SUMMARY AND CONCLUSION

Eucalyptus citriodora oil is one of the most important essential oils used in soaps, perfumes, medicinal purposes, and as a source of citronellal for the manufacture of citronellol hydroxy citronellal and menthol. A small proportion of oil added to germicides and disinfectants made from other eucalyptus oil greatly improves their odor.

Data in this work could be used as a base for the evaluation of volatile oil from Egyptian E. citriodora oil.

1. The yield of the oil was determined monthly along the year. It decreased in winter at December , January and Febreuary. On the other hand the volatile oil content increased in spring and summer and reached its maximum at September and October. The yield of oil varried from 0.34 to 0.96 percent.

The moisture content was determined monthly and varried from 54.5 percent in September, to 66.5 percent in May. This may be due to dormancy period at late autumn and winter, and the climate.

2. The physico-chemical properties of the oil distilled from green and dry leaves and terminal branchlets in winter, and spring were determined. The moisture content of the dry leaves and terminal branchlets before distillation ranged from 11.0 to 14.0 percent. The properties determined were: specific gravity, refractive index, optical rotation, evaporation residue, solubility in 70 percent ethyl alcohol, acid number, ester number, saponification number, ester number after acetylation, ester as citronellyl acetate, and total aldehydes as citronellal.

Specific gravity at 20/20°C, refractive index at 20°C solubility in 70 percent ethyl alcohol, acid number, and total aldehydes as citronellal were within the limits reported in the literature. It is worthy to mention that the lower optical rotation of Egyptian E. citriodora oil, -10.80°, - 9.95°, -11.90°, and -9.10° for the oil distilled from green and dry leaves in winter, and spring , may be due to the fact that the obtained oil has unsymmetric molecules which have optical activity.

Lack of data concerning the evaporation residue of Eucalyptus oils, the present investigation was carried out to fined the suitable weight and time required to determine the evaporation residue of Egyptian E. citriodora oil where 4 grams are recommended to evaporate for 4 hours. The obtained values were 12.37, 11.87, 12.16 and 12.04 percent for the oil distilled from green and dry leaves in winter and spring respectively.

The physical and chemical properties of oil distilled from green leaves in winter, generally, showed higher values of specific gravity, evaporation residue, solubility in 70 percent ethyl alcohol, acid number, ester number, ester number after acetylation and total aldehydes as citronellal than those of oil distilled in spring. This may be due to climate , plant maisture content and plant activity of growth.

3. Yield and physico-chemical properties of the Egyptian flower bud E. citriodora oil was determined. The yeild was 0.55 percent. The specific gravity and ester number were within the limits reported in the literature. Total aldehydes as citronellal was higher. Refractive index, pptical rotation and acid number were

lower than those reported in the literature.

4. The ultraviolet and infrared absorption properties of the Egyptian E. citriodora oils could be taken as a truly characteristic "finger -print" of the oils. The maximum ultraviolet absorption, its absorbance and transmittance percent and the frequencies as wavenumber cm^{-1} of the different infrared absorption bands: their absorbance and transmittance percent of these oils were determined. Besides, infrared spectroscopy might be used as guide for the qualitative analysis of eucalyptus oils. The infrared spectrum of Egyptian E. citriodora oils included the characteristic absorption bands of some functional groups, i.e. the characteristic bands "carbonyl compounds " group which gave the highest absorbance in the infrared spectrum. It was noticed that the Egyptian E. citriodora oil from dry leaves distilled in spring contained more carbonyl compounds. The infrared spectrum of oil included also the characteristic absorption bands of "aromatic derivatives", the charateristic band of "c=o" group which indicates the presence of esters in oils and the characteristic banas of the "OH" group (free and bonded) in these oils.

5. Gas liquid chromatographic analysis was carried out for the qualitative and quantitative determinations of the constituents of Egyptian E. citriodora oils. The following components were identified: citronellal (the principal constituent) 35.08%, iso valeraldehyde 0.05% , iso pulegol 3.97%, linalool 0.81%, borneal 0.28%, menthol 3.03% , citronellol 7.97% , geraniol 3.44%, benzyl acetate 0.40%, citronellyl acetate 6.59%, geranyl acetate 0.90%, citronellyl propionate 1.15%, phyllandrene 10.47%, lemonene 0.37%, dipentene 2.25% and terpenolene 0.43%.

The gas liquid chromatographic analysis of Egyptian flower bud E. citriodora oil showed the following components: citronellal (the principal constituent) 25.60%, iso valeraldehyde 0.39%, iso pulegol 2.43%, borneol 1.18%, menthol 13.44%, citronellol 15.62% , geraniol 1.86%, benzyl acetate 1.82%, citronellyl acetate 2.15%, phyllandrene 14.98%, lemonene 0.79 and dipentene 1.71%.

Menthol and citronellol showed remarkable increase in the flower bud oil than those of the leaves oil,

P-cymene, linalool, geranyl acetate and citronellyl acetate disappeared in the flower bud oil.

6. Fraction distillation of the Egyptian E. citriodora oil gave 13 fractions. The temperature program of the fractional distillation ranged from 79°C to 130°C. Vapor temperature of oil ranged from 69°C to 96°C. The fractions percent were 6.4, 10,11.6,9.6, 8.8,3.6 , 3.2,3.2,8,3.2,2.4,1.6 and 27.2 percent respectively. Citronellal percent was 84.4, 87.9 86.3 and 84.2 in fractions 3,4,5 and 6 respictively.

7. For purification of crude citronellal, 33.6 grams obtained from mixing the fractions 3,4,5 and 6 were placed in the reaction vessel and purified by bisulfite method where 26 grams of pure citronellal were obtained. The infrared absorption spectra of citronellal isolated from Egyptian E. citsiodora oil showed a band at wave number 1715 cm^{-1} within the limits of the characteristic band of the carbonyl compounds.

8. Menthol was produced from isolated citronellal by acetylation with acetic acid anhydride, then cyclized to iso-polegol acetate to produce menthol acetate by

reaction with HI acid. Saponification and hydrolysis of menthol acetate were carried to produce menthol. where 20 grams of citronellal produced 16 grams of menthol acetate that gave 9.6 grams of menthol.

The infrared absorption spectra of obtained menthol was in agreement with the "finger print" of this component reported in the literature.

The two characteristic bands at wavenumbers 2960 and 3630 cm^{-1} in the infrared spectrum might prove the presence of the "OH" group in the oil. Gas liquid chromatographic analysis showed that menthol percentage was 94.75.