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Effect on bees of insecticides used on rape

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Rapeseed could provide beekeepers in Western Australia with a valuable new honey crop—but insecticidal spraying of rape at flowering time is a potentially serious threat to most commercial beekeepers.

There are indications that insect pollination may improve rapeseed yields, so both growers and beekeepers could gain from a co-operative approach to the problem. Spraying after sundown and preventing spray drift to nearby apiaries should avoid most losses.

It is estimated that 70,000 acres of rapeseed were planted in Western Australia in 1971. This figure could be extended over the next five years to 280,000 acres.

Insecticidal spraying of rapeseed has already caused some heavy losses and the problem could grow as the area of rapeseed expands.

According to reports from the Eastern States, honey bees find the crop very attractive and will fly up to 5 km (3 miles) over capeweed and Paterson's curse to work rape.

This was confirmed in the Lancelin area last spring, when a beekeeper who suffered severe casualties through spray estimated that his bees were flying 4 to 5 km (2 1/2 to 3 miles) to the crop. Odd cases have been recorded in Cowra, N.S.W., of bees flying up to 10 km (6 miles) to work rape.

If the crop is so attractive to bees, and the area is to be increased, rape will certainly provide a useful source of nectar for beekeepers in W.A.

Beekeepers who work York gum, cape weed, Paterson's curse or coastal plain crops near developed areas are all likely to have bees within flying range of rape crops. It is estimated that 60 to 75 per cent of the commercial apiaries in the State would come within the above areas when rape crops are in flower.

The beekeeper who places his hives on the crop with the authorisation of the land owner may have little to fear from insecticides. His bees are not likely to fly over rape to work an adjoining property. He can ask the owner to advise him of any spraying programmes and move the bees out of the danger area.

However, infestations of native budworm and aphids can build up very rapidly and crops must be sprayed within the shortest possible time to avoid serious damage. This could mean that a beekeeper may have from 24 to 36 hours to shift his hives. Should he be out of contact when spraying is necessary, his bees could suffer.
The real danger arises where a farmer who does not know of the existence of apiaries in his neighbours' paddocks, or on Crown land several miles away, sprays his crop and quite innocently causes untold damage to another primary producer—the beekeeper.

The field bees caught by the spray may die in the field or, as in the case of demeton-S-methyl (Metasystox), many may have time to return to the hive before dying. With some sprays, the nectar may be poisoned for many days after application. Two such types are carbaryl (7 to 11 days) and phosphamidon (11 days).

On returning to the hive, field bees regurgitate their load of poison nectar. Young, newly emerged bees gorge themselves on this nectar and are also killed by the poison. Apart from the death of these bees, and subsequent loss in hive production, there is the loss of bees as cross-pollinators on the crop.

A Metasystox spraying programme was carried out on a Lancelin property in the late spring of 1971, and the spray was applied after dark. There were several apiaries within a one-mile radius. Bees from these apiaries were working the treated crop early the following morning and there were no signs of bee losses from these apiaries.

A trial was conducted at Avondale Research Station last year, using insecticides with little known effect on bees. Caged bees were placed in the field and a hand-operated boom sprayer was used to apply each treatment. A high percentage of the bees died quickly, as can be seen from the graph. The toxicity of Metasystox was already known but was used as a guide in assessing the classes of the other three. After 16 hours, only 53 per cent of the bees in the Metasystox group were dead. This would account for bees being able to return to the hive before they died.

Further trials are in progress.

