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GROWNOTES™

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GRAINS RESEARCH & DEVELOPMENT CORPORATION

BARLEY

SECTION 12

HARVEST

HEADER SETTINGS | MONITORING GRAIN LOSS | WET HARVEST ISSUES AND MANAGEMENT | FIRE PREVENTION | RECEIVAL STANDARDS | HARVEST WEED-SEED CONTROL | SUMMARY

SECTION 12

Harvest

In southern Australia, barley is generally harvested from October to December prior to wheat, which provides some spread of harvest timing. Barley yield can be expected to be similar to or better than wheat yield. The crop dries down well and desiccation is generally not necessary unless late weed growth needs to be controlled. Note that growers should not apply glyphosate or paraquat to malting barley varieties prior to harvest for either weed control or desiccation; it may result in reduced malting barley germination potential and maximum residue limit violations. [1,2]

12.1 Header settings

Suggested header-setting adjustments for barley are:

- drum speed (rpm): conventional, 700–1000; rotary, 700–1000
- concave clearance (mm): front, 8; rear, 3
- fan speed: high

Harvest and handling are particularly important for malting barley because maintaining germination >95% is vital. Even minor damage to the seed can affect its ability to germinate. Cracked grains, skinned or partially skinned grains, and grains killed through damage to the germ do not malt properly.

When examining a barley seed sample for damage, look at individual grains and not just a mass of grain. Always examine the back of the grain first and ignore the crease side. Severe cracking and germ damage are nearly always accompanied by a high degree of skinning. The most common causes for this are:

- Drum speed too high: use only the slowest drum speed that will effectively thresh the grain from the barley head. A higher drum speed is needed when harvesting crops not properly ripe and can cause serious grain damage.
- An incorrectly adjusted or warped concave: the initial header settings should have the concave set one notch wider than for wheat. Check the setting frequently during the day. If the thresher drum speed is correct, concave adjustments should cope with the changes in temperature and other harvesting conditions met during the day.

The airflow may need to be increased slightly to obtain a clean sample. The application of heat can also affect germination of grain and this should be taken into account if artificial drying is intended for malting-quality barley. [3]

1 DAF Qld (2012) Barley planting, nutrition and harvesting. Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

2 GrainCorp. Application of glyphosate to canola & barley. GrainCorp, http://www.graincorp.com.au/LiteratureRetrieve.aspx?ID=148376

3 DAF Qld (2012) Barley planting, nutrition and harvesting. Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

12.2 Monitoring grain loss

Monitoring for grain loss should begin before harvest. A seed count on the ground of >26 seeds in an area 10 cm by 100 cm means a loss of >100 kg/ha. After checking for any grain on the ground prior to harvest, you should check after beginning harvest to determine any harvest loss. It is recommended that a minimum of 10 counts be taken and averaged. [4,5]

12.3 Wet harvest issues and management

Because mature barley does not stand weather damage as well as wheat, it is important not to delay harvest. Lodging can be a problem and patches of unripe crop on headlands and low-lying areas should be avoided, because unripe grains can contaminate samples and cause downgrading. [6]

Barley is physiologically mature at 30–50% moisture, which is well before it is ripe enough to harvest mechanically. [7]

When ripe, winter cereals are easy to thresh, and harvest can begin at moisture content as high as 20%, although generally very little is harvested at >18% moisture. If harvested at >12.5% moisture, access to an aeration or drying facility is necessary. (For more information on storing barley, see GrowNotes Barley South, Section 13. Storage.) [8]

12.3.1 Cost-effective harvest and logistics

Growers need to consider how to avoid the losses arising from wet weather during harvest. Options include increasing the capacity or number of the grower-owned header(s), bringing in contractors, methods to improve harvesting efficiency (chaser and mother bins), and the use of on-farm storage.

Key points:

- Machinery costs are driven by scale: the challenge is to keep the capacity of the machine matched to scale (current and anticipated).
- Harvesting costs depend on the header throughput. Doubling header capacity (e.g. with two machines) increases harvesting costs from $16.47 to $24.40/t (inclusive of chaser bin) with only half the throughput through each of the two machines.
- It is not necessary to double harvesting capacity with two headers to avoid weather damage, but header capacity needs to be enough to get the crop off in reasonable time, so as not to affect other activities.
- Any excess capacity available through having two headers might be used to provide contracting services to neighbours.
- Mother bins are a cost-effective form of short-term, in-paddock storage to provide a buffer between the header and the trucks. Two mother bins might be practical for large (≥3,000 ha) grain-growing operations. Round bins are a cheaper and cost-effective option.

