



# A Review on Carminative and Gastrointestinal Regulators.

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## Abstract

*Coriandrum sativum L. is one of the most useful essential oil bearing spices as well as medicinal plants, belonging to the family Umbelliferae and Apiaceae. The seeds, leaves, and fruits of this plant are edible and have an aromatic odour, colour and are used as a flavour in curries, soup, and other dishes. All parts of plant seeds, leaves, flower and roots of coriander can be used and processed. Coriander is also known for its antioxidant, anti-diabetic, anti-mutagenic, antianxiety and antimicrobial activity along with analgesic and hormone balancing effect that promotes its use in foods due to numerous health benefits and its protective effect to preserve the food for longer period of time. The main aim of present study was to highlight the processing, nutritional and functional aspects of coriander. Our study suggested that coriander seeds and leaves may be used for different purposes. This review presents comprehensive analysed information on the botanical, chemical, and pharmacological, microbiological aspects of Coriander.*

## Keywords

Coriandrum sativum, Dhania, biological, cultivation, macroscopic characters, Coriander, limonene.

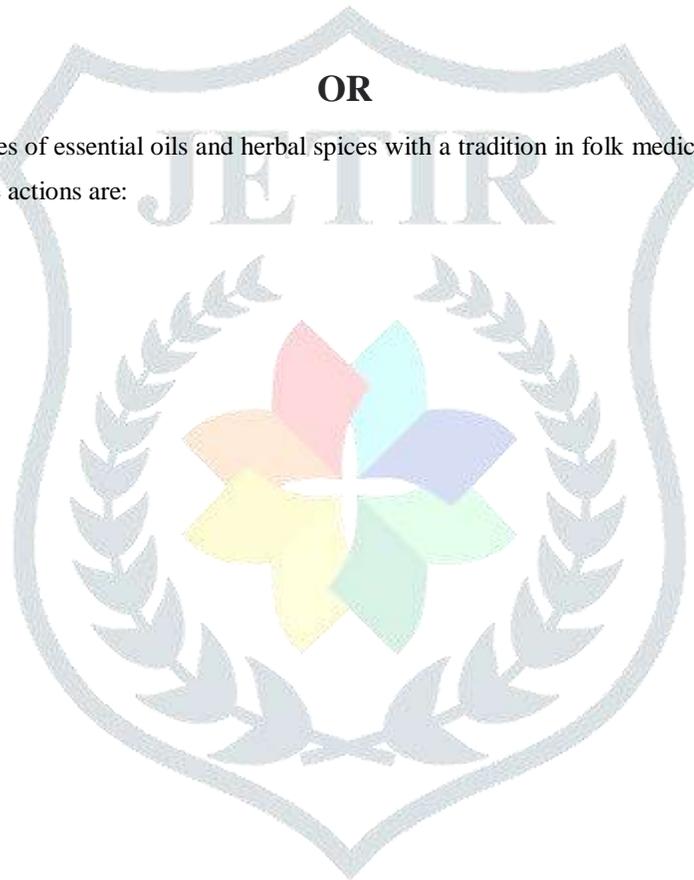
## Introduction

Carminatives are agents that prevent or relieve flatulence and may help in the treatment of colic in infants<sup>1</sup> They are soothing medicaments that act by relieving pain in the stomach and intestine and expel flatulence<sup>1,2</sup> The origin of the word "carminative" is particularly curious. It was borrowed from the French carminatif, which means carminative. Virtually all English-language dictionaries state that the French took the word from the Latin carminare, to card wool. However, a respected French dictionary Le Petit Robert indicates that carminare meant nettoyer, to cleanse. The confusion appears to stem from the fact that to card wool was to cleanse it. Thus, a carminative cleanses the bowels<sup>1</sup>. Gastrointestinal regulators are drugs that help regulate gastrointestinal motility and function<sup>3</sup>. They can be used to treat conditions such as constipation, diarrhea, and irritable bowel syndrome<sup>4</sup>.

OR

**Carminatives** are often mixtures of essential oils and herbal spices with a tradition in folk medicine for this use. Some examples for oils and spices with carminative actions are:

- Angelica
- Ajwain
- Anise seed
- Asafoetida
- Basil
- Calamus
- Caraway
- Cardamom
- Cinnamon
- *Coriander*
- Oregano
- Parsley
- Pepper
- Pennyroyal



## Classification :-

### 1. ANTIFOAMING AGENTS

- Simethicone

### 2. ENZYME-BASED DIETARY SUPPLEMENTS

- Beano
- Lactase (brand Lactaid)
- Marmite

### 3. HERBAL ANTIFLATULENTS

- *Epazote is claimed to have anti-flatulent properties.*
- *Asafoetida reduces the growth of indigenous microflora in the gut thereby reducing flatulence.*

## IN DETAIL

Simethicone is an anti-foaming agent that works by breaking up gas bubbles in the stomach and intestines, preventing bubble formation and reducing bloating, discomfort, or pain caused by excessive gas<sup>1,2,3</sup>

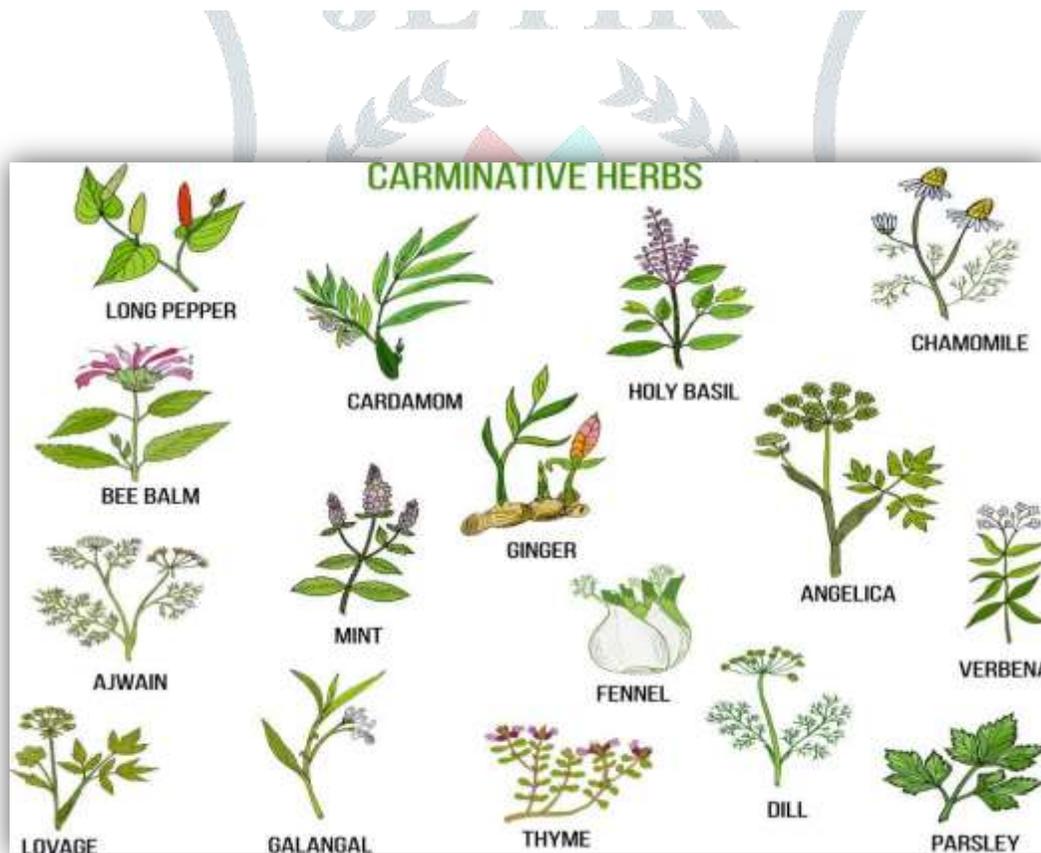
Beano is an enzyme-based dietary supplement that contains alpha-galactosidase, which breaks down complex carbohydrates in foods such as beans, broccoli, onions, whole grains, and pasta that are difficult to digest. This helps reduce gas in the digestive tract, thereby improving digestion and reducing bloating, discomfort, and flatulence caused by gas<sup>1,4,5</sup> Lactase is an enzyme produced by many organisms that breaks down lactose, a sugar found in milk. It is essential to the complete digestion of whole milk and is located in the brush border of the small intestine of humans and other mammals. Lacking lactase, a person consuming dairy products may experience the symptoms of lactose intolerance. Lactase can be purchased as a food supplement and is added to milk to produce “lactose-free” milk products<sup>3</sup>. *Dysphania ambrosioides* and *asafoetida* are herbs that have been traditionally used as carminatives to relieve stomach gas. *Epazote* is claimed to have antifatulent properties, while *asafoetida* reduces the growth of indigenous microflora in the gut, thereby reducing flatulence<sup>3</sup>.

