

## VELVET ANTLER



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Deer velvet has been used in Chinese medicine for at least 2,000 years [50]. It is used either as an ingredient in pharmaceutical products or as a stand-alone product. Historically, most velvet antler used in oriental medicine has been sourced from Sika, Red, Wapiti and Reindeer.

A traditional oriental approach to health is based on ancient practices and techniques that have been passed to successive generations. It relies on the prevention of ill health and promotion of health by balancing the Yin and Yang forces within the body. Ill health is said to result from an imbalance of the Yin and Yang forces.

### Antler Growth

Mature male deer experience an annual cycle of antler growth. During the breeding season mature animals carry a pair of hard, calcified antlers that they use to assert their dominance over breeding females and rival males.

At the end of the breeding season, in association with a decrease of testosterone in the blood stream, the antlers are shed or cast. In Australia casting usually occurs from August to September (Red, Fallow, Wapiti).

After casting the wound left by the cast antler heals and growth of a new antler set is initiated. The growing antler is composed of cartilage covered with skin and soft short hair. It grows very rapidly and is richly supplied with blood. The term velvet originates from the soft hair covering the new growth, but the whole of the new growth is described as velvet antler.

Growth of velvet antler continues for a variable period that is determined by the species of animal and its age. The range for Red deer is quoted as 138 to 177 days [92] but is harvested at 55 to 65 days after button casting.

Where velvet is not harvested, growth continues and antlers begin to calcify. Calcification continues until the whole of the antler is a hard bony structure on the animal's head. Calcification is completed before the beginning of the rut (mating season), usually in February to March in Australia. When calcification is complete the velvet skin on the antler dies and is shed. During this time the animals regularly rub their antlers on trees, posts or other hard structures to remove the dead velvet skin and polish their antlers in preparation for the rut.

Calcified antlers or calcified buttons of antler remain until they are naturally cast at the end of the breeding season.

Male deer must not be left in hard antler since they can be extremely aggressive during the rut and pose a significant danger to humans and other deer. The Deer Industry Code of Practice encourages the annual removal of male antlers before they calcify.

### Farmed Male Deer

Immediately prior to the rut (mating season), male animals become very aggressive. They aggressively defend their harem of females from rival males and other perceived threats including humans.

During the breeding season males aggressively push females from their harem away from rival males. These behavioural attributes of males mean that animals in a herd may pose a lethal threat to other males in close proximity (same paddock), people who enter the paddock and females that are unable to move in the direction required by a male (fences).

To minimise these risks it is desirable as part of normal management practice to annually remove deer antlers.

There are two principal reasons for the antler to be removed before it calcifies. The first is that an animal that has fully calcified antler is already very aggressive. These animals are difficult and dangerous to handle. The second reason to remove the antler in its velvet stage is that ideally harvested velvet antler provides deer farmers with an alternative source of income.

Stags kept for velveting are best managed as a separate mob so that attention can be paid to management and nutrition. From about mid August the mob should be checked regularly and the date each stag casts its buttons noted. When the majority of a mob have cast, animals can be sorted into small groups on the basis of casting date. Small mobs are more easily managed and there is reduced risk of velvet damage during harvest. At harvest velvet weights should be recorded so that poor performing stags can be culled.

### Red Deer

The majority of velvet antler produced in Australia is sourced from Red deer. Some herds specialise in high quality velvet antler production and in the selection of breeding stock that will maximise velvet production.

Red deer stags generally produce their largest antlers when they are from five to seven years of age. Velvet production usually stays constant for a couple of years and then declines from nine to ten years of age.

**Fallow Deer**

Mature Fallow deer bucks may yield up to 1.0 kg of velvet per year although selected strains and subspecies (Danish Fallow, Hungarian Fallow, Mesopotamian Fallow) can yield more. In comparison to returns from venison production, Fallow deer velvet production must be considered of secondary importance to Fallow deer farmers.

**Wapiti/Elk**

Wapiti Velvet is characterised by its greater length and greater thickness compared to Red deer velvet. Thickness (beam) circumference is considered a major quality criterion on Asian markets. New superior Canadian Wapiti (Elk) genetics have been brought to Australia in recent years. Parent bulls of these superior genetics in North America produce up to 20kg of velvet annually.

