

# White cottonseed – a supplementary feed for beef cattle

## Ian Blackwood

Livestock Officer, Extensive Industries  
Development, Paterson (Tocal)

### WARNING

White cottonseed (WCS) and de-linted cottonseed (black cottonseed) may contain residue of chemicals applied to the cotton crop during the growing season. The Australian Pesticides and Veterinary Medicines Authority (APVMA) calculates maximum residue levels on the basis of a 30% maximum dry matter (DM) intake of cottonseed (WCS and black cottonseed) in the diet. This means that using WCS at levels above 30% of the total dry matter intake could result in excessive residues in cattle.

This is particularly true for cattle destined for export markets, where the 30% limit set to comply with domestic MRLs may not apply. If you have fed WCS from crops treated with chemicals within 60 days of harvest (all cottonseed would be in this category), to cattle within 60 days of sending them for sale/slaughter, then you must disclose this at Question 7 of the National Vendor Declaration (Cattle).

The NSW Department of Primary Industries does not recommend the use of cottonseed at more than 30% of the total dry matter intake, even in severe drought.

### Introduction

White cottonseed (WCS) is the seed remaining after the ginning process. It is known as raw white or 'fuzzy' cottonseed as it still has some lint left on the seed.

WCS can be used as a supplement to dry standing feed to increase dry matter intake or as a component of a drought diet. It can be used as, and in, a supplement when a paddock has more than 1200 kg DM/ha of pasture.

- dry standing pasture (green less than 500 kg/ha/DM) quality declining,
- frosted mature native pasture, low quantity,
- frosted mature improved grass with some clover, low quantity,
- where pasture dry matter exceeds 1200 kg DM/ha and 54% digestibility and the purpose is to maintain liveweight.

It can be used as a component in drought feeding rations in conjunction with molasses or grain.

### Feed value and problems

WCS is a nutrient dense feed in energy, protein and fibre. Rumination of WCS causes a slow release of nutrients which makes feeding more beneficial.

Usable Energy (ME) MJ/kg dry	Crude Protein % of dry feed	Fibre (acid detergent fibre)
13	20 (range 12-22)	52%

- Fibre level is high (acid detergent fibre 52%).
- Oil content varies between 18% and 22%.
- Cottonseed is high in energy (from the oil content) and in protein.
- Dry matter is 90–93%.
- Digestibility is 80%.
- Calcium is 0.15%; phosphorus is 0.75%.
- Some lint (about 8%) is retained on the seed.
- It does provide some roughage:
  - 1 kg WCS = 0.5 kg fibre.

### Cottonseed as an alternative to urea

Cottonseed can replace urea as a nitrogen supplement.



WCS grams/day	Provides rumen protein equal to	Urea grams/day
900	50	

When used to replace urea, cottonseed must be fed daily and be fed with dry roughage available (more than 1200 kg DM/ha).

Because cottonseed contains equivalent energy to grain, and urea contains no energy, cottonseed supplies a more balanced supplement.

## Gossypol

Gossypol is a naturally occurring pigment present in the cottonseed. In cottonseed, the gossypol is present in a form known as 'free' gossypol. The rumen of cattle can detoxify free gossypol but only up to a certain level.

Free gossypol levels in WCS are:

USA	Australia
0.39% – 1.7%	0.55% – 1.6% (based on a 4-gin site 'spot' analysis by Cargill)

This is potentially harmful to several classes of stock:

- calves less than 4 months of age – just 10 g/day of WCS would supply the toxic limit for calves.
- cattle 12 months of age or older – where 'free' gossypol intakes exceed 25 g/day in the diet (2.5 kg WCS supplies 25 g/day)
- bulls – not more than 0.5 kg/hd/day WCS.

The amount shown in the following feeding rates section should avoid gossypol toxicity from excess gossypol intake when feeding white cottonseed.

## Effect on bulls

Work in the USA with bulls has looked at young developing bulls (6 months age to 14 months age) and mature bulls.

Early work with mature bulls (60 days feeding) shows damage to sperm-producing tissue and lower semen quality. However, partial recovery is reported. It is not reported whether this resulted in lower conception rates on subsequent joining.

With young developing bulls fed for 8 months (i.e. 6–14 months of age), as little as 1.6 g/day of free gossypol intake reduced semen quality and damaged sperm-producing tissue. No partial recovery assessment was made in this study.

The cow seems to be relatively insensitive to the anti-fertility effect of gossypol.

There are no studies that have assessed any similar results for ovary function in cows or heifers.

## Semen quality

The literature from the USA shows that WCS in the diet of bulls can reduce semen quality when compared to diets containing no gossypol. Effects were seen in immature spermatozoa, detached sperm heads and a decrease in number and mobility of spermatozoa.

Degeneration of testicular tissue (germinal epithelium – the layer of cells that produce sperm) is recorded. The observation is that it takes approximately 6 weeks after gossypol is removed from the diet for semen to return to normal.