4 DAF Qld (2012) Barley planting, nutrition and harvesting. Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

5 Agriculture Victoria (2012) Estimating crop yields and crop losses. AG0104. DEDJTR Victoria, http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/estimating-crop-yields-and-crop-losses

6 DAF Qld (2012) Barley planting, nutrition and harvesting. Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

7 DAF Qld (2012) Barley planting, nutrition and harvesting. Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

8 DAF Qld (2012) Barley planting, nutrition and harvesting. Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

- Grain bags are an alternative means of keeping the grain away from the header during harvest through short-term storage in the paddock.
- With good carriers, it may be unnecessary to own enough trucks to keep up with high-capacity headers. [9]

Delayed harvest due to wet weather can result in yield losses and downgrades in grain quality, which vary significantly between cereal varieties. Varietal differences in yield loss with delayed harvest can exceed 1.5 t/ha. If growers know which varieties are most susceptible to wet weather, they can make more informed decisions about prioritising harvest by variety.

12.3.2 Pre-harvest weather damage on barley varieties

In southern Australia, rainfall and strong winds are not uncommon around harvest time. In 2013, winds were prevalent, resulting in widespread reports of awn and head loss in some barley varieties. The ability of current commercial varieties to tolerate these conditions has been assessed in field trials at Turretfield and Moyhall, South Australia, during 2012 and 2013. Up to 24 varieties were harvested at two dates, beginning at physiological maturity and again more than 30 days later after significant rainfall and wind events that were conducive to head loss and quality downgrading. Lodging and head loss were measured at each harvest date and physical tests were conducted on grain samples from each plot.

Yield loss from delaying harvest has been most prevalent in Sloop SA⦶, a variety known to have poor head retention. In some trials, it lost up to 180 heads/m^2, resulting in grain yield losses of >2 t/ha between harvest dates (Figure 1).

Newer barley releases have not been as susceptible as Sloop SA⦶ to head loss. Of the newer releases, Oxford⦶ did not incur significant yield losses from a delay in harvest across all three sites–seasons. GrangeR⦶ and Bass⦶ also demonstrated good head retention with minimal yield losses.

Hindmarsh⦶ and LaTrobe⦶ have both displayed superior straw strength and reduced lodging compared with other varieties such as Keel, Skipper, and Fleet⦶ when harvest is delayed. However, their improved straw strength has not necessarily translated to improved head retention, with both Hindmarsh⦶ and LaTrobe⦶ recording large yield losses from a delay in harvest at more than one site–season, suggesting that they should be harvested early within a program along with other varieties more prone to head loss.

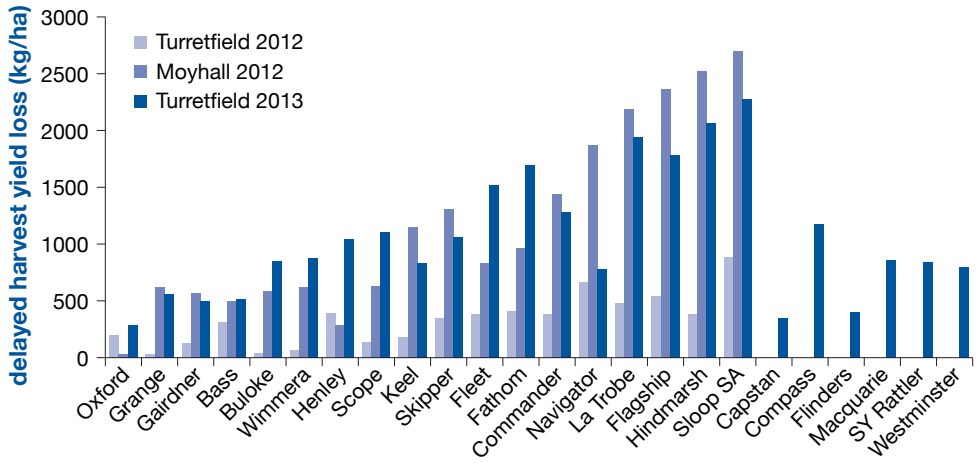

Figure 7: Yield loss (kg/ha) of current barley varieties between early and delayed harvest at Turretfield in 2012 and 2013 and Moyhall in 2012. Values of l.s.d. (P = 0.05) are 225, 395, and 450 kg/ha, respectively.

[9] A. Polkinghorne (2011) Cost effect harvest and logistics. GRDC Update Paper.