**Rusa Deer**

Antler cycles of Rusa deer appear similar in phases and lengths to those of temperate deer and generally a complete cycle for any one male occurs over 12 months. However synchronisation of cycles with other males is not as evident, although observations are that the majority of males in a herd appear to be at a similar stage of antler growth at any one time.

Antlers are usually cast between October and February. While data is limited, it appears that spiker antler weights vary from 50 to 200 grams with mature (2 year old plus) stags yielding 1.0 to 2.5 kg hard antler.

**Production Guide**

Average velvet production of Red deer and Wapiti/Elk stags typically increases annually until about 5 to 7 years of age, stays constant for a couple of years and then declines from about 10 years of age. However average velvet weight of similar age stags can vary between years depending on many factors.

Information in the tables below should only be considered as a very broad guide for commercial herd sires. Annual velvet production is influenced by factors including:

- Time of cutting velvet
- Animal age
- Strain of deer selected
- Mature body size
- Degree of hybridisation

Many stags in Australia do not currently produce the weight of velvet shown in Tables 34 and 35. However genetic improvement in velvet production will only occur if there is strong selection of breeding stock for increased velvet weight. Guide minimum production that should be acceptable in existing commercial Red deer velveting herds is also shown.

Velvet weight of spiker animals, those about 12 months of age, is also influenced by the actual age of the animal. This age can vary by the length of the mating period (usually 6 to 12 weeks) so spiker velvet weight is not always a good indicator of future production.

Guide velvet weights shown in Tables 35 and 36 were determined in consultation with industry breeding specialists.

Age (yrs)	Velvet Weight (kgs)		Age (yrs)	Sire Velvet Weight (kgs)
	Sires	Velvet Stags		
1	1.8	1.2	1	2.0
2	2.2	1.8	2	4.5
3	3.0	2.2	3	6.5
4	3.5	2.6	4	8.0
5	4.0	2.7	5	10.0
6	5.0	2.8	6	12.0

Table 35: Guide minimum annual antler weight (first cut) for Red deer stags

Table 36: Guide minimum annual antler weight (first cut) for Wapiti/Elk stags

Velvet production after animals reach six years of age should be monitored until its weight or quality declines.

Selection of sires and retention of stags in a herd should not be solely based on weight of velvet antler produced but also on velvet quality (grading) and the animal's temperament, which strongly influences its manageability.

**Maximising Velvet Production****Management and Nutrition of Animals**

Ensuring that energy, protein and mineral requirements are readily available at least two weeks prior to the anticipated 'button drop' may influence the season's velvet production. Over feeding will not improve velvet antler production [45]. While it is important to avoid 'under nutrition' most research suggests that over feeding is unlikely to provide an economic increase in antler

growth. The aim should be to ensure that an animal's genetic potential for antler size is not compromised by poor nutrition. Optimum body condition for maximum economic velvet production is condition score 3.

Managers must also consider the genetic influence of dams on velvet production. Dams contribute 50% of the genes for velvet production so dam selection is important.

Dr George Bubenick [74] reported "animals will produce smaller antlers the following year if they are under pressure in the rut, are kept low in the herd hierarchy, or have had to concentrate on foraging or defending small territories". He believes this is due to lower testosterone levels in those deer during the autumn and that higher levels of testosterone will help set the pattern for velvet growth the following year.

#### ***Selection for Velvet Antler Production***

Commonly used methods of selection of males for retention in a velvet herd are based on measurements of spiker (12 month old animals) live weight or velvet weight of two-year-old animals. However both methods have significant disadvantages. The New Zealand Deer Industry Manual [9] reports a better method for Red deer stags that involves:

- Yarding yearling stags when the velvet antler spike measures between 260 to 300 mm from its base (the pedicle) to its tip
- Measuring the mid-circumference (MC) of the spike (measured halfway between the pedicle and the tip of the spike)
- Culling or retaining stags on the basis of the MC measurement (larger measurements suggest an ability to produce more velvet)

#### ***Genetic Influence***

Genetic potential and environment, in particular mature body size, significantly influences velvet production of a male deer. Although genetic potential is important, if management of environmental factors like body condition score are not ideally maintained, the animal's ability to express high genetic potential for high velvet production will be severely compromised.

Velvet production is highly heritable, 35% up to 5 years of age, [52] so careful selection, based on objective measurement in an ideal environment, has the potential to increase velvet antler weight of a herd.

