Shaping yield with Metconazole in oilseed rape

BASF Agricultural Products
Continuing to advance the yield and performance of oilseed rape.

www.totaloilseedcare.co.uk
1. Introduction

The UK oilseed rape crop has grown steadily in area, to reach around 700,000 hectares harvested in 2011. With continuing buoyant demand for vegetable oil globally, rapeseed grain prices remain highly attractive and getting the best out of the crop has been brought sharply into focus. Crop growth and development can be actively steered and supported by good agronomic advice and intelligent use of inputs.

The use of Metconazole, as contained in Sunorg Pro, Juventus and Caramba 90 is a key part of this process. Much has been discovered about its use in oilseed rape over recent years, but new information on how yield is shaped continues to be found. This guide is written to summarise the key elements of Metconazole use, based on current knowledge. It is therefore intended to be used as an aide memoire to both the professional advisor and the farmer, when addressing recommendations for use.

2. Record yields in 2011

Despite severe concerns in the spring, 2011 produced much higher yields than expected. In the HGCA Recommended List results, East and West Regions were 0.48 t/ha above 5 year average; in the North 0.45 t/ha above 5 year average.

The weather in many areas had a large positive impact. Why?

Good rooting in the autumn meant crops were more able to withstand the high moisture deficits in the following spring.

Canopies stayed green post flowering.

This allowed a long seed fill period from mid-end May onwards. It particularly favoured the later maturing varieties.

However not all yields were good – in areas with light soils or rain arriving too late, yields suffered through lack of water and poor seed-fill.
3. An ‘efficient’ flower canopy = high seeds/sq m

Efficient canopy
Good light penetration to lower canopy for pod and leaf photosynthesis. This produces a high number of seeds/sq m, and high potential yield.

Over-large canopy
Terminal raceme reflects and intercepts up to 60% of light. Results in poor light penetration to lower canopy, low seeds/sq m, low potential yield.

4. Metconazole – Its growth regulator effects explained

Crop establishment and inputs can be used to produce the desired crop type, emulating that assisted by the weather in 2011. Controlling how the crop grows during the season is very valuable. Metconazole can provide this. It is used to produce an efficient flower canopy, reduce lodging and increase rooting, substantiated by extensive independent trials information.

Metconazole is a fungicide registered for control of foliar diseases of oilseed rape. However it is also has strong growth regulation properties.

It inhibits apical dominance – it diverts growth away from the growing tip of the main stem (ie which will form the terminal flowering shoot) back to the side branches and roots of the plant.
4.1. The effect of Metconazole applied at stem extension/yellow bud

From around mid-March the main stem starts to extend rapidly. It branches from the top downwards, so the last branch to form is the one nearest the ground. Branches off the main stem are called primary branches. There are 6-9 potential primary branches, but fewer are shown in the diagram for simplicity.

Secondary branches (branching off the primary branches) start developing on the top branches as the lowest primary branch is formed.

What happens if Metconazole is applied at mid-stem extension/yellow bud stage?
It reduces the growth of the main stem so the plant is shorter (by about 7-11 cm). Best shortening occurs at mid-stem extension since growth has only just started. However it is important not to apply much before this stage or in poor growing conditions since Metconazole relies on active growth to work well.

It encourages lower branches to grow strongly and flower well rather than grow weakly/be unproductive. It also encourages secondary branching.

The reduction in height and more branching produces a more open pod canopy. There is less light reflectance and maximum photosynthetic efficiency – both pods and leaves intercepting light. The terminal raceme will have fewer seeds but this is more than compensated for by increase in seed number per pod lower in the canopy resulting in total increase in seeds/sq m.

Metconazole treated – growth ‘diverted’ from terminal raceme

4.2. The effect of Metconazole applied at flowering

Once the plant is flowering, the branch number and canopy size is ‘fixed’ and cannot be affected by reducing apical dominance. However the flowering of the terminal raceme can still be affected.

A second application of Metconazole can be very useful now just prior to when the seeds/sq m are determined. At this stage it:
- Reduces flower number on the terminal raceme – results in less light reflectance and more light penetration to lower canopy.
- More photosynthesis lower in canopy leads to more seeds per pod and more seeds/sq m overall – improved ‘pod balance’.
- Improved evenness in pod development across the whole plant, improved synchrony of pod ripening.
- There may be a minor increase in secondary branching, particularly from applications applied at early flowering stage.
- Despite the little reduction in height and canopy size at this stage, lodging can still be significantly reduced. This may be due to branch/stem strengthening.

These ‘plants’ had Metconazole applied at stem extension

Metconazole at flowering

Energy demand for pod production on terminal raceme

Improved ‘pod balance’

No Metconazole at flowering

More even energy use across the plant

Before treatment

More open canopy

+ more rooting below 40 cm
4.3. Lodging control

Leaning/lodging of the crop will make the canopy less efficient at photosynthesis and contributes to yield gain. The actual yield loss will depend on the degree of leaning and time of lodging. Metconazole will reduce the risk of early lodging in particular.

