



# Good Agricultural Practices

CORIANDER



## Good Agricultural Practices – Coriander



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Coriander (*Coriandrum sativum* L.) (Family Apiaceae) is one of the first spices to be used by man as common flavouring substance. The stem, leaves and fruits have a pleasant aroma. The whole young plant is used in preparing chutney and leaves are used for flavouring curries, sauces and soups. Dry fruits are extensively used in preparation of curry powder, pickling spices, sausage and seasonings. The seeds are also used as a carminative, refrigerant, diuretic and aphrodisiac. The volatile oil is used chiefly as a flavoring agent in liquor, cocoa and chocolate industry and it is also a valuable ingredient in perfumes. Good quality oleoresin can be extracted from coriander seeds. The oleoresin is used for flavouring, beverages, pickles, sweets and sausages. The other important product is Dania Dal, which is a major adjunct in Supari and Pan masala.

Coriander is a native of Mediterranean region and its cultivation is limited mainly to tropics. Besides India, it is cultivated in Morocco, Rumania, France, Spain, Italy, Holland, Burma, Pakistan, Trukey, Mexico, Argentina, England and USA. In India, the main coriander growing states are Andhra Pradesh, Rajasthan, Madhya Pradesh, Karnataka, Tamil Nadu and Uttar Pradesh.

### **Climate and soil**

Coriander is a tropical crop and requires frost-free climate particularly at the time of flowering and seed formation stage. Germination of coriander is severely reduced at temperature above 30°C and below 10°C. Heavy rains are harmful for the crop and continuous cloudy weather invites diseases and aphids. For green coriander, it can be grown throughout the year provided moisture is made available. However, summer season does not suit coriander when grown for green leaves because it switches over within a short time from vegetative growth to reproductive phase as soon as temperature rises beyond 20°C. Dry as well as moderately cool weather conditions during seed formation stage increase the yield as well as quality of the produce.

For irrigated coriander, loamy soil is the best. But for unirrigated crop, where crop is grown using conserved moisture, black or heavy soil is the best. Saline, alkaline and sandy soils are not suitable for its cultivation. The pH of soil should be near 7.0 for better growth and quality of coriander.

## Varieties

### *Andhra Pradesh*

**Swathi:** It matures in 100 days with seed yield of 1000-1100 kg ha<sup>-1</sup>.

**Sindhu:** It is a medium duration variety and mature in 100-105 days with seed yield of 1000 kg/ha<sup>-1</sup>.

**Lam Selection CS 2:** It matures in 110 days and gives 1030 kg ha<sup>-1</sup> seed yield.

**Sadhna:** It matures in 100 days with seed yield of 1030 kg ha<sup>-1</sup>.

### *Bihar*

**Rajendra Swathi:** It matures in 100 days with seed yield of 990-1170 kg ha<sup>-1</sup>.

**Rajendra Sonia:** It matures in about 110 days with seed yield of 1200 kg ha<sup>-1</sup>.

### *Haryana*

**Hisar Sugandh:** On an average, it gives 1400 kg ha<sup>-1</sup> seed yield.

**Hisar Anand:** The average yield is 1400 kg ha<sup>-1</sup> seeds.

**Hisar Surabhi:** It matures in 130-140 days and yields 1800-2000 kg ha<sup>-1</sup>.

### *Gujarat*

**GCr-1:** It matures in 112 days and gives 1100 kg seed yield ha<sup>-1</sup>.

**GCr-2:** It matures in 110-115 days and gives 1400-1600 kg ha<sup>-1</sup> grain yield.

### *Rajasthan*

**RCr 41:** It matures in 130-140 days and gives 1100-1400 kg ha<sup>-1</sup> seed yield.

**RCr-20:** It is suitable for dry land cultivation or with limited moisture.

**RCr-435:** It matures in about 135 days and gives 1000-1400 kg seed yield ha<sup>-1</sup>.

**RCr-436:** It is an early maturing type and matures in 90-110 days with an average seeds yield of 1100 kg ha<sup>-1</sup> under limited moisture conditions and gives as high as 1400-1600 kg ha<sup>-1</sup> under favourable climatic condition.