Genetic improvement in velvet production can be achieved using within herd (breed) selection or through hybridisation with other species.

#### ***Body Weight/Antler Size Relationship***

Within a genotype, the pre-rut weight of males, specifically frame size, is the factor that most influences velvet weights. Each 10 kg increase in pre-rut body size brings forward the date of casting by 3 to 4 days and increases velvet weights by 0.12 kgs [45]. There is a general relationship between antler weight and body weight across strains of Red deer and Wapiti/Elk [21] that is shown in Table 37.

Live weight (kgs)	Hard antler weight (kgs)
400	14.9
300	9.4
200	4.9
100	1.6

*Table 37: Example of the general relationship between live weight and antler weight*

#### **Harvesting Velvet Antler**

##### ***Harvest Timing***

Guidelines for harvesting and grading Australian deer velvet are provided in the 'Australian Deer Industry Velvet Antler and Venison Co-Products Language and Specifications Guide' [77].

Velvet antler growth on Red deer can reach 20 mm to 30 mm per day during peak growth periods [92]. The time from initiation of new velvet growth (button drop) to harvest is critical.

The main factors that contribute to the value of a stick of velvet are:

- Absence of damage
- Diameter relative to length
- Weight
- The degree of branching of the antler
- Degree of calcification
- Beam size

A rule of thumb is that individual animals will be ready for harvesting from 55 to 65 days after buttons have been cast. Animals should be separated into mobs according to the date their buttons are cast and when close to harvesting individuals should be checked daily.

Routine daily observation of males requires good handling facilities that allow the animals to be easily yarded without stress and without risk of damage to their antlers.

Most observers suggest that it is preferable to harvest the antler a little too early rather than a little too late, but maximum profit can only ever be realised by harvesting at the ideal time. If cut too early there is a loss of weight and therefore income. If it is cut too late, calcification and a smaller diameter:length relationship [77] can reduce income.

Most deer are harvested twice in any season. The primary harvest in Australia occurs during October/November and regrowth is harvested in January/February. Velvet regrowth has a lower value than velvet harvested during the first period.

### ***Surgical Removal***

In Australia only registered veterinary surgeons or people who have been accredited by the National Velvet Accreditation Scheme (NVAS) can undertake velvet harvesting (velveting). The Australian Veterinary Association, the Deer Industry Association of Australia, Animal Welfare Groups and Government agencies endorse the NVAS that accredits farmers to remove velvet from their own deer or deer under their management.

The Deer Industry Association of Australia (DIAA) provides an extensive NVAS training program that includes information relating to techniques for velveting, management of male deer to maximise velvet production and Quality Assurance standards. The program also trains lay operators in the use of drugs used for velveting. People accredited by the course are legally allowed to use drugs provided by a veterinarian to velvet their own animals (see below).

Accredited farmers are able to velvet their animals at the optimum time for harvesting rather than needing to wait until a veterinarian is able to service their request.

As velveting involves the surgical removal of velvet antler from male deer, the initial procedure is to restrain the animal. In the past chemical (sedative) restraint was the common method used, as yards and handling facilities were unable to effectively control the deer. However, the modern deer industry has access to a range of restraints (deer crush) that can safely and effectively restrain all species of deer.

**The preferred method of restraint is physical restraint in a well-designed deer crush in a well-designed deer handling facility.**

A restrained animal is given an appropriate local anaesthetic to prevent pain. After an appropriate time delay that allows the anaesthetic to take effect, a rubber tourniquet is applied to the base of each antler.

After the antler is surgically removed, the tourniquets are removed and the animal is released to return to the paddock.

Although it is desirable that no deer in hard antler are present on commercial properties, on some breeding properties males are left in hard antler to demonstrate their velvet producing capability. Antler can be removed at the velvet stage or when hard antler growth becomes evident. Unlike velvet antler removal, hard antler removal does not require the use of drugs. Removal of velvet or hard antler does not affect the reproductive performance of stags.

Hard antler removal is considered a procedure that ensures safe handling and management and there is a requirement to remove all hard antler prior to transporting animals (QA and Code of Practice).

### ***Velvet Stick Terminology and Measurement***

Australian deer farmers should refer to the Australian Deer Industry Velvet Antler and Venison Co-products Language and Specifications Guide for more detailed information on measurement and grading of deer velvet. Information about measurements is taken directly from the guide. This measurement information specifically relates to velvet from Red deer and Wapiti/Elk [77].

