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**CHANGES IN THE PHYSICO-CHEMICAL PROPERTIES
OF SPEAR AND PEPPER MINT VOLATILE
OILS DURING STORAGE**

BY

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SUMMARY

The experiment was conducted in Sabahia Horticultural Research Station, Alexandria, Egypt during the period from February 2005 until July 2007. Spear and pepper mint fields were planted late February and harvested in June 2005. The oil from the herbs was extracted by steam distillation method in a private factory in 6-October city. Then, the storage experiment was started in the middle of July 2005 and extended for two years.

Dark and clear glasses, 25 ml, were filled with the oils to study the effects of the presence vs. absence of oxygen in the bottle atmosphere (half full vs. full filled bottles), dry oil vs. moisted oil (1% moisture), darkness vs. light (dark vs. clear glasses) and the effect of room temperature vs. low temperature (4°C) on the oils quality during storage. Each treatment was represented by 3 bottles, used once only in each sampling every three months for 9 times lasted for 24 months, June 2007, including the starting point samples.

The results of this experiment can be summarized as follows:

5.1. Effect of the studied factors on

5.1.1. Specific gravity

- a. Long storage period increased specific gravity of both mint oils.
- b. Storing the dry oils away of each of oxygen or light or at 4°C was far better than the v.s treatments to keep specific gravity down of both mints.
- c. Moderate values of specific gravity were reached in dark, dry and away of oxygen treatments after 12 months compared with 6 months only for the vs treatments.

5.1.2 Optical rotation

- a. Optical rotation was increased during storage period for both mints oils.
- b. Storing oils away of oxygen or dry or darkness or low temperature kept optical rotation down than the vs. treatments.
- c. Optical rotation of spear mint volatile oil stored away of oxygen was about equal with kept in oxygen after 12 months. And the same result occurred with moisture treatment.
- d. Spear mint volatile oil kept low optical rotation levels for dark or away of oxygen treatments after 12 than 6 months only, respectively for the vs. treatments.
- e. Deterioration of pepper mint volatile oil was reached the highest level after 24 months at 4°C while it was reached the same level of spoilage after 12 months only at room temperature.
- f. Optical rotation of pepper mint volatile oil was lower after 18 months when stored away of air than that at 9 months only when stored in air.

5.1.3. Refractive index

- a. Long storage duration increased the oil deterioration due to increasing refractive index of both mints oils.
- b. Storing dry oil or away of air or in dark or in a refrigerator kept the oil from spoilage due to reducing refractive index, respectively for the vs. treatments.
- c. The highest refractive index level of the spear mint volatile oil and pepper mint volatile oil were reached when stored away of air after 18 months, the same level was reached

after 12 months in air for pepper mint volatile oil and after 6 months for spear mint volatile oil

- d. The refractive index value of spear mint volatile oil and pepper mint volatile oil at the end of the experiment, (24 months) in the cold storage were reached at room temperature after 15 months only.

5.1.4. Solubility in 70% ethanol

- a. Extending storage duration increased the solubility of the two mints oils.
- b. No effect of the studied factors on spear mint volatile oil solubility was noticed.
- c. Solubility of the pepper mint volatile oil was decreased by storing the oil away of oxygen or at low temperature, respectively for the vs. treatments.

5.1.5. Acid number

- a. Acid number was increased by increasing storage duration for both mints oils.
- b. The acid number was kept down when the oils were either stored dry or away of air or in dark or in a cold store.
- c. Spear mint volatile oil reached a moderate acid number after 9 months of Storage under any storage conditions while it was reached the same level nearly after 12 months for pepper mint volatile oil when it was stored dry or away of air or at room temperature.

5.1.6. Ester number

- a. Ester number was decreased when the storage period was increased
- b. Storing the oil dry or away of air or in dark or in a low temperature 4°C resulted in better quality of oils than the vs. treatments

5.1.7. Soaping number

- a. Soaping number was decreased increasing the storage period of both mints oils
- b. Soaping number of spear mint volatile oil was decreased when the oil was stored moisted or in air or in light or at room temperature, and pepper mint volatile oil was affected in the same trend by air or at room temperature.
- c. Soaping number was at a moderate level after 6 months of storage in air and 9 months if stored away of air for spear mint volatile oil, and it was after 3 months latter for both cases in pepper mint volatile oil.

5.1.8. Alpha-pinene content

- a. The α -pinene content was decreased by the increased storage duration of both mints oils.
- b. Spear mint volatile oil α -pinene content was decreased when stored in air only in this study. While for pepper mint volatile oil it was decreased when the oil was moisted or placed in light

5.1.9. β -pinene content

- a. The β -pinene content was decreased by increasing storage period for both oils.
- b. β -pinene content of oils was decreased when they were stored in oxygen or moisted or stored in light or stored at room temperature respectively for the vs. treatments.

5.1.10. Limonene content

- a. Limonene content was decreased by the prolong storage period for both mints oils.
- b. The highest levels of limonene of both mints were obtained when the oils were stored dry or away of oxygen or in dark or placed in a refrigerator at 4°C.
- c. Moisture content of spear mint volatile oil did not affect the limonene content after 12 and 15 months of storage, while it was significantly differed for others given time.
- d. In the case of pepper mint volatile oil the differences caused by light or darkness were about equal after 3,6 and 9 months, but they were different after 12,18,21 or 24 months.

5.1.11. Carvone content

- a. Carvone content of the spear mint volatile oil was increased by increasing the storage period.
- b. The decreased carvone content of the oil was achieved when the oil was dry or away of oxygen or in dark or when placed in a refrigerator.

5.1.12. Menthol content

- a. Menthol content of pepper mint volatile oil was increased with long storage period
- b. The highest contents of menthole were gained when the oil was stored moisted or stored either in the air or in light or a placed at room temperature.

5.1.13. Menthone content

- a. Menthone content was increased by increasing storage period of both mints oil.
- b. The highest levels of menthone of spear mint volatile oil were found by storing the oil in the air or light or placed in a refrigerator. While, the oxygen and moisture did not affect menthone level of pepper mint volatile oil.
- c. The highest levels of spear mint volatile oil menthone formation were found when the oil was stored in or out of air after 9 months and remanded constant to the end of the experiment for both cases.
- d. The highest level of spear mint volatile oil menthone in the dry oil was found after 12 months while, it was after 21 in the moisted oil.
- e. The highest level of menthone for spear mint volatile oil was found in the case of dark storage after 12 months, while it was after 24 months in the light.
- f. The highest level of menthone for spear mint volatile oil was found at room temperature after 12 months while, it was after 21 months under low temperature 4°C
- g. Pepper mint volatile oil behaved more or less similar to spear mint volatile oil in this respect.

5.1.14. Unknown substances level

- a. Unknown substances level was decreased by time for both mints oils.
- b. It was increased when the oil was stored dry or in dark or in a refrigerator.

Storing either spear mint volatile oil or pepper mint volatile oil dry, away of air, in dark and placed in a refrigerator is recommended to keep the oils quality in good status. The active compounds will be remained in the acceptable levels and retard it far from spoilage for longer time, it might reach 24 months.