Blackleg of rapeseed

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Blackleg of Rapeseed

Unless blackleg can be controlled there is little future for rapeseed as a major commercial crop in W.A.


Until 1972, oilseed rape showed great promise as an alternative cash crop for Western Australian farmers, especially in the Great Southern and south coastal areas where the annual rainfall ranges from 450 to 650 mm.

Good prices and market prospects brought an increase from about 120 hectares in 1969 to 49 000 ha in 1972, and it appeared that rapeseed could become an important crop for Western Australia.

However, like most other cruciferous crops, rape is prone to attack from diseases and insect pests. Most of these can be controlled, but the fungus disease black-
Blackleg lesion on the cotyledon

Two rape stems showing blackleg lesions on the crown

Mildly infected rape crop with few plants lodging from blackleg disease

Fungal fruiting bodies (perithecia) on rape trash

Crop ruined by blackleg disease showing sparse stand and lodging plants
Leg (Leptosphaeria maculans) emerged as a major threat to the industry.

A serious outbreak of this disease in rape plantings in the Mt Barker area in 1971 was followed by a severe general epidemic in 1972. Many crops were devastated and yields drastically reduced in others. Infected stubble from previous crops enhanced disease development in nearby crops.

This disease situation resulted in a decline in rape plantings from 49,000 ha in 1972 to 3,200 ha in 1973 and 2,000 ha in 1974.

Clearly, unless the disease can be controlled, there is little future for rapeseed as a major commercial crop in Western Australia.

The disease
Blackleg can affect other cruciferous crops, such as cabbage and cauliflower, and has been well known to local vegetable growers for many years. In agricultural areas the fungus has only been recorded on wild radish and rapeseed.

Both species of rape grown in Western Australia—Brassica napus and B. campestris—are susceptible to the disease. In the Northern Hemisphere these are grown as summer crops; in Western Australia they are sown from early July onwards and grow through the winter and early spring, taking about six months to reach maturity.

The mild, wet conditions during winter and early spring in this State are especially favourable for the development of blackleg.

The fungus exists as an imperfect state, Plenodomus lingam, which lives on the growing plant and produces asexual spores (pycnidiospores) from black fruiting bodies called pycnidia, and as a perfect state Leptosphaeria maculans, which lives on dead crop residues and produces sexual spores (ascospores) from small black fruiting bodies (perithecia) on the stems of the dead plants.

In the imperfect state the fungus produces pycnidia in lesions on infected leaves, stems and pods. These release pycnidiospores in a slimy mass, and these spores are spread by rain-splash in the growing crop. Seed infection can result from fungal threads (mycelium) growing through the pod and becoming established under the seed coat.

Symptoms
The fungus can infect any part of the plant.

The lesions are first seen on the seedlings as white or grey, circular spots on the cotyledons (seed leaves), and subsequently pycnidia develop in these. Less frequently, lesions appear on the stem as well.

Infected cotyledons die prematurely and the fungus may invade the stem by advancing through the petiole (leaf stalk). Pycnidiospores produced on the cotyledons may later infect the crown (basal stem).

Lesions are more discrete on the true leaves than on the cotyledons. Leaf, stem and pod infection sites on older plants are surrounded with a dark purplish margin.

Attack of the flowering structure can cause blighting of the flowers. Pods which have fungal lesions usually produce infected seed, which is often shrivelled and may not germinate.

Invasion of the crown, which mostly results from cotyledon and leaf infection at the seedling stage, is the most damaging phase of the disease.

Badly affected plants are ring-barked at ground level by the cankers, and lodge. Less severely affected plants remain standing but have restricted sap flow; pods fail to fill and seed is pinched.

Although the fungus can be introduced into new production areas through infected seed this method of spread is not likely to cause a significant primary disease outbreak in the crop. An average of 0.1 per cent of infected seed has been detected in commercial seed lines.

If seed with this level of infection is the only source of inoculum the resulting disease incidence in the crop will be low. However, stems colonised by the fungus could constitute a disease risk for next season's crop planted in nearby areas.

Infected debris remaining after harvesting may be spread onto nearby clean paddocks by wind.

The fungus can survive on undecomposed crop residues for many years* and sowing onto old rape paddocks can result in severe losses.

Perithecia develop on infected crop residues left on the soil surface and may be found on plant fragments re-exposed by cultivation even after several years in the soil. Ascospores are released from these and blown on to neighbouring rape crops.

The first infection of the growing crop is usually from ascospores released from the previous year's stubble in autumn. The spores are forcibly discharged under moist conditions in the temperature range of 10 to 20°C and widely dispersed by wind to infect current crops.

In 1972, isolation of 5 to 8 kilometres (3 to 5 miles) from previous year's stubbles was necessary for crops to be reasonably free of the disease.

