International J. Seed Spices 5(1), January 2015:34-36

Disease problems in cultivation of celery (*Apium graveolens* L), ajwain (*Trachyspermum ammi* L), dill (*Anethum graveolens* L), nigella (*Nigella sativa* L.), anise (*Pimpenella anisum* L) and their management

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Abstract

Celery, ajawain, dill, nigella and anise are important minor seed spices grown in India. These are consumed as condiments in the kitchen and are also used as medicines. Their essential oils are also beneficial. These crops suffer due to diseases reducing the yield and seed quality. It is essential to manage the pathogen causing diseases and also to produce pathogen free high quality seed.

I. Celery (*Apium graveolens* L)

Celery was introduced in India from France in 1930 in Punjab. It is mainly grown in Punjab, Haryana and Uttar Pradesh. It is cultivated in countries from Sweden to Egypt, Algeria, Ethiopia etc. The produce is mainly exported in the form of dried seed, essential oils and oleoresins. The seeds yield 2-2.5% essential oil and nearly 16% fatty oil. Celery seed is used as tonic, stimulant, diuretic, carminative to control asthma, liver problems, nervous problems, chronic fever, cold, diseases related to urine bladder, spleen, rheumatoid, arthritis, hypertension, high blood pressure etc. It is useful in the treatment of pleurisy, bronchitis and tuberculosis (Malhotra and Vashishtha, 4, Singh *et al*, 6).

The crop suffers due to several diseases.

Stem rot (*Rhizoctonia solani*)

Black spots are formed on the collar region of the plant which coalesce and the infected part of the stem turns water soaked and rot. Later the whole plant dries up.

Cercospora blight (*Cercospora apii*)

Small circular brownish yellow spots are formed on the foliage. On the lower surface a number of conidia are formed which spread the disease. The pathogen is seed borne. For spore germination water droplets are needed on the foliage. Heavy persistent dew is more favourable.

Septoria blight *(Septoria apii)*

On leaves small, circular water soaked spots are formed which later coalesce and give blight appearance and turn black. The pathogen is seed borne. The disease starts from lower outer leaves and spread upward, later the whole foliage is affected. Blackish pycnidia are formed in the spots, they are in large number. The spores are straight, 0-4 septate and are ejected out in a cirrhus. Pycnidia are embedded in the seed coat. It is soil borne also present on plant refuge. It is necessary to have good pathogen free seed. Seed treatment with fungicides is necessary. According to Chupp and Sherf (1960) there are two species of *Septoria, S. apii* and *S. apii graveolentis.* The former develops large spots and the later small spots.

Vascular wilt (*Fusarium oxysporum*)

The disease appears at seedling stage if the conditions are warm. The seedlings dry. At later stages of crop growth the leaves exhibit yellowishness followed by drying. On splitting, the roots exhibit brown discolouration in the vascular strand, heavy losses are incurred. The pathogen is seed as well as soil borne.

Root rot (*Phoma apiicola*)

The main symptoms are drooping and wilting of leaves starting with the outer area. The base of the stem or the crown of roots is attacked. The affected tissues turn brown to black. The diseased spots crack exposing the discoloured tissues. The pathogen is seed and soil borne.

Fusarium yellows (*Fusarium oxysporum* f.sp. *apii*)

The plants remain stunted. Young plants die when get infected. On splitting the stem exhibits yellow to black discolouration. The roots are also injured. The pathogen is soil borne.

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Bacterial leaf spot (*Psuedomonas syringae pv. apii*)

Circular or angular spots are formed which are yellowish first then turn brown with yellow halo. When the disease is severe it gives blight appearance and whole leaf dies. The bacterium is seed borne as well soil borne on plant refuge. The bacteria spread to plants by rain splash and enter through stomata. Water droplets are required on the leaves for ten hours at least for causing infection. Copper fungicides are useful in disease control.

Black crown rot (*Centrospora acerina*)

Brownish-tan coloured spots develop on the foot of the plant; it later turns black due to decay of tissues. On leaves the spots are gray with pale center and dark brown margin. Under high humidity disease develops fast. The fungus is soil borne hence long rotation is essential.

Brown spot disease (*Cephalosporium apii*)

Light brown spots of irregular shape occur on stem, petiole and leaflets. In wet weather the spots coalesce and weft of the fungus hyphae develop in the spots with fungal spores.

Rust (*Puccinia apii*)

The rust has been reported from Europe. The aerial stage is represented by yellowish pustules, cinnamon brown uredo stage and black telial stage.

Virus diseases

Several viruses attack celery crop. Common mosaic, cucumber mosaic, southern celery mosaic and spotted wilt have been reported from western countries (Chupp and Sherf, 1960).

II. Ajawain (*Trachyspermum ammi* L)

Ajawain is an important seed spice with excellent medicinal properties used in kitchen as well as in making pickles. In India it is mainly grown in Rajasthan and Gujarat and in small quantities in Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Tamil Nadu and West Bengal. It is grown in *rabi* season and prefers cool and dry climate. The seed is tasty and pungent. It is digestive and used as remedy for indigestion, flatulence, low appetite, stomach ache, cough, respiration problems, dyspepsia, worms like hookworm, tonsillitis, kidney pain etc. it regulates menstrual flow of blood also. The seed contains essential oils 2-4% and 26% fatty oils. The oil has thymol.