**Preventing gas :-** Flatulence is caused by various factors, including eating behaviors and the bacterial fermentation of certain foods<sup>1</sup>. Here are some ways to prevent or reduce flatulence

**Enzymes:-** Enzyme-based dietary supplements breakdown indigestible substances and prevent these substances from reaching the large intestine intact, where anaerobic bacteria produce gas. These supplements are usually taken with foods associated with flatulence. For example, when consuming beans and other

vegetables high in complex carbohydrates, it may be helpful to take a product that contains alpha-galactosidase, such as Beano or kombu<sup>1</sup>.

**Herbal inhibitors:**—Many herbal substances have been observed since antiquity for reducing flatulence, reducing gas. The potency of garlic increases when heated, whereas the potency of cinnamon decreases. Other spices have a lesser effect in reducing gas, including turmeric, black pepper, asafoetida and ginger. Other common Indian spices like cumin, aniseed, ajwain, and cardamom do inhibit gas production but can also exacerbate it significantly<sup>1</sup> particularly gas from eating legumes. Cloves, nutmeg, cinnamon, and garlic are potent in<sup>2,3,4</sup>. Chamomile, anise, caraway, coriander, fennel, and turmeric are some other herbs that can help with food-related gas and bloating<sup>1</sup>. It is important to take the appropriate enzyme with the appropriate food when consuming foods associated with flatulence<sup>1</sup>. Additionally, for individuals with lactose intolerance, taking a lactase-containing product with lactose-containing foodstuffs may reduce flatulence<sup>1</sup>. Pairing legumes with herbs such as oregano, rosemary, fennel and cilantro may also support better digestion<sup>5</sup>.



*Carminative Herbs*

## INTRODUCTION

Coriander is a highly demanded horticultural product in the market for aromatic herbs, with the highest demand worldwide being for use in the food industry<sup>1</sup>. However, current demand in the food industry is oriented towards the consumption of high-quality products and value-added services, which provide greater benefits. In this context, organic agricultural products have grown in consumer demand<sup>1</sup>.

Organic agriculture is a method that consists of reducing the use of agricultural inputs such as synthetic fertilizers and pesticides, as well as genetically modified seeds and species. Instead, it relies on practices that are compatible with the environment and that aim to maintain or increase soil fertility in the long term<sup>1</sup>. Here are some key points from the search results about organic coriander production. Organic coriander is highly profitable due to export demand and is of high quality, safe, nutritious, and environmentally friendly<sup>1,2</sup>. Coriander dried seeds can be used as a carminative and diuretic because they have medicinal properties<sup>3</sup>. Organic coriander farming can help to lower blood sugar, boost the immune system, reduce blood pressure levels, protect brain health, and aid in stomach digestion processes<sup>4</sup>. Organic fertilizers such as vermicompost and glycine can significantly increase growth, yield, and biochemical quality traits of coriander including root and shoot biomass, leaf SPAD value, ascorbic acid, mineral nutrients<sup>5</sup>. Organic coriander seeds are grown without the use of harmful chemicals or pesticides, making them a safe and healthy choice for cooking. They are also a good source of dietary fibers, iron, and minerals and have been used in traditional medicine for centuries<sup>6</sup>.



### Coriander

Coriander is a glabrous aromatic, herbaceous annual plant that belongs to the family Umbelliferae/Apiaceae. It has a long history as a culinary herb and is the source of aroma compounds and essential oils (EO) with biologically active components possessing antibacterial, antifungal, and antioxidant activities<sup>1</sup>. Coriander

provides two types of herbal raw materials - fruits and leaves, the main biologically active substance of which is EO. The yield of *C. sativum* EO and its chemical composition undergoes changes during ontogenesis which affects the aroma of the plant, and thus the coriander fruit aroma is completely different from the aroma of the herb<sup>1</sup>. Immature fruits and leaves have an unpleasant odor called a “stink bug smell” which is due to trans-tridecen contained in the oil<sup>1</sup>. Coriander seeds are added to dishes as an aromatic spice, which at the same time act as digestive agents accelerating the digestion process<sup>1</sup>. In general, organic coriander products are sold at higher prices than conventional products because consumers are willing to pay more for products that satisfy certain ideological and health needs<sup>2,3,4</sup>. Here are some examples of organic coriander products available for purchase. Organic Coriander Seed Essential Oil<sup>1</sup>. Organic Way Premium Coriander Whole<sup>2</sup>. Organic Coriander Seeds<sup>3</sup>. Coriander Seed (organic) - Oshadhi Essential Oils<sup>5</sup>. Organic coriander seed, powder<sup>4</sup>. Organic Coriander - High Quality Herb – CADIA<sup>6</sup>.



### **Fruit, roots, leaves.**

Coriander is an annual herb that belongs to the family of Apiaceae<sup>1</sup>. It is a tropical or subtropical crop that can tolerate heat and drought, and can be grown all year round for leaf purpose<sup>2</sup>. Coriander can fairly tolerate light frost and high temperature, and the temperature of 15-20°C for vegetative growth and 20-30°C along with cool and dry weather for seed formation is considered good<sup>2</sup>. Heavy rain affects the crop yield and quality badly. For very hot weather, the crop for leaves can be grown under assured irrigation facilities<sup>2</sup>. Coriander shows broad adaptation by growing well under different types of soil and weather conditions<sup>2</sup>. Coriander is used in cooking, and all parts of the plant are edible, but the fresh leaves and the dried seeds are the most common parts used<sup>3</sup>. The leaves are used in the preparation of chutney and are also used as seasonings in curries, soups, sauces,

and chutneys. The fruits are said to have carminative, diuretic, tonic, stomachic, and aphrodisiac properties<sup>2,4</sup>. Nitrogen has a considerable effect on the quality and quantity of coriander produce. Nitrogen is one of the major elements for growth and development of plants. It is involved in photosynthesis, respiration, and protein synthesis. It imparts the dark green color of the leaves, promotes vigorous vegetative growth, more efficient use of available inputs, and finally leads to higher productivity<sup>1</sup>. In Indian traditional medicine, coriander is used in disorders of digestive, respiratory, and urinary systems as it has diaphoretic, diuretic, carminative, and stimulant activity. In Iranian traditional medicine, coriander has been indicated for a number of medical problems such as dyspeptic complaints, loss of appetite, convulsion, and insomnia<sup>2</sup>.

