Canola production in Australia - Agronomic issues and concerns

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Introduction

Rapeseed was first tested in Australia in the early 1960s and was first grown commercially in 1969. Rapeseed breeding commenced in Australia in 1970.The early cultivars used for commercial production were all of Canadian origin. Their quality was poor, with oils high in erucic acid and meal high in glucosinolates. Canadian breeders led the world in the development of improved quality rapeseed, with the first low erucic acid cultivar released in 1968 and the first canola quality (low erucic acid and low glucosinolates) cultivar released in 1974.

These Canadian cultivars were used by Australian breeders as a source of improved quality. Subsequently, the first Australian low erucic acid *B. napus* and *B. rapa* cultivars were released in 1978 and 1982 respectively. The first Australian canola quality *B. napus* cultivars were released in 1980. Both *Brassica napus* and *B. rapa* species were grown in the early years; *B. napus* in the medium to high rainfall areas and *B. rapa* in the drier, shorter season areas.

High yielding, canola quality, blackleg resistant *B. napus* cultivars released in the late 1980s became the cornerstone of the Australian industry. The availability of high yielding cultivars, crop management packages and good prices led to rapid expansion in Australian canola production through the 1990s. The area sown to canola in Australia rose from 150,000 ha in 1991 to 1.8 million ha in 1999. Production rose from 99,000 tonnes in 1990-91 to an estimated 2.4 million tonnes in 1999. With only 300,000-400,00 tonnes of canola seed required for the domestic market, significant exports began in 1992. Over 1 million tonnes are now exported annually from Australia. Recent canola production in Australia has ranged from 1.3 million to 1.7 million hectares between 1999 and 2001, depending on seasonal conditions and price. During 2002 a major drought severely reduced canola production in eastern Australia, while production in 2003 and 2004 were also reduced by late seasonal breaks and lower rainfall. Production in these years has ranged from 0.79 million tonnes in 2002 to between 1.5 and 1.6 million tonnes in 2003 and 2004.

Agronomic issues

The mix of canola cultivars

All canola grown in Australia is spring cultivars that are sown in winter. While the Australian industry began with conventional cultivars, there has been a rapid uptake of herbicide tolerant cultivars due to the weed spectrum and also herbicide resistant

weeds. Most canola produced in W A is triazine tolerant due to the weed spectrum present. In other states the mix of cultivars has changed over the past years with Clearfield canola being released in 2000 and now taking about 15% of the market. Triazine tolerant canola in the eastern states now has over 50% of market share. This is due to ease of use and the weeds that can be controlled. Farmers are willing to grow cultivars that are lower yielding than conventional cultivars because sowing can be earlier with weed control by herbicide application rather than by cultivation or knockdown spray before sowing about one week later. Oil content of TT cultivars is also often lower than conventional cultivars.

Rotations

In the past, canola has been grown after a legume pasture or a pulse crop to provide additional nitrogen for the canola crop. In recent years the place of canola in the rotation has changed. In much of southern NSW canola is grown in rotation with wheat as other rotations do not provide such a high gross margin. The development of a consistent, high yielding pulse crop would reduce the pressure on canola. In South Australia (SA), canola is now often grown after wheat to allow the wheat stubble to be burnt to reduce snail numbers.

Relativity between canola and wheat yields

In the past, canola yields have been about 55% of the yield of wheat. There are suggestions that the relative performance of canola has decreased in recent years. This suggestion of canola yield decline has resulted in several research projects particularly in NSW. There are probably many reasons for this, some of which have been discussed above. In seasons with a late break, or a dry finish, canola yields less compared to wheat. Such seasons have occurred in 2002, 2003 and 2004. Also disease has decreased canola yields in southern NSW, particularly *Sclerotinia* in 1999 and 2000. In addition to plant death, internal blackleg infection of canola stems has been shown to reduce yield and oil content. In paddock surveys, an average of 30% stem infection has been shown where there was no external evidence of blackleg (Steve Marcroft - unpublished data). Other factors such as trace element nutrition also need to be investigated to ensure high canola yields relative to wheat. The last factor is the switch from conventional to TT cultivars that may also result in reduced yield and oil content.

Disease

Blackleg remains the main disease of canola throughout Australia, with many new highly resistant cultivars released since 2001. Several of these cultivars used resistance from *Brassica rapa* subspecies *sylvestris*. This conferred virtual immunity to blackleg from the date of release of the first cultivar (Surpass 400 in 2000). However, in 2003, several crops suffered severe damage due to blackleg and from 2005, cultivars that use this form of resistance are not being marketed.

Other alternative sources of resistance are being sought, including those from winter rapeseed and other *Brassica* species. Studies into the epidemiology of blackleg are continuing throughout Australia and management guidelines to reduce damage by blackleg have been developed.

Sclerotinia has occurred in the last several years particularly in southern New South Wales (NSW). In some cases it has caused greater economic loss than blackleg.