The crop suffers due to diseases influencing the yield negatively.

Alternaria blight (*Alternaria alternata*)

Typical leaf spot symptoms appear first which coalesce and develop blight symptoms. The tender stems and petioles are also infected. The spots are small irregular, reddish brown with tan to gray in centre. Mancozeb 0.25% is the best as spray to control the disease.

Collar rot (*Sclerotium rolfsii*)

The stem near the soil gets infected and lesion is formed. The white hyphae grow around the stem which later covers the lower portion of the stem. Mustard like sclerotia are formed by hyphae. The leaves exhibit yellowing starting from the base. The plant dries up. The disease develops in patches. Turning of soil helps in checking the disease spread.

Powdery mildew (*Eryiphe polygoni*)

All the above ground parts are infected which get covered by white powdery mass the conidia of the fungus. When the inflorescence gets infected all the flowers get aborted with no seed formation. Spray of wettable sulphur 0.25% or Karathane 0.05% is effective in controlling the disease.

III. Dill (*Anethum suwa Roxb., A.graveolens* L.)

Its tender leaves are used as vegetable and the seeds as spice. Two species of sowa are grown. Indian dill and European dill. Indian dill is native of India and grown in Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Madhya Pradesh and Uttar Pradesh besides other states where it is grown in small pockets. European dill is native of Asia, Mediterranean region of Europe and Africa. Dill has several medicinal properties being pain killer, antipyretic, stomachic, antiflatulence and control jaundice.

The crop is attacked by several pathogens causing diseases at various stages of crop growth.

Wilt/root rot (*Fusarium oxysporum*)

The crop is attacked at seedling stage when the seedling dry and die. At later stage of crop growth wilt symptoms are observed, the leaves turn yellow, droop down and finally the plant dies. The root on splitting exhibits brown discolouration of vascular strand. The pathogen is seed and soil borne.

Powdery mildew (*Erysiphe polygoni*)

The foliage, stem, branches, flowers and fruits are attacked and get covered with white floury mass which are conidia of the fungus. The yield is highly affected as well as the quality as the seeds get shriveled and produce reduced oil content.

Kusterer *et al.* (2002) reported dill to be damaged by *Mycosphaerella anethi*, parsley virus Y (Par Vg) carrot red leaf luteovirus (CRLV) and *Psuedomonas* spp. in Germeny.

Rust (*Puccinia petroselini*)

It is reported from European countries. The aecial stage

exhibits yellowish pustules, the uredo stage cinnamon brown and telial stage as black pustules.

Nematode Problem

Pratylenchus hamatus attacks dill crop. The plants remain stunted with yellowed leaves and poorly developed roots.

IV. Nigella (Kalonji) (*Nigella sativa* L.)

Nigella is native of Madeterranean region. In India it grows wild. Its commercial cultivation is done in Punjab, Madhya Pradesh, Bihar and Assam and in small scale in Uttar Pradesh, Tamil Nadu and West Bengal. It is used in Indian Kitchen. It has medicinal properties as it is carminative, stimulant and diuretic. It controls skin blisters and scorpion sting. Nigella contains about 0.7% essential oil which has nigellone used in cough and asthama. The nigella seed contains alkaloids, nigellmin, nigellidin and nigellicin and also has anticarcinogenic properties. Seeds are scatterd between folds of linen and woolen clothes to check insect attack (Malhotra and Vashistha, 4; Singh *et al.*, 6).

The crop is attacked by pathogens which cause root rot disease.

Root rot (*Rhizoctonia solani*)

The roots are attacked by the fungus R. solani, the tender roots get killed, the main root rots and the plant dries up gradually.

V. Anise (*Pimpenella anisum* L)

Anise is a native of East Medeterranean region covering Greece, Egypt and Asia. It is commercially grown in India. It is a crop of temperate and subtropical region. Anise has some medicinal properties as it is carminative, digestive, expectorant, antispasmodic, soporific, antiseptic etc. It is also used as insecticide to kill lice, mites and vermin. The seed yield 2.0-2.4% essential oil called 'oil of anise' and is used for flavoring food and confectionery (Malhotra and Vashishtha, 4; Singh *et al.*, 6).

The crop suffers due to several diseases.

Alternaria blight (*Alternaria alternata*)

Small brownish spots develop on the foliage which enlarge and coalesce to give blight appearance. Conidiophores and conidia are formed on these spots giving them black appearance. Spread of the disease is through conidia.

Seed borne fungi

Odstreilova *et al.* (5) reported 21 fungi associated with anise seeds collected from several localities in Czech Reoublic. They were both pathogenic and saprophytic. Saliman and Badeaa (7) observed complete inhibition of *Aspergillus flavus*, *A. ochraceus*, *A. parasiticus* and *Fusarium miniliforme* by 500 ppm essential oil of anise. Sharma 8, reported phyllody disease in anise from India. The symptoms observed resemble with the association of phytoplasma.

Future strategy

It is necessary to evolve varieties resistant to diseases. Survey should be undertaken in areas where seed spices crops are grown commercially for diseases and to select areas with hot spots of disease for screening the genetic material and to find disease free areas for cultivation of pathogen free high quality seeds.

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Received : July 2014; Revised : October 2014;
Accepted : November 2014.