However there are other costs associated with lodging – e.g. seed loss at harvest, harvest difficulties.

Metconazole reduces lodging mainly by shortening the plant. This is most effective from mid-stem applications since it has the maximum potential stem growth to work on. However active growth is also very important so it’s better to wait until the crop is ‘visibly’ growing than stick to an actual growth stage.

Metconazole can still reduce lodging from applications at flowering – this is a smaller but still very useful effect. Little shortening occurs at this stage, other factors may be involved.

4.4. Summary of how the effects vary according to growth stage at application

A sequence can be very beneficial.
– The first spray at stem extension/yellow bud reduces plant height and produces the right canopy structure.

- The second spray at flowering maintains effective light penetration to the lower pods.
5. Published scientific findings for Metconazole

Independent published information on Metconazole

It reviewed 173 comparisons over 13 ADAS experiments (1999-2007).

5.1. Summary of findings

The findings are very robust. Only statistically significant results at the 95% confidence limit were included which is a challenge for growth regulator trials where effects are ‘indirect’, reliant on the growth of the plant at application.

Metconazole reduces apical dominance resulting in:
- Reduced lodging – primarily by shortening the plant.
- Increased seeds/sq m – increases light penetration to lower canopy.
- Increased rooting – prolongs seed-fill.

**Efficient canopy** – more seeds/sq m + 0.21 t/ha on ‘target’ crops

**Lodging control** 28% reduction in lodged area

**Rooting** 25% Increase at depth approx 0.3 t/ha if ‘dry’ post flowering (occurs every 2-2.7 seasons)

All yield effects in addition to disease control

6. Rooting effects

There is no direct relationship between canopy size and root length density (RLD) – a large crop does not necessarily mean a large root system. Note that many areas especially in the east currently have high soil moisture deficits, as a result of the ‘dry’ past 12 months. This will test the OSR rooting capacity at seed-fill time.

6.1. Why the interest in WOSR rooting

Oilseed rape may produce insufficient adventitious rooting at depth (40-100 cm zone). This zone is important for water uptake in May and June during seed-fill. Root Length Density (RLD) is the ratio of root length: soil volume. A RLD of 1 (dotted line on graph) is the minimum required to utilize available water.

The shaded area on the graph represents the range of RLD for the crops sampled, the solid line is the mean. Deeper than 40 cm, 50% of crops had a RLD less than 1 and therefore had insufficient rooting. This will limit yield if it is dry at seed-fill – this occurs every 2-2.7 seasons, equating to 0.24-0.34 t/ha.
6.2. Metconazole rooting studies – methodology

- Extract soil cores to 100 cm.
- Wash out roots (20 cm horizons).
- Remove organic debris from root sample.
- Measure root length and thickness (adventitious roots).
- Time consuming work.

The scientific paper findings –
Spring applications increased root length density 25% at depth (40-100 cm depth).

“The only evidence in a peer reviewed scientific journal for a chemical product to significantly increase rooting in OSR”. Pete Berry ADAS.

Additional water uptake was calculated at 6-9 mm; this equates to reducing the number of ‘dry’ years from 1 in every 2-2.7 seasons to 1 in 5 seasons.

6.3. Reducing risk of drought stress

Metconazole reduces the risk of drought stress and helps protect yield.

<table>
<thead>
<tr>
<th>AWC Class</th>
<th>% of seasons with drought stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untrated</td>
<td>Metconazole*</td>
</tr>
<tr>
<td>High – silty loam, silty clay loam</td>
<td>37.4 (1 in 2.7 years)</td>
</tr>
<tr>
<td>Medium – clays, clay loam, sandy loam</td>
<td>47.8 (1 in 2 years)</td>
</tr>
</tbody>
</table>

*Derived from root length densities vs. Soil moisture deficit and available water capacity in ADAS and BASF trials across 15 sites.

6.3. Reducing risk of drought stress

Metconazole reduces the risk of drought stress and helps protect yield.

<table>
<thead>
<tr>
<th>AWC Class</th>
<th>% of seasons with drought stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untrated</td>
<td>Metconazole*</td>
</tr>
<tr>
<td>High – silty loam, silty clay loam</td>
<td>37.4 (1 in 2.7 years)</td>
</tr>
<tr>
<td>Medium – clays, clay loam, sandy loam</td>
<td>47.8 (1 in 2 years)</td>
</tr>
</tbody>
</table>

*Derived from root length densities vs. Soil moisture deficit and available water capacity in ADAS and BASF trials across 15 sites.

7. Determining which crops need canopy regulation

Identifying the crops which will benefit from reducing canopy size
A simple field assessment (GAI tool) has been developed to guide field recommendations of Metconazole. This is available for use at www.totaloilseedcare.co.uk. The Green Area Index (GAI) is the ratio of green plant tissue to ground area.

Triggers for Metconazole treatment to optimise final canopy size are based on the published scientific data (see Section 5).

