

# A Monographic Profile of *Coriandrum sativum* Linn. : An Official Drug of Ayurvedic, Unani and Siddha Systems of Medicine

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## Abstract

*Coriandrum sativum* (L.) is widely used as drug in Ayurvedic, Unani and Siddha Systems of medicine. The drug (dried fruit), which is aromatic, carminative, digestive and laxative, is chiefly used as spice in commerce. Very few clinical studies on modern lives have been conducted on this drug. The approved modern therapeutic application for coriander is based on its long history of use in Ayurveda, Unani and Siddha systems of Medicine. The present studies deal with detailed pharmacognosy and review the related aspects of this important drug.

**Key Words** – *Coriandrum sativum* Linn., Drug standardization, Quality specifications.

## Introduction

*Coriandrum sativum* (Family: Apiaceae) commonly known as 'Coriander', is used in Ayurvedic, Unani and Siddha system of medicine since time immemorial as aromatic, carminative and also in laxative preparations to prevent griping. The drug is known as 'Dhanyka' (Ayurveda), 'Kishneez' (Unani) and 'Kottumalli vitai' (Siddha) in Sanskrit, Urdu and Tamil respectively in different systems of medicines. The young leaves are used as a garnish in cooking and seeds as flavouring ingredient in all types of food products. Coriander is carminative, diuretic, stomachic, laxative, refrigerant and aphrodisiac. It has bactericidal and fungicidal properties. The quality parameters of the drug are also part of regulatory standards in drugs and food as spice (Anonymous, 1955; 1966; 1986; 1987; 1998 and 2008).

## Methodology

Drug samples were collected from different places with a view to find out any significant difference present within the same species. For studying powder, Jackson and Snowdon (1992) was followed. To determine physico-chemical constants, Indian Pharmacopoeia (Anonymous, 1966) was consulted and for fluorescence study schedules mentioned by Trease and Evans (1972) were followed. Colours were named by consulting Rayner (1970). Standard prescribed procedures for histochemical studies (Johanson, 1940; Youngken, 1951; Cromwell, 1955, Trease and Evans, 1978), organic group detection (Robinson, 1963); U.V. Spectrophotometry (Willard, *et al.*, 1965) and Chromatography (Shellard, 1968; Stahl, 1969; Smith and Feinberg, 1972) were adopted. The informatics is complied by reviewing the available literature.

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## Nomenclature

The plant is known by different vernacular names e.g. Dhan (Bengali), Konphir (Gujarati), Dhaniya, Dhanya (Hindi), Kottampala, Kottamalli, Malli and Kottampalari (Malayalam), Dhanya, Khotbir, Khotmir, and Kothmir (Marathi), Dhania (Oriya), Dhania (Punjabi), Dhaniya, Kottamalli (Tamil), Daniyalu, Kotimira (Telugu), Akkishneez (Urdu) and Dhano (Sindhi) etc.

## Chemical Constituents

Coriander fruit contain about 2-3% volatile oil, the major component for pleasant smelling  $\alpha$ -linalool, which is present 70-90%, depending upon ripeness of the fruit. Other compounds are decyl aldehyde, trans-tridecene – (2) -al- (1), borneol, geraniol, geranyl acetate, camphor, carvone, anethole, caryophyllene oxide, elemol, methylheptenone monoterpene hydrocarbons ( $\alpha$ -pinene,  $\beta$ -pinene, limonene,  $\beta$ -phellandrene,  $\gamma$  terpine,  $\beta$ -sistosterol, D-mannitol, flavonoid glycosides, coriandrinonediol, quercetin- 3- O- coffeyl-glucoside,  $\Delta$  octadecenoic acid, citrolol, geraniol, thymol, linalyl acetate, geranyl acetate. It also contain 26% fats made up of glycerides, proteins (11-17%), 1.0% starch, 20% sugars, coumarins (psoralen, angelicin, scopoletin, umbelliferone, etc.), rutin, tannins, chlorogenic and caffeic acid. coriander leaves contain less volatile oil, oxalic acids, vitamin C, calcium and carotene. Other components which are present in coriander plants are triacontane, triacontanol, coriandrones C to E, quercetin, oflatoxins B1 and B2 and a new compound trans-tridecene-(2)-al-(1) (tridecenal) is responsible for the bug like smell of the green plant (Shah and Qudry, 1990-91; Leug and Foster, 1996).