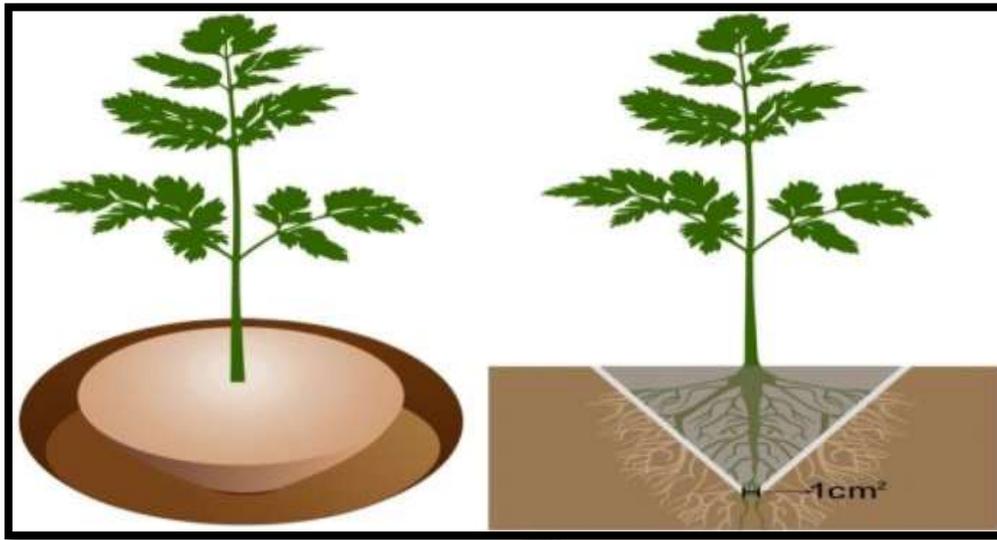
#### *Materials and Methods*

##### ❖ *Experimental site*

The present investigation was conducted in green house condition at Department of Biochemistry, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during Rabi 2015-16. The experiment was conducted in the research field of Agronomy Farm of Institute of Agriculture and Animal Science, Paklihawa Campus, Rupandehi, Nepal during Januray to March, 2018. Geographically, the experimental site is located at an altitude of 79 m above sea level in Terai belt of Western Development Region of Nepal. The GPS coordinates of the site are 0742278 quite uniform in respect to its topography and total area occupied for the experimental purpose was 77 m<sup>2</sup>. Here are some additional search results related to greenhouses and agricultural research. Greenhouses are used for study plants and their biochemistry in various conditions<sup>1</sup>. Research greenhouses can have different environmental conditions and contain rolling benches for growing plants<sup>2</sup>. Greenhouse conditions can differ from field conditions, which can affect plant-soil feedbacks<sup>3</sup>. Long-term tillage and cropping system experiments are conducted in greenhouses to study greenhouse gas reduction through agricultural carbon enhancement<sup>4</sup>. Greenhouses have a long history of contribution to agricultural research<sup>5</sup>.

##### ❖ *Experimental soil*

*To prepare the soil for the pot trial, the soil was collected from Agronomy farm, Junagadh Agricultural University, Junagadh [source not found]. The soil was sterilized using an autoclave, which is a machine that uses steam to kill microorganisms. The autoclave used in this experiment was a STERIS 137 brand autoclave, which was run for three 15-minute liquid cycles at 121°C<sup>1,2,3</sup>. After sterilization, the soil was dried properly and used for the pot trial. There were 24 pots, each with a depth of 40 cm and a width of 45 cm, with a capacity of 40 kg soil per pot [source not found]. The experimental soil was calcareous in texture and slightly alkaline in reaction with normal electrical conductivity [source not found].*



**Growth in soil**

#### ❖ PGPR culture (*Plant growth promoting rhizobacteri*)

Three plant growth promoting rhizobacteria, namely *Azotobacter*, *PSB*, and *Pseudomonas*, were obtained from Microbial Cell, Department of Biotechnology, Junagadh Agricultural University, Junagadh<sup>1</sup>. These bacteria are known to colonize the rhizosphere of plants and promote their growth by suppressing soil-borne pathogens at the root surface<sup>2</sup>. Many studies have been conducted to evaluate the effect of these bacteria on plant growth and yield. For example, a pot experiment was conducted to evaluate the effect of inoculation of these three bacteria on coriander seedling. The results showed that the inoculated plants had higher levels of biochemical parameters compared to the control group<sup>3,1</sup>. Similarly, a field study was conducted to determine the effect of plant growth promoting rhizobacteria on the growth and yield of bitter melon. The results showed that the inoculated plants had a higher yield compared to the control group<sup>4</sup>. Plant growth promoting rhizobacteria can also be used in an integrated system of plant nutrition management to improve the growth, yield, and flower quality of African marigold<sup>5</sup>. Overall, these studies suggest that plant growth promoting rhizobacteria can have a positive impact on plant growth and yield.

#### ❖ Seed materials

The following statement was made about coriander seeds: "The coriander seeds (cv. Gujarat Coriander-2) were obtained from Department of seed science and technology, Junagadh Agricultural University, Junagadh, India."

There is no information in the provided search results that relates to coriander seeds or agriculture.

#### ❖ Seed treatment

Prior to the treatments, coriander seeds were sterilized with 70% ethanol and 0.1% mercuric chloride (Hg) and washed with distilled water four times<sup>1,2</sup>. Pure cultures of plant growth-promoting rhizobacteria (PGPR) were treated with the seeds, either individually or in combination, while the seeds in the control variant were not inoculated. The treatments were as follows:

1. T1-Control
2. T2-Azotobacter
3. T3-PSB (Phosphate solubilizing bacteria)
4. T4-Pseudomonas
5. T5-Azotobacter + PSB
6. T6-Azotobacter+ Pseudomonas
7. T7-PSB + Pseudomonas
8. T8-Azotobacter + PSB + Pseudomonas

There are several studies on the effect of PGPR on coriander growth and yield. One study found that the activity of antioxidant enzymes APX and GPX in coriander leaves treated with PGPR strains was significantly reduced compared to untreated plants<sup>3</sup>.

Another study evaluated the potential of selected PGPR towards enhancing the growth and yield of coriander<sup>4</sup>. A third study investigated the effect of seed priming with PGPR on the growth of coriander seedlings<sup>5</sup>. Finally, a study examined the ability of PGPR to improve coriander growth under salt stress conditions<sup>6</sup>. Overall, these studies suggest that PGPR can improve coriander growth and yield under various conditions.



**coriander seed.**

### ❖ Pot trial

The pot trials were conducted at the green house of the Biochemistry Department, College of Agriculture, J.A.U., Junagadh<sup>1</sup>. The seedlings were sown in pots in three replications during December month, after half an hour of seed treatment. These seedlings were analyzed in four stages: S1 (5 DAG), S2 (10 DAG), S3 (15 DAG) and S4 (20 DAG)<sup>1</sup>. The sufficient amount of water was supplied to the pots until the last stage of the trial<sup>1</sup>.