Factors other than wind conditions can contribute to head loss. These include disease, plant stress and changes in environmental conditions coinciding with the development period for a variety (maturity). Varieties were harvested as close to maturity as possible in these trials and plots were sprayed with fungicide. Leaf rust and spot form of net blotch in commercial paddocks may have contributed to a weakening of the plant structure and resulted in greater head loss than reported here. Fungicide trials have shown that a late spray of fungicide to protect against leaf rust significantly reduces lodging and head loss in the barley varieties that are most susceptible to disease. [10]

12.4 Fire prevention

Grain growers must take precautions during the harvest season when operating machinery in extreme fire conditions. They should take all possible measures to minimise the risk of fire. Fires are regularly experienced during harvest in stubble as well as standing crops. The main cause is hot machinery combining with combustible material. This is exacerbated on hot, dry, windy days. Seasonal conditions can also contribute to lower moisture content in grain and therefore a higher risk of fires. [11]

12.4.1 Using machinery

To prevent machinery fires, it is imperative that all headers, chaser bins, tractors and augers be regularly cleaned and maintained. All machinery and vehicles must have an effective spark arrester fitted to the exhaust system to prevent fires. To prevent overheating of tractors, motorcycles, off-road vehicles and other mechanical equipment, all machinery needs to be properly serviced and maintained. Keeping fire-fighting equipment available and maintained is not just common sense—it is a legal requirement.

Take great care when using this equipment outdoors. Tips on machinery include:

- Be extremely careful when using cutters and welders to repair plant equipment, including angle grinders, welders and cutting equipment.
- Ensure that machinery components including brakes and bearings do not overheat; these components can drop hot metal on to the ground, starting a fire.
- Use machinery correctly; incorrect usage can cause it to overheat and ignite.
- Be aware that blades of slashers, mowers and similar equipment may hit rocks or metal, causing sparks to ignite dry grass.
- Avoid using machinery during inappropriate weather conditions such as high temperatures, low humidity and windy conditions.
- Do maintenance and repairs in a hazard-free, clean working area such as on bare ground or concrete or in a workshop, rather than in the field.
- Keep machinery clean and as free from fine debris as possible to reduce risk of on-board ignitions. [12]

Downloaded the Farm FireWise Checklist and Action Plan, or you can request one through your local Fire Control Centre.

12.4.2 Steps to preventing header fires

With research showing that 12 harvesters, on average, are burnt to the ground every year in Australia (Figure 2), agricultural engineers encourage care in keeping headers clean to reduce the potential for crop and machinery losses.

[10] K Porker, R Wheeler (2014) Getting the best from barley; agronomy and management. GRDC Update Papers, 25 February 2014, http://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2014/02/Getting-the-best-from-barley-agronomy-and-management

[11] NSW Rural Fire Service. Farm fire safety. Farm FireWise. NSW Government, http://www.rfs.nsw.gov.au/plan-and-prepare/prepare-your-property/farm-fire-safety

[12] NSW Rural Fire Service. Farm fire safety. Farm Firewise, NSW Government, http://www.rfs.nsw.gov.au/plan-and-prepare/prepare-your-property/farm-fire-safety

Figure 8: Keeping headers clean can reduce the risk of fire. (Photo: Rebecca Thyer)

Key points:

- Most harvester fires start in the engine or engine bay.
- Others are caused by failed bearings, brakes and electricals and rock strikes.
- Regular removal of flammable material from the engine bay is urged. [13]

12.5 Receival standards

The minimum protein level acceptable for malt-grade barley is 9%. Malt protein content is reported at 0% moisture (dry), which will be 1–1.5% higher than the 'as-is' basis commonly used for feed grain. In line with malting industry standards, GrainCorp reports all protein figures at 0% moisture basis. Feedlots generally use the 'as-is' figure.

Growers should check receival standards with GrainCorp or their local grain merchant. Updated specifications are usually available from July each season, with all relevant information. Other purchasers of barley grain may use different specifications. [14]

Most grain purchasers will base their quality requirements on Grain Trade Australia (GTA) standards. For feed barley, grain is required to meet screenings and hectolitre weight specifications. For malting barley, as well as screenings and hectolitre weights, there are requirements for retention (above the 2.5-mm screen) and protein.

GrainCorp provides a grower harvest information kit, including local contacts, contract options, warehousing conditions, grain-protection strategies and more. [15]

Download the latest barley receival standards from the GTA website.