## Pharmacology

Fruit extract of *C. sativum* Linn. inhibits mycelia growth of *Pythium aphanidermatum*. The essential oil has strong antifungitoxicity at very low concentrations. The drug is known to possess, because of essential oil, stomachic, spasmolytic and carminative properties (Pandey and Pant, 1975; Bisset, 1994).

## Therapeutic and non-Therapeutic Uses

Leaves are aromatic, astringent, carminative, antibilious, antiinflammatory, analgesis, styptic and native useful in halitosis, pharyngopathy, epistaxis, ulemorrhagia, chronic conjunctivitis, hiccough, inflammation, suppuration, hemorrhoids, jaundice and odontalgia.

The fruits are aromatic, sweet, bitter, acrid, astringent, emollient, anti-inflammatory, anthelmintic, stomachic, carminative, antibilious, digestive, appetizer constipating, diuretic, antipyretic, stimulant, expectorant, aphrodisiac, refrigerant, tonic anodyne, cough, bronchitis, sore throat, common catarrh, vomiting, dyspepsia, anorexia, diarrhoea, colic, flatulence, dysentery, chronic conjunctivitis, haemorrhoids, helminthiasis, headache, epistaxis, erysipelas, carbuncles, ulcers, strangury, scrofula, helminthiasis, gout, rheumatism, intermittent fever, giddiness hyperpiesia and gout . Oil is useful in flatulent colic, rheumatism and neuralgia. (Prajapati *et. al.*, 2003). In folk medicine the drug is supportive in treatments for complaints of the upper abdomen, such as a feeling of distension, flatulence and mild cramp-like gastrointestinal upset.

The green leaves of coriander used as garnish in cooking. The seed are used as flavour ingredient in all types of food products, especially as a spice. The essential oil is used as an aroma substance in the tobacco and perfumery industries. It also used alcoholic, nonalcoholic beverages, candy, backed goods, meat products, relishes and others.

### Classical Formulations

The drug is used as an ingredient in a various classical formulations of Ayurveda, Unani and Siddha systems of medicine. The seeds are utilized in preparation of -

Ayurveda - Dhanyapancak kvatha churna (Anonymous, 1986).

Unani - Khamira Gao Zaban Sada, Khamira Gao Zaban Ambari Jawahar Wala, Jawarish-e-Shahi, Intrifal-e-Kishneezi, Dawa-ul-Misk Motadil Sada, Qurs-e-Ziabetes Sada, Arq-e-Musaffi-e-Khoon Qawi (Anonymous, 1998).

Siddha - Inci Vatakam, Naratai Ilakam, Pitta Curam Kutinir (Anonymous, 2008).

Modern Medicine (as per Indian Pharmacopoeia) - Coriandri Pulvis, Tincture Rhei Coposita, Extractum sennae lignidum (Anonymous, 1955, 1966).

### Safety Aspects

Allergic reactions like contact dermatitis are known to be associated with the use of powdered coriander and more particularly with oil (Bisset, 1994 and Evans, 1977).

Dosage and mode of administration (Kapoor, 1990)-

Powder : 4-8 g  
Oil : 0.1-0.3 ml  
Infusion : 12-20 ml

### Adulterants and Substitutes

Similar small fruits and seeds like fenugreek seeds, stems, and cereal fruits are present in as adulterant, Bombay coriander fruits and ground coriander is more prone to adulteration; these fruits are ellipsoidal, 5-8 mm long, 3-4.5 mm wide and contain less volatile oil.

Regulatory Status- An official drug in –

- i. Ayurvedic Pharmacopoeia of India, Part I, Vol. I.
- ii. Ayurvedic Formulary of India, Part I & II.
- iii. Unani Pharmacopoeia of India Part I & Vol. I.
- iv. National Formulary of Unani Medicine Part I-V.
- v. Siddha Pharmacopoeia of India, Part I, Vol. I.
- vi. Siddha Formulary of India, Part I.
- vii. Indian Pharmacopoeia, 1955; 1966.

### Observations

#### I. Organoleptic Characteristics

Entire Drug- Fruits are globular, mericarps usually united by their margins forming a cremocarp about 3-5 mm in diameter, uniformly brownish-yellow or brown, glabrous, sometimes crowned by the remains of sepals and styles, primary ridges 10 wavy and alight inconspicuous secondary ridges 8, straight, and more prominent ; in the central region of the pericarp the cells are fuciform and sclerotic forming in each mericarp a thin hemispherical shell of compact hard tissue which makes the fruit difficult to cut and troublesome to powder, the seed is endosperm coelospermous; odour , aromatic; taste spicy and characteristic [Fig. 1 B, C)].