Ascospore discharge from diseased 1972 stubble was measured with a spore trap. Spore levels were high in June, July and August.

| Ascospore discharge from rape stubbles by the blackleg fungus, Leptosphaeria maculans. |
| Mount Barker, June 9—October 31, 1972 |
| No. of no. spores | No. of spores collected | Average no. spores per emission day |
| June …… | 89,200 | 13 | 6,861 |
| July …… | 110,280 | 13 | 8,483 |
| August …… | 148,802 | 21 | 7,052 |
| September | 21,840 | 17 | 1,284 |
| October | 1,960 | 6 | 326 |

* The number of days per month on which spores were released.

Research in France has shown that heavy ascospore discharge during the early developmental stage of the rape plants (the cotyledon and one to two leaf stages), causes the general epidemic outbreaks of the disease in that country*. However, the primary lesions caused by ascospores appear identical to those produced by spores of the pycnidial state.

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Control

Destruction of crop residues after
harvest will reduce carry-over of the
fungus on infected stalk and basal
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rape stubble and then root-raking
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ing has proved successful in reduc
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Leaving rape out of the rotation
for as long as possible will allow the
diseased residues to decompose and
so reduce the risk of ascospore in
fection. At least three and even
four years is the time necessary for
this to occur.

Planting rape as far away as pos
sible from previous rape crops will
reduce the risk of infection by the
wind-borne ascospores. This may
not be possible to achieve if rape

stage. Spores washed from leaf and
stem lesions down into the soil may
infect the base of the plant. Pycni
diospores exuded during moist
periods cause secondary infection
when spread by rain-splash.

Warm dry conditions hinder
secondary disease build-up, whereas
prolonged moist weather favours
rapid spread and development of the
disease.

Variatel resistance

Varieties now commercially avail
able are all highly susceptible to
blackleg infection. Tolerance to the
disease is present in some rape selec
tions developed overseas and plant
breeders are now involved in incor
porating this tolerance into commer
cial varieties.

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has been grown on neighbouring
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If planting is delayed, blackleg
infection may be reduced if the
weather conditions are unfavourable
for fungal development. However,
if planting is delayed too long both
the yield and oil content of the seed
will be reduced.

Research

Research is continuing on fungicidal
treatment of seed and seedlings
aimed at protecting the plants from
primary infection by ascospores and
secondary spread by pycnidiospores.
Studies are continuing on the role
of seed infection and on canker de
velopment. New varieties and selec
tions are being screened for resist
ance to the disease.

NEW ENVIRONMENTAL AND CONSERVATION PUBLICATIONS

Three publications which have ap
peared recently will interest those
cerned with specific areas of the
environment and its management.
All are published by the Elsevier
Scientific Publishing Company of
Amsterdam and the first issue of
each was in June 1974. Free sam
ple copies of Vol. 1 No. 1 for each
series are probably still available on
request to the company at P.O. Box
211, Amsterdam, The Netherlands.
Annual subscriptions range from
$A24 to $A26.

Landscape Planning is described as
an international journal on land
scape ecology, reclamation and con
servation, outdoor recreation and
land-use management. In Vol. 1
No. 1 its editor discusses the need
for work in this area and suggests
that the journal will provide a
medium for the exchange of ideas
and the involvement of both en
vironmental scientists and profes
sional landscape planners.

He recognises that there is a need
for teamwork between workers from
different disciplines, under the lead
ership of a landscape architect, as a
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trovery in Western Australia over
such things as the Kwinana indus
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the Yunderup canals project, one
can only agree.

Vol. 1 No. 1 contains papers
from authors in The Netherlands,
Australia, the United States of
America, Czechoslovakia and Ni
geria on topics including tourism,
practical approaches, forestry prob
lems, possible relationships between
art, science and technology, and
considerations of unity and diversity
in the landscape.

Agro-Ecosystems is an international
journal sponsored by the Interna
tional Association for Ecology. As
such it is concerned with ecological
interactions within and between
agricultural and managed-forest
environments, including interactions
between crops and grazing animals,
natural wildlife vs domestic live
stock, nutrient leaching into water
ways, and so on. Vol. 1 No. 1
contains papers from authors in
several countries and though more
of a research reporting issue than
Landscape Planning will provide a
medium for those authors whose
work lies between established journ
als and scientific fields.

Agro-Ecosystems will probably
have less general appeal than Land
scape Planning but nevertheless is
likely to contain much that will
interest those concerned with the
environment.

Agriculture and the Environment is
concerned with the balance between
food production and environmental
and biospherical management. On
the one hand it will be concerned
with the spatial relationship between
agriculture and its environment, and
on the other with the need to pro
mote a balance between food pro
duction for populations and the
need for responsible environmental
management. It will be more
directly related to agriculture than
Agro-Ecosystems and Vol. 1 No. 1
contains a mixture of theoretical
and research approaches to agricul
tural problems.

Agriculture and the Environment
will appeal to people concerned
with the directions in which agricul
ture is moving, and with the
effects of modern agricultural prac
tices on the environment. Contribu
tions in the inaugural issue come
from several countries and cover
such topics as using models to solve
agricultural development problems,
disease problems in intensive pig
houses, soil pesticide residues and
their uptake by crops, and the con
trol of odour and pathogens arising
from intensive poultry and livestock
units.