[13] N Baxter (2012) A few steps to preventing header fires. GRDC Ground Cover Issue 101, 2 November 2011, http://www.grdc.com.au/Media-Centre/Ground-Cover/Ground-Cover-Issue-101/A-few-steps-to-preventing-header-fires

[14] DAF Qld (2012) Barley planting, nutrition and harvesting. Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

[15] DAF Qld (2012) Barley planting, nutrition and harvesting. Queensland Department of Agriculture and Fisheries Queensland, https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/barley/planting-nutrition-harvesting

FAQ

12.6 Harvest weed-seed control

Targeting weed seeds at harvest is a pre-emptive action against problematic populations of annual weeds. Our most damaging crop weeds—annual ryegrass, wild radish, wild oats and brome grass—are all capable of establishing large, persistent seedbanks. If annual weeds are allowed to produce seed that enters the seedbank, the cropping system will inevitably be unsustainable.

More information

GRDC Webinars: Beginner's guide to harvest weed seed control

Fortunately, seedbank decline is rapid for these weed species, with annual seed losses of 60–80%. Without inputs, a very large seedbank (>1000 seed/m^2) can therefore be reduced to a very modest one (<100 seed/m^2) in just 4 years. A small seedbank of weeds allows easier and more effective weed control with a reduced risk of development of herbicide resistance. Effective weed management in productive cropping systems is thus reliant on preventing viable seed from entering the seedbank. Several systems developed over the past three decades target the weed-seed-bearing chaff fraction during harvest. [16]

12.6.1 Intercepting annual weed seed

In Western Australia, where high frequencies of herbicide-resistant annual weed populations have been driving farming practices for the last decade, techniques targeting weed seeds during harvest have been widely adopted, and these techniques are now being adopted in the southern states. At crop harvest, much of the total seed production for the dominant weed species is retained above harvester cutting height (Table 1). Additionally, for some of these species such as wild radish, high levels of seed are maintained over much of the harvest period (Figure 3). Therefore, the collection and management of the weed-seed-bearing chaff fraction can result in significant reductions in population densities of annual weeds.

Table 3: Proportion of total weed-seed production retained above a low harvest cutting height (15 cm)

Species	Seed retention above 15 cm (%)
Annual ryegrass	88
Wild radish	99
Brome grass	73
Wild oats	85

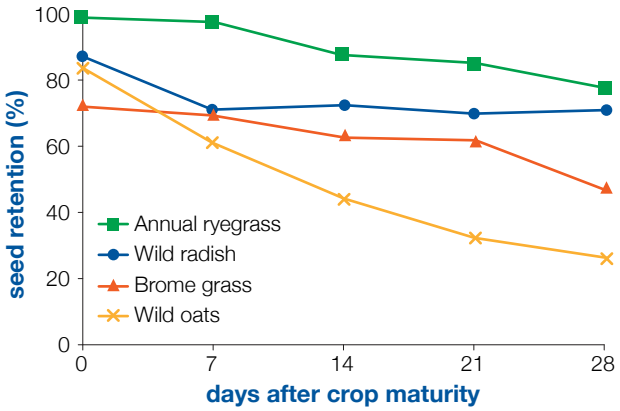

Figure 9: Seed retention above a harvest height of 15 cm over the first 4 weeks of harvest for the major crop weeds of Western Australian wheat crops.

Lower in-crop weed densities are easier to manage and their potential development as herbicide-resistant populations is dramatically reduced. Western Australian farmers

[16] M Walsh, S Powles (2012) Harvest weed seed control. GRDC Update Papers, 12 April 2012, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Harvest-weed-seed-control

More information

IWM in Australian cropping systems: Section 4. Tactics

have driven the development of several systems now available that reduce inputs of annual ryegrass, wild radish, wild oats and brome grass into the seedbank. The adoption of these systems has been critical for the continuation of intensive cropping systems. [17]

A key strategy for all harvest weed-seed control operations is to maximise the percentage of weed seeds entering the header. This means harvesting as early as possible before weed seed is shed, and harvesting as low as is practical (e.g. 'beer-can' height).

12.6.2 Burning of narrow windrow

During traditional whole-paddock stubble burning, the very high temperatures needed for weed-seed destruction are not sustained for long enough to kill most weed seeds. By concentrating harvest residues and weed seed into a narrow windrow, fuel load is increased and the period of high temperatures extends to several minutes, improving the kill of weed seeds.