**RCr 684:** It is a medium duration variety (130 days) with an average seed yield of 1000 kg ha<sup>-1</sup>.

**RCr- 446.:** An average yield of the variety is 1200kg ha<sup>-1</sup> and crop duration is of 130 days.

**ACr-1:** It is resistant to stem gall and have tolerance to powdery mildew. Its yield potential is as high as 1250 kg seed ha<sup>-1</sup>.

**ACr-2:** It is resistant to stem gall and have tolerance to powdery mildew. On an average it gives 1450 kg ha<sup>-1</sup>.

### *Uttar Pradesh*

**Pant Haritma:** It is a late maturing type and medium in plant growth habit. Its yield potential is as high as 1500 kg seed ha<sup>-1</sup>.

### *Tamil Nadu*

**Co-1:** It matures in about 110 days with an average seed yield of 450 kg ha<sup>-1</sup>.

**Co-2:** Its plants are erect and bear oblong, medium size seeds having dull colour with an average seed yield of 520 kg ha<sup>-1</sup>. When it is grown for leaf purpose it gives 1000 kg ha<sup>-1</sup> green leaves at 40 days crop growth stage.

**Co-3:** It is an early maturing type and matures in 85-100 days and gives 650-700 kg seed yield ha<sup>-1</sup>.

**CS-287:** Its plants are early maturing type and mature in 80- 100 days with 540-630 kg seed yield ha<sup>-1</sup>.

### **Seed rate**

Coriander is commercially propagated by seeds. To achieve optimum plant density in irrigated condition, a seed rate of 12-15 kg ha<sup>-1</sup> is required.

### **Land preparation**

Land preparation should be done with the help of plough or cultivator, 3-4 times to bring the soil to a fine tilt.. To avoid loss of soil moisture and to break the clods, the field must be planked immediately after ploughing. Under irrigated condition, if soil moisture is not sufficient, pre-sowing watering before land preparation helps in good germination of seeds. For dry land condition, field must be ploughed after rain for conservation of soil moisture. Field must be kept either fallow or grown with short duration crops. Less number of ploughings are required in light soils whereas more number of ploughings are required in heavy soils. At the time of sowing, soil must be friable for better seedling emergence and their further establishment and growth.

### **Sowing**

The optimum sowing time of coriander is last week of October. Delayed sowing reduces the plant growth and increases the incidence of pests and diseases. Therefore sowing should be done early when the day temperature falls below 25°C. Sowing should be done

30 cm apart in lines with plant to plant distance of 10 cm, whereas in heavy soils or fertile soils 40 cm spacing between rows is recommended.

- Take 20-25 kg seed ha<sup>-1</sup> and treat with Bavistin @ 2 g kg<sup>-1</sup> seed or Thiram @ 2.5 g kg<sup>-1</sup> seed or *Trichoderma* @ 4 g kg<sup>-1</sup> seed after splitting the seed properly for wilt control.
- Use *Azospirillum* or *Azotobactor* as seed treatment and soil treatment in combination with 5 t sheep manure ha<sup>-1</sup> for higher seed yield.
- Seed treatment with either PGPR viz., FK 14 (*Pseudomonas putida*) or FL 18 (*Microbacterium paraoxidans*) significantly improves seed yield and net returns.
- Adopt crop rotation and summer ploughing to control wilt and stem gall.

### ***Sowing time recommended for different states of India***

Rajasthan:	Mid of October to mid of November
Gujarat:	Last week of Oct. to first fortnight of November
Tamil Nadu:	June-July ( <i>khariף</i> ), September- October ( <i>rabi</i> )
Andhra Pradesh:	first fortnight of November
Bihar:	first fortnight of October
Uttar Pradesh:	Middle of October to first week of November

