Comparative Head Space GC/MS Studies of Different Flavored Moâssel in the Egyptian Market (I)

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ABSTRACT
The current study aimed to compare three different types of Egyptian flavored tobacco (Moâssel) used in Hookah smoking. The samples (Apple, Creamy Strawberry and Mix Grapes) were obtained from Al Dandash company (a famous Tobacco company in Egypt). They were analyzed by Head Space GC/MS. There were great differences among the investigated samples. The identified compounds of the Apple sample showed 34 constituents, which represented (93.13%) of the total compounds. The major one was anethole (30.43%). While, the Creamy Strawberry specimen exhibited 27 recognized compounds, which represented (59.61%) of the sample. The chief constituent was acetic acid (15.83%). Finally, the last sample showed 25 identified constituents, which represented (93.16%) of the total compounds and the main compound was 1,2-propanediol (32.74%) of the constituents.

Keywords: Head Space, GC/MS, Egyptian Flavored Moâssel, Al Dandash Company.

INTRODUCTION
Tobacco smoking is an addictive and lethal habit. Moreover, it harms others through passive inhalation of both adults and children to exhaled and side stream smoke1,2. While, smoking in pregnancy impairs fetal development and growth, in some cases reach to the point of fetal death3. Moreover, it causes fires generally reduce economic productivity and social engagement4. One of tobacco smoking types is Hookah (syn.: water pipe, shisha or bubble bubble), which is an old form of non-cigarette tobacco smoking that has been commonly practiced in the middle Eastern region contains over 4800 different chemicals out of which 69 are carcinogens and several others are tumor promoters5,7. Another study demonstrated that humectants such as glycerol and propylene glycol have added to tobacco products to facilitate processing of the cured tobacco leaf, retain moisture and increase half shelf life8,9. Furthermore, Cooperation Center for Scientific Research Relative to Tobacco (CORESTA) made experiments focused on the quantitative analysis of these humectants in tobacco and tobacco products10. Also, CORESTA recommended an another method to determine nicotine in tobacco and tobacco products by GC/MS10. All these data provoked us to make Head space GC/MS analyses on different types of flavored Moâssel used in the Egyptian Hookah.

MATERIALS AND METHODS
Materials
Egyptian flavored Moâssel samples viz., Apple (AFM), Creamy Strawberry (CSFM) and Mix Grapes (MixGFM) were collected from the Egyptian market (June 2016).