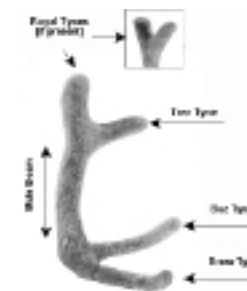


Figure 24: Velvet Stick Terminology

### ***Circumference***

Circumference is taken as the smallest measurement of the beam measured on the clear beam:

- Immediately above the tres tyne
- Midway between the top of the stick and the top of the inside cut surface

‘Clear’ means that the measurement is not to be taken where webbing from a tine or other antler growth on the antler would interfere with the measurement. The objective is to get a measurement representative of the average circumference of the beam.

#### *Top Length*

Top length is measured between the top of the stick and the bottom of the fork where the trez meets the beam

#### *Overall Length*

Overall length is measured from the top of the stick to the top of the inside cut surface

#### *Indentation (Wapiti/Elk velvet)*

Indentation is measured along the length of the longest royal to the bottom of the fork where the royal begins

#### **Handling Velvet**

Deer velvet is used as a human food/ pharmaceutical product. It must be treated like any other human food product and harvesting, handling and storage techniques must reflect its use in human nutrition and pharmacology. As soon as antlers have been harvested from the animal they should be stored on racks in cool, clean disinfected insect proof rooms at about 15 degrees to a horizontal plane. Their cut surface should be upper most.

If the stick of velvet lies horizontally, blood will drain from the velvet reducing its value. If the sticks are stored at greater than 15 degrees to the horizontal, blood will accumulate at the tip of the velvet reducing its value. Recommended cooling and freezing procedures for velvet after its removal from an animal are provided in NVAS accreditation course notes. However it is important to ensure that blood is not lost from the velvet stick nor accumulates at the tip and that the stick is not deformed during chilling or freezing.

#### **Selling Velvet**

Australian Deer farmers have the opportunity to sell their velvet directly to processors, buyers who visit their farm or through the system of velvet pools managed by Australian Deer Horn and Co Products Pty Ltd (ADH).

ADH is responsible for the collection, grading and marketing of deer antler on behalf of the growers. There is no compulsion for producers to sell their deer antler through ADH but an estimated 60% of Australia's deer antler is sold through ADH.

ADH promotes the harvesting of velvet antler according to the Quality Assurance (QA) Program promoted by the industry. The QA Program provides strict guidelines for animal welfare and hygiene practices during harvest, storage and handling of the velvet to ensure product quality meets international standards.

#### **Saleable Forms of Velvet**

Velvet antler is made available to clients in both unprocessed and processed forms. A range of alternate product forms is described below.

#### *Frozen, Unprocessed Whole Velvet Antler Stick*

Farmers harvest and freeze velvet according to strict quality assurance guidelines. After harvesting, velvet sticks are individually tagged and hygienically frozen. It is stored frozen until it is sold.

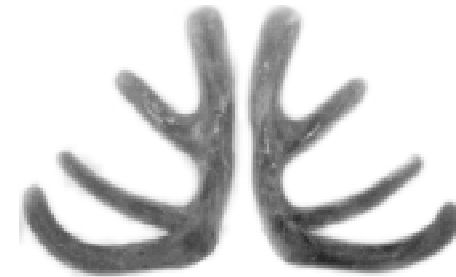


Figure 25: Frozen, Unprocessed Whole Velvet Antler Stick

#### *Dried Whole Velvet Antler Stick*

Whole velvet sticks are dried according to strictly controlled processes that combine traditional and modern technologies developed to meet requirements of individual buyers. Sticks can be sold whole, sliced or in powder form.

