IN THE SUPREME COURT OF WESTERN AUSTRALIA
COMMERCIAL AND MANAGED CASES LIST

CIV 1561 of 2012

B E T W E E N:

STEPHEN WILLIAM MARSH Plaintiff

and

MICHAEL OWEN BAXTER Defendant

SUPPLEMENTARY EXPERT REPORT OF
PROFESSOR STEPHEN POWLES

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Stephen Powles **Supplementary report** **November 4th 2013**

1. Opinion as to how easy or difficult it is to distinguish flowering volunteer canola plants from other plants.

I) Ease or difficulty distinguishing volunteer canola plants from other plants in pasture paddocks where capeweed is present (both before and after capeweed has commenced flowering)

A pasture paddock in the Kojonup area usually comprises plant species that have spontaneously emerged from the soil seedbank and established (termed volunteers). Usually there are grazing livestock (most often sheep). In the Kojonup area, paddocks are rotated such that an individual paddock can be devoted to a pasture in one year and seeded to a crop in the following year. Because a pasture is comprised of volunteers, there are desirable species (eg ryegrass, clover, medics, serradella) and from few to many undesirable species. The undesirable capeweed is almost ubiquitous in pastures in the Kojonup area, where it can vary from low to very high density.

In pasture paddocks, canola individuals at low density at the vegetative stage (before flowering) may be extremely difficult to locate, especially in low quality pasture containing a mix at high density of different broadleaf weed species including capeweed, all at the vegetative stage. As sheep graze pasture close to the ground, this would further render difficult the task of finding low density canola among other broadleaf species, all at the vegetative stage. Although difficult, if vegetative canola individuals can be located, upon close inspection they can be distinguished from the vegetative stage capeweed and many other species.

When flowering, canola is distinguishable from many other plants including capeweed, despite both canola and capeweed having yellow flowers. The capeweed flower is a distinctive round, yellow compound flower with a black oval centre (resembling a small sunflower). Canola has a smaller, distinctive four-petalled yellow flower on erect stems. If capeweed and other broadleaf weeds were at low density in a good quality pasture that was not heavily grazed then very thorough inspection could find flowering canola among other plants in a pasture in which low density capeweed was also flowering at the same time. However, if capeweed was flowering at high density in a pasture and canola simultaneously flowering at a very low density, it would be extremely difficult to find rare canola individuals (photographs available on request).

II) Ease or difficulty distinguishing volunteer canola plants from other plants in cereal crop paddocks where capeweed is also present (both before and after capeweed has commenced flowering)

Conventional agricultural practice in cereal crops involves use of herbicides to ensure low densities of other plants. Thus, herbicide use in a cereal crop normally ensures that the densities of canola, capeweed and other crop-infesting weeds would be low. At low densities of capeweed and other broadleaf weeds, careful cereal crop inspection could find low density canola plants at the vegetative stage (before flowering). Vegetative canola can be distinguished from other plants, including vegetative capeweed. However, if there was a high density of vegetative stage broadleaf weed species infesting a cereal crop it would be very difficult to locate low density vegetative stage canola individuals.

If the density of crop-infesting weeds was low then with careful crop inspection it would be possible to locate and distinguish flowering canola individuals from other plants, even if low densities of capeweed were flowering. However, if flowering capeweed was present at high density, and flowering canola at low density, it would be very difficult to locate the rare canola individuals.

III) Ease or difficulty distinguishing volunteer canola plants from other plants in cereal crop paddocks where capeweed is not present.

With conventional agricultural practice, in a cereal crop the densities of volunteer canola and crop-infesting weeds should be low. At low densities of other plants, careful cereal crop inspection could find low density canola plants. If there was a high density of broadleaf weed species infesting a cereal crop it would be very difficult to locate low density canola individuals. The ease with which one can locate volunteer canola growing with other plants in standing cereal crops is dependent upon the canola density. Where vegetative canola density is very low, inspection of large areas of crop will enable locating and distinguishing canola from other plants. The task would be easier with flowering canola as canola stems are elongated at flowering, often to the same height as the crop, and the distinctive yellow canola flower can be identified by careful inspection of a large area of cereal crop.

2. In the event that no volunteer canola plants (GM or otherwise) have germinated on Eagle Rest since 2011, what is the likelihood that significant numbers of volunteer GM canola plants will emerge in the future in the absence of a further transfer of GM canola seed onto the farm.