Establishing narrow windrows suitable for autumn burning (Figures 4 and 5) is achieved by attaching chutes to the rear of the harvester to concentrate the straw and chaff residues as they exit the harvester. This concentration of residue increases the seed-destruction potential of residue burning. With more fuel in these narrow windrows, the residues burn hotter than standing stubbles or even conventional windrows. Weed-seed kill levels of 99% for both annual ryegrass and wild radish have been recorded from the burning of wheat, canola and lupin stubble windrows. [18]

Note that narrow windrow burning is not generally recommended in barley because of the bulkier canopy posing a greater risk of fire escape to the rest of the paddock.

Figure 10: Harvest in action—producing narrow chaff rows for burning the following autumn. (Photo: A Storrie)

[17] M Walsh, S Powles (2012) Harvest weed seed control. GRDC Update Papers, 12 April 2012, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Harvest-weed-seed-control

[18] M Walsh, S Powles (2012) Harvest weed seed control. GRDC Update Papers, 12 April 2012, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Harvest-weed-seed-control

GRDC Videos

Weed seed bank destruction—windrow chute design

Weed seed bank destruction—header setup and tips for narrow windrowing

Weed seed bank destruction—narrow windrow burning

Weed seed bank destruction—burning windrows safely

Weed seed bank destruction—nutrient Losses: comparing chaff heaps with narrow windrows

Weed seed bank destruction—vary windrow placement to avoid potassium concentration

More information

GRDC/Grassroots Agronomy: Narrow windrow burning in southern NSW

GRDC Report: Developments in stubble retention

IWM Section 4. Tactics

Figure 11: Windrow burning. (Photo: Penny Heuston)

12.6.3 Chaff carts

Figure 12: Chaff cart in action at Tarin Rock, Western Australia. (Photo: A Storrie)

Chaff carts are towed behind headers during harvest to collect the chaff fraction as it exits the harvester (Figure 6). Collected piles of chaff are then either burnt the following autumn or used as a source of stock feed. [19]

The weed-seed collection efficiency of several commercially operating harvesters with attached chaff carts was evaluated by the *Australian Herbicide Resistance Initiative* (AHRI); harvesters were found to collect 75–85% of annual ryegrass seeds and 85–95%

More information

IWM Section 4. Tactics

[19] GRDC. Section 6: Managing weeds at harvest. GRDC Integrated Weed Management Hub, http://grdc.com.au/Resources/IWMhub/Section-6-Managing-weeds-at-harvest

of wild radish seeds entering the front of the header during the harvest operation. Collected chaff must be managed to remove weed seeds from the cropping system. [20]

12.6.4 Bale-direct systems

An alternative to the *in-situ* burning or grazing of chaff, the bale-direct system uses a large baler attached to the back of the harvester to collect all chaff and straw material as it exits the harvester. As well as removing weed seeds, the baled material has an economic value as a livestock feed source. [21]

The bale-direct system was developed by the Shields family in Wongan Hills as a means of improving straw hay production. It consists of a large square baler directly attached to the harvester that collects and bales all harvest residues. A significant secondary benefit is the collection and removal of annual weed seeds. Studies by AHRI determined that ~95% of annual ryegrass seed entering the harvester was collected in the bales. [22]

As well as being an effective system for weed-seed removal, the baled material can have a substantial economic value as a feed source. However, as with all baling systems, consideration must be given to nutrient removal. [23]

For the story of development of header-towed baling systems, see: http://www.glenvar.com/.

12.6.5 Harrington Seed Destructor

The Harrington Seed Destructor (HSD) is the invention of Ray Harrington, a progressive farmer from Darkan, Western Australia. Developed as a trail-behind unit, the HSD system comprises a chaff-processing cage mill, chaff and straw delivery systems. The retention of all harvest residues in the field reduces the loss and/or banding of nutrients and maintains all organic matter to protect the soil from wind and water erosion, as well as reducing evaporation loss compared with windrow burning, chaff carts and baling. [24]

12.6.6 Chaff grinding

Processing of chaff sufficient to destroy any weed seeds that are present during the harvest operation is the ideal system for large-scale Australian conservation cropping systems. Rendering weed seeds non-viable as they exit the harvester removes the need to collect, handle and/or burn large volumes of chaff and straw residues. The importance and potential industry benefits of this process have meant substantial interest in the development of an effective system.