Powdered Drug – The powdered drug is yellowish brown in colour with pleasant aromatic odour and spicy taste (Fig. 1 D).



A. Flowering Plant



B. Seeds



C. Seeds (Magnified)



D. Seed Powdered

*Coriandrum sativum* Linn

II. Micro-Morphological Characteristics

Entire Drug - Transverse section of fruit show composed of polygonal tabular cells of pericarp with slightly thickened anticlinal wall; trichomes and lignified reticulate parenchyma are outer layer of mesocarp is parenchymatous with inner cells in wavy longitudinal rows and degenerated vittae as tangentially flattened cavities; middle layer of mesocarp sclerenchymatous forming a thick layer of fusiform, pitted cells in very sinuous rows, layer often crossing at right angles with definite longitudinal strands in the secondary cells of mesocarp, large, hexagonal with rather thin, lignified walls; inner epidermis of the pericarp is composed of frequently cells and the hypodermis of large slightly thickened, flattened hexagonal sclerenchyma; endosperm of thick-walled cellulosic parenchyma containing fixed oil, numerous – aleurone grains, about 4-8 in diameters containing micro-rosettes of calcium oxalate; split carpophore passing at apex of each mericarp into raphe, adjacent to which a large cavity

and on inner side of this a flattened vascular stron; carpophore consisting of fibers surrounded by spiral vessel.

Powdered Drug - Powdered drug under microscopy exhibit epicarp; thin walled cells, polygonal in shape the surface view contain smooth cuticale.Each cell contain 1 or more prismatic calcium oxalate. Stomata are present. The vittae are elliptical, schizogenous, secretory cavities varying in size from about 150-300 microns, long axis and 60-70 microns, short axis. They are flanked by thick walled cells. Occasional brown polygonal vittae present in surface view. Mesocarp; is of two type outer layer mesocarp 4 layers of tangentially oblong, thin walled, parenchyma cells, there is also a fiber layer consisting of densely packed sclerenchya fiberes,sinous,fusifform cells with a narrow lumen, inner mesocarp consisting 3 layers thin walled tangentially elliptical cells. Endocarp; consist of layer of tangentially long, narrow, lignified cells.Testa; single layer brown in colour, thin-walled, polygonal in surface view. Endosperm; thick-walled cells containing aleurone, grains and micro-rosettes of calcium oxalate (Fig. 2).

### III. Histochemistry

Micro – Chemical Tests and Behaviour of specific reagents towards Plant/Drug Tissues – Observations and results pertaining to micro-chemical tests and behaviour of specific reagent towards plant tissues are presented in Table-1.

