CHAPTER 118

Volatile Profile of New Improved Brazilian Capsicum chinense Peppers

Náyra O.F. Pinto1, Victor C. Castro Alves1, Maria Flávia A. Penha1, Bruna L. Gomes2, Francisco J.B. Reifschneider3 and Deborah S. Garruti4

1Embrapa Tropical Agroindustry, Fortaleza, CE, Brazil
2Embrapa Vegetables, Brasília, DF, Brazil
3Federal University of Ceará, Fortaleza, CE, Brazil

118.1 INTRODUCTION

Capsicum peppers have a significant international market [1]. Their attributes such as pungency, color, aroma, and flavor are desirable in a variety of culinary dishes around the world, which make them widely appreciated. In order to expand the Brazilian Capsicum agribusiness, the Brazilian Agricultural Research Corporation (Embrapa) is carrying out a breeding program in order to develop new genotypes with characteristics of agronomical and industrial interest. Besides the capsaicin content, which is responsible for the burning sensation, the program is looking after strains able to add aroma and flavor to foods [2]. In the present work, the volatile profile of two accessions of the Embrapa’s Pepper Active Germplasm Bank, with strong pungency, was compared to the profile of a very scented and not pungent Brazilian variety, called Orange Biquinho.

118.2 MATERIALS AND METHODS

Fruits of CNPH 3931 (a yellow Murupi), CNPH 4080 (a Cumari-do-Pará), and Orange Biquinho, all Capsicum chinense Jacquin cultivars [3], were harvested at Embrapa Vegetables, in Brasília, and transported by air to Embrapa Tropical Agroindustry, in Fortaleza, Ceará. Fruits were washed and stored frozen (−18°C).

The extraction of volatile compounds was performed by solid phase microextraction (SPME). DVB/CAR/PDMS fiber was exposed to
the headspace of 10 g crushed samples for 45 min at 65°C. A Shimadzu GC-2010/QP-2010 was used for the separation and identification of volatile compounds. Chromatographic conditions were: DB-5 MS column (J&W, 30 mm × 0.25 mm i.d. × 0.25 μm f.t.), injection in the splitless mode at 250°C, helium as the carrier gas (1.5 mL/min), and oven temperature from 50°C to 120°C at 5°C/min and then to 180°C at 2°C/min. Compounds were identified by comparison of mass spectra with those provided by the NIST library with the aid of Kovats indices (KI) [4,5].

118.3 RESULTS AND DISCUSSION

The volatile profiles of CNPH materials were very similar to each other. Compounds were mostly the same, varying in amounts for a few compounds. Major compounds were also the same: 3,3-dimethylcyclohexanol, esters hexyl pentanoate, (Z)-3-hexenyl pentanoate, hexyl isopentanoate, hexyl 2-methylbutanoate, heptyl isopentanoate, citronellyl isopentanoate, decyl pentanoate, and the terpene trimethyl-methylene-bicycoundene (Table 118.1).

Biquinho pepper showed a higher number of compounds (41) than CNPH 3931 (34) and CNPH 4080 (32), presenting more compounds of higher volatility (KI ≤ 1200), while the new materials presented more compounds of lower volatility (KI ≥ 1800). Biquinho also presented 17 more trace compounds that were not included in Table 118.1. However, its total chromatogram area was only about half of that of the other genotypes. 3,3-Dimethylcyclohexanol and the last three esters cited above were also major compounds in the Biquinho sample, but almost always in much fewer quantities.

In a previous work on Orange Biquinho’s aroma-active compounds [6], 3,3-dimethylcyclohexanol was described as “fried, onion” with low intensity; citronellyl and heptyl isopentanoate as “green” (medium to high); decyl pentanoate and hexyl 2-methylbutanoate as “pepper” (low); hexyl isopentanoate and (Z)-3-hexenyl pentanoate as “spicy” (medium to high). Hexyl pentanoate, described as “fruity, citrus,” was present in large quantities in CNPH samples, while heptyl butanoate, described as “pepper, floral” has only been identified in high amounts in Orange Biquinho pepper.

The number and quantity of compounds with “pepper-like” notes was higher in Orange Biquinho than in the other analyzed genotypes. While Biquinho showed 18 compounds with this description (including trace compounds...
Table 118.1 (Continued)

<table>
<thead>
<tr>
<th>Peak</th>
<th>Volatile Compounds</th>
<th>Area Counting (x10^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KI CNPH 3931 CNPH 4080 Biquinho</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>n.i.*</td>
<td>1616 - - 62.5</td>
</tr>
<tr>
<td>42</td>
<td>n.i.*</td>
<td>1640 - - 17.5</td>
</tr>
<tr>
<td>43</td>
<td>pentadecan</td>
<td>1677 - - 7.0</td>
</tr>
<tr>
<td>44</td>
<td>α-cardinal</td>
<td>1687 - - 31.6</td>
</tr>
<tr>
<td>45</td>
<td>pentadeceno (Z)-6-acetate</td>
<td>1860 11.5 - -</td>
</tr>
<tr>
<td>46</td>
<td>isocamphone</td>
<td>1872 1.2 42.7 4.8</td>
</tr>
<tr>
<td>47</td>
<td>octadecyl acetate</td>
<td>1989 18.2 12.9 -</td>
</tr>
<tr>
<td>48</td>
<td>oleic acid</td>
<td>1923 94.8 103.8 -</td>
</tr>
<tr>
<td>49</td>
<td>dimethyl tetradecanol acetate</td>
<td>1958 9.2 151.8 -</td>
</tr>
<tr>
<td>50</td>
<td>9-hexadecenoic acid</td>
<td>1968 32.7 - -</td>
</tr>
</tbody>
</table>

*n.i., not identified

...compounds), with an area of 522 × 10^3, CNPH 3931 and CNPH 4080 presented seven and eight compounds, totaling 353 × 10^3 and 466 × 10^3, respectively.

Many compounds found in the Biquinho sample with "sweet," "floral," and "fruity" notes [6] were only found in the novel materials in small quantities or were not detected (pentyl isopentanoate, pentanal, squalene, α-cardinal, and others). Orange Biquinho showed 13 peaks (21.3%) described with these odor notes, while CNPH 3931 and CNPH 4080 showed only nine, representing 26.5% and 24.3% of peaks, respectively.

118.4 CONCLUSION

CNPH 3031 and CNPH 4080 presented very similar volatile profiles, with fewer compounds than Orange Biquinho, described as a very aromatic pepper, but with higher volatile quantity, which were represented by a larger chromatogram area. The new genotypes lack some important compounds to Biquinho's sweet, floral, fruity, and pepper notes. However, the presence of some desirable esters can add a variety of pleasant notes to food preparations as citric, green, and spicy. These peppers are promising materials but could undergo future cross breeding to enhance their flavor.

ACKNOWLEDGEMENT

The authors are thankful to Embassa Vegetables for providing the peppers and financial support.

REFERENCES