

Chemical and technological studies on some essential oils

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The present investigation was conducted in the analytical laboratory of the farm of the Medicinal and Aromatic Plants in El-Kanater El-Khairia, Horticulture Research Institute (HRI), Agriculture Research Center (ARC) during 1999 and 2001. The objective of this work is to study the effect of different methods and periods of extraction as well as crushing on the oil content (fixed and essential oil) of black cumin seeds and its physicochemical properties and the chemical composition of the oil. In addition to study the effect of crushing, soaking and distillation periods on the essential oil content of cumin fruits as well as its physicochemical properties the obtained results were as follows :

1- Black Cumin :

a) The effect of extraction methods and crushing on oil content of black cumin seeds and physicochemical properties of extracted oil and its composition:

- 1-The results indicated that, crushing of black cumin seeds up to 84.49% (granules diameter <500 μ) led to increasing extraction efficiency by organic solvents consequently the highest oil content was obtained.
- 2-Extraction of crushed seeds 85.49% yielded 7 fold of oil than that obtained from the whole seeds.
- 3-The most effective solvent was chloroform and hexane (the obtained oil contents were mostly similar) while petroleum ether was the least in this respect,
- 4-Increasing the extraction period up to 6 hours resulted in an increase in the obtained oil content of the crushed black cumin seeds however, the obtained oil after 3 hours was found to be slightly less than that obtained after 6 hours of extraction,
- 5-Accordingly, it could be recommended that, black cumin seeds should be crushed up to 85.49% and extracted by hexane up to 3 hours for the extraction of the oil,
- 6-It was found that, the oil obtained by mechanical pressure at room temperature of black cumin seeds was less by about 9% than the oil extracted by the organic solvents. The same results were obtained in case of mechanical pressure of heated seeds (80° C for one hour),
- 7-The results denoted that, physical properties mainly (specific gravity, refractive index and optical rotation) of the oil samples obtained by the different extraction methods were found to be in line with the standard values.
- 8-Also, as for the chemical properties (acid no., ester no., iodine value, peroxide value, saponification value and unsaponification value), it was found that, the obtained values met those of the standard
- 9-The results emphasized that, the oil of black cumin seeds contained saturated and unsaturated fatty acids similar in quantity and quality of those of the standard

b) Storage Black cumin seeds oil (obtained by mechanical pressure at room temperature) was stored for 3, 6, 9 and 12 months in order to study the effect of some factors mainly O₂, light and moisture as well as the storage at 5 \pm 2° C on the physicochemical properties of the oil in comparison with control (stored at room temperature). The following results were obtained:

- 1-The best treatment was storage of the oil at 5 \pm 2° C. as the physicochemical properties did not exhibit any changes after one year and the obtained values met those of the standard. Regarding the room temperature storage, it was found that, no obvious changes on physicochemical properties of the oil samples were observed during the first six months and most of the changes were found in the last 6 months,
- 2-Generally, it was found that, the storage in the presence of O₂, light and moisture (each of them solely) caused some changes in some physicochemical properties of the oil especially after 9 and 12 month of storage. However, the obtained values were in accordance with those of the standard,

this part of the investigation aimed to study the effect of steam distillation (at different periods 3, 6, 9, 12 and 15 hours) of cumin fruits (whole dry, dry-crushed and previously soaked for

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118 12 hours) on essential oil content and physicochemical properties of the obtained oil. The results were as follows : 1-The highest essential oil percent of cumin fruits was obtained after 6 hours of distillation for the dry-crushed fruits. mean-while 3 hours of distillation of dry-crushed cumin fruits produce nearly the same content of 6 hours distillation, 2-The highest essential oil content was produced from the dry whole fruits steam distilled for 12 hours. In case of the soaked fruits, the highest essential oil content was obtained after 9 hours of distillation.3-Also, the results indicated that, distillation for 3 hours in case of the crushed fruits gave the highest essential oil content in comparison with the former 2 cases 4-As for the physicochemical properties of cumin essential oil obtained by the previous methods, it was found that the obtained values were met those of the standard By gas chromatographic analysis, 9 components were identified. These identified components namely: α -pinene. β -pinene, γ -terpene, *p*-cymene, 1,8-cineol, β -phellandrene, cuminaldehyde, 1,3-p-menthadien-7-al, 1,4-P-menthadien-7-al, Accordingly, it could be recommended that, the distillation of the moisted fruits should be achieved by steam for 9 hours in order to obtain the highest essential oil content and the highest quantity of cumin aldehyde English.