It would appear that most insecticides recommended for rape would be less harmful to bees if applied after periods of concentrated activity by the bees on the crop. As some sprays have residual effect
### Recommended insecticides and rate per acre for rape seed crops in flower, and their toxicity to bees

<table>
<thead>
<tr>
<th>Name of insect (common and official)</th>
<th>Active ingredient</th>
<th>DDT</th>
<th>demeton-S-methyl (Metasystox)</th>
<th>carbaryl (Sevin, Dicarbam)</th>
<th>trichlorfon (Dipterex, Klorfon)</th>
<th>methidathion (Ultrade)</th>
<th>Toxicity to bees</th>
<th>Residual effect</th>
<th>Use class</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aphids</strong> - Various spp.</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>8 fl oz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate</td>
<td>Nil</td>
</tr>
<tr>
<td><strong>Cabbage Moth</strong> <em>Flotella xylostella (L.)</em></td>
<td>16 fl oz of 25% Conc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate</td>
<td>1 day</td>
</tr>
<tr>
<td><strong>Cabbage Moths and Aphids</strong></td>
<td>16 fl oz of 25%, conc. + 8 fl oz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate</td>
<td>1 day</td>
</tr>
<tr>
<td><strong>Cabbage White Butterfly</strong> <em>Pieris rapae (L.)</em></td>
<td>As for Cabbage moth</td>
<td>16 fl oz of 40%, concentrate</td>
<td>Moderate to high</td>
<td>Nil</td>
<td>11 * (b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cabbage Centre Grub</strong> <em>Hellula sp.</em></td>
<td>As for Cabbage moth</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Native Budworm</strong> <em>Heiothis punctigera</em>Wall.</td>
<td>32 fl oz of 25%, Conc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate to high</td>
<td>1 day</td>
</tr>
<tr>
<td><strong>Native Budworm</strong> <em>Heiothis punctigera</em>Wall.</td>
<td>16 oz of 80% soluble powder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low to moderate</td>
<td>Nil</td>
</tr>
<tr>
<td><strong>Native Budworm</strong> <em>Heiothis punctigera</em>Wall.</td>
<td>20 oz of 80% soluble powder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate to high</td>
<td>7-12 days</td>
</tr>
</tbody>
</table>

**Classes:**

1 - Hazardous to bees at any time.
11 - Not hazardous if applied when bees are not foraging.
(a) Because of high rating per acre this classification may have to be regrouped under Class 1 and may have a higher residual effect.
(b) Results from trials on Avondale Research Station.
* May be removed from this class after full scale field tests.
A typical apiary on agricultural land. Bees from these hives are likely to be within flying range of flowering rape.

lasting one to three hours, spraying would be best carried out after sundown rather than early morning. Growers should also avoid spray drift onto an apiary. Beekeepers would be well advised to consider this possibility when siting apiaries, giving consideration to the direction of the prevailing winds in the area at the time of the year.

Attempts have been made to produce an insecticide that will kill the pests and not harm the honey bee. Trials carried out at Cowra, N.S.W., using endosulfan on rape crops appeared at first to give the desired response. Its effects are questionable, however. It has been suggested that it could upset the environment by killing the fish in nearby streams.

In New Zealand, legislation has been introduced whereby a farmer wishing to spray insecticide which is harmful to the bees must apply for a permit. Under section 35 of The New Zealand Apiaries Act, 1969, a farmer is prohibited from applying these sprays to cruciferous or leguminous crops when they are in flower or to flowering plants within the crop, until a permit has been issued by the Department of Agriculture. Permits are not issued until the applications are investigated so that the necessity to spray is considered and beekeepers have been advised to move their hives from the danger area. Let us hope this will not be necessary in Western Australia.

However, close liaison between insecticide manufacturers and the Department of Agriculture, together with co-operation of sprayers and beekeepers, will be necessary to avoid disastrous losses of bees working rape crops.

Rapeseed growers may make greater efforts to avoid killing bees working their crops when it is pointed out that pollination by bees may increase the yield of rapeseed.

Research in rapeseed growing countries in the northern hemisphere has indicated that under some conditions, particularly in Europe, bee pollination can lead to valuable increases in yield of rapeseed. No such research has been carried out locally, but it is likely that the beneficial effects would be much less under our conditions. However, it is logical for rapeseed growers to want to avoid killing pollinating insects when there is some likelihood that insect pollination may increase the yield of their crops.

The table gives recommendations for spraying rape. Where possible, information on the toxicity and residual effect on bees has been recorded. The toxicity of some classes is based on the results of last season’s trial at the Department of Agriculture’s Avondale Research Station, Beverley.