### ❖ *Sample collection*

Based on the available search results, it seems that there are various types of markets in Dhaka metropolitan city, including open markets, municipal markets, chain shops, and wholesale shops. Some of the popular markets in Dhaka city are New Market, Kawran Bazar, Bashundhara City Shopping Complex, and Police Plaza Concord<sup>1,2</sup>. The selection of the 12 markets for purchasing RSV items might have been based on their popularity within the Dhaka metropolitan city area. Among them, three chain shops (Agora, Swapno, and Minabazar), three wholesale markets (Kawran bazar, Shyambazar, and Jatrabari), and six retail markets (New Market, Mohakhali, Khilkhet, Mirpur-1, Mohammadpur Krishi Market, and Santinagar bazaar) were chosen<sup>3</sup>.

### ❖ *Agro meteorological observation*

The experimental site has a tropical climate with hot summers and cool winters. Occasional showers of rain are received during winter months and the area has an average rainfall of 1436.5mm<sup>1</sup>. The maximum temperature during hot months can reach up to 45.2°C and the minimum temperature during cooler months can drop to 2.4°C<sup>1</sup>. The following studies provide additional information about the effects of climate on wheat growth and yield. In a study conducted in China, researchers assessed the temperature sensitivity of wheat yield using three distinct approaches<sup>2</sup>. Another study in China found that climatic warming increased winter wheat yield but reduced grain nitrogen concentration<sup>3</sup>. Researchers in Italy evaluated the impacts of climate change on durum wheat production and phenology<sup>4</sup>. A study in the United States gathered experimental data on local daily weather data, soil characteristics, and initial conditions to study plant physiology and genetics research<sup>1</sup>. A study in the United States used field experiments and multi-model simulations to study wheat growth and phenological stages<sup>5</sup>. A study in Iran quantified the impacts of climate change on wheat phenology, yield, and evapotranspiration under irrigated and rainfed conditions<sup>6</sup>.

### ❖ **Physiochemical properties of soil**

Soil analysis is a process that determines the content of plant nutrients and other physical characteristics of the soil. The chemical composition of soil can be assessed through lab analysis, which can include measuring the content of nitrogen, phosphorus, potassium, pH, humus content, total CaCO<sub>3</sub>, available lime, organic matter, total sulfur, sodium, micro-nutrients, and other physical characteristics such as capacity, permeability, density, and pH value<sup>1</sup>. The main objective of chemical analysis is to predict sites where applying nutrients will increase yields<sup>2</sup>. Archaeologists might also study soil texture and chemical composition, including organic matter, nitrogen, phosphorus, and pH<sup>3</sup>. Soil analysis is carried out in a lab, and there are many different methods for determining soil composition, such as chemical analysis, which involves using various chemical reagents to test the soil<sup>4</sup>. Soil contains both organic and non-organic materials, both of which are necessary for good root growth and plant health<sup>5</sup>. The chemical composition of the soil at the experimental site was analyzed, and the results showed that the soil contained 3.35% organic matter, 0.49% total nitrogen, 187.53 kg/ha available phosphorus, 123.11 kg/ha K<sub>2</sub>O, and had a pH of 5.2<sup>1</sup>.

## ❖ Planting materials

The study evaluated eight varieties of coriander collected from different agro-vets of Butwal, Rupandehi, Nepal. Table 1 in the study shows the list of the coriander varieties used in the experiment and their sources. The varieties used were Khusboo, Kalamy, Lotus, Evergreen, American Long Standing, IKO-BR-50, Kasturi, and Sugandh. The sources of these varieties were seed companies from India, Thailand, and Nepal<sup>1,2</sup>. Coriander, also known as cilantro, is an herb that is widely used as a condiment and spice in Nepal<sup>3</sup>. It is an annual herb that is grown for its leaves and seeds. In Nepal, coriander is mainly grown in the Terai and the mid-hills regions<sup>4</sup>.

## ❖ Experimental design and details

The experiment was laid out in a simple randomized complete block design (RCBD) with eight treatments and three replications, and the total number of plots was 24. All treatments were based on the varietal differences in coriander plant yielding behavior, with Khusboo, Kalamy, Lotus, Evergreen, Americal Long Standing, IKO-BR-50, Kasturi, and Sugandh considered as treatments. The experimental unit size was 1.4 m<sup>2</sup> (1.4m × 1m), and the gross size of the experimental area was 77 m<sup>2</sup> (15.4m × 5m). The spacing between blocks was 1m, and the spacing between experimental units within a block was 0.6m. There were five rows per plot accommodating 28 plants per row, with the row-to-row distance being 20 cm and the plant-to-plant distance being five cm. Therefore, there were a total of 140 plants per plot<sup>1,2</sup>.



*Growth of coriander.*

### ❖ *Data collection*

The provided search results do not directly relate to the given statement about plant observation recording. However, it is possible to provide some general guidance on how to record plant observations based on the results. To record plant observations, it is necessary to select a sample of plants from the experimental plot. In each experimental unit, a specific number of sample plants should be selected randomly for recording data on different growth and yield contributing characters<sup>1</sup>. After selection, each sample plant should be tagged, and all data should be noted on an observation sheet<sup>1</sup>. Various resources are available to help teachers and students record plant observations, such as recording sheets and data worksheets<sup>1,2,3</sup>. The National Phenology Network has also developed resources to help collect phenology records, which can help understand plant and animal responses to environmental changes<sup>4</sup>. Additionally, iNaturalist is a platform that allows users to record observations of plants and other organisms as biodiversity data that contribute to citizen science<sup>5</sup>.

### ❖ *Flow chart of Production Process of Coriander Seeds.*

*Coriander crop requires a cool climate during the growth stage and warm dry climate at maturity can be cultivated in most types of soils, but well-drained loamy soil suits the crop well*

*Cold climate and high altitudes may lead to superior quality seed and higher essential oil content*

Crop duration of coriander Harvested plants are dried in the sunlight for 1-2 days

to bring the moisture levels down to 18%.

This dried plant is then thrashed to remove the seeds.

Seeds are further dried in the shade to bring the moisture levels down to 9%.

Coriander seed is mainly processed into powder by crushing, and this powder, with its aroma, is used as a food ingredient

The seeds are also used to extract essential oils.

### ❖ Flow chart of Preparation of Aqueous Extract of Coriander.

Dried coriander seeds were homogenized to a fine powder.



For coriander extract, the seeds were washed well with water, air dried at room temperature, and then ground in an electric grinder to have a coarse powder.



Fifty grams of the seed powder was suspended in distilled water (500 mL) and heated to boil under reflux for 30 min. The decoction obtained was centrifuged, filtered, frozen at  $-20^{\circ}\text{C}$ ,



lyophilized (FreeZone Dry 4.5, USA) to give a residue (yield = 10% w/w).



For assuring stability, the residue was stored at  $-20^{\circ}\text{C}$  until used, and *Coriandrum sativum* extract was prepared in distilled water on the day of experiment.