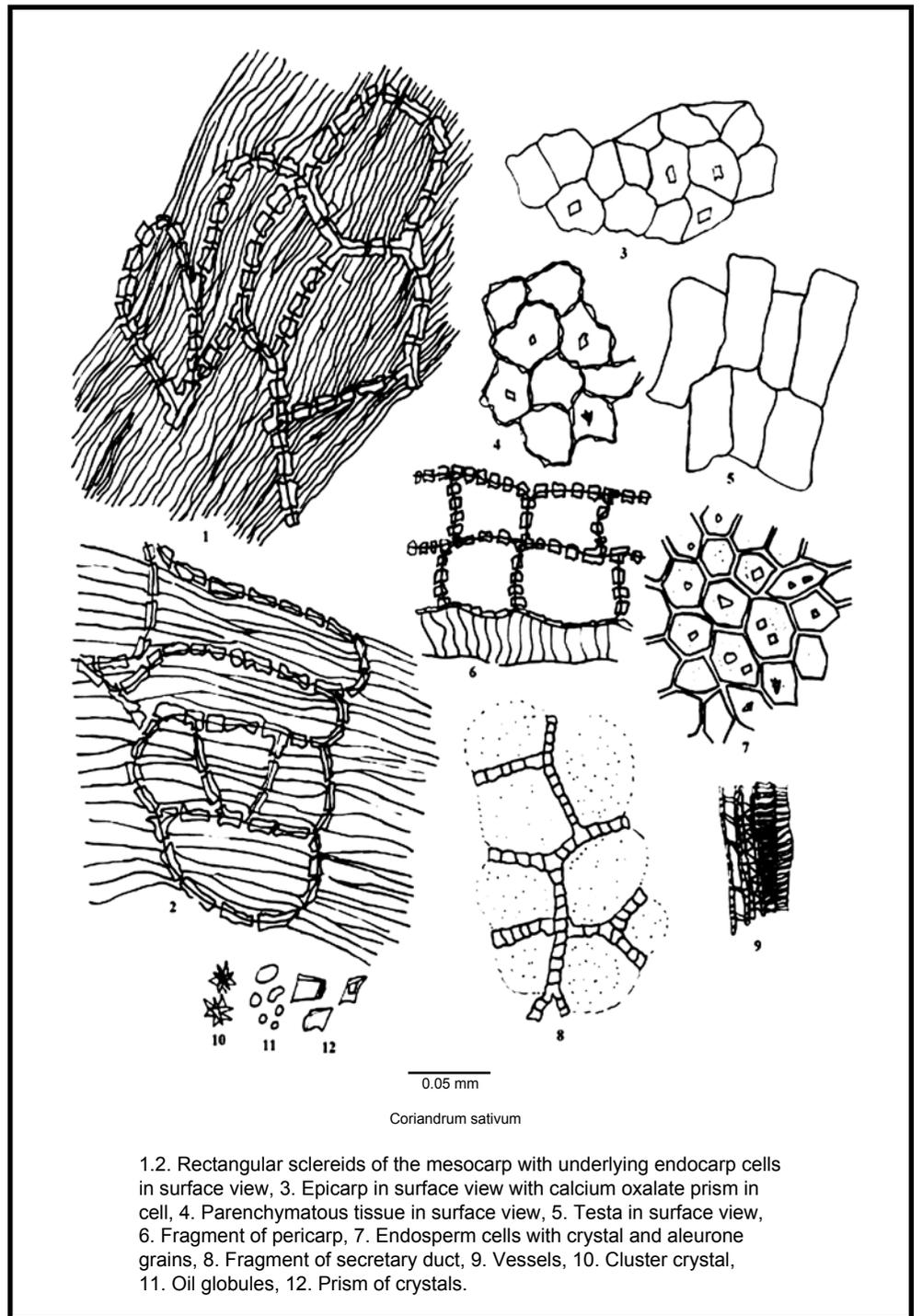
**Table-1:** Micro-chemical Tests and behaviour of specific reagents towards plant tissues and cells contents.

Sl. No.	Reagent	Test for	Inference	Histological zone/cell contents responded
1.	Dragendorff's reagent	Alkaloid	-	Not responded.
2.	Marme's reagent	Alkaloid	-	Not responded.
3.	Wagner's reagent	Alkaloid	-	Not responded.
4.	Potassium hydroxide solution (5% w/v)	Anthocynin	-	Not responded.
5.	Sulphuric acid (66% v/v)	Anthocynin	-	Not responded.
6.	Acetic acid	Calcium oxalate	+	Epicarp and endosperm cells

Sl. No.	Reagent	Test for	Inference	Histological zone/cell contents responded
7.	Potassium hydroxide solution (5% v/v ) + Hydrochloric acid	Calcium oxalate	+	Same as above
8.	Sulphuric acid	Calcium oxalate	+	Same as above
9.	Kedde reagent	Cardiac glycoside	-	Not responded.
10.	Iodine Solution followed by Sulphuric acid	Cellulose	+	Epicarp, mesocarp and other cellular region
11.	Sudan III	Fixed oil and fats	+	Vittae, endosperm and mesocarp cells
12.	Chlor-zinc-Iodine Solution	Latex	-	Not Responded
13.	Aniline sulphate Solution followed by Sulphuric acid	Lignin	+	Sclereids in mesocarp
14.	Phloroglucinol HCl	Lignin	+	Same as above
15.	Lugol's solution	Protein	+	Endosperm cells
16.	Millon's reagent	Protein	+	Same as above
17.	Picric acid	Protein	+	Same as above
18.	Heating with KOH (5% w/v) + H <sub>2</sub> SO <sub>4</sub>	Suberin	-	Not responded.
19.	Sudan III	Suberin	-	Not responded.
20.	Weak Iodine solution	Starch	-	Not responded.
21.	Potassium hydroxide solution (5% w/v)	Starch	-	Not responded.
22.	Sulphuric acid	Starch	-	Not responded.

Indications: '-'Absence and '+' presence of constituent.

Organic Groups of Chemical Constituents – The extracts of the drug were tested for presence of different organic groups and results are presented in Table – 2.



