1.1 Plant description

Coriander (*Coriandrum sativam* L.) also known as cilantro, Chinese parsley or dhania is one of the most important spice crops in the world belonging to the family *Apiaceae*. Its name is derived from the Greek word ‘Koris’ meaning bedbug because of the unpleasant fetid bug like odour of the green herb and unripe fruits, it was eventually loaned to Latin *Coriandrum*. It is native to regions spanning from southern Europe and North Africa to south western Asia.

Coriander plant is a thin stemmed, small, bushy herb, 25 to 50 cm in height with many branches and umbels. Leaves are alternate and compound. The whole plant has a pleasant aroma. Inflorescence is a compound umbel comprises five smaller umbels. Fruit is globular, 3 to 4 mm diameter, when pressed break into two parts each having one seed. Fruit has delicate fragrance; seeds are pale white to light brown in colour. The fruit of the coriander plant contains two seeds which, when dried, are the parts that are used as the dried spice. When ripe, the seeds are yellowish brown in colour with longitudinal ridges. They have a fragrant flavour that is reminiscent of both citrus peel and sage. Coriander seeds are available in whole or ground powder form.

1.2 Use of Coriander

Due to its aromatic flavour fresh leaves are used in salads, soups, chutney and also used for flavouring the curries, sauces and soups. All parts of the plant are edible, but the fresh leaves and the dried seeds are most traditionally used in cooking. Coriander is common in South Asian, Southeast Asian, Indian, Middle Eastern, Caucasian, Central Asian, Mediterranean, Tex-Mex, Latin American, Portuguese, Chinese, African and Scandinavian cuisine (Anon., 2014a).

In Ayurvedic system of medicine, coriander is used as a carminative, refrigerant, diuretic and aphrodisiac. In household medicines, it is used against
seasonal fever, stomach disorders and nausea. Coriander is a commonly used domestic remedy, valued especially for its effect on the digestive system, treating flatulence, diarrhoea and colic. It is used medicinally for a number of purposes, particularly to relieve flatulence (Bhuiyan et al., 2009).

The seed is aromatic, carminative, expectorant, narcotic, stimulant and stomachic. It is most often used with active purgatives in order to disguise their flavour and combat their tendency to cause gripe. Externally the seed has been used as a lotion or have been bruised and used as a poultice to treat rheumatic pains. The essential oil is used in aromatherapy. The dry fruits are extensively used in preparations of curry powder, pickling, spice sauces, seasoning and dhanadal. It is also served as a flavouring agent for bakery preparations. The fruits are an important ingredient of curry powder (Ramadan and Morsel, 2002).

1.3 Nutritive value of coriander

From the nutritive point of view 100 g edible portion of coriander seeds contains 6.3 g water, 12.3 g protein, 19.6 g fat, 56.5 g total carbohydrate, 5.3 g ash, 0.8 g calcium, 0.44 g phosphorus, 0.02 g sodium, 1.2 g potassium, 5.9 g iron, 0.26 mg thiamine and 0.23 mg riboflavin (Anon., 1982).

1.4 Area and Production

In India, it is cultivated in about 5.52 lakh hectares and produces 4.61 lakh tonnes seed. Gujarat and Rajasthan both are major seed spices producing states with more than 80 per cent of the total seed spices production in India, both the states known as “Seed spices bowl” of India. Its fruits are exported to an extent of ₹ 35 million. Gujarat occupies an area of 4406 hectares with production of 6438 metric tonnes and productivity of 1461 kg/ha (Anon., 2014b).

Coriander is mainly grown in Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu and Uttar Pradesh. The crop requires a cool climate during the growth stage and warm dry climate at maturity. It can be cultivated in most types of soils, but well-drained loamy soil suits the crop well. Cold climate and high altitudes may leads to superior quality seed and higher essential oil content. Changing trend towards increased environmental sensitivity and changing food habits and consumers demand for food products and supplements that are natural and organic are commonly realized.
nowadays. Hence, there is a need to produce coriander seeds adopting technologies which minimize the use of chemical fertilizers and pesticides.

1.5 Diseases of Coriander

Coriander is affected by many diseases which may be fungal, bacterial or viral. But mainly with four important fungal diseases like, root rot (*Rhizoctonia solani*), wilt (*Fusarium oxysporum* f. sp. *corianderii*), powdery mildew (*Erysiphe polygoni*) and stem gall caused by *Protomyces macrosporus*.

Among these, root rot of coriander caused by *Rhizoctonia solani* Kühn is appear regularly in various villages of Junagadh districts of Gujarat state in mild to moderate form and adversely affect the yield.

1.6 Classification of Pathogen

According to scientific classification *Rhizoctonia solani* belongs to:

- Kingdom: Fungi
- Phylum: Basidiomycota
- Class: Agaricomycetes
- Order: Cantharellales
- Family: Ceratobasidiaceae
- Genus: *Rhizoctonia*
- Species: *solani*

1.7 Descriptions of pathogen

Most fungi in the form genus *Rhizoctonia* belongs to the basidiomycetes; however, some are ascomycetes (Tu and Kimbrough, 1978). The genus *Thanatephorus* was erected for the teleomorph of *R. solani* [*T. cucumeris* Frank (Donk)], the most widely studied species in the form genus *Rhizoctonia* (Garcia et al., 2006).

The sexual stage of *R. solani*, *Thanatephorus cucumeris* was first reported in 1990 in New York on table beets (Olaya and Abawi, 1991) and may be one of the contributing factors to increased damage by *Rhizoctonia* incited diseases through large numbers of aerially dispersed basidiospores (Olaya and Abawi, 1994).
1.8 Objectives

1) Efficacy of different fungicides, weedicides and phytoextracts against *Rhizoctonia solani* under *in vitro* condition.

2) *In vitro* evaluation of biocontrol agents against *R. solani*.

3) Isolation of microorganisms from rhizosphere, their molecular identification and antagonism against test pathogen *in vitro*.

4) Management of coriander root rot under pot condition.