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Table 1: Identified compounds of AFM from Head Space GC/MS.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>RT£</th>
<th>RRT£</th>
<th>Base</th>
<th>Relative</th>
<th>M.</th>
<th>M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acetone</td>
<td>0.173</td>
<td>0.086</td>
<td>43</td>
<td>00.27%</td>
<td>58</td>
<td>C₆H₁₀O</td>
</tr>
<tr>
<td>2</td>
<td>2,3-Butanediene</td>
<td>0.213</td>
<td>0.105</td>
<td>43</td>
<td>00.22%</td>
<td>86</td>
<td>C₄H₈O₂</td>
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<tr>
<td>3</td>
<td>Acetic acid</td>
<td>0.177</td>
<td>0.107</td>
<td>44</td>
<td>00.28%</td>
<td>60</td>
<td>C₂H₄O</td>
</tr>
<tr>
<td>4</td>
<td>3-Methyl-1-butanol (Fusel oil)</td>
<td>0.380</td>
<td>0.188</td>
<td>55</td>
<td>00.98%</td>
<td>88</td>
<td>C₇H₁₄O</td>
</tr>
<tr>
<td>5</td>
<td>1,2-Propanediol</td>
<td>0.401</td>
<td>0.198</td>
<td>45</td>
<td>01.37%</td>
<td>76</td>
<td>C₆H₁₂O</td>
</tr>
<tr>
<td>6</td>
<td>Dimethyl acetic acid</td>
<td>0.454</td>
<td>0.225</td>
<td>43</td>
<td>00.78%</td>
<td>88</td>
<td>C₂H₆O₂</td>
</tr>
<tr>
<td>7</td>
<td>Butanoic acid</td>
<td>0.513</td>
<td>0.254</td>
<td>60</td>
<td>00.21%</td>
<td>88</td>
<td>C₂H₈O₂</td>
</tr>
<tr>
<td>8</td>
<td>Furfural</td>
<td>0.614</td>
<td>0.307</td>
<td>96</td>
<td>00.65%</td>
<td>96</td>
<td>C₁₂H₂₄O</td>
</tr>
<tr>
<td>9</td>
<td>Ethyl-1-butanol</td>
<td>0.639</td>
<td>0.317</td>
<td>43</td>
<td>00.23%</td>
<td>102</td>
<td>C₇H₁₄O</td>
</tr>
<tr>
<td>10</td>
<td>Ethyl-2-methyl butanoate</td>
<td>0.662</td>
<td>0.337</td>
<td>57</td>
<td>01.64%</td>
<td>130</td>
<td>C₆H₁₄O</td>
</tr>
<tr>
<td>11</td>
<td>E-3-hexen-1-ol</td>
<td>0.700</td>
<td>0.331</td>
<td>61</td>
<td>05.19%</td>
<td>100</td>
<td>C₇H₁₄O</td>
</tr>
<tr>
<td>12</td>
<td>Z-3-hexen-1-ol</td>
<td>0.828</td>
<td>0.337</td>
<td>41</td>
<td>01.17%</td>
<td>142</td>
<td>C₆H₁₂O</td>
</tr>
<tr>
<td>13</td>
<td>α-Hexyl formate</td>
<td>0.724</td>
<td>0.358</td>
<td>56</td>
<td>11.43%</td>
<td>130</td>
<td>C₇H₁₄O</td>
</tr>
<tr>
<td>14</td>
<td>3-Methylbutyl acetate (syn.: Isoamyl acetate or Isopentyl acetate)</td>
<td>0.741</td>
<td>0.366</td>
<td>43</td>
<td>00.41%</td>
<td>130</td>
<td>C₇H₁₄O</td>
</tr>
<tr>
<td>15</td>
<td>2-Methylbutyl acetate</td>
<td>0.748</td>
<td>0.377</td>
<td>43</td>
<td>00.24%</td>
<td>130</td>
<td>C₆H₁₂O</td>
</tr>
<tr>
<td>16</td>
<td>Camphene</td>
<td>0.690</td>
<td>0.475</td>
<td>93</td>
<td>00.18%</td>
<td>136</td>
<td>C₁₀H₁₆</td>
</tr>
<tr>
<td>17</td>
<td>Benzaldehyde</td>
<td>0.999</td>
<td>0.494</td>
<td>77</td>
<td>00.53%</td>
<td>106</td>
<td>C₆H₆O</td>
</tr>
<tr>
<td>18</td>
