

What is effective against anthracnose?



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What do we know about anthracnose? What do we want to know about the disease that would help us to control it? What are the most important steps to improve anthracnose control?

A disease is a condition in a plant that affects the plant's normal functioning or development. For a disease to occur, three conditions must be met. Firstly, a pathogen has to be present on or in the plant. Secondly, there needs to be suitable environmental conditions for the pathogen. Thirdly, the plant must be susceptible to the disease.

Managing anthracnose (*Colletotrichum acutatum*) is probably one of the most difficult aspects of growing olives. In olives, anthracnose affects flowers, fruits, leaves and shoots. The incidence of anthracnose depends on cultivar susceptibility and weather. In warm and humid conditions olive varieties are susceptible to anthracnose and if care is not taken, an epidemic can occur. Olive cultivars can be classified into three categories of susceptibility to anthracnose: highly susceptible,



Barnea harvest in Boort, 2011

moderately susceptible and resistant. Barnea is an Israeli cultivar developed from the Kalamata variety to be disease-resistant and to produce a generous crop. This variety was named for the Kadesh Barnea region in which it was found, on the border between the Sinai Desert and Israel. Barnea has many advantages for the modern orchard. In Israel, commercial yields of 10 tonnes per hectare with 20% oil content have been recorded in the third year. This variety produces high quality fruit for the top end of the olive oil market. Once believed to be the best tree for some parts of Australia and New Zealand, many were planted and it is common in many olive groves.

However, Barnea has high vigour and very strong vertical plant growth, requiring regular pruning. After severe pruning, regrowth can go through a slow period, before normal rapid growth resumes. It can suffer from root rot in wet soils and has a tendency to let people know when conditions are not perfect: it is more prone to diseases than other varieties. In Australia's warm and humid weather, Barnea is much more susceptible to anthracnose during the growing season compared to Israel, which has a hot, dry climate. The fruits of Barnea are considered to be moderate to highly sensitive to chilling injuries and frost damage before harvest.

In Australia, if weather conditions conducive to anthracnose prevail during flowering, the disease can build up, causing severe flower infection and reducing fruit set. Different olive cultivars had varying responses to flower and fruit infection. Flowers and ripening fruits are very susceptible to anthracnose fruit rot. The symptomless infection of flowers was first observed on

Barnea in New South Wales in 2007, in South Australia in 2009 and Victoria in 2010, where anthracnose had not previously been a problem. Developing fruit that are infected may show symptoms soon after infection, when they are at peppercorn and pea size. Infected fruits at both stages can drop; however they may also remain on the tree, carrying the sporulating pathogen. Alternatively, infection can become 'latent'—meaning that symptoms do not develop until after harvest. Latent infection of developing fruit during the Spring may permit survival of the pathogen during the hot and dry Summer and serve as source of inoculum for anthracnose epidemics that develop on ripening fruit in Autumn.

The pathogen can infect immature and mature fruits. For Barnea, immature fruits were infected in all phenological stages. The first symptoms of anthracnose fruit rot are light brown sunken lesions or infected areas that may shrivel with time. Under humid conditions before harvest, salmon-colored spore masses cover the lesions. Spore production, spore germination, and infection of olive fruit are favoured by warm, humid weather. As the fruit matures, fruit susceptibility increases and the latent period of the disease decreases.

Conidia (asexual spores) are produced in a slimy matrix and the spores can easily be spread to adjacent ripe and healthy fruit by splashing rain, dew, insects, or by contact during harvest. Infected fruits eventually dry up and mummify and can become a source of inoculum for the following season.

The disease epidemiology and disease cycle play an important role in working out strategies for effective and timely management of anthracnose and in reducing the

number of unnecessary fungicide applications. Anthracnose is difficult to control after the symptoms appear, particularly when environmental conditions are favourable for infection. Epidemiological studies of olive groves demonstrated the asymptomatic presence of *Colletotrichum acutatum* in the olive tree. Inoculum is present year-round throughout the canopy. Therefore, control measures must begin early in the season.