The proximate analysis of coriander powder was determined according to AOAC

### ❖ REGIONAL AND OTHER NAMES OF CORIANDER

Here are translations of the word "coriander" in different languages based on the search results-

- a) Armenian: chamem<sup>3</sup>.
- b) Bengali: Dh.ane, Dhania<sup>3</sup>
- c) Czech: koriandr<sup>3,5</sup>.
- d) Danish: koriander<sup>3,5</sup>.
- e) Dutch: koriander<sup>3</sup>.
- f) English: coriander, collender, Chinese parsley<sup>3,6,4</sup>.
- g) Georgian: kinza, kindza, kindz<sup>3,5</sup>.

- h) German: Koriander<sup>3,5</sup>.
- i) Greek: koriannon, korion<sup>3</sup>.
- j) Hindi: dhania, dhanya, Dhaniya, Dhanika, Dhania Vitunnaka, Dhaniwal, Dhanawal<sup>3,6</sup>.
- k) Hungarian: coriander<sup>3,5</sup>.
- l) Italian: coriandolo<sup>3</sup>.
- m) Japanese: koendoro<sup>3</sup>.
- n) Kashmiri: Dhaniwal, Dhanawal<sup>6</sup>.
- o) Marathi: Dhaue, Kothimbir<sup>3</sup>.
- p) Polish: kolendra<sup>3</sup>.
- q) Portugese: coentro<sup>3,2</sup>.
- r) Punjabi: Dhania<sup>3</sup>.
- s) Russian: koriandr, koljandra, kinec, kinza, vonjuezel'e, klopovnik<sup>3</sup>.
- t) Sanskrit: dhanayaka, kusthumbari, Dhanika, Dhania Vitunnaka<sup>3,6</sup>.
- u) Spanish: coriandro, cilantro, cilandrio, cilantro<sup>3,2</sup>.
- v) Tamil: Kottamalli, Viral dhania<sup>3</sup>.
- w) Telagu: Dhaniyalu<sup>3</sup>.

#### DRUG INFORMATION

#### Overview:-

Coriander, also known as cilantro or Chinese parsley, is a plant whose leaves and fruit (seeds) are used as food and medicine<sup>1</sup>. The leaves are usually referred to as cilantro, while the term "coriander" is typically used to describe the fruit<sup>2</sup>. Coriander is used for a variety of conditions, including irritable bowel syndrome (IBS), constipation, diarrhea, gas (flatulence), nausea, athlete's foot, and many others, but there is no good scientific evidence to support these uses<sup>1</sup>. In foods, coriander is used as a culinary spice and to prevent food poisoning<sup>1</sup>. In manufacturing, coriander is used as a flavoring agent in medicines and tobacco and as a fragrance in cosmetics and soaps<sup>2</sup>. There are many potential health benefits associated with coriander. For example, coriander is a fragrant, antioxidant-rich herb that has many culinary uses and health benefits. It may help lower blood sugar, fight inflammation, and improve heart health<sup>3</sup>. Coriander is also effective at lowering blood sugar, but people who are taking diabetes medication or who have hypoglycemia should be cautious when eating coriander<sup>4</sup>. Additionally, coriander might stimulate the gut and increase the production of stomach acid, which might help people with conditions such as indigestion<sup>5</sup>.

## + How does it work ?

Coriander is a plant that is commonly used in culinary applications, but it also has some potential medicinal uses. Here's what we know about coriander based on the search results:**Potential medicinal uses** Lowering blood sugar: Coriander may help lower blood sugar levels<sup>1</sup>.Killing some parasites: Coriander seeds have been shown to have antibacterial properties and can fight the bacteria responsible for urinary tract infections<sup>1</sup>. Relieving gastrointestinal discomfort: Coriander has been used traditionally in India for relieving gastrointestinal discomfort and respiratory and urinary complaints<sup>2</sup>. Treating flatulence, dysentery, diarrhea, and vomiting: In some areas of Pakistan, the whole plant of coriander has folk medicinal uses to treat these conditions<sup>2</sup>.

### ○ Current limitations

Lack of scientific evidence: There is no good scientific evidence to support many of the traditional uses of coriander, including treating constipation, diarrhea, and athlete's foot<sup>3</sup>.Insufficient information: While coriander has potential medicinal uses, there currently isn't enough information to know how coriander might work for medicinal uses<sup>2</sup>.

## + Other benefits

Antioxidant properties: Coriander offers several antioxidants, which prevent cellular damage caused by free radicals. Its antioxidants have been shown to fight inflammation in the body<sup>1</sup>. Vitamin A: Coriander is a great source of vitamin A, which helps protect vision and keep eyes moist<sup>4</sup>. It's important to note that while coriander has some potential medicinal uses, it is not a substitute for medical treatment and should not be used as a primary treatment option without consulting a healthcare professional.

### + Uses & Effectiveness

- *Insufficient Evidence for:- Coriander oil has several properties that can be beneficial for health, but there is not enough evidence to rate its effectiveness for most conditions. Here are some of the uses and benefits of coriander oil based on the search results.*
- **Joint pain and swelling:-** Coriander oil has analgesic and antispasmodic properties, which means that it can be used for reducing swelling in stiff joints and sore muscles, stopping and preventing muscle spasms, easing menstrual cramps, soothing toothaches and headaches, and managing arthritis pain<sup>1</sup>.
- **Digestive issues:-** Coriander oil can aid digestion and help with constipation, diarrhea, and flatulence. It is also used to treat bacterial or fungal infections in the digestive tract<sup>2</sup>.
- **Skin:-** Coriander oil has a high linalool content, which helps skin maintain a clear complexion. It can be used topically to soothe sore muscles and improve symptoms of athlete's foot<sup>3,4</sup>.
- **Anxiety and stress:** Coriander oil has a calming effect and can be used to reduce stress and anxiety when inhaled or applied topically<sup>5,6</sup>. It's important to note that more research is needed to fully

understand the benefits of coriander oil for these conditions. It's always best to consult with a healthcare professional before using essential oils or any other natural remedies for health issues.

## ✚ Side Effects

Coriander is an herb that is used for a variety of purposes. It is generally safe when used in appropriate amounts, but it can cause side effects in some people. Here are some of the possible side effects of coriander according to the search results: **When taken by mouth:** Coriander is likely safe when taken in food amounts<sup>1</sup>. It is possibly safe for most people when taken in larger amounts as medicine, but can cause allergic reactions. Symptoms of such reactions can include asthma, nasal swelling, hives, or swelling inside the mouth. These reactions appear to be most common in people who work with spices in the food industry<sup>1,2</sup>. Coriander can cause low blood pressure in people who already have low blood pressure or who take medications to lower their blood pressure<sup>1</sup>. Coriander might cause sleepiness and drowsiness, especially when taken with other medications that cause sleepiness<sup>2</sup>.

✚ **When applied to the skin** :-Coriander is possibly safe when used appropriately, but it can cause skin irritation and itching<sup>1,3,4</sup>. Overall, coriander is considered safe for most people when used in appropriate amounts. However, people who work with spices in the food industry should be cautious due to the risk of allergic reactions. If you experience any side effects from coriander, you should stop using it and consult with a healthcare professional.

✚ *Special Precautions and Warnings:* -Coriander is a plant that is used as a culinary spice and also has some medicinal uses. However, there are some precautions and side effects associated with its use. Here are some important points from the search results:

✚ *Precautions:* -**Pregnancy and breast-feeding:** There isn't enough reliable information to know if coriander is safe to use when pregnant or breast-feeding. Stay on the safe side and avoid use<sup>1,2,3</sup>. **Allergies:** People who are allergic to mugwort, aniseed, caraway, fennel, dill, or similar plants might have allergic reactions to coriander<sup>1,4</sup>. **Low blood pressure:** Coriander might decrease blood pressure. This could cause blood pressure to go too low in people with low blood pressure. Use cautiously if you have low blood pressure or take medications to lower your blood pressure<sup>1,4</sup>. **Surgery:** Coriander might lower blood sugar. There is some concern that it might interfere with blood sugar control during surgery. Stop using coriander at least 2 weeks before a scheduled surgery<sup>1,5</sup>.