<td>Isoamyl propionate</td>
<td>0.299</td>
<td>0.509</td>
<td>57</td>
<td>00.20%</td>
<td>144</td>
<td>C₁₀H₁₆O</td>
</tr>
<tr>
<td>19</td>
<td>Hexanoic acid</td>
<td>0.777</td>
<td>0.533</td>
<td>60</td>
<td>00.75%</td>
<td>116</td>
<td>C₇H₁₄O</td>
</tr>
<tr>
<td>20</td>
<td>Glycerol</td>
<td>10.95</td>
<td>0.542</td>
<td>61</td>
<td>00.21%</td>
<td>92</td>
<td>C₆H₁₂O</td>
</tr>
<tr>
<td>21</td>
<td>Z-3-Hexenyl acetate</td>
<td>11.48</td>
<td>0.568</td>
<td>43</td>
<td>00.17%</td>
<td>142</td>
<td>C₆H₁₂O</td>
</tr>
<tr>
<td>22</td>
<td>α-Hexyl acetate</td>
<td>11.69</td>
<td>0.578</td>
<td>43</td>
<td>05.45%</td>
<td>144</td>
<td>C₆H₁₄O</td>
</tr>
<tr>
<td>23</td>
<td>Benzyl alcohol (syn.: Phenylmethanol or Benzenemethanol)</td>
<td>12.45</td>
<td>0.616</td>
<td>79</td>
<td>09.82%</td>
<td>108</td>
<td>C₇H₁₄O</td>
</tr>
<tr>
<td>24</td>
<td>Benzyl acetate</td>
<td>16.40</td>
<td>0.811</td>
<td>108</td>
<td>00.73%</td>
<td>150</td>
<td>C₆H₁₀O₂</td>
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<tr>
<td>25</td>
<td>Menthol</td>
<td>16.78</td>
<td>0.830</td>
<td>71</td>
<td>04.06%</td>
<td>156</td>
<td>C₁₀H₈O₂</td>
</tr>
<tr>
<td>26</td>
<td>Hexyl butanoate (syn.: Hexyl butyrate)</td>
<td>17.27</td>
<td>0.854</td>
<td>43</td>
<td>00.44%</td>
<td>172</td>
<td>C₁₀H₁₀O₂</td>
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<tr>
<td>27</td>
<td>Anisaldehyde (syn.: 4-Methoxybenzaldehyde)</td>
<td>19.23</td>
<td>0.951</td>
<td>135</td>
<td>00.93%</td>
<td>136</td>
<td>C₆H₁₂O</td>
</tr>
<tr>
<td>28</td>
<td>Anethole</td>
<td>20.22</td>
<td>1.000</td>
<td>148</td>
<td>30.43%</td>
<td>148</td>
<td>C₁₀H₁₄O</td>
</tr>
<tr>
<td>29</td>
<td>Benzyl butanoate</td>
<td>21.78</td>
<td>1.077</td>
<td>91</td>
<td>00.19%</td>
<td>178</td>
<td>C₁₁H₁₄O</td>
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<tr>
<td>30</td>
<td>Nicotine</td>
<td>21.89</td>
<td>1.083</td>
<td>84</td>
<td>00.19%</td>
<td>162</td>
<td>C₁₀H₁₄N₂</td>
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<tr>
<td>31</td>
<td>Hexyl hexanoate</td>
<td>22.80</td>
<td>1.128</td>
<td>43</td>
<td>00.22%</td>
<td>200</td>
<td>C₁₂H₂₀O</td>
</tr>
<tr>
<td>32</td>
<td>Vanillin</td>
<td>23.03</td>
<td>1.139</td>
<td>151</td>
<td>00.99%</td>
<td>152</td>
<td>C₈H₁₆O</td>
</tr>
<tr>
<td>33</td>
<td>Ethylvanillin (syn.: Vanilul or 3Ethoxy4-hydroxy benzaldehyde)</td>
<td>24.87</td>
<td>1.230</td>
<td>137</td>
<td>06.75%</td>
<td>166</td>
<td>C₁₀H₁₆O</td>
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<tr>
<td>34</td>
<td>Dihydro methyl jasmonate</td>
<td>29.64</td>
<td>1.466</td>
<td>83</td>
<td>05.80%</td>
<td>226</td>
<td>C₁₃H₂₂O₃</td>
</tr>
</tbody>
</table>