**Fig. 2**

**Table-2:** Major Group of Organic Chemical Constituents of Drug.

Sl. No.	Organic Groups of Chemical Constituents	Reagents / Tests	Inference
1.	Alkaloid	Dragendorff's and Mayer's reagents	-
2.	Anthraquinone	Borntrager reaction	+
3.	Coumarin	Alcoholic potassium hydroxide	+
4.	Flavonoid	Shinoda reaction	+
5.	Glycoside	Mollisch's test	+
6.	Protein	Xanthoprotein test	+
7.	Resin	Ferric chloride reagent	+
8.	Saponin	Libermann-Burchard reaction	-
9.	Steroid	Salkowski reaction	+
10.	Tannin	Gelation test	+

#### IV. Identity, Purity & Strength

Physico-Chemical Constants – The analytical values in respect of physico-chemical constant of drug were established and results are reported in Table-3.

**Table-3:** Analytical Values of Physico-chemical Constants

Sl. No.	Physico-Chemical Constants	Analytical values
1.	Moisture content, % w/w	2.5
2.	Total Ash, % w/w	6.0
3.	Acid insoluble ash, % w/w	1.5
4.	Alcohol soluble extractive % w/w	10.0
5.	Water soluble extractive % w/w	19.0
6.	Essential oil, %, v/w	0.3

#### V. Fluorescence & Spectroscopy

Fluorescence Characteristic of Powdered drug under Ultra-Violet Light – Powdered drug was screened for fluorescence characteristic with or without chemical treatment. The observations pertaining to their colour in daylight and under ultra-violet light were noticed and are presented in Table-4.

**Table-4:** Fluorescence Characteristic of Powdered Drug under Ultra-Violet Light.

Sl. No.	Treatments	Coriandrum sativum	
		Colour in day light	Nature of colour in fluorescence
1.	Powder as such	Yellowish brown	Brown
2.	Powder with		
	Carbon tetra chloride	Brown	Brownish yellow
	Ethyl acetate	Light brown	Brownish yellow
	Hydrochloric acid	Greenish brown	Brown
	Nitric acid + water	Light brown	Greenish yellow
	Sodium hydroxide + methanol	Yellowish brown	Brown
	Sodium hydroxide + water	Greenish brown	Dark brown
	Sulphuric acid + water	Light brown	Reddish brown
	Buffer- pH 5	Light brown	Brown
	Buffer- pH 7	Light brown	Greenish brown
	Buffer- pH 9	Light brown	Greenish brown

Ultra-Violet Spectroscopy – The data related to Ultra-Violet Spectrophotometric characteristics as computed in Table-5.

**Table-5:** Ultra-Violet Spectrophotometer characteristic of drugs

Sl. No.	Specifications	Data
1.	Tincture dilution ml/ml	0.02
2.	Maximum absorption peak	0.141 0.111 0.306
3.	I Maxima at, nm	275.10 266.50 223.05

#### VI. Chromatographic Profile

Thin-Layer Chromatography – Best separation for TLC fingerprinting were obtained by using different layers and solvent systems. Inferences are shown in Table-6.

**Table-6:** TLC fingerprinting data

S. No.	Drug	Mobile Phase/Solvent System	Derivatizing Reagents	Visualizations	No. of Spots	Rf Values of bands
2.	Coriandrum sativum	Toluene: Ethyl acetate (9:1) v/v	Anisaldehyde-Sulphuric Acid	Under UV 254 nm	–	No significant bands
				Under UV 366 nm	3	0.30(red), 0.36 (sky blue), and 0.43 (red)
				After derivatization	6	0.30,0.36 (both violet), 0.43 (grey), 0.47, 0.55 (both light violet), and 0.86 (dark grey)

## Discussion

The fruits of *C.sativum* Linn. are used in a number of classical, patent and proprietary formulations of Ayurveda, Siddha and Unani preparations. It is also most commonly used as a spice. Pharmacopoeia provides its specification in respect of macro-morphology, micro-morphology, physico-chemical constants (total ash value, alcohol insoluble, water soluble extractive and alcohol soluble extractive), assay (essential oil limits) and Thin layer chromatography. Prevention of Food Adulteration Act (PFA) also provides limited specifications viz. foreign matter, insect damaged matter, moisture and total ash (Table. 7) in respect of dried mature fruits and its powder. Indian Pharmacopoeia (1955, 1966) also provides specifications for dried ripe fruit and oil derived from the fruits of *C. sativum* Linn. (Table.8). In the present study, pharmacognostic standardization of ripe fruit of *C.sativum* Linn is carried out which can be a pointer in the quality control of *C.sativum* Linn. widely used as drug or spice and also other commodity of commerce. The monographic profile on *C. sativum* Linn. is an attempt to review the compiled information on different aspects of this drug with a view to strictly enforce quality checks on ISM pharmaceutical products.