If no volunteer GM canola plants have germinated on Eagle Rest since 2011 it is unlikely that there will be significant numbers of future GM canola volunteers. Without GM canola plants on Eagle Rest in 2012 or 2013 and without transfer of GM seeds onto Eagle Rest then any future GM canola volunteers on Eagle Rest would have had to originate from 2010 or 2011 seed. This seed would have had to persist in a viable state in the soil seedbank and retain the ability to volunteer (germinate, emerge and establish) in 2014 or later years. Canola seed, GM or otherwise, is widely considered to have a short seedbank life and it is normally expected that, given favourable soil moisture and temperature, canola seed residing in the top few soil centimetres will have its highest percentage germination in the year after entering the soil seedbank. The Kojonup 2012 and 2013 growing seasons were adequate for canola seed emergence. Light soil cultivation may be conducive to canola seed germination but it is unlikely that it occurred in 2012 or 2013. Thus, without any GM canola plants in the 2012 and 2013 years it is unlikely that there will be significant numbers of GM canola volunteer plants emerging in future years.

3. Is the flowering of a canola plant essential to the formation of seed?

Yes. Flowering and pollination are necessary for seed formation in canola.

4 & 5. Approximately how long after a canola plant flowers does it commence to form seed?

The process of canola seed production commences shortly after the canola flower is pollinated. Seed maturation takes several weeks, dependent upon environmental variables especially temperature as well as the health and water status of the plant. It is important to note, that dependent upon plant size and environmental conditions, a canola plant produces many individual flowers, with new flowers regularly appearing over an extended period. In the Kojonup area, a canola crop may commence flower production in late July and may continue producing new flowers through to end of October. Nearly all fertilized flowers have the potential to form seed but, impacted by a range of environmental factors, not all flowers will produce seed.

6. What factors would you expect a farmer in the Kojonup area, or SW of WA generally, to take into account in determining whether to plant GM canola on a farm, or in any particular field on a farm?

A farmer would make this decision on a paddock by paddock basis, while also considering the decision within a whole farm context. In the context of a Kojonup area or SW WA farmer the only GM canola choice available is GM glyphosate resistant canola. Having decided to plant canola in a particular paddock the major factors to be considered in determining whether to choose GM or non GM canola are:

-The likely income derived per hectare for GM canola relative to non-GM canola. This includes assessment of canola seed and technology costs, canola variety yield potential, expected GM versus non-GM canola grain price and expected herbicide input costs. Most other costs would remain largely similar for GM or non GM canola.

-The expected weed species and density of infestation (weed challenge) likely in the paddock under consideration for seeding to canola. GM canola may be chosen where it is expected that there will be difficult-to-control weeds, or weeds that are resistant to certain herbicides or for which few herbicide choices exist. GM canola allows glyphosate use and glyphosate is effective on a wide range of weed species.

-The soil moisture status of the paddock in April in the year under consideration and, potentially, the seasonal rainfall forecast for that growing season.

7. What steps would you expect a farmer, either in the Kojonup region specifically, or in the SW of WA generally, to undertake in order to identify herbicide resistant Wimmera ryegrass on a farm?

A farmer in the Kojonup area should know that ryegrass (Lolium rigidum, sometimes called Wimmera ryegrass) can have resistance to herbicides, as it is generally and long-known by WA farmers and their advisers that herbicide resistance exists in ryegrass across WA farm regions. All WA farmers are familiar with and can identify ryegrass. A farmer may become aware of herbicide resistant ryegrass on their farm following a direct failure of a herbicide to control ryegrass (where the herbicide had been effective in the past). Farmers, including those in the Kojonup area, would suspect from experience of herbicide failure to control ryegrass on their own farm, and from information from peers, advisers, the rural media etc that they have herbicide resistant ryegrass, but may not take any concrete steps to specifically identify herbicide resistant ryegrass. Commercial herbicide resistance testing services are available. Farmers will know from their advisers and contacts that if they wish to specifically identify herbicide resistance, they can sample ryegrass seed from their paddocks and submit it to commercial herbicide resistance testing services.

8. What means are available to a farmer, either in the Kojonup area or the SW of WA, to attempt to eradicate herbicide resistant Wimmera ryegrass identified on a farm, and how effective are those means?