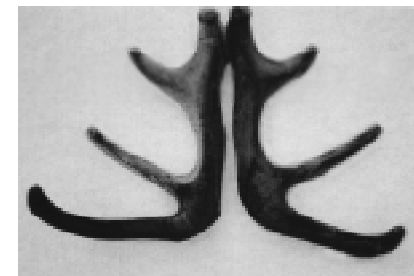


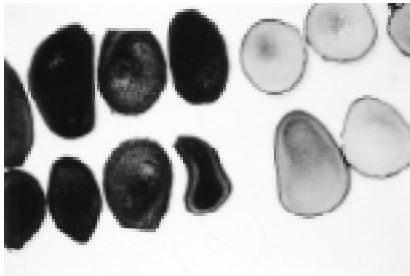
Figure 26: Dried Whole Velvet Antler Stick

*Velvet Antler Slices*

Velvet is available in traditional sliced form. Its quality and price varies according to the grade of slices and the grade of slices is relative to:

- The quality of the stick from which the slice originates
- The portion of the stick used for the slice
- The quality of the drying and slicing process

As grading systems vary between processors so a representative sample should always be sought before purchase.



*Figure 27: Velvet Antler Slices*

*Velvet Antler Powder*

Dried velvet can be milled to buyer specifications. Quality relates to that portion of the stick that is ground to produce the powder. It is generally sold according to results of chemical analysis and Ash content is generally regarded as an indicator of the quality of velvet processed to produce the powder.



*Figure 28: Velvet Antler Powder*

*Deer Velvet Capsules*

High quality deer velvet is dried, ground and encapsulated for easy use in growing western markets as well as traditional markets.



*Figure 29: Deer Velvet Capsules*

**National Velvet Accreditation Scheme**

The Australian National Velvet Accreditation Scheme was developed from State-based programs from W.A., Victoria and S.A., with the approval of the Veterinary Surgeons' Board and welfare organisations in each State.

The scheme and its' objectives was subjected to close scrutiny by a group of veterinarians very familiar with the deer farming industry in Australia, with the overall aim to produce a training program which was entirely consistent and acceptable in all States.

In particular there was a clear need to ensure that both the training program itself, including the examination/accreditation process, and the details it contained of drugs permitted and so on, were consistent across the country. It was accepted that there may well be variations in the mechanics by which the scheme was administered in some States, depending on the opinions and attitudes of Veterinary Surgeon's Boards.

All Boards support the accreditation process, with some variation in how they oversee the way in which drugs are prescribed.

Key elements of the National Velvet Accreditation Scheme:

- On application on the approved DIAA form a farmer will be sent a self-assessment, which will include guidelines for proper deer handling facilities, to allow farmers to upgrade their own facilities if necessary. It is

at this stage that they will also be required to nominate their attending veterinary surgeon, who will eventually carry out the practical evaluation of the farmer concerned, and his or her ability to perform velvet antler harvest effectively on his or her own farm. This veterinarian will be responsible for the supervision of velveting each year by that person. This one to one relationship between the farmer and the veterinarian is central to the effective management of the scheme, and to the proper control of all drugs prescribed to accredited farmers. It should be clearly understood that there is no compulsion for a veterinarian to accept such an arrangement, nor can a deer farmer demand that drugs be made available because a training program has been completed

- The deer farmer will then attend a theoretical training course held over 2 days - the location, timing and administration of such courses is a DIAA responsibility in each State. The course involves training related to:
  - Antler anatomy and physiology
  - Pain control
  - Pharmacology
  - Legal aspects of the possession and use the approved drugs
  - Velveting procedures including:
    - Restraint and handling
    - Stress reduction
    - Management of deer before and after velveting
    - Factors affecting velvet quality
    - Velvet grading
    - Handling of velvet antler after harvest
- After achieving the required mark in the theory examination, the deer farmer must then seek a practical assessment by the nominated veterinarian. The farmer will need to demonstrate skills involved during the complete velvet harvesting process including:
  - The yarding and handling of deer
  - Management of animals prior to velveting
  - Knowledge of and administration of drugs
  - Harvesting of velvet
  - Post-velveting supervision of velveted animals
- The minimum age for accreditation is 18 years
- Once applicants have passed the theoretical and practical components, they will be issued with a Farmer Operator Accredited Number.

Accreditation Numbers will be issued for a period of (3) three years. Numbered velvet tags are issued to each farmer in the program, and all velvet antler should be identified with the tags when sent for sale. Tagged velvet will be promoted as quality assured

- At the completion of the velveting season and before the 30th June each year, all holders of an Operator Accredited Number are required to submit an audit report stating: the number of deer velveted, the method of velveting used, the species of deer, the number of deaths within 48 hours of velveting, and details of drugs received and used. All deer that die within 48 hours of velveting must be submitted to necropsy by the nominated veterinarian. The nominated veterinarian must sign this audit