✚ *Side effects:-*



**Skin irritation:** -Coriander can cause skin irritation and itching when applied to the skin<sup>1</sup>.

**Allergic reactions:-** When taken by mouth or inhaled, coriander can cause allergic reactions. Symptoms of such reactions can include asthma, nasal swelling, hives, or swelling inside the mouth. These reactions appear to be most common in people who work with spices in the food industry<sup>4</sup>.

**Low blood sugar:-** Coriander might lower blood sugar levels. If you have diabetes and take coriander, monitor your blood sugar levels closely<sup>1,4,5</sup>. It is important to note that coriander is generally safe in food amounts and possibly safe for most people when taken by mouth in appropriate medicinal amounts<sup>4</sup>.

✚ *Dosing*

As per the search results, the appropriate dose of coriander depends on several factors such as the user's age, health, and several other conditions<sup>1,2,3,4</sup>. At this time there is not enough scientific information to determine an appropriate range of doses for coriander. It is important to keep in mind that natural products are not always necessarily safe and dosages can be important. Coriander is **LIKELY SAFE** in food amounts and **POSSIBLY SAFE** for most people when taken by mouth in appropriate medicinal amounts. When taken by mouth or inhaled, coriander can cause allergic reactions. Symptoms of such reactions can include asthma, nasal swelling, hives, or swelling inside the mouth. These reactions appear to be most common in people who work with spices

in the food industry<sup>1</sup> It is recommended to follow relevant directions on product labels and consult your pharmacist or physician or other healthcare professional before using<sup>1</sup>.

### Disease in which coriander is use.

#### Monograph of herbal drugs as per WHO guidelines.

##### ✓ Monograph Title:- BOTANICAL.

**Parameters:-** Sensory Evaluation.

**Types:-** Visual Macroscopy; Touch; Taste; Odour; Size; Colour.

**Parameters:-** Foreign Plants.

**Types:-** Foreign Animal, Foreign Mineral (Soil, Stones, Sand, and Dust)

**Microscopy:-** Histological observation, Histochemical detection, Measurement of specimens etc.

##### ✓ Monograph Title:- PHYSICOCHEMICAL.

**Parameter:-** TLC.

**Types:-** Ascending technique, Horizontal technique, etc.

**Parameter:-** Ash.

**Types:-** Total, Acid insoluble, Water soluble.

**Parameter:-** Extractable Matter.

**Types:-** Hot water, Cold water and Ethanol.

**Parameter:-** Water content and volatile matter.

**Types:-** LOD, Azeotropic.

**Parameter:-** Volatile oils.

**Types:-** By Steam distillation.

##### ✓ Monograph Title:- PHARMACOLOGICAL.

**Parameter:-** Bitterness value.

**Types:-** Unit equation to the bitterness of standard solution of Quinine hydrochloride.

**Parameter:-** Haemolytic activity.

**Types:-** On oxygen blood by comparison with standard saponin.

**Parameter:-** Astrigency

**Types:-** Fraction (tannins) that binds to standard hide powder.

**Parameter:-** Swelling index.

**Types:-** In water.

**Parameter:-** Foaming index.

**Types:-** Foam height produced by 1gm material under specified conditions.

✓ **Monograph Title:- TOXICOLOGICAL.**

**Parameter:-** Pesticide residue

**Types:-** Total organic chloride and total organic phosphorus.

**Parameter:-** Arsenic.

**Types:-** Stain produced on HgBr<sub>2</sub> paper in comparison to standard stain.

**Parameter:-** Heavy metal.

**Types:-** Cadmium and Lead.

✓ **Monograph Title:- MICROBIAL CONTAMINATION.**

**Parameter:-** Total viable aerobic count pathogens.

**Types:-** Enterobacteriaceae-E.coli Klebsiella, salmonella, staphylococcus aureus, Pseudomonasaeruginosa .

**Parameter:-** Aflatoxins

**Types:-**By TLC using standard aflatoxins (B<sub>1</sub>,B<sub>2</sub>,G<sub>1</sub>,G<sub>2</sub>) mixture.

✓ **Monograph Title:- RADIOACTIVE CONTAMINATION.**

Microbial growth in herbal can be avoided by irradiation. Nature and intensity of irradiation depend on the source. The radio activity of the plant sample should be checked according to the guiedlines ofthe International Atonic Energy Agency (IAEA) , Vienna ,Austeia

➤ METHOD OF EVALUATION OF HERBAL DRUG

*Organoleptic or morphological evaluation.*

**Coriander:-** Coriander consists of dried ripe fruits of *Coriandrum sativum* Linn., belonging to family Umbelliferae.

**Synonyms:-** Fructus coriandri, Coriander fruits, Cilantro, Chinese parsley.

**Colour :-Leaf:-** Green to yellowish brown of Indian Coriander. **Seeds:-** Yellowish brown to brown. **Odour:-** Aromatic odour of Umbelliferae fruits. **Taste:-** Spicy and characteristic.

**Size:-** 2 to 4mm diameter. 4 to 8mm length.

**Shape:-** Cremocarp with 10 primary ridges and 8 secondary ridges.

**Biological Source:-** Coriander consists of dried ripe fruits of *Coriandrum sativum* Linn., belonging to family Umbelliferae.

**Geographical Sources:-** Cultivated in Central and Eastern Europe, particularly in Russia, Hungary, in Africa and India. In India it is cultivated in Maharashtra, U.P., Rajasthan, Jammu, and Kashmir. It is also found in a antiwild state in the east of England.

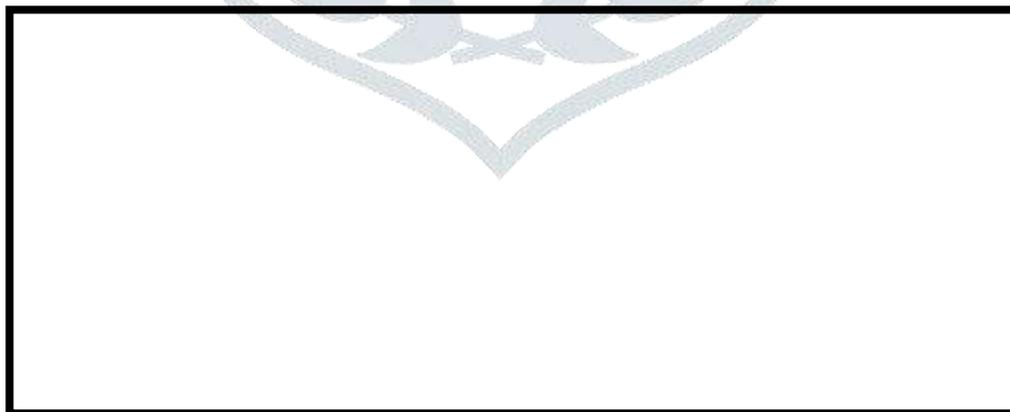
**Cultivation and Collection:-** The coriander seeds are sown in dry weather either in March or in early autumn. Shallow drills, about 1/2 inch deep and 8 inches apart are made and the seeds are sown in it, the rate of germination is slow. The plants are annual herb, which grow to a height of 1 to 3 feet high, slender, and branched. The flowers are in shortly stalked umbels with five to ten rays. The seeds fall as soon as ripe and when the seeds are ripe (about August), the disagreeable odour is produced. Plant is then cut down with sickles; the fruits are collected and dried. During drying fruits develop aromatic smell and the unpleasant odour disappears.

