Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

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Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

The Azores are one of the regions in Europe where the cultivation of protea flowers has grown and developed most in the last two decades; The genus *Leucospermum*, *Protea* and *Telopea* being the most representative and the cultivars *L.* 'Succession', *L.* 'Tango', *L.* 'High Gold', *P.* 'Grandicolor' and *P.* 'King' are responsible for more than 80% of the regional production.
Periods of risk for the occurrence of the most common diseases and pests in 
Proteaceae in the Azores islands

Influence of the climate to the pests and diseases development in Azores

- Climate conditions with mild temperatures, high relative humidity, long periods of 
abundant rain, strong winds, which are sometimes cyclonic, and long periods with low light,
create a favorable conditions for the development of diseases and pests;
- The risk of development is more high for fungus diseases and insects when we compare 
with the Mediterranean zones;
- The high humidity (above 80% a long period of the year) and the mild temperatures 
(average around 14ºC in winter to 23ºC in summer periods) give conditions for the pests 
develop more life cycles than usually in other places with Mediterranean climate;
- Pests such Aphis, Diaspididae, Planococcus or Heliothrips develop very fast, mainly in the 
summer period but shows a relatively risk during the winter period as well.
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

Influence of the climate to the pests and diseases development in Azores

Attack of *Thrips* in *P. ‘Lime light’* during the harvest season.

Attack of *Aphis fabae* in *L. ‘Tango’* during the winter period.
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

Influence of the climate to the pests and diseases development in Azores

Strong attack of *P. citri* in *P. ‘Grandicolor’* during the summer period.

Strong attack of *Diaspididae* in *P. ‘Grandicolor’* at the end of the winter.
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Influence of the climate to the pests and diseases development in Azores

- Other pests such *Pantomorus cervinus* or *Popillia japonica* we found them in the normal period of occurrence.

*Pantomorus cervinus* on L. ‘Succession’.  

*Popillia japonica* on *Telopea* plant.
Influence of the climate to the pests and diseases development in Azores

- Climate is changing and we do not have well-defined climate seasons as in the past and it is necessary to be careful for the occurrence of the pests and diseases out of the normal period;
- In Azores the diseases that are more concerned are the fungus diseases and it development is related to the high humidity periods, because the temperature is favorable for the development of almost every fungus that appear in the proteas crop;
- The periods of high risk for the fungus diseases are between autumn at spring. Normally, during this period the humidity is up to 90% and 75% of the total rainfall of the year.
- Fungus such Botritis cinerea, Drechslera, Elsinoe and Mycosphaerella develops quickly between the autumn to spring. But it is in the spring period that those fungus are more dangerous because, normally, the development stage of the cultivars of proteas are more susceptible due the tender shoots.
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

Influence of the climate to the pests and diseases development in Azores

Strong attack of *Elsinoe* on *L. ‘Succession’* plant during the spring period.

Strong attack of *Elsinoe* on *L. ‘Succession’* in the base of the flower bud. Flowers aborted.
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

Influence of the climate to the pests and diseases development in Azores

*Botrytis* on young shoot of *P. ‘Grandicolor’* in the spring growth.

*Botrytis* symptoms on flower bud of *L. ‘High Gold’* during the winter period.
Periods of risk for the occurrence of the most common diseases and pests in 
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Influence of the climate to the pests and diseases development in Azores

*Botrytis* on *L. ‘High Gold’* in the harvest moment.

*Botrytis* symptoms on flower head of *L. ‘Tango’* developed inside the coldroom (2ºC).
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

Influence of the climate to the pests and diseases development in Azores

- There are another fungus such *Alternaria* and *Drechslera* that shows more development during periods of mild temperature and high humidity. The autumn and the spring periods are the most dangerous for this fungus and sometimes in the winter with mild temperatures.

*Alternaria* on *L. ‘High Gold’* during the autumn season.

*Drechslera* on *L. ‘High Gold’* during the autumn season.
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

Influence of the climate to the pests and diseases development in Azores

- *Botryosphaeria* is a big problem in Azores at the moment. It is a fungus that is difficult to control because most cuts in the plants are made during harvest periods that occur between autumn and spring in adult plants and in young plants in new field planted with infected plant material.

*Botryosphaeria* on *P. ‘Grandicolor’* during the autumn season. Infection by pruning.
Periods of risk for the occurrence of the most common diseases and pests in \textit{Proteaceae} in the Azores islands

Influence of the climate to the pests and diseases development in Azores

- \textit{Rosellinea necatrix} and \textit{Armillaria mellea} are both fungus that develop in the soil with roots attacks. Normally we found this attacks in fields near to the forest trees or in some fields replanted with proteas. It is a problem each time more frequent in Azores, because there is more farms with old plants replanted and both fungus are promoted by wet winters during long periods of rainfall. It is usual the plants die during the end of spring when the plant shows more activity and growth.

\textit{Armillaria} on \textit{L. ‘Succession’}. 

\textit{Rosellinea}

\textit{Armillaria}

\textit{Rosellinea}
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

In view of what we have presented above, we have created a risk calendar based on information collected:

- Some specific research done in Azores about identification of diseases and pests with Azores University and La Laguna University;
- Samples of infected plants sent to a laboratory (Regional Laboratory of Plant Sanity of the Agriculture Azores Department) for analysis and identification (reports from the laboratory);
- Observations and notes registered during the technical support for the farmers (local, cultivar, date, etc...), sometimes technical support by colleagues in visits to protea farms in Azores;
- Pictures collected;
- Correlation between the environment conditions of the climate in the Azores and the conditions favorable to the development of the diseases and pests.
Periods of risk for the occurrence of the most common diseases and pests in *Proteaceae* in the Azores islands

Risk calendar for the main diseases and pests of the *Proteaceae* in the Azores.

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- Period of low risk, conditions are not favourable to its development
- The conditions are favourable to the appearance of the disease or pest
- Period of risk, conditions are very favourable to the propagation of the disease or pest
- Period of high risk, the disease or pest may reach its maximum potential for spread and cause serious damage
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Thank you for your attention!