Farmers in the Kojonup area, SW WA and elsewhere in Australia know that eradication of ryegrass, herbicide resistant or otherwise, is commercially very difficult. Rather, Kojonup area farmers, especially if their farm enterprise involves cropping, will take steps to achieve low density of ryegrass in their crops, especially if it is herbicide resistant ryegrass. It is important to note that farmers operating crop dominant farm enterprises make different decisions regarding ryegrass than do farmers for whom livestock and thus pastures and/or hay are dominant on the farm. The situation for most farmers in the Kojonup area is that livestock on pastures are a significant often dominant component of the farm enterprise. In other regions the cropping enterprise dominates and there can be no livestock/pasture, or a much smaller percentage than prevails for most Kojonup area farmers. As most Kojonup area farmers have livestock (usually sheep) and a substantial area of the farm in any year devoted to pasture paddocks, then ryegrass may be viewed by Kojonup area farmers as a valuable grazing component of a pasture. For these farmers, ryegrass is considered a weed only in a crop. Therefore, many Kojonup area farmers would be comfortable with ryegrass present in pasture paddocks but would take action to minimise ryegrass density in crops (whether herbicide resistant ryegrass or not).

Farmers will be unlikely to attempt to eradicate herbicide resistant ryegrass. Rather they will seek to reduce ryegrass density, especially if herbicide resistant. There are many techniques available to farmers to manage ryegrass densities but none are specific to the herbicide resistant form of ryegrass. Before and during crop production, effective herbicides are commonly used for ryegrass control. Kojonup area farmers have effective herbicides available to them, except for those herbicides to which resistance is evident in ryegrass on their farms. They will use those herbicides that they consider to be effective on ryegrass.

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Kojonup area farmers with pastures with ryegrass (resistant or susceptible) will utilise livestock to graze ryegrass, as ryegrass is a valuable, nutritious pasture grass. Very late in the growing season, for any pasture paddock that will be cropped in the following year, the pasture will be sprayed with herbicide in a technique known as spray-topping to minimise seed production of a range of annual species, including ryegrass. For the majority of Kojonup area farmers there is not resistance to these spray-topping herbicides on their farms and this practice will greatly reduce ryegrass infestation in the following crop. In the cropping year there are a range of agronomic and herbicide options aimed to minimise the density of ryegrass (and other weeds) in the crop. If the rainfall occurs sufficiently early in the growing season the farmer will wait for a germination of volunteers from the seedbank, including ryegrass, and destroy these with effective herbicides (sometimes cultivation). Before or at crop seeding they will utilise a pre-emergent herbicide effective on ryegrass. They will utilise good agronomic practice to maximise the growth of the crop to help suppress weed growth. Dependent upon the crop, they will utilise any herbicides able to selectively control ryegrass within the standing crop. At crop harvest the farmer may utilise one of a range of harvest weed seed control techniques. Some farmers in the Kojonup area may operate a hay and/or silage operation to minimise seed production by ryegrass. When properly conducted, all of these techniques will significantly reduce ryegrass density.

9. What matters would you expect such a farmer, either in the Kojonup area or the SW of WA, to take into account in determining how to attempt to eradicate herbicide resistant Wimmera ryegrass on a farm, or a particular paddock on a farm?

As outlined in (8) above, farmers and their advisers would be unlikely to seek to eradicate herbicide resistant ryegrass on their farm, rather they would seek to achieve low ryegrass densities in crops. Economic realities for the individual farmer would be foremost in determining strategies and measures employed to manage ryegrass densities. The Kojonup area farmer, with pastures rotated with crops, would consider the relative economic returns from crops versus livestock/pasture, and perhaps hay crops. They would know that a pasture phase is an opportunity to reduce herbicide resistant ryegrass densities for a subsequent cropping phase. They would know that by intensive pasture grazing and by judicious end of season spray-topping it is possible to greatly minimise ryegrass seed production. The pasture phase may extend to two or three consecutive years in which the objective is minimal to no ryegrass seed production each year. In this manner the amount of ryegrass seed in the soil seedbank would be reduced to very low density. The farmer would then return the paddock to cropping years and would employ several of the practices outlined in (8) above to maintain ryegrass densities at low levels. Some farmers in the Kojonup area may operate a hay and/or silage operation to minimise seed production by ryegrass.

S. B. Powles

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