**Characteristics:-** The fruit described in the question is a cremocarp, which is a type of dry fruit that is a schizocarp formed from two one-seeded carpels<sup>1,2,3,4,5,6</sup>. The carpels remain separate and form indehiscent mericarps that are attached to a central supporting strand for some time before dispersal. Cremocarp fruit is characteristic of the Umbelliferae (Apiaceae; carrot family)<sup>1</sup>. Cremocarps are present in a variety of plants, including coriander<sup>3</sup>, nutmeg, fennel, clove, mace<sup>6</sup>, and others. The fruit is subspherical in shape, yellowish-brown in colour, and typically 3-4 mm in diameter. It has an aromatic odour and a spicy, aromatic taste<sup>1</sup>



### **Coriandrum sativum**

**Chemical Constituents:-**Coriander fruit contains about 0.2%–1.5% of volatile oil and 13%–20% of fat oil. However, some cultivars contain up to 2.6% of volatile oil, and the content ranges from 1.87%–2.33%<sup>1</sup>. The chief volatile components of coriander are D-(+)-linalool (coriandrol), along with other constituents like borneol, p-cymene, camphor, geraniol, limonene, and alpha-pinenes<sup>1,2</sup>. The fatty oils in coriander include acids of petroselic acid, oleic acid, linolenic acid, whereas the hydroxycoumarins include the umbelliferone and scopoletine<sup>1</sup>. The major constituents of the essential oil of coriander include linalool,  $\gamma$ -terpinene,  $\alpha$ -pinene, camphor, decanal, geranyl acetate, limonene, geraniol, and others<sup>2,3</sup>. Linalool is the main constituent of dry seed oil under all conditions and recorded 59.6%, 59.28%, and 47.69% of the treatments of the oil at zero humidity, 75% humidity, and air, respectively<sup>4</sup>.



## Plant profile

**Table 3:-Scientific classification**

Scientific	Classification
Kingdom	Plantae
Subkingdom	Viridaeplantae
Infrakingdom	Streptophyta
Division	Tracheophyta
Subdivision	Spermatophytina
Infradivision	Angiospermae
Class	Magnoliopsida
Superorder	Asteranae
Order	Apiales
Family	Apiaceae
Genu	Coriandrum L.coriander

### *Plant Parts*

Coriander (*Coriandrum sativum*) is an annual herb in the family Apiaceae, also known as cilantro in some regions<sup>1,2</sup>. It is a fast-growing plant that can reach up to 50 cm in height<sup>3</sup>. The plant has an erect, herbaceous, green cylindrical, hollow stem that is solid in the lower region and dichotomously branched<sup>1</sup>. The leaves are simple, highly dissected, alternate, and amplexicaul, which means they clasp the stem<sup>1,4</sup>. The leaves are exstipulate, meaning they do not have stipules<sup>1</sup>. Coriander has a compound umbel inflorescence, where the primary branches are called rays and the members of the involucre are bracts, and the members of the involucre subtending the umbels are bractlets<sup>1</sup>. The flower of Coriander is zygomorphic, which means they have a single plane of symmetry, and six different kinds of flowers are present<sup>1</sup>. The outermost sterile flower is pedicellate, bracteate, incomplete, and zygomorphic. The outer female flower is pedicellate, bracteate, unisexual, zygomorphic, and epigynous. The outer male flower is pedicellate, bracteate, unisexual, and zygomorphic<sup>1</sup>. The outer bisexual flower is pedicellate, bracteate, bisexual, zygomorphic, and epigynous. The inner male flower is unisexual and actinomorphic. The inner bisexual flower is bisexual, complete, actinomorphic, and epigynous<sup>1</sup>. The calyx of Coriander has five sepals, gamosepalous, and in zygomorphic flowers, two anterior sepals are larger, valvate, green, persistent, epigynous, while all sepals are equal-sized in actinomorphic flowers<sup>1,4</sup>. The corolla has five petals, polypetalous, pinkish-white, valvate-lobed, and the zygomorphic flowers have an anterior large petal, two on its sides with one large and one small lobe, and the rest two have two small lobes each; all petals are of equal size in actinomorphic (central) flowers<sup>1</sup>. The

androecium of Coriander has five stamens, incurved in bud condition, free, and epigynous; filaments long, anther dorsifixed, and extrose<sup>1</sup>. The gynoecium of Coriander is bicarpellary, syncarpous, ovary inferior, bilocular, axile placentation, one ovule in each loculus, two stigmas, two long styles which flatten at the base into a bilobed epigynous disc called stylopodium<sup>1</sup>. The fruit of Coriander is a cremocarp that splits up into two mericarps which remain suspended on the carpophores for some time<sup>1</sup>.

### Chemical Evaluation:-

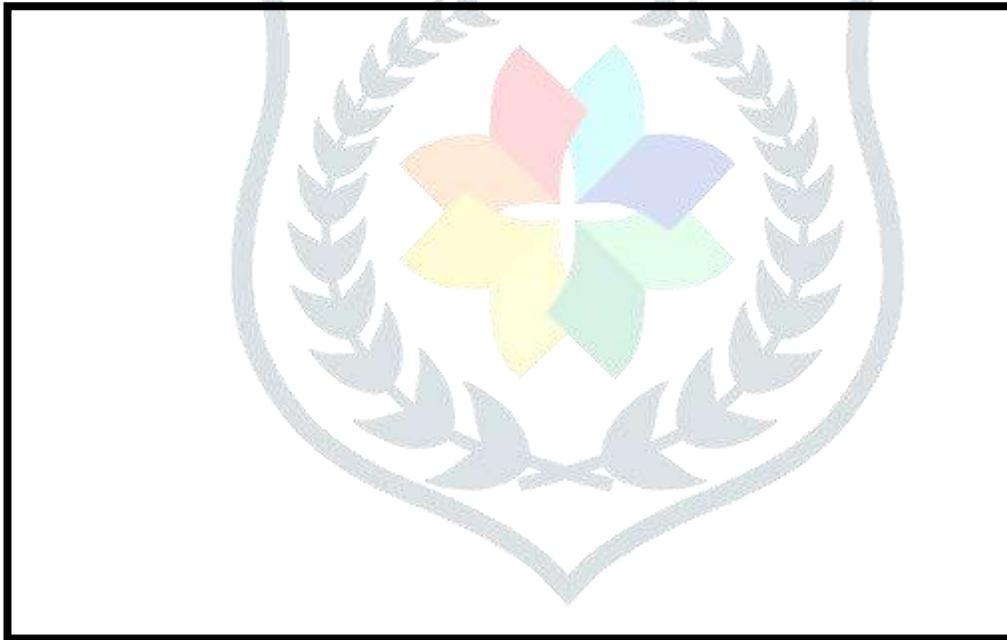
**Fluorescent test-** The powdered samples were treated with different chemicals and observed with naked eyes.. It is observed that the