Unidentified compounds 06.87%

| Identified compounds 93.13% | Oxygenated compounds 92.76% | Nitrogenous compounds 00.19% | Hydrocarbons compounds 00.18% |

Creamy Strawberry Flavored Moëssel (CSFM)

The identified compounds are classified into three different classes viz., 92.76% oxygenated, 0.19% nitrogenous and 0.18% hydrocarbons compounds as shown in Figure 1 and enumerated in Table 1.

Head Space GC/MS analysis of CSFM exhibited 37 compounds. The unidentified compounds represented 40.39% (10 compounds) and identified compounds represented 59.61% (27 compounds). The major one was acetic acid (15.83%). The identified compounds are classified into three diverse classes viz., 57.44% oxygenated, 0.90% nitrogenous and 0.27% hydrocarbons compounds as demonstrated in Figure 2 and listed in Table 2.

Mix Grapes Flavored Moëssel (MixGFM)
Table 2: Identified compounds of CSFM from Head Space GC/MS.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>RT*</th>
<th>RRT**</th>
<th>Base peak</th>
<th>Relative Area %</th>
<th>M. Weight</th>
<th>M. Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acetic acid</td>
<td>2.26</td>
<td></td>
<td>43</td>
<td>15.83</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>2</td>
<td>Butanoic acid</td>
<td>5.10</td>
<td></td>
<td>60</td>
<td>01.49</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>3</td>
<td>Furfural</td>
<td>6.15</td>
<td></td>
<td>96</td>
<td>00.94</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>4</td>
<td>Ethyl-2-methyl butanoate</td>
<td>6.61</td>
<td></td>
<td>57</td>
<td>01.97</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>5</td>
<td>Ethyl isovalerate</td>
<td>6.71</td>
<td></td>
<td>88</td>
<td>00.46</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>6</td>
<td>Z-3-hexen-1-ol</td>
<td>6.81</td>
<td></td>
<td>41</td>
<td>00.79</td>
<td>O</td>
<td>C</td>
</tr>
<tr>
<td>7</td>
<td>Camphene</td>
<td>9.59</td>
<td></td>
<td>93</td>
<td>00.50</td>
<td>O</td>
<td>C2</td>
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<tr>
<td>8</td>
<td>Benzaldehyde</td>
<td>9.99</td>
<td></td>
<td>77</td>
<td>00.61</td>
<td>O</td>
<td>C</td>
</tr>
<tr>
<td>9</td>
<td>Glycerol</td>
<td>10.48</td>
<td></td>
<td>43</td>
<td>00.94</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>10</td>
<td>Hexanoic acid</td>
<td>10.71</td>
<td></td>
<td>60</td>
<td>01.85</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>11</td>
<td>Limonene</td>
<td>12.16</td>
<td></td>
<td>68</td>
<td>00.39</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>12</td>
<td>Benzyl alcohol (syn.: Phenylmethanol or Benzenemethanol)</td>
<td>12.40</td>
<td></td>
<td>79</td>
<td>03.54</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>13</td>
<td>Benzyl acetate</td>
<td>16.40</td>
<td></td>
<td>108</td>
<td>01.58</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>14</td>
<td>Ethyl maltol (syn.: 2-Ethylpyromeconic acid)</td>
<td>17.52</td>
<td></td>
<td>140</td>
<td>02.70</td>
<td>O</td>
<td>C3</td>
</tr>
<tr>
<td>15</td>
<td>Benzyl butanoate</td>
<td>21.78</td>
<td></td>
<td>91</td>
<td>00.43</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>16</td>
<td>Nicotine</td>
<td>21.86</td>
<td></td>
<td>84</td>
<td>00.90</td>
<td>O</td>
<td>C2</td>
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<tr>
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<td>Z-Methylcinamate</td>
<td>22.84</td>
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<td>131</td>
<td>00.71</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>18</td>
<td>Vanillin</td>
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<td>151</td>
<td>00.68</td>
<td>O</td>
<td>C3</td>
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<tr>
<td>19</td>
<td>α-Ionone</td>
<td>24.00</td>
<td></td>
<td>121</td>
<td>00.96</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>20</td>
<td>Ethylvanillin (syn.: Vanilal or 3-Ethoxy-4-hydroxy benzaldehyde)</td>
<td>24.80</td>
<td></td>
<td>137</td>
<td>04.70</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>21</td>
<td>γ-Decalactone</td>
<td>25.06</td>
<td></td>
<td>85</td>
<td>02.35</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>22</td>
<td>β-Ionone</td>
<td>25.56</td>
<td></td>
<td>177</td>
<td>01.22</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>23</td>
<td>δ-Decalactone</td>
<td>25.80</td>
<td></td>
<td>99</td>
<td>00.89</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>24</td>
<td>γ-Undecalactone</td>
<td>27.70</td>
<td></td>
<td>85</td>
<td>00.92</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>25</td>
<td>α-Amylcinnamaldehyde (syn.: Z-Jasminaldehyde)</td>
<td>29.50</td>
<td></td>
<td>129</td>
<td>10.21</td>
<td>O</td>
<td>C2</td>
</tr>
<tr>
<td>26</td>
<td>Dihydro methyl jasmonate</td>
<td>29.61</td>
<td></td>
<td>83</td>
<td>01.67</td>
<td>O</td>
<td>C2</td>
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<tr>
<td>27</td>
<td>Neophytadiene</td>
<td>33.55</td>
<td></td>
<td>68</td>
<td>00.38</td>
<td>O</td>
<td>C2</td>
</tr>
</tbody>
</table>

Unidentified compounds 40.39%
Identified compounds 59.61%

59.61% Oxygenated compounds
57.44% Hydrocarbons compounds
97.44% Nitrogenous compounds
01.27% Hydrocarbons compounds

RT: Retention Time. \*\*RRT: Relative Retention Time.
Head Space GC/MS analysis MixGFM displayed 34 compounds. The unidentified compounds represented 06.84% (9 compounds) and recognized compounds represented 93.16% (25 compounds). The major one was 1,2-propanediol (32.74%). The identified compounds are classified into three various classes viz., 92.51% oxygenated, 00.37% nitrogenous and 00.28% hydrocarbons compounds as shown in Figure 3 and recorded in Table 3.

