

Subject: Food Technology

Production of Courseware
e-Content for Post Graduate Courses



Paper No. : 10 Technology of Spices and Condiments

Module : 13 Pepper Products: Essential Oil And Oleoresins



Development Team


Principal Investigator Prof. (Mrs.) Vijaya Khader, Ph.D
Former Dean, Acharya N G Ranga Agricultural University

Paper Coordinator Prof. Dharmesh Chandra Saxena
SLIET, Longowal

Content Writer Miss Syed Insha Rafiq & Prof. Dharmesh Chandra
Saxena SLIET, Longowal

Content Reviewer Prof. (Mrs.) Vijaya Khader, Ph.D
Former Dean, Acharya N G Ranga Agricultural University
Dr. MC Varadaraj , Chief Scientist CSIR-CFTRI, Mysore

Description of Module	
Subject Name	Food Technology
Paper Name	10 Technology of Spices and Condiments
Module Name/Title	Pepper Products: Essential Oil And Oleoresins
Module Id	
Pre-requisites	
Objectives	
Keywords	

 **Pathshala**
पाठशाला
A Gateway to All Post Graduate Courses

13.1 Pepper: Essential Oil and Oleoresin

The quality of pepper is contributed by two components:

- Piperine that contributes the pungency
- Volatile oil that is responsible for the aroma and flavour.

Oleoresin of black pepper, produced by solvent extraction of dried powdered pepper, contains both aroma and pungency principles. Thus the chemistry of pepper is the chemistry of its essential (volatile) oil and piperine.

13.2 Essential oil of pepper

The essential oil of pepper is a mixture of a large number of volatile chemical compounds. The aroma is contributed by the totality of the components. The volatile oil derived from steam distillation of pepper is almost colorless to slightly greenish liquid with the characteristic odor of pepper. The taste of the oil is mild, not at all pungent. More than 80 components have been reported in pepper essential oil. The important components are mentioned below.

13.2.1 Monoterpene hydrocarbons and oxygenated compounds

This group includes: camphene, ρ -cymene, limonene, myrcene, *cis*-ocimene, α -phellandrene, β -phellandrene, α -pinene, β -pinene, sabinene, α -terpinene, γ -terpinene, terpinolene, α -thujene. Among them the major components are α -pinene, β -pinene, sabinene and limonene. About 43 Oxygenated monoterpeneoid compounds present in pepper essential oil are known including: borneol, camphor, carvacrol, *cis*-carveol, *trans*-carveol, carvone, carventanacetone, 1,8-cincole, cryptone, ρ -cymene-8-ol, ρ -cymene-8-methyl ether, dihydrocarveol, dihydrocarvone, linalool, *cis*-menthadien-2-ol, 3,8,(9)- ρ -menthadien-1-ol, 1(7)- ρ -menthadien-6-ol, 1(7)- ρ -menthadien-4-ol, 1,8(9)- ρ -menthadien-5-ol, 1,8(9)- ρ -menthadien-4-ol, *cis*- ρ -2-menthen-1-ol, myrtenal, myrtenol, methyl carvacrol, *trans*pinocarveol, pinocamphene, *cissabinenehydrate*, *trans*-sabinene hydrate, 1-terpinen-4-ol, 1 terpinen-5-ol, α -terpeneol, 1,1,1,4-trimethylcyclo-hepta-2, 4-dien-6-ol, phellandral, piperitone, citronellal, nerol geraniol, isopinocamphone, methyl citronillate, methyl geranate, α -terpenyl acetate, terpenolene epoxide and *trans*-limonene epoxide.

13.2.2 Sesquiterpene hydrocarbons and oxygenated compounds.

About 25 sesquiterpenehydrocarbons are present in pepper oil, the most important one being: β -caryophyllene, α -*cis*-bergamontene, α -*trans*-bergamontene, β -bisabolene, δ -cadinene, γ -cadinene, calamenene, α -copaene, α -cubebene, β -cubebene, ar-curcumene, β -elemene, δ -elemene, β -farnasene, δ -guaiene, α -humulene, γ -humulene, isocaryophyllene, γ -muurolene, α -santalene, α -selinene, β -selinene, ledene, sesquisabenene and zingiberene.

13.2.3 Miscellaneous compounds

In addition to the above groups of compounds many others were also identified in black pepper oil. They are: eugenol, methyl eugenol, benzaldehyde, *trans*-anethole, myristicin, safrole, piperonal, methylacetophenone, *p*-methylacetophenone, *n*-butyrophenone, methylheptanone, pinol, methyl heptanote, methyloctanoate, 2-undecanone, *n*-nonane, *n*-tridecane, and aromatic acids such as benzoic acid, phenyl acetic acid, cinnamic acid, piperonic acid, butyric acid, 3-methyl butyric acid, haxanoic acid and 2-methyl pentanoic acid.

13.3 Pepper Oleoresin

Oleoresin of black pepper is obtained using organic solvent resulting in the product possessing odor, flavor and pungent principles of the spice. As the name implies, pepper oleoresin consists of a blend of the essential oil, resinous matter of the spice and related compounds like the pungent alkaloid piperine. Pepper oleoresin has a relatively full flavor profile characteristic of pepper as compared to pepper oil. The quantity and quality of the components principally depends upon the raw material used for extraction. The pepper may be comminuted in flakes or ground into coarse powder and is extracted with a suitably purified solvent like acetone, ethanol or dichloroethane. The extraction may be conducted by:

- ❖ Circulation of hot or cold solvent through a bed of ground spice
- ❖ Soxhlet extraction
- ❖ Countercurrent process employing several extractions.

In this last process, pepper remains in the small extractors, but the solvent is transferred from one extractor to the next, during which time the concentration of the material extracted progressively increases, until the solvent meets fresh pepper, after which it is conveyed into a steel vessel where most of the solvent is removed. The concentrated extract is then subjected to carefully controlled vacuum distillation in which the solvent in the extract is reduced to trace levels.

Pepper oleoresin is a dark green, viscous, heavy liquid with a strong aroma. The components and the quality of the extract depend on the raw material used, method and condition of the processing and handling of the products. The oleoresin produced is influenced by the solubility of the solvent used. Hexane gives very low yield, because of low solubility of piperine in hexane. Ethanol is the best one because it gives the highest yield at the solvent recovery process due to its lower cost and easier availability.

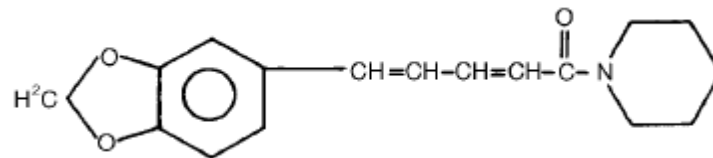


Fig: Structure of Piperine

eG Pathshala
 पाठशाला
 A Gateway to All Post Graduate Courses