The thresholds for treatment
GAI of 0.8 or above measured at growth stage – flower buds visible at start of stem extension (March) or GAI of 2.0 or above measured at growth stage – late green bud/yellow bud (April).

Treating crops with GAI smaller than these will not be cost effective and may even over-regulate canopy size and lose yield.

March is the best time to measure GAI even if you intend to apply in April. Often by April the GAI is over 3 and the accuracy of the GAI tool is reduced.

7. Determining which crops need canopy regulation

Identifying the crops which will benefit from reducing canopy size
A simple field assessment (GAI tool) has been developed to guide field recommendations of Metconazole. This is available for use at www.totaloilseedcare.co.uk. The Green Area Index (GAI) is the ratio of green plant tissue to ground area.

Triggers for Metconazole treatment to optimise final canopy size are based on the published scientific data (see Section 5).

The thresholds for treatment
GAI of 0.8 or above measured at growth stage – flower buds visible at start of stem extension (March) or GAI of 2.0 or above measured at growth stage – late green bud/yellow bud (April).

Treating crops with GAI smaller than these will not be cost effective and may even over-regulate canopy size and lose yield.

March is the best time to measure GAI even if you intend to apply in April. Often by April the GAI is over 3 and the accuracy of the GAI tool is reduced.

7. Determining which crops need canopy regulation

Identifying the crops which will benefit from reducing canopy size
A simple field assessment (GAI tool) has been developed to guide field recommendations of Metconazole. This is available for use at www.totaloilseedcare.co.uk. The Green Area Index (GAI) is the ratio of green plant tissue to ground area.

Triggers for Metconazole treatment to optimise final canopy size are based on the published scientific data (see Section 5).

The thresholds for treatment
GAI of 0.8 or above measured at growth stage – flower buds visible at start of stem extension (March) or GAI of 2.0 or above measured at growth stage – late green bud/yellow bud (April).

Treating crops with GAI smaller than these will not be cost effective and may even over-regulate canopy size and lose yield.

March is the best time to measure GAI even if you intend to apply in April. Often by April the GAI is over 3 and the accuracy of the GAI tool is reduced.

7. Determining which crops need canopy regulation

Identifying the crops which will benefit from reducing canopy size
A simple field assessment (GAI tool) has been developed to guide field recommendations of Metconazole. This is available for use at www.totaloilseedcare.co.uk. The Green Area Index (GAI) is the ratio of green plant tissue to ground area.

Triggers for Metconazole treatment to optimise final canopy size are based on the published scientific data (see Section 5).

The thresholds for treatment
GAI of 0.8 or above measured at growth stage – flower buds visible at start of stem extension (March) or GAI of 2.0 or above measured at growth stage – late green bud/yellow bud (April).

Treating crops with GAI smaller than these will not be cost effective and may even over-regulate canopy size and lose yield.

March is the best time to measure GAI even if you intend to apply in April. Often by April the GAI is over 3 and the accuracy of the GAI tool is reduced.

7. Determining which crops need canopy regulation

Identifying the crops which will benefit from reducing canopy size
A simple field assessment (GAI tool) has been developed to guide field recommendations of Metconazole. This is available for use at www.totaloilseedcare.co.uk. The Green Area Index (GAI) is the ratio of green plant tissue to ground area.

Triggers for Metconazole treatment to optimise final canopy size are based on the published scientific data (see Section 5).

The thresholds for treatment
GAI of 0.8 or above measured at growth stage – flower buds visible at start of stem extension (March) or GAI of 2.0 or above measured at growth stage – late green bud/yellow bud (April).

Treating crops with GAI smaller than these will not be cost effective and may even over-regulate canopy size and lose yield.

March is the best time to measure GAI even if you intend to apply in April. Often by April the GAI is over 3 and the accuracy of the GAI tool is reduced.

8. Coping with large crops 2012

GAI threshold for application
- GAI > 0.8 in March at flower buds visible/start stem extn
- GAI >2 in April @ late green/yellow bud
- Any crop above GAI threshold justifies up to the 0.8 l/ha rate
- Be bolder with the rates

Application timing. Note – sustained growth is key; delay if poor conditions
- Best shortening and lodging control
- Crops where GAI>2 in March
- From mid-stem extension onwards
- Use 0.8 l/ha Sunorg Pro*

- Canopy effects to maximize yield
- Lodging control
- Contribution to sclerotinia control
- Yellow bud
- 0.5-0.8 l/ha Sunorg Pro*

Rooting is increased at both timings

*Also available as Caramba 90 and Juventus.
SunOrg Pro, Caramba 90 and Juventus are registered trademarks of BASF. SunOrg Pro, Caramba 90 and Juventus all contain Metconazole.

Use plant protection products safely. Always read the label and product information before use. For further product information including warning phrases and symbols refer to www.agricentre.basf.co.uk

BASF Plc, PO Box 4, Earl Road, Cheadle Hulme, Cheadle, Cheshire UK SK8 6QG
www.agriCentre.basf.co.uk