**Note.** None of the semen quality work above has proven that WCS feeding will reduce conception rates in paddock joining, at a specific gossypol intake level. The trials did not determine if WCS feeding, for the free gossypol levels supplied in the diets, left the bulls infertile.

## Sex drive

A study in Texas showed that free gossypol in the diet did not alter blood serum testosterone levels, indicating that gossypol *does not* affect the sex drive of bulls.

Most of the work in the USA has been done with young developing bulls. In other work it is unclear if the results were from young immature bulls or mature bulls.

## Practical implications for bulls

Feeding WCS to bulls may result in fertility problems at joining. No 'safe' gossypol intake/ day level is recorded. Until more definite work is done, WCS should be excluded from bull diets or limited to 0.5 kg/hd/day in a mix, in the two months before joining.

Where cows are being supplemented with WCS over joining, a maximum feeding rate of 2.5 kg/hd/day is suggested. This means that any bulls feeding with the cows would have a free gossypol intake of about 25 grams/hd/day.

Semen quality would be expected to decline over the joining period, especially from 2 months on, although the bulk of the mating would be done, providing the bull was not put out too early.

## Effects on calves

When WCS is used to supplement cows through the joining period, then young calves 4 to 16 weeks

would be at risk from gossypol toxicity if they consumed 10 g per hd/day of WCS.

There are no reports of calf losses where WCS is being fed to cows over the rejoining period. This probably means that in practice:

- cows feeding on WCS eat the ration quickly, or
- boisterous feeding behaviour of cows discourages calves from feeding, or
- WCS is not attractive to young calves.

Towards the end of joining, the older calves can be expected to show interest in feeding and would compete with the cows for the supplement. Risks would increase depending on the rumen development on the older calves and their intake of WCS.

#### Warning

White cottonseed should not be fed to:

- horses,
- pigs,
- poultry,
- calves less than 140 kg liveweight.

#### Recommendations

- Do not feed WCS to calves with still developing rumen, i.e. less than 4 months of age.
- Calves 5–12 months of age, in drought conditions, will have a functioning rumen but cannot tolerate feeding rates of WCS above 2 kg/hd/day under 200 kg liveweight.
- Avoid feeding WCS to bulls for 60 days pre-joining and during the joining period if possible.
- Add limestone to the WCS at the rate of 0.5% to 1.0% or 5–10 kg/tonne of WCS. This assists the rumen to detoxify gossypol.

#### Feeding white cottonseed

The amount we can feed is limited by:

- the potential risk from chemical MRLs
- oil intake and its effect on the rumen
- risks of gossypol toxicity.

#### Introducing white cottonseed

Feed daily amounts for 10 days before switching over to twice weekly feeding. Molasses can be used as an attractant to entice cattle onto WCS. Alternatively, coarse salt could be used.

#### How to feed

White cottonseed is fed whole (unprocessed). If using troughs allow 600 mm/head for adult stock. If dump feeding, use small dumps across the paddock, enough for 4 head to feed from. The weight of feed can be estimated.

#### Supplementary feeding

With dry standing feed available (more than 1200 kg DM/ha):

Cows with young calves at foot	1 – 2.5 kg/hd/day
Dry breeders	1 – 2 kg/hd/day
Steers	1 kg/hd/day
Weaners	1 kg/hd/day

#### Low Pasture Quantity

On the Far North Coast, Bill Hoffman has developed a series of feeding rates based on a mix of whole cottonseed and cottonseed meal or Norpro<sup>®</sup> at 1:1 by weight. The WCS and protein meal mix very well as the meal sticks to the lint on the seed. It can be trough-fed or put on the ground in approximately 20 kg heaps, 3–5 metres apart.

The feeding rates are based on there being sufficient pasture available (1200–1500 kg DM/ha) across low and medium quality pastures.

*Whole cottonseed + cottonseed meal kg/hd/day, assuming low pasture availability*

Pasture quality	Weaners (calves at foot)	Dry stock	First calvers
<b>Low – frosted matured and native pasture</b>	1.0	-	2.5
<b>Medium – frosted matured and improved grasses with some clover</b>	1.0	-	2.0

These rates should not be fed for more than 3 months.

#### Drought feeding

##### Feeding white cottonseed only

In severe droughts WCS has been used as a sole drought feed for beef cattle but pasture availability must not fall below 800 kg DM/ha. Below 800 kg, DM/ha pasture ground cover will be less than 70% on most pastures (improved and native). Not only is this not enough to support the 70:30 roughage:WCS ratio, but it would also lead to

degradation of the paddock. De-stocking of pastures below 800 kg DM/ha is recommended.

### Recommendation

WCS-only diets should not exceed 2.5 kg/hd/day for adult stock where roughage is available. Do not feed where no roughage is available.

