SECTION 12

Harvest

For more information, see the *GRDC GrowNotes WHEAT (Northern region),* Section 12: Harvest.

12.1 Dry harvest issues and management

Attention to detail at harvest is required for durum wheat. Premiums are only paid when grain is large and undamaged, not mottled or bleached and, most importantly, not contaminated by other grains, and meets all other delivery specifications. Therefore, issues of grain-harvester machine settings, careful segregation and clean, insect-free grain storage must receive attention. Damaged, contaminated or insect-infested grain will be downgraded. Durum wheat is a high-quality product trading into a high-quality food market and attention to detail at harvest is critical. [1]

EGA Bellaroi(Ⓓ) is marginally more difficult to thresh than Hartog and Sunco, but easier than Sunlin; consequently, concave adjustments may be necessary. These durum varieties are not prone to shelling, a factor of significance when wind and rain prevail at harvest. All grain should be retained in the head despite these weather conditions. Care needs to be exercised when threshing the crop, as the very hard grain has a greater tendency to fracture than grain of bread wheats. The crop should be stripped as soon as the grain reaches dead ripe maturity. Buyers of durum grain consider grain appearance important and pay premiums for large, well-filled, hard, vitreous grain with a low percentage of mottled and bleached seeds. [2]

Black point is a dark discoloration at the germ end of otherwise healthy grain. In wheat, the discoloration occurs in the outer portions of the seed and, in some severe cases, may extend along the groove on the underside of the grain. [3] Jandaroi(Ⓓ) and EGA Bellaroi(Ⓓ) are significantly more resistant to the problem than Kamilaroi(Ⓓ), but this resistance may not offer sufficient protection in prolonged wet seasons. Ensure that all grain handling equipment (e.g. headers, bins, augers, silos etc.) are free of contaminant grain, as the presence of foreign seeds (maximum 3% bread wheat seed) can downgrade the crop grain. [4]

Although durums have slightly better resistance to pre-harvest sprouting than current bread wheats, they may be downgraded to feed due to bleaching and softening of the grain in prolonged wet harvest seasons. [5]

1 J Kneipp (2008) Durum wheat production. NSW Department of Primary Industries, http://www.nvtonline.com.au/wp-content/uploads/2013/03/Crop-Guide-NSW-Durum-Wheat-Production.pdf

2 Hare, R, (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

3 DAFF (2012) Durum wheat in Queensland. Queensland Department of Agriculture, Fisheries and Forestry, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/wheat/durum-wheat

4 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

5 DAFF (2012) Durum wheat in Queensland. Queensland Department of Agriculture, Fisheries and Forestry, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/wheat/durum-wheat

12.2 Receival standards

Six aspects of grain quality are considered at receival:

1. Protein
2. Test weight
3. Screenings
4. Falling number
5. Black point
6. Weed seed contamination

The endosperm section of the grain is the important part, as it is this fraction that is processed into semolina (a coarse flour) and, in turn, mixed with a little water to form a stiff dough under vacuum and extruded under pressure into pasta, forming various shapes—both long and short goods. The endosperm is the food supply or life-support system for the developing embryo. The endosperm and embryo are 'wrapped up' in several layers of tissue called the aleurone, pericarp and testa. The embryo and outer grain layers are removed during milling, into the bran and pollard fractions, while the endosperm is reduced to semolina. The endosperm is composed of numerous constituents including starch, sugars, proteins, amino acids, minerals, fats, vitamins, enzymes, pigments and fibre. A large, well-filled grain with bright amber colour and oval shape with minimal crease length is required at receival. [6]

Durums express a satisfactory level of resistance to pre-harvest sprouting compared with current bread wheat varieties. Weather-affected grain is soft, which reduces the semolina extraction in the mill. Weathered semolina gives low pasta-dough strength due to the partial enzymatic breakdown of starches and proteins. These small protein and starch molecules have reduced cohesive properties. Weak doughs make inferior pasta. High-protein durum grain with a bright amber bloom is certain to attract the best available premium price. It is not advisable to leave your durum harvest until last, relying on its weathering resistance. Its resistance is only relative to other varieties and will eventually fail. Weathered durum is not valuable and may be received as feed grain. [7]