### **Manures and fertilizers**

- Apply 15-20 t ha<sup>-1</sup> of FYM.
- Apply 50% recommended dose of fertilizer (RDF) through vermicompost + 50% RDF through chemical fertilizer for obtaining higher seed yield.
- Application of 10 to 15 t ha<sup>-1</sup> vermicompost.
- Drill 20 kg N + 30 kg P<sub>2</sub>O<sub>5</sub> + 20 kg K<sub>2</sub>O ha<sup>-1</sup> at sowing in unirrigated crop.
- For irrigated crop, drill 20 kg N + 30 kg P<sub>2</sub>O<sub>5</sub> + 20 kg K<sub>2</sub>O ha<sup>-1</sup> at sowing, foliar spray of 20 kg N ha<sup>-1</sup> at the time of first irrigation and foliar spray of 20 kg N ha<sup>-1</sup> at flowering stage
- Soil + foliar application of FeSO<sub>4</sub> @ 5 kg ha<sup>-1</sup> + 0.125%, MnSO<sub>4</sub> @ 12.5 kg ha<sup>-1</sup> + 0.25% and CuSO<sub>4</sub> @ 12.5 kg ha<sup>-1</sup> + 0.25% increases seed yield and lustre.
- Application of NAA @ 50 ppm/Triacontanol @ 1.0 mL L<sup>-1</sup> twice at 40 and 60 DAS or thrice at 40, 60 and 80 DAS enhances growth and yield.

## Irrigation

Depending on the climatic conditions, soil type and variety used, 4-5 irrigations are required after germination for irrigated coriander. First irrigation should be given at 30-35 days after sowing (DAS), second at 60-70 DAS, third at 80-90 DAS, fourth at 100-105 DAS and fifth at 110-150 DAS. Drip irrigation is better than other methods.

## Intercultural operations

Thinning, first hoeing and weeding should be done 30 DAS as initial growth of coriander is slow. Second hoeing and weeding in irrigated coriander may be done between 50-60 DAS depending upon the regrowth of weed. Pre- plant herbicide fluchloralin 0.75 kg ha<sup>-1</sup>, pre- emergent oxyfluorfen @ 1.0 kg ha<sup>-1</sup> supplemented with hand weeding once at 50 DAS gives effective control of weeds.

## Pest management

### *Aphids (Hyadaphis coriandri)*

Aphids colonize on leaves, tender apical shoots and umbels where both nymphs and adults suck cell sap and devitalize the plant. Infestation in early stages causes distortion in plant growth, yellowing of leaves and reducing their vigour. The heavy infestation of aphid on coriander occurs between December to March and reduces yield by more than 50% in unprotected crop.

### *Management:*

- Timely sowing of crop between 15-30<sup>th</sup> October helps avoid heavy infestation.
- Crop should be free from weeds. Clean cultivation in coriander field and surroundings by removal of alternate host to minimize aphid infestation.
- Avoid judicious use of nitrogenous fertilizers and water.
- Use of yellow or blue sticky traps for aphid management.
- Use botanicals like neem seed kernel extract (5.0%), neem oil (2.0%) and bio-pesticides like *Verticillium lacanii* as foliar application.



- Need based application of safe chemical insecticides.
- Conserve natural enemies and pollinators by judicious application of insecticides. Coriander crops attract large numbers of Coccinellid predators and other parasitoids. Honey bees are major source of pollination to coriander crop.

### *Seed wasp*

*Systole albipennis* causes damage in field conditions but the immature stage present inside the seed emerges at storage. The larva damages the seed and survives inside the fruits. The infestation of this insect continues in the seeds till storage. Female adults lay eggs inside the developing seeds. The eggs hatches inside seed and the larva feeds and destroys the



embryo and/or endosperm, thereby reducing seed viability. Adults emerge by making exit hole in the seed. They complete their life span within 25 days from egg to adult stage. In general, yield loss of approximately 30% is expected. However, if infestation is more severe, yield loss of 50% can be expected.

### *Management:*

- Timely sowing of coriander reduces the *S. albipennis* incidence, late sown crop invited more infestation.
- Crop should be grown in specified crop geometry.
- Apply botanical products i.e. neem products like neem seed kernel extract (5.0%) or neem oil (2.0%).
- Intercropping with sesame helps in lower infestation.



### *Thrips*

Amongst the species of thrips attacking seed spices, *Thrips tabaci* is the major species found on most of the seed spice crops. Both nymphs and adults feed on umbel, leaf sheath



and stems of plants. Both nymphs and adults congregate in between the leaf sheath and stem of plants which results in drying of the leaves. Severe infestation results in drying of flowers and production of shriveled fruits.