**DISCUSSION**

The present study investigated three different Egyptian flavored Moâssel's viz., Apple, Creamy Strawberry and Mix Grapes by Head Space GC/MS analyses. The samples showed very high percentage of oxygenated compounds and traces of (nitrogenous & hydrocarbons) constituents. Therefore, they have strong flavored odors. The three samples had six common compounds viz., acetic acid, butanoic acid, furfural, Z-3-hexen-1-ol, benzyl alcohol and nicotine. Furthermore, AFM and CSFM had also ten common compounds viz., ethyl-2-methyl butanoate, camphene, benzaldehyde, hexanoic acid, glycerol, benzyl acetate, benzyl butanoate, vanillin, ethylvanillin and Dihydro methyl jasmonate. But, AFM and MixGFM had an another common compound; 1,2-propanediol. Finally, CSFM and MixGFM had also three common
### Table 3: Identified compounds of MixGFM from Head Space GC/MS.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>RT*</th>
<th>RRT**</th>
<th>Base peak</th>
<th>Relative Area %</th>
<th>M. Weight</th>
<th>M. Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5,6-Epoxy-β-ionone</td>
<td>0.47</td>
<td>0.359</td>
<td>40</td>
<td>26.82</td>
<td>208</td>
<td>C₁₃H₁₄O₂</td>
</tr>
<tr>
<td>2</td>
<td>2-Propanol (syn.: Isopropanol)</td>
<td>0.73</td>
<td>0.423</td>
<td>45</td>
<td>02.41</td>
<td>60</td>
<td>C₃H₆O</td>
</tr>
<tr>
<td>3</td>
<td>Acetic acid</td>
<td>0.16</td>
<td>0.528</td>
<td>43</td>
<td>01.55</td>
<td>60</td>
<td>C₂H₄O</td>
</tr>
<tr>
<td>4</td>
<td>1-Hydroxy-2-propanone (syn.: Acetol)</td>
<td>0.79</td>
<td>0.682</td>
<td>43</td>
<td>00.27</td>
<td>74</td>
<td>C₂H₆O</td>
</tr>
<tr>
<td>5</td>
<td>2,4-Dimethyl-1,3-dioxolane</td>
<td>0.07</td>
<td>0.751</td>
<td>43</td>
<td>00.21</td>
<td>102</td>
<td>C₈H₁₀O₂</td>
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<tr>
<td>6</td>
<td>1,2-Propanediol</td>
<td>0.09</td>
<td>1.000</td>
<td>45</td>
<td>32.74</td>
<td>76</td>
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<tr>
<td>7</td>
<td>Butanoic acid</td>
<td>0.18</td>
<td>1.267</td>
<td>60</td>
<td>01.85</td>
<td>88</td>
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<tr>
<td>8</td>
<td>Ethyl butanoate</td>
<td>0.30</td>
<td>1.296</td>
<td>71</td>
<td>01.98</td>
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<tr>
<td>9</td>
<td>Furfural</td>
<td>0.14</td>
<td>1.501</td>
<td>96</td>
<td>00.77</td>
<td>96</td>
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<tr>
<td>10</td>
<td>Z-3-Hexen-1-ol</td>
<td>0.80</td>
<td>1.663</td>
<td>41</td>
<td>01.50</td>
<td>100</td>
<td>C₆H₁₂O</td>
</tr>
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<td>11</td>
<td>Propylene glycol 1-acetate (syn.: 1-Acetoxy-2-propanol or 2-Hydroxypropylacetate)</td>
<td>0.75</td>
<td>1.834</td>
<td>43</td>
<td>00.28</td>
<td>118</td>
<td>C₁₇H₂₀O₃</td>
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<tr>
<td>12</td>
<td>Benzyl alcohol (syn.: Phenyldimethanol or Benzenemethanol)</td>
<td>1.41</td>
<td>3.034</td>
<td>79</td>
<td>04.33</td>
<td>108</td>
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<tr>
<td>13</td>
<td>Butanoic acid anhydride</td>
<td>1.44</td>
<td>3.286</td>
<td>71</td>
<td>00.40</td>
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</tr>
<tr>
<td>14</td>
<td>Heptanoic acid</td>
<td>1.78</td>
<td>3.369</td>
<td>60</td>
<td>00.33</td>
<td>130</td>
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<tr>
<td>15</td>
<td>Ethyl acetate (syn.: Ethyl 3-oxobutanoate)</td>
<td>1.38</td>
<td>3.516</td>
<td>43</td>
<td>00.23</td>
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<tr>
<td>16</td>
<td>3-Hydroxy-2,3-dihydromaltol (syn.: 2,3-Dihydror-3,5-dihydroxy-6-methyl 4H pyran-4-one)</td>
<td>1.80</td>
<td>3.863</td>
<td>43</td>
<td>00.32</td>
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<tr>
<td>17</td>
<td>Z-3-Hexenyl butyrate</td>
<td>1.70</td>
<td>4.181</td>
<td>67</td>
<td>00.63</td>
<td>170</td>
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<tr>
<td>18</td>
<td>Ethyl maltol (syn.: 2-Ethylpyromeliconic)</td>
<td>1.53</td>
<td>4.286</td>
<td>140</td>
<td>00.29</td>
<td>140</td>
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<td>19</td>
<td>Phenyl-3-methylbutanote</td>
<td>2.78</td>
<td>5.325</td>
<td>91</td>
<td>00.52</td>
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<tr>
<td>20</td>
<td>Nicotine</td>
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<td>5.330</td>
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<td>3-Allyl-2-methoxyphenol</td>
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<td>5.413</td>
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<td>Z-Jasmonate</td>
<td>2.28</td>
<td>5.692</td>
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<tr>
<td>23</td>
<td>E-β-Damascone</td>
<td>2.70</td>
<td>5.795</td>
<td>177</td>
<td>07.46</td>
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<tr>
<td>24</td>
<td>α-Ionone</td>
<td>2.03</td>
<td>5.875</td>
<td>121</td>
<td>03.61</td>
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</tr>
<tr>
<td>25</td>
<td>Neophytadiene</td>
<td>3.55</td>
<td>8.203</td>
<td>68</td>
<td>00.28</td>
<td>278</td>
<td>C₂₀H₃₆</td>
</tr>
</tbody>
</table>

