES**

<table>
<thead>
<tr>
<th>Additive</th>
<th>0</th>
<th>14</th>
<th>70</th>
<th>140</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>M</td>
<td>Y</td>
<td>M:Y</td>
<td>SEM</td>
</tr>
<tr>
<td>Dry matter, %</td>
<td>24.0</td>
<td>23.0</td>
<td>24.0</td>
<td>24.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Ash, %</td>
<td>10.5</td>
<td>11.2</td>
<td>10.8</td>
<td>10.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Crude protein, %</td>
<td>21.9</td>
<td>23.1</td>
<td>23.2</td>
<td>23.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Ether extract, %</td>
<td>3.8</td>
<td>3.7</td>
<td>3.7</td>
<td>3.8</td>
<td>0.1</td>
</tr>
<tr>
<td>Neutral detergent fiber, %</td>
<td>22.5</td>
<td>21.5</td>
<td>22.5</td>
<td>21.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Acid detergent fiber, %</td>
<td>14.4</td>
<td>13.8</td>
<td>14.2</td>
<td>14.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>

SEM: standard error of the mean; C: control, tomato silage without additives; M: tomato silage added with 5% of cane molasses on DM basis; M:Y: tomato silage added with 5% of cane molasses and 5% of brewer’s yeast on DM basis; x, y: different letters among rows indicate significant differences (P<0.05).

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**REFERENCES**