### *Management*

- Timely sowing of crop between 15- 30<sup>th</sup> October helps in avoiding heavy infestation.
- Crop should be free from weeds. Clean cultivation in coriander field and surroundings by removal of alternate host minimizes aphid infestation.
- Avoid injudicious use of N fertilizers and water.
- Use yellow or blue sticky traps.
- Treat seeds with Imidacloprid 0.5g kg<sup>-1</sup> seeds.
- Use botanicals like neem seed kernel extract (5%), neem oil (2.0%) and bio-pesticides like *Verticillium lacanii* as foliar application.
- Need based use of safe chemical insecticides.
- Conserve natural enemies, coccinellid predators, other parasitoids and pollinators by judicious application of insecticides.

### **Natural enemies or beneficial insects**

#### *Coccinella (Lady Bird beetle)*



- This is very important predators found on all seed spice crops.
- Coccinella adult and grub feed on numbers of insect which causes damage and yield loss to the crops.
- In coriander crop it is one of important natural control agents of aphids and other sucking pests.
- It is found in significant numbers when aphid population is at a peak.
- Conservation of coccinella and further multiplication on the crop is possible through good agricultural practices and application of Integrated Pest Management practices.

### Disease management

#### *Wilt*

Wilt is caused by *Fusarium oxysporum*. The infected plants dry up due to wilting. The wilt infection may appear in patches at any stage of growth.

#### *Management*

- The complete control of this disease is difficult but the incidence can be reduced by using certified healthy and disease free seeds.
- *Pseudomonas fluorescens* and Trichoderma may be applied to the soil before sowing as prophylactic measure.
- Summer ploughing and soil solarization in summer and proper crop rotation will reduce wilt incidence.

#### *Powdery mildew*

Powdery mildew (*Erysiphe polygoni*), in the initial stage appears as a white powder mass on the leaves and then on the stem and other parts such as umbels.

#### *Management*

- Seed treatment with *Pseudomonas fluorescens* @ 10 g kg<sup>-1</sup> and foliar spray of @ 2 g L<sup>-1</sup> or spraying Wettable sulphur 1.0 kg ha<sup>-1</sup> at the time of initial appearance of the disease and 2<sup>nd</sup> spray at 10 days interval.
- Spray neem seed kernel extract (5.0%) thrice (1<sup>st</sup> spray immediately after the appearance of disease, 2<sup>nd</sup> and 3<sup>rd</sup> at 10 days interval).
- The disease can also be managed by dusting sulphur powder @ 20-25 kg ha<sup>-1</sup> or spraying karathane @ 0.1%. Second spray should be repeated after 15-20 days.

### ***Blight***

Blight caused by *Alternaria poonensis* appears in the form of dark brown spots on the stem and leaves.

### ***Management***

- Spraying of 500-700 L ha<sup>-1</sup> solution of 0.2% Indofil M-45 or 0.1% Topsin M helps in managing the disease.

### **Module for integrated management of pests and diseases**

- Soil application of vermicompost 5 t ha<sup>-1</sup> + seed treatment with neem seed kernel extract (5.0%) and spray of neem seed kernel extract (5.0%\_ on appearance of powdery mildew and aphid at 10 days interval (twice/thrice).
- Using 5.0% onion leaf extract as foliar spray three times can also protect the plants from powdery mildew.

### ***Frost damage***

Coriander crop is most vulnerable to frost damage at the flowering and early seed formation stage. The frost damage can be minimized by spraying 0.1% solution of sulphuric acid, irrigating the crop prior to the incidence of frost, using wind breaks and creating smoke cover in the early morning.

### **Harvesting**

- To obtain good luster of seed with yield, harvesting should be done when 50% seeds turn yellow.
- To obtain extra income, leaf plucking to the extent of 50% at 75 days after sowing without reductions in seed yield may be done.
- The harvested material should be dried in shade to retain seed colour and quality. If it is not possible then the harvested material should be kept in bundles upside down to avoid direct sun rays on the seeds which reduce the quality of product.
- After drying the harvested material, the seeds are separated by light beating with sticks and winnowing.
- With good management practices and use of high yielding varieties, an average yield of 12-25 q ha<sup>-1</sup> under irrigated condition and 7-8 q ha<sup>-1</sup> under unirrigated conditions can be obtained.

### **Post-harvest management**

- Clean and dried seeds are filled in bags and stored in damp free aerated store houses.

- On a commercial scale, seeds are cleaned with the help of vacuum gravity separator and destoner and spiral gravity separator.
- To get good price and easy marketing, the produce should be categorized in different grades and stored properly.