## Consequences of poor fibre quality

| Fibre trait | Trait description | Ideal range | Consequences of poor fibre quality – cotton price | Consequences of poor fibre quality – spinning |
|---|---|---|---|---|
| Length | Fibre length varies with variety. Length and length distribution are also affected by stress during fibre development, and mechanical processes at and after harvest. | UHML in excess of 1.125 inch or 36/32$^{nds}$. | Premiums can be gained for long staple length. Significant price discounts below 33/32$^{nds}$. | Fibre length determines the settings of spinning machines. Longer fibres can be spun at higher processing speeds and allow for lower twist levels and increased yarn strength. |
| Micronaire | Micronaire is a test of fibre fineness. The test measures the resistance offered by a weighed plug of fibres in a chamber of fixed volume to a metered airflow. | Micronaire values between 3.8 and 4.5 are desirable. Premium range is considered to be 3.8 to 4.2. | Significant price discounts below 3.5 and above 5.0. | Micronaire determines the number of fibres needed in a yarn cross-section, and hence the yarn count that can be spun. Cotton with a low micronaire may have immature fibre. High micronaire is considered coarse and provides fewer fibres in cross section. |
| Short fibre content | Short fibre content (SFC) is the proportion by weight of fibre shorter than 0.5 inch or 12.7 mm. | < 8% | No premiums or discounts apply. | The presence of short fibre in cotton causes increases in processing waste, fly generation and uneven and weaker yarns. |
| Uniformity | Length uniformity or uniformity index (UI), is the ratio between the mean length and the UHML expressed as a percentage. | > 80% | Small price discounts at values less than 78. No premiums apply. | Variations in length can lead to an increase in waste, deterioration in processing performance and yarn quality. |
| Strength | The strength of cotton fibres is usually defined as the breaking force required for a bundle of fibres of a given weight and fineness. | > 29 grams/tex | Small premiums for values above 29 g/tex. Discounts appear for values below 27 g/tex. | The ability of cotton to withstand tensile force is fundamentally important in spinning. Yarn and fabric strength correlates with fibre strength. |
| Grade | Grade describes the colour and 'preparation' of cotton. Under this system colour has traditionally been related to physical cotton standards although it is now measured with a colorimeter. | > MID 31 | Small premiums for good grades. Significant discounts for poor grades. | Aside from cases of severe staining the colour of cotton and the level of 'preparation' have no direct bearing on processing ability. Significant differences in colour can lead to dyeing problems. |
| Trash / dust | Trash refers to plant parts incorporated during harvest, which are then broken down into smaller pieces during ginning. | Low trash levels of < 5% | High levels of trash and the occurrence of grass and bark incur large price discounts. | Whilst large trash particles are easily removed in the spinning mill too much trash results in increased waste. High dust levels affect open end spinning efficiency and product quality. Bark and grass are difficult to separate from cotton fibre in the mill because of their fibrous nature. |
| Stickiness | Contamination of cotton from the exudates of the silverleaf whitefly and the cotton aphid. | Low / none | High levels of contamination incur significant price discounts. | Sugar contamination leads to the build-up of sticky residues on textile machinery, which affects yarn evenness and results in process stoppages. |
| Seed - coat fragments | In dry crop conditions seed-coat fragments may contribute to the formation of a (seed-coat) nep. | Low / none | Moderate price discounts. | Seed-coat fragments do not absorb dye and appear as 'flecks' on finished fabrics. |
| Neps | Neps are fibre entanglements that have a hard central knot. Harvesting and ginning affect the amount of nep. | < 250 neps/gram | Moderate price discounts. | Neps typically absorb less dye and reflect light differently and appear as 'flecks' on finished fabrics. |
| Contamination | Contamination of cotton by foreign materials such as woven plastic, plastic film, jute / hessian, leaves, feathers, paper leather, sand, dust, rust, metal, grease and oil, rubber and tar. | Low / none | A reputation for contamination has a negative impact on sales and future exports. | Contamination can lead to the downgrading of yarn, fabric or garments to second quality or even the total rejection of an entire batch. |

# FIBREpak introduction

Australian cotton is viewed worldwide as an excellent fibre. It is usually purchased with the intention of producing high-quality combed, ringspun yarns for use in the woven and knitted apparel sector in the Asia-Pacific region. China is becoming an increasingly significant market.