**Table-7:** Regulatory Specifications for fruits of *C. sativum* Linn. in different regulatory compendium.

Sl. No.	Quality Specification	Ayurvedic Pharmacopoeia of India (API)	Unani Pharmacopoeia of India (UPI)	Siddha Pharmacopoeia of India (SPI)	India Pharmacopoeia '66 (IP'66)	Prevention of Food Adulteration (PFA)
1.	Official Title	Dhanyka	Kishneez	Kottumalli vitai	Corriander, Corriand.	Coriander (Dhaniya)
2.	Botanical Species	Coriandrum sativum Linn.(Fam. Apiaceae)	C. sativum Linn. (Fam. Apiaceae)	C. sativum Linn. (Fam. Apiaceae)	C. sativum Linn. (Fam. Apiaceae)	C. sativum Linn. (Fam. Apiaceae)
3.	Morphological part/Official part	Dried ripe fruits	Dried ripe fruits	Dried ripe fruits	Dried ripe fruits	Dried mature fruits
4.	Description	I. Macroscopic II. Microscopic III. Powder	I. Macroscopic II. Microscopic III. Powder	I. Macroscopic II. Microscopic III. Powder	I. Macroscopical II. Microscopical	–
5.	Identity, Purity & Strength					
	Foreign Matter	12.0 %, Not more than	2.0 %, Not more than	2.0 %, Not more than	2.0 %, Not more than	2.0 %, Not more than
	Total Ash	6.0% Not more than	6.0%, Not more than	6.0%,Not more than	–	–
	Acid insoluble ash	1.5% ,Not more than	1.5% ,Not more than	1.5% ,Not more than	1.5%, Not more than	1.5%, Not more than
	Alcohol soluble extractive	10.0% ,Not less than	10.0%, Not less than	10.0%, Not less than	–	–
	Water soluble Extractive	19.0%, Not less than	19.0% ,Not less than	19.0%, Not less than	–	–
	Volatile Oil (Assay)	0.3 %, Not less than	0.3 % ,Not less than	0.3 %,Not less than	0.3 %, Not less than	0.3 % ,Not less than
6.	Thin layer chromatography	–	–	TLC profile	–	–
7.	Extraneous Matter including dust dirt, stones, lumps of earth, chaff, stalk, stem or straw, edible seeds of fruit other than coriander and insect damaged seeds	–	–	–	–	8.0 %, w/w, Maximum

Sl. No.	Quality Specification	Ayurvedic Pharmacopoeia of India (API)	Unani Pharmacopoeia of India (UPI)	Siddha Pharmacopoeia of India (SPI)	India Pharmacopoeia '66 (IP'66)	Prevention of Food Adulteration (PFA)
8.	Insect Damaged Matter (partially or wholly bored by insects)	-	-	-	-	5.0 , w/w % ,Maximum
9.	Powder's Specification	-	-	-	-	Rough or fine powder powder obtained by grinding clean, dried coriander fruits.
10.	Moisture content in powder	-	-	-	-	12.0% ,w/w, Not more than
11.	Total ash in powder	-	-	-	-	7.0 % ,w/w, Not more than
12.	Acid insoluble ash in powder	-	-	-	-	1.5% ,w/w, Not more than
13.	Added colouring matter in powder	-	-	-	-	Free from Added colouring matter

**Table-8:** Regulatory Specification for oil of *C. sativum* Linn in Indian Pharmacopoeia.

Sl. No.	Quality Specification	Indian Pharmacopoeia (1955 and 1966)
1.	Official Title	Coriander oil, Coriand. Oil, oleum Corianderi, oil of Coriander
2.	Botanical Species	Coriandrum sativum Linn.
3.	Official product	Volatile oil distilled with steam from the dried fruit of Coriandrum sativum Linn.
4.	Description	A colourless or pale yellow liquid; odour and taste, those of Corriander.
5.	Solubility	Soluble in 3 volumes of alcohol (70%)
6.	Weight per ml.	At 250, 0.863 to 0.875g
7.	Refractive index at 250	At 200, 1.4620 to 1.4720
8.	Optical Rotational (+80 to + 150)	+ 80 to + 150
9.	Heavy Metals	Conformance to prescribed test

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