Unidentified compounds 06.84%
Identified compounds 93.16%
Oxygenated compounds 92.51%
Nitrogenous compounds 00.37%
Hydrocarbons compounds 00.28%

*RT: Retention Time. **RRT: Relative Retention Time

compounds viz., ethyl maltol, α-ionone and neophytadiene. From these data, there are relatively differences between the three studied samples specially between (AFM & MixGFM) and (CSFM & MixGFM). While, AFM and CSFM samples are the most similar. The AFM exhibited that anethole was the main compound (30.43%). It is an organic compound, which was widely used as a flavouring agent, showing a reduction in vitro and in vivo leucocytes migration induced by formyl-methionyl-leucyl-phenylalanine (fMLP), leukotriene B₄ (LTB₄) and carrageenan. In addition to, it suppressed cell survival and induced apoptosis in human breast cancer cell independent on estrogen receptor status. Furthermore, it demonstrated an inhibitory effect in non-immune acute inflammation. However, it was associated with a slight increase in liver cancer in rats. While, the CSFM showed that acetic acid (15.83%) was the chief identified constituent. It has many synonyms as ethanoic acid or methane carboxylic acid or ethylic acid or methane carboxylic acid. It is used in pharmaceutical, plastics and chemical industries. During controlled exposure to vapours of acetic acid, it caused a mild nasal irritation at 10 ppm. It demonstrated an anticancer activity since the 1800s. Moreover, it possessed a broad antibacterial spectrum against Streptococci, Staphylococci, Pseudomonas, Enterococci and others. Also, it can treated skin infections caused by Pseudomonas resistant to ideal antibiotics. Furthermore, it can be also used to treat obesity-linked type 2 diabetic Otsuka Long-Evans Tokushima Fatty rats. Finally, the third one MixGFM displayed that 1,2-propanediol (32.74%) was the major secondary metabolite. The undiluted 1,2-propanediol was minimally
irritating to the eye and producing slight transient conjunctivitis. The eye recovered after the exposure removed\(^1\). Its concentration increased the hazard of respiratory and immune ailments in children including asthma, hay fever, eczema and allergies from 50% to 180%.\(^{26,27}\)

**CONCLUSION**

By comparing three different samples of Moâssel (Apple, Creamy Strawberry and Mix Grapes) from one of the most popular company in Egypt (Al Dandash Company), showed pronounced difference in the identified constituents. Therefore, it is possible for researchers to predict the physiological effects for these samples.

**CONFLICT OF INTEREST**

We declare that no conflict of interest.

**REFERENCES**

1. www.rcplond


24. Yamashita H. Biological Function of Acetic Acid-Improvement in Obesity and Glucose Tolerance by
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