Black point is a discoloration of sections of the external layers of the grain (i.e. pericarp/testa). A small percentage of discoloured seeds will be present following a wet pre-harvest period when the problem is most active. This level of incidence should be below the minimum dockage limits in most seasons. Black point tolerances are 3% for ADR1 and 3–5% for ADR2 and ADR3. Because small fragments of bran are included in semolina, discoloured grain will leave small black specks, which can be seen in the vitreous (translucent) pasta. The overall appearance of pasta with black specks is diminished and there is some consumer reluctance to purchase the product. Black specks can be perceived as contaminants (e.g. soil, insect parts). If sown, grain with black point will germinate satisfactorily. EGA Bellaroi(b) is significantly more resistant to black point than Kamilaroi(b) and many of the current bread wheats. Research findings suggest that black point is not a disease caused by fungi, but a physiological character resulting from the formation of dark compounds in the outer layers of the grain. Some varieties are more prone to develop these dark compounds when appropriate conditions prevail (e.g. warm and moist). [8]

6 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

7 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

8 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

Protein content is an important factor in grain classification at receival, with classifications and premiums as follows:

- ADR1 attracts a premium around APH or better
- ADR2 attracts a premium around AH or better [9]

Grain with adequate protein is very hard, vitreous and free from mottling. For milling, a small percentage of mottled grains can be tolerated in top grades, but a greater proportion will result in downgrading and a reduced premium. Vitreous grain contains sufficient protein to combine all the starch granules; however, a shortage of protein will give a mottled, softer grain. Protein can be envisaged as the equivalent of cement, which binds the starch granules or the aggregate together. With insufficient cement, the aggregate will not all bind and thus the concrete will be weak and break down readily. The same is the case with mottled sectors in grain. The degree of mottling in individual grains, together with the percentage of mottled grains in the seed lot, both contribute to the 'flour' formation and consequent milling losses. 'Flour' or 'fines' has a lower economic value than that of semolina. Hard, vitreous grains shatter into rough aggregates and produce a high semolina yield. [10]

For pasta making, the canning industry specifies high-protein semolina for canned pasta. High-protein pasta withstands the high pressure/temperature cooking and retorting processes in acidic tomato pasta. Further, this pasta retains its consistency on warming and serving by the consumer. Dry pasta manufacturers require acceptable levels of protein but not as high as those required by the canning industry. Low-protein semolina is unsuitable for pasta making as it has insufficient protein to give the product acceptable keeping, cooking and eating consistency. EGA Bellaroi(Þ) and the newer varieties, Jandaroi and Caparoi, are highly suitable for pasta and couscous production which are regarded by many Italian manufacturers as being equivalent to the best in the world. [11]

The protein content of grain is largely under environmental control. Plants growing in soils with adequate nitrogenous fertility will lay down acceptable protein levels in the grain. EGA Bellaroi(Þ) and Jandaroi(Þ) have the genetic capability to achieve higher protein content (up to 1%) than Caparoi(Þ). [12]

The grain protein comprises a large number and complex range of protein types. The proteins range from short molecules to long, folding molecules. The long molecules adhere to each other and form an interlocking network, which prevents the starch and other components from moving freely. The degree of interlocking (chemical bonds) between these long-chained proteins determines the mobility of the pasta dough, which is called the 'dough strength'. Pasta dough strength, or the resistance of the dough to move under work (force), is mainly under genetic control. Cultivars that offer strong to very strong pasta doughs have been released. The dough strength, which is equivalent to protein strength, is a key determinant of pasta quality through its effect on the internal consistency of extruded products. Pastas made from strong protein doughs retain their shape and consistency on cooking and eating. Weaker pastas tend to break down

9 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

10 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

11 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

12 R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

during cooking to a rather unpalatable mess. Bread wheat pastas are of this undesirable type. [13]

The colour of pasta is a factor in consumer acceptance. Pale to white or brown pastas do not have a pleasing appearance and they are passed over for the bright, clear yellow pasta by the consumer. Only durum wheat can provide this colour without the addition of expensive synthetic pigments or egg products. The addition of artificial colours is banned in Italy and France. Law dictates that durum wheat must be used for dry pasta in these countries. Pasta colour is principally under genetic control; therefore, only highly coloured varieties are released. The pre-release varieties from the DBA program offer significantly improved colour compared with Bellaroi(b), Caparoi(b) and Jandaroi(b). [14]

12.3 Harvest weed-seed management

It is most important to control weeds in the crop, as some weed species, such as bindweed and New Zealand spinach, have small black seeds that can be difficult to remove from the grain. These seeds have the same effect on consumer acceptance as black point contamination. The black seeds shatter during milling to leave numerous small black fragments mixed in the semolina. [15]

For more information about the growing area of weed seed control, see the *GRDC GrowNotes WHEAT (Northern region)*, Section 12: Harvest.

[13] R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

[14] R Hare (2006Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf

[15] R Hare (2006) Agronomy of the durum wheats Kamilaroi, Yallaroi, Wollaroi and EGA Bellaroi. Primefacts 140, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/63646/Agronomy-of-the-durum-wheats---Primefact-140-final.pdf