**Table 4:- Florescent test for leave powder**

S. No.	Solutions	Observation
1	Powder as such (P)	Dark green
2	Powder+ammonia	Green
3	Powder+Conc. HCl	Dark green
4	Powder+Conc.HN <sub>3</sub>	Dark orange
5	Powder+Conc.H <sub>2</sub> SO <sub>4</sub>	Black
6	Powder+Chloroform	Fluorescent green
7	Powder+Glacial acetic acid	Whitish-green
8	Powder+2 N acetic acid	Whitish-green
9	Powder+2 N HCl	Whitish-green
10	Powder+2 N NaOH	Brownish-yellow
11	Powder+2 N H <sub>2</sub> SO <sub>4</sub>	Whitish-green

### *Microscopical Evaluation*

The transverse section of coriander shows the presence of a dorsal surface and a commissural surface. The dorsal surface consists of two vittae and a carpophore. The dorsal surface has five primary ridges and four secondary ridges. The epicarp consists of a single row of small thick-walled cells with calcium oxalate crystals. The mesocarp has an outer loosely arranged tangentially elongated parenchyma cells and the middle layer consisting of sclerenchyma. The middle layer is again divided into; the outer region of sclerenchyma is represented by longitudinally running fibers, whereas the inner region has tangentially running fibers. The vascular bundles are present below the primary ridges. The inner layer has polygonal, irregularly arranged parenchyma cells. The endocarp has the parquetry arrangement. In the testa, it has single-layered, yellowish cells, and the endosperm is thick, polygonal, colorless parenchyma with fixed oil and aleurone grains<sup>1,2</sup>. Additionally, coriander (also called cilantro) is native to the Mediterranean but cultivated worldwide as a culinary herb. The stems, leaves, roots, and seeds are all used in cooking. The seeds have been found in



Neolithic excavations. It occasionally escapes cultivation in New England.

### **Transverse section of coriander fruit (mericarp)**

#### **Biological Evaluation**

- Antioxidant effect
- Antimicrobial and anthelmintic Effects
- Anticancer effect

- Anxiolytic effect
- Antimigraine effect
- Antiseizure effect
- Antimigraine effect
- Neuroprotective effect
- Analgesic effect
- Anti mutagenic activity
- Diuretic
- Anthelmentic activity.
- Skin disease.



## Physical Evaluation

Coriander is a herb that is commonly used in international cuisine. It has several health benefits, which are discussed in the search results. Here are some of the benefits of coriander.

**Lowering blood sugar:-** Coriander is effective at lowering blood sugar levels<sup>1,2</sup>. **Antioxidant properties:-** Coriander is full of antioxidants, which are important for fighting free radicals in the body. Free radicals are loose oxygen molecules that can damage cells, potentially causing cancer, heart disease, and more<sup>1</sup>.

**Improving heart health:** Coriander may protect the heart by lowering blood pressure and LDL (bad) cholesterol while increasing HDL (good) cholesterol. A spice-rich diet appears to be associated with a lower risk of heart disease<sup>2</sup>.

**Promoting digestion:** -Coriander leaves contain a good amount of fiber, which can help provide relief from digestive problems. It is also being studied for various digestion problems like stomach upset, diarrhea, bowel spasms, gas, or nausea<sup>3</sup>.

**Reducing fine lines and wrinkles:-** Coriander seeds are effective at treating fine lines and saggy skin. It contains vitamin A that maintains the mucous membrane of the skin. It also delays the onset of wrinkles, reduces fine lines, and pigmentation. It also keeps the skin hydrated and glowing by removing the dead skin cells<sup>4</sup>.

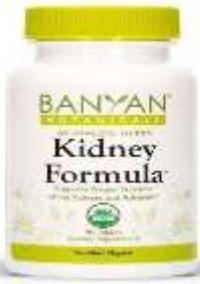
**Promoting heart health:-**Coriander seeds have a remarkable cholesterol-lowering action. Studies showed that those fed with coriander seeds experienced a decrease in total cholesterol and triglycerides in their tissues<sup>5</sup>.

**Protecting against neurological diseases:** Coriander seeds may protect against neurological diseases like Alzheimer's and Parkinson's disease<sup>5</sup>. Coriander has many other benefits, such as improving kidney function, benefiting vision, and treating respiratory ailments. It is a good source of nutrients like fiber, vitamins, and minerals.



List of various marketed preparation.

Nowdays, Coriander is available as the marketed formulation for curing numerous clinical conditions and is accessible in combination with various other ingredients some of which are enlisted in following table:

Sr.No	Name of the Formulation	Ingredient	Use
1	<p><b>Coriander Capsules</b></p> 	<p>Coriander Seed Powder (Coriandrum sativum) - 470mg per capsule</p> <p>Other Ingredients: Vegetable HPMC Capsule (Hydroxypropyl Methylcellulose)</p>	<p>Take 2 to 4 capsules daily with warm water or as directed by your health practitioner. Do not exceed stated dose.</p>
2	<p><b>Kidney Formula™ tablets</b></p> 	<p>Gokshura fruit, Punarnava root, Guduchi herb, Manjistha root, Musta Anantamulindicus), Passionflower herb, Amalaki fruit Bibhitaki fruit Haritaki fruit Coriander seed Fennel seed</p>	<p>Used to support healthy kidneys and adrenals.</p>

3	<b>Aroma Therapy coriander leaf</b> 	Leaves of coriander	Analgesic, antispasmodic, carminative, depurative, deodorant, digestive, carminative, fungicidal, lipolytic, stimulant and stomachic
4	<b>Cilantro (Coriander) Leaf Cream</b> 	Cilantro (Coriander) Leaf Cream	Beauty ,Skin Care,Face, Creams & Moisturisers ,Face Cream
5	<b>Crabtree &amp; Evelyn Energising Hand Cream Therapy, Citron and Coriander</b> 	WATER (AQUA)(EAU). MACADAMIA TERNIFOLIA SEE DOIL. ZEA MAYS	This intensive cream nourishes skin so it's noticeably smoother after each application

## *CONCLUSION*

Coriander (*Coriandrum sativum* L.) is a plant whose essential oil is used in different ways such as in foods, flavoring, and preservatives. The major constituent of the essential oil from dry seeds of *C. sativum* is linalool (59.6%), while the major constituents of dry waste essential oil are trans-anethole (29.29%) and then linalool

(20.06%)<sup>2,3</sup>. The constituents of coriander oil are greatly affected by the method of storage. It is observed that the largest change in essential oils was found in dry seeds and dry waste after one year of storage. Storage of coriander oil immediately after extraction in the refrigerator is less harmful than extracting from seeds or waste stored for 1 year at room temperature<sup>2,3,4</sup>. The waste of Coriander can be used as a fertilizer or as a new source of essential oil, as well as protecting the environment from pollution resulting from the presence of coriander wastes<sup>3</sup>. The powder of plant leaves was extracted by three different solvents, that is, alcohol, ether, and aqueous extract. For aqueous extract, microwave is used as energy supplier. The percentage of MAE is high as compared with other solvent extraction. Qualitative phytochemical tests show the presence of alkaloids, carbohydrates, and phenolic compounds which were further confirmed by infrared spectroscopy. The extract is also active against *Escherichia coli*, *Bacillus subtilis*, and *Staphylococcus aureus* but inactive against *S. typhi*<sup>1</sup>.

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