Chemical and microbilogical studies on some essential oils

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This study was carried out to evaluate the chemical composition, the physico-chemical properties and the antimicrobial effects of volatile oils of cardamom fruits (Elettaria cardamomum, Maton), family: Zingeberaceae and cumin fruits (Cuminum cyminum, Linn) family: Umbelliferae, and the antimicrobial effects of the mixture of the two volatile oils and its their basic compounds, namely (1, 8-cineole, a-terpinyl acetate and cuminaldehyde)..The data could be summarized as follows : 1.The volatile oils percentages of cardamom and cumin were found to be 3.733 and 3.133%, respectively.2.The physico-chemical characteristics of cardamom and cumin volatile oils were found to be as follows: specific gravity at 15°C 0.9269, 0.9379; refractive index at 20°C 1.4670, 1.5101; optical rotation: +24.54°, +3.07°; solubility in ethyl alcohol: 1 vol. oil in 2.64 vols. of 70% ethanol; 1 vol. oil in 1.36 vols. of 80% ethanol; acid number: 1.4688, 1.4664; ester number: 105.56, 40.61; ester number after acetylation: 115.61, 127.241, respectively, 3.Gas liquid chromatography (GLC) analysis of cardamom and cumin volatile oils indicated that the number of identified components in these volatile oils were: 6 and 7 components, respectively. These compounds representing (90.38 and 93.57%), of the structure of the two volatile oils, respectively. The number of unidentified constituents of cardamom and cumin volatile oils, were 23 and 17 compounds corresponding (9.62 and 6.43%) of the structure of the two volatile oils, respectively.4.The number of major constituents (>10%) of two volatile oils were two compounds for cardamom volatile oil namely (1 , 8- cineole, 39.072% and a-terpinyl acetate, 34.682%) and four compounds for cumin volatile oil namely (cuminaldehyde, 27.16%, 1, 3-p-menthadien-7-al, 20.55%, 1, 4-p-menthadien-7-al, 15.81% and y-terpinene, 14.31%), corresponding 73.754 and 77.83% of the structure of the two volatile oils, respectively, 5.The minor components (<10%) of the tested volatile oils were six compounds for cardamom volatile oil (four identified constituents namely, linalool, 8.711%, limonene, 3.20%, geranyl acetate, 3.16%, menthone, 1.551% and two unidentified constituents, 3.47%) and four compounds for cumin volatile oil namely, 13-pinene, 9.72% and p-cymene, 5.41% and two unidentified constituents, 2.27%, corresponding, 20.092 and 17.40% of the structure of the two volatile oils, respectively. In addition, cardamom and cumin volatile oils contained 21 and 16 trace components (<1%), corresponding 6.154 and 4.770% of the structure of the two volatile oils, respectively, 6.The antimicrobial effects of cardamom and cumin volatile oils and their mixture at concentrations of [0.075, 0.10, 0.25, 0.50, 0.75, 1.00, 12.50, 25.00, 50.00 and 100.00% (v/v)], while its their basic compounds namely, 1, 8-cineole, a-terpinyl acetate and cuminaldehyde at concentrations namely (0.075, 1.0, 0.25, 0.50, 0.75 and 1.00% (v/v) were determined in comparison with phenol at concentrations namely, 0.075, 0.10, 0.25, 0.50, 0.75 and 1.00% (w/v), against six bacterial strains: three negative bacterial strains (Escherichia coli, Pseudomonas aeroginosa and Pseudomonas flourescens), three gram positive bacterial strains (Bacillus subtilis, Bacillus cereus and Staphylococcus aureus), three yeast strains (Saccharomyces cerevisia, Candidia utilis and Candida tropicalis) and three fungi strains (Aspergillus niger, Aspergillus flavus and aspergillus parasiticus). The tested volatile oils and their mixture had the lowest inhibition effect against E. coli compared with the other gram negative bacteria. It could be noticed that the studied volatile oils and their mixture had higher antimicrobial activity against gram negative bacteria than gram positive bacteria. As well, cumin volatile oil was more active against gram negative bacteria than both of the

mixture and cardamom volatile oil. While cardamom oil was more active against yeast strains than both of cumin volatile oil and the mixture of the two volatile oils. Moreover, the mixture of the two volatile oils was found to be more active against gram positive bacteria and moulds than both of cumin and cardamom oils. In general, it could be noticed that, fungi (mouds and yeasts) were more sensitive to the tested volatile oils than bacteria. While, yeasts were more sensitive to the basic compounds of the two essential oils than both of bacteria and moulds. Furthermore, the inhibitoryeffect of the tested basic compounds namely, 1, 8-cineole, a- terpinyl acetate and cuminaldehyde could be ranked as follows: 1, 8-cineole cuminaldehyde a-terpinyl acetate, the volatile oils mixture was found to be more active against gram positive bacteria and moulds than both of cardamom and cumin volatile oils. Generally, the antimicrobial activities of different studied volatile oils increased with every increase in the concentrations. As for, the antimicrobial effect of cardamom and cumin volatile oils, it could be related to the major components namely, 1, 8-cineole, a-terpinyl acetate and cuminaldehyde, respectively. Moreover, the presence of other aromatic components which could interact and affect the polarity and consequently the extent of inhibition. In general, cardamom and cumin essential oils and their mixture were more potent against all tested microorganisms and can be recommended as safe antimicrobial agents to prevent the spoilage of food products, Therefore, it could be concluded that individual or combinations of cardamom and cumin volatile may provide an effective mixture for inactivation of pathogenic and spoilage microorganisms.