### Feeding WCS with grain

*Cottonseed as an aid to introducing cattle to grain feeding*

WCS is a 'rumen friendly' feed so it can be used to introduce cattle to grain feeding. Use 30%:70% mixtures of grain: WCS to reduce grain poisoning when cattle are first being introduced to grain rations. The cottonseed portion is reduced slowly for the first 2–4 weeks and then reduced by 10% every week until only grain is being fed.

*Cottonseed as an additive to a full grain ration*

Use the above approach but do not remove WCS from the mix. A mix of 70:30 grain:WCS is ideal for cows being drought fed. An upper limit of 1.8 kg WCS/hd/day should be fed.

### Twice weekly versus second daily feeding

Twice weekly feeding means offering daily amounts on a twice weekly basis (3 days quantity then 4 days quantity). This feeding method would best suit the grain:WCS feed mix.

It is not known if feeding twice weekly increases the risk of gossypol absorption and possible deleterious effects in bulls, or even cows. Practical experience indicates that this is not a problem for short-term feeding (up to 3 months).

Feeding every second day provides more control of intakes than twice weekly feeding.

### Handling whole cottonseed

- In bulk, 12 t of cottonseed is equivalent to 20 t of grain in volume. Most NSW suppliers can arrange transport in special 'walking floor' body trucks or with 'hungry' boards to maximise payload to 20 tonne of whole cottonseed.
- Don't store WCS in grain silos.
- It does not flow so it cannot be augered.
- Handle with a front-end loader, tractor blade or a grain shovel.
- WCS should be stored in a shed. If stored outside, cover it with a tarp or black plastic to prevent rain spoiling it.
- **Note:** Mouldy whole cottonseed can cause stock losses, or reduce performance.

- Cottonseed can combust spontaneously if it is stored wet or stacked more than 5 metres high.
- Storage life is at least one year but watch for weevil infestation. Fumigation is necessary for storage longer than a year.

### Availability

White cottonseed is available during the ginning season from April through to August. WCS is marketed by oilseed crushers such as Cargill, on behalf of the cotton ginning companies. Because the WCS crop is forward sold for export (usually around 70% of estimated tonnage), orders are required to ensure domestic supply.

Orders can be placed through Cargill, Melbourne or Brisbane. Cotton ginning companies also sell direct to users. Commodity traders also on-sell to users. 'Spot' market WCS will always be more expensive as it represents the trader's profit.

### Manufactured cottonseed products

A number of 'manufactured' cottonseed products are now available. These products are usually coated white cottonseed. The coating process makes the WCS easier to handle by changing its physical characteristics and increasing bulk density (leading to cheaper transport costs). Coated WCS can be handled as you would handle grain.

The manufactured cottonseed products should be used in the same way, and under the same limitations, as WCS and black (de-linted) cottonseed.

### Black cottonseed

Black cottonseed is white cottonseed with the lint component removed. This is usually done only for seed cotton to be used to sow the next season's crop.

Because of this, black cottonseed may be treated with seed treatment chemicals to protect it from insect and fungal damage. These chemicals may not be safe for beef cattle.

A vendor declaration is recommended when you buy black cottonseed.

### Vendor declarations

All cottonseed based commodities should be accompanied by a vendor declaration that states their residue risk status for ruminants.

The current practice is for a declaration stating that no chemicals have been applied during the period from ginning to cottonseed sale, i.e. the period under the control of the gin.

Further information is available from Primefact 315 *Buying stock feeds: minimising chemical residue risks*.

### **Genetically modified cottonseed**

The majority of the NSW/QLD cotton crop is grown from genetically modified seed.

This means that the cottonseed co-products will contain a majority of genetically modified (GMO) seed. At ginning there is no segregation, meaning that the cotton seed commodity sold is a blend of GMO and non GMO seed.

This will only be a use limitation if the market you supply stipulates freedom from GMO stock feeds. At this stage the commodity beef markets have no known restrictions in place.

### **Publications available**

For a complete list of NSW Department of Primary Industries Primefacts and Farm Enterprise Budgets on the Web, see the Web site at:

[www.dpi.nsw.gov.au/aboutus/resources](http://www.dpi.nsw.gov.au/aboutus/resources)

---

© State of New South Wales  
through NSW Department of Primary Industries 2007

ISSN 1832-6668

Replaces Agnote DAI-274

Check for updates of this Primefact at:

[www.dpi.nsw.gov.au/primefacts](http://www.dpi.nsw.gov.au/primefacts)

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (February 2007). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries or the user's independent adviser.

The product trade names in this publication are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product name does not imply endorsement by NSW Department of Primary Industries over any equivalent product from another manufacturer.

Recognising that some of the information in this document is provided by third parties, the State of New South Wales, the author and the publisher take no responsibility for the accuracy, currency, reliability and correctness of any information included in the document provided by third parties.

Job number 7086