Studies into disease prediction and control measures are being conducted in southern NSW while some surveys have also been undertaken in Victoria. A new project being developed in conjunction with Australia, India and China and funded in part by the Australian Centre for International Agricultural Research (ACIAR) aims to develop screening methods for *Sclerotinia* and to identify sources of resistance.

Beet Western Yellows virus occurs in most states and yield losses of up to 50% have been reported in Western Australia (WA) where inoculated plants have been transplanted into trials. Further work is continuing in WA.

Insect pests

In WA, diamond back moth *(Plutella xylostella)* has caused significant damage to canola crops in northerly growing regions in some years. The moths are a greater pest in warmer, drier seasons and have also occurred in spring sown crops in SA. In 2002, diamond back moth caused significant damage in all eastern states. Insect populations are often resistant to several insecticides and further work is required to control this pest.

In the south eastern states, slugs have damaged emerging crops to a greater extent in 2001 and 2002 than in previous years and many crops have been baited up to 4 times. Since 2002, slugs have not caused the same degree of damage but farmers need to remain vigilant. A major study into the ecology and control of slugs is necessary to ensure good establishment of canola crops. In addition, snails remain a major problem in many areas of SA where alkaline soils predominate. These snails include round snails that can cause damage by feeding on emerging crops and also small conical snails that cause most damage by acting as a contaminant of grain at delivery. Many crops in SA have been cleaned after harvest to remove conical snails while a great deal of work is being done to modify harvesting machinery to eliminate snails from harvested seed.

In addition to perennial problems with red legged earth mite (*Halotydeus destructor*), the larvae of the bronzed field beetle (*Adelium brevicorne*) has been a major pest of emerging canola in many areas. This pest has often been incorrectly identified as false wire worm by farmers. Further work is required on the ecology and control of these ground dwelling pests of emerging canola to ensure adequate plant stands are established.

In 2004, heliothis (*Helicoverpa punctigera*) caused damage to canola crops in SA, Victoria and NSW. Canola is not usually the preferred host for heliothis but perhaps once every six years or so there can be enough heliothis present to require spraying.

Breeding issues

Breeding programs

The publically funded National *Brassica* Improvement Program (NBIP) is currently releasing canola cultivars for all areas of Australia. In the longer term, the likely future focus of the NBIP is in the development of germplasm, rather than the release of cultivars. A major priority for breeders is the development of early conventional and triazine tolerant cultivars with higher levels of oil and protein content.

End point royalties are currently being introduced in Australia. To ensure the acceptance of end point royalties by farmers, they need to be applied to superior cultivars with enhanced blackleg resistance, yield and oil content. The development of hybrid cultivars is another means for companies to maintain returns from breeding. This is now the preferred option for several companies in Australia.

GM canola

The development and release of GM canola offers considerable potential benefits to Australian growers. The acceptance of this product by farmers and consumers is a key issue. The introduction of GM canola will require enhanced record keeping by farmers and this will allow traceability and segregation. Thresholds are required to allow co-existence of GM, conventional and organic canola. All information regarding GM canola must be presented to farmers and consumers in an unbiased forum to allow informed decisions to be made. However, at present all states where canola is grown have put moratoriums in place to stop commercial production of GM canola.

Low rainfall areas – breeding opportunities

Canola is grown in low rainfall areas throughout Australia but production and quality have been variable. In recent years, the autumn break has often been late and therefore canola has not been sown. Many farmers still grow triazine tolerant canola in these areas because of broad leaf weeds resulting in low oil content, particularly in years with a dry finish to the season. Alternative herbicide tolerance systems need to be cost competitive if they are to be acceptable in low rainfall environments. Higher oil content cultivars adapted to low rainfall areas are required to ensure greater production from these areas.

Indian mustard (*Brassica juncea*) has been regarded as the main hope for low rainfall areas in Australia and lines with low glucosinolates, low erucic acid and higher oleic acid are being developed. While commercial cultivars of juncea canola are now available in Canada, several cultivars adapted to Australian conditions will be released to growers in 2006. At present, yields of juncea canola and *Brassica napus* cultivars are similar. However it is envisaged that costs of production of juncea canola will be lower due to shattering tolerance reducing the need for windrowing.

Other industry issues

Costs of production of canola

One problem raised by many canola growers is the high cost of production, associated with high levels of inputs. Further studies are required to determine the necessary level of inputs and eliminate unnecessary costs.

The future?

The Australian canola industry has the potential to increase in area and production over the next few years. However, production is always likely to remain somewhat variable due to seasonal conditions, particularly in lower rainfall areas. The role of biodiesel in the Australian industry also needs to be assessed.

Resolution of identified agronomic issues and issues associated with the introduction of GM canola will allow production to continue to increase, perhaps up to 2.5 million hectares per year.