Australian cotton is often purchased for a premium as it meets spinner's requirements on the basis of quality and consistency. It has the specific fibre qualities required to spin high-quality yarn, and its uniformity and low levels of contamination allow for more efficient, higher-speed spinning. Coarse (high micronaire) fibre, high nep counts and excessive short fibre content are aspects of Australian cotton that spinners would like to see improved.

Fibre quality is affected by a large number of interacting factors: variety, seasonal conditions, crop and harvest management and ginning can all shape whether or not the spinner's requirements are met. While some of these factors cannot be controlled, there are many that can be influenced. Better varieties, management for each region's climate, and processing to minimise damage to fibre are opportunities to improve fibre quality.

The Cotton Catchment Communities CRC is committed to improving the growing and ginning so as to enhance the spinning and marketing characteristics of Australian cotton. FIBREpak will contain information for managing fibre quality at every step, from pre-planting to processing. The aim is to provide all those involved in producing and delivering fibre — the grower, manager, agronomist, consultant, retailer, ginner, classer, merchant and shipper — with:

- ❖ Knowledge of what aspects of fibre quality they can influence;
- ❖ Options for managing those aspects;
- ❖ An understanding of the needs and constraints of the other participants in the fibre supply chain.

Key fibre quality issues to be addressed by FIBREpak include:

- Maintaining and improving fibre length through variety choice; management during hot, dry seasons; preservation through harvest and ginning.
- Producing fibre within the optimum micronaire range through hot sunny seasons; high yield management strategies; appropriate defoliation and harvest preparation.
- Reducing nep content through effective defoliation and harvest preparation; better management of fibre moisture in the field and through the gin; and reduced requirement for cleaning processes in the gin.
- Minimising contamination found in Australian cotton bales.
- Ensuring fibre quality uniformity and consistency within and between years.

**More information:**
Cotton Catchment Communities CRC
crcadmin@cotton.crc.org.au
Phone 02 6799 1500
www.cotton.crc.org.au

Cotton Catchment Communities CRC

## Managing for improved fibre quality in the field

Grow a healthy crop for both yield and quality. Adoption of appropriate and efficient management for improving yield will also contribute to improved fibre quality. Refer to current IPM guidelines, SOILpak, NUTRIpak, WATERpak, WEEDpak, DISEASEpak and HydroLOGIC. Select variety fibre properties, plant type and maturity based on seed company comparative quality data and local experience.

| Objectives | Pre planting | Sowing to first flower | First flower to open boll | Open boll to harvest | Harvest to gin |
|---|---|---|---|---|---|
| Realising the genetic potential for fibre length | Variety selection.<br>Strategic planning for irrigation availability.<br>Consider skip row for dryland. | Monitor soil moisture schedule irrigation to optimise plant vegetative size. | Monitor soil moisture schedule irrigation to optimise plant vegetative size and to avoid stress on developing fibres. | | |
| Maintaining fibre strength | Variety selection. | | Maintain healthy crop. | | |
| Producing fibre with mid range micronaire | Variety selection. | Monitor soil moisture schedule irrigation to optimise plant vegetative size.<br>Sow at appropriate date for the region to avoid early crops in hot areas or late crops in cool areas. | Management of plant vegetative size, structure and balance with boll setting pattern.<br>Uniform boll set is achieved by having the appropriate plant type for the variety, region and climate.<br>Optimise agronomic management and inputs such as water, fertiliser and growth regulators. | Timely harvest to avoid bad weather. Use appropriate nitrogen fertiliser rates to match crop and fertiliser cut out