Evaluation under commercial harvest conditions by AHRI has determined that the HSD process will destroy ≥95% of annual weed seed during harvest. A new version of the HSD, a prototype 'Integrated Weed Destructor', has been developed by engineers at the University of SA in collaboration with AHRI. It is mounted within the rear of the harvester. Testing and development are under way. [25,26]

GRDC Videos

Weed seed bank destruction—an integrated approach to weed management

Weed seed bank destruction—more efficient use of chaff carts

Weed seed bank destruction—wild radish seed

Weed seed bank destruction—burning chaff dumps

Weed seed bank destruction—seeing results from integrated weed management

More information

IWM Section 4. Tactics

More information

AHRI: Weed Destructor integrated into harvester

IWM Section 4: Tactics

GRDC Videos

IWM—Harrington Seed Destructor (3 videos)

Weed seed destruction—beer can height

Weed seed bank destruction—lessons learned—windrowing canola

Weed seed bank destruction—Spear grass (*Bromus* spp.) an emerging problem

[20] M Walsh, S Powles (2012) Harvest weed seed control. GRDC Update Papers, 12 April 2012, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Harvest-weed-seed-control

[21] GRDC. Section 6: Managing weeds at harvest. GRDC Integrated Weed Management Hub, http://grdc.com.au/Resources/IWMhub/Section-6-Managing-weeds-at-harvest

[22] M Walsh, S Powles (2007) Management strategies for herbicide-resistant weed populations in Australian dryland crop production systems. Weed Technology 21, 332–338, http://www.jstor.org/stable/4495856?seq=1#page_scan_tab_contents

[23] M Walsh, S Powles (2012) Harvest weed seed control. GRDC Update Papers, 12 April 2012, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Harvest-weed-seed-control

[24] GRDC. Section 6: Managing weeds at harvest. GRDC Integrated Weed Management Hub, http://grdc.com.au/Resources/IWMhub/Section-6-Managing-weeds-at-harvest

[25] M Walsh, S Powles (2012) Harvest weed seed control. GRDC Update Papers, 12 April 2012, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Harvest-weed-seed-control

[26] AHRI (2013) Weed Destructor integrated into harvester. AHRI, University of Western Australia, http://ahri.uwa.edu.au/weed-destructor-integrated-into-harvester/

More information

Grassroots Agronomy: Narrow windrow burning in southern NSW

GRDC Fact Sheets: Managing the weed seedbank

GRDC Ground Cover: Harvest systems combined to crush weed-seed resistance

GRDC: The effectiveness of on-farm methods of weed seed collection at harvest time: Case studies of growers in the Albany Port Zone

12.7 Summary

Productive, large-scale conservation cropping as practised across large areas of the Australian grainbelt is reliant on herbicides for the management of weed populations. This reliance has produced, and continues to produce, widespread occurrence of herbicide-resistant weed populations. Herbicide dependency and resulting loss of effective herbicides is constraining effective grain crop production. Consequently, producers are farming to control weeds instead of for grain crop production. Harvest weed-seed control provides the opportunity to manage weed populations more effectively and to move away from reliance on herbicidal weed control. The consequence is that growers regain flexibility in the overall management of their cropping program. [27]

GRDC Update papers

Development of the Harrington Seed Destructor

The nuts and bolts of efficient and effective windrow burning

Windrow burning for weed control—WA fad or viable option for the east

GRDC Videos

GCTV1: Integrated weed control & HSD

GCTV10: Harvester mounted weed destructor

GRDC Webinar: A beginner's guide to harvest weed seed control

IWM—Weed seed capture at harvest (5 videos)

GCTV15: Harvest weed seed control

Weed seed destruction—weed seed management

Weed seed destruction—weed seed capture

Weed seed bank destruction—herbicides alone not the answer

Weed seed bank destruction—seeing results from integrated weed management

Over the Fence: Windrow burning beats wild radish

Videos

AHRI: Sustaining herbicides with harvest weed seed management

DAFWA: Burning windrows for weed control

Grassroots Agronomy: NWB Show and Tell video 1: paddock experiences in SNSW

Grassroots Agronomy: NWB Show and Tell video 2: chute designs from the growers' perspective

WeedSmart: Capture weed seeds at harvest: chaff carts

WeedSmart: Capture weed seeds at harvest: Harrington Seed Destructor

WeedSmart: Capture weed seeds at harvest: windrow burning

WeedSmart: Chaff carts as part of the arsenal

WeedSmart: Control harvest weed seed set with windrows and crop topping

WeedSmart: Grazing chaff dumps

WeedSmart: Narrow windrow burn like a pro

WeedSmart: Setting up your header for harvest weed seed control

[27] M Walsh, S Powles (2012) Harvest weed seed control. GRDC Update Papers, 12 April 2012, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Harvest-weed-seed-control