If an anthracnose epidemic has occurred in the previous year, fungicides will play an important part in the following year's methods of disease control. Fungicide application focuses on reducing damage to the olive's inflorescence by fungus. An early season application of protective fungicides is a key factor for successful management of anthracnose.

A current project that is being jointly funded by RIRDC, the AOA and Nufarm Australia, is evaluating new-generation copper fungicides and a systemic strobilurin fungicide for their efficacy against anthracnose. Amistar (250g/L azoxystrobin) is a member of the Group K fungicides strobilurin or QoI group of fungicides. Azoxystrobin has a mode of action identical to the naturally occurring strobilurins. Strobilurins, such as azoxystrobin, have both curative and protectant efficacy against certain pathogens, but should be used primarily as

protectants because their systemic movement is limited. Because they are very site-specific in their mode of action, certain pathogens have become resistant to them. Fungal resistance to some of these chemicals is always a risk. Resistance to the strobilurin fungicides in anthracnose populations has been reported on some crops. Only limited applications of strobilurins should be made per season to help prevent resistance. Do not apply the same fungicide repeatedly, or for not more than two consecutive spays. Rotate fungicides belonging to different chemical

groups. The use of fungicides should be based on an IPM program. Follow a scheduled fungicide spray program, particularly for fields that have a history of anthracnose. Even with a fungicide spray program, expected results may not be achieved if the disease pressure is very high. Therefore try to prevent/minimise the amount of inoculum (spores) and sources of infection in the field. The best strategy is to prevent anthracnose. The flowering stage appears to be the more critical for infection; however infection also occurs during fruit set. In this



Anthracnose in olive fruit. Photo: Dr Vera Sergeeva

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Barnea fruits suffering from both anthracnose and mouse infestation.

case spraying would be effective in reducing anthracnose—use two sprays, one before flowering and one in early fruit set. Two applications may be necessary through the Spring as trees should be protected before rain events. A preventive spray with Amistar may help to control the disease. These products are most effective if applied before disease development.

Complete coverage of large, tall trees is difficult to achieve; spraying

is not very efficient and might not be justified or feasible. While control might occur in some situations, anthracnose can return annually and warrant a continued, preventative spray program. In rainy years the application of chemical treatments can be difficult.

Copper-based fungicides are not effective in suppressing anthracnose in olives experiencing high disease pressure. Managing anthracnose by the application of copper is relatively more effective if the variety is more tolerant than susceptible. Frequent (four or more) applications per year can cause a build-up of copper in some soils which can become toxic to roots. High copper levels may also interfere with the uptake of other plant nutrients. Overuse of fungicides and other chemicals can cause air, soil and water pollution and disrupt the natural ecological balance in the soil by killing beneficial soil microbes.

Anthracnose and frost damage can both cause a 'brown rot' before harvest in some varieties. Disease (anthracnose) and disorder (frost and chilling injuries) were both observed in one grove of Barnea before harvest.

Future studies should be conducted to determine new strategies and products for the management of anthracnose in olives:

The best way to control this disease is by planting cultivars less susceptible

or resistant to anthracnose pathogens. When planting a new olive grove, start out with disease-free planting material. A healthy tree is less susceptible to disease than a stressed tree. Fertilise as needed, using a balanced fertiliser with fairly low nitrogen content for moderate growth. Excessive nitrogen can promote anthracnose. The olive is drought tolerant, but grows best when it has sufficient water. Overwatering should be avoided in the grove where anthracnose is present. Water during drought periods, but do not use overhead irrigation since this may increase the potential for disease infection and spread. Use under tree irrigation to reduce moisture build-up in the canopy. Anthracnose likes moist closed canopies. Prune to improve air movement. A less dense canopy encourages faster drying of foliage and fruit surfaces. After pruning remove dead branches—dead plant material is a potential source of re-infection.

Along with proper plant selection and care and the judicious use of fungicides, sanitation should play a prominent role in any integrated approach to plant-disease control.

An IPM strategy can help to control anthracnose in olives, thereby helping to increase the yield and quality of the olives and to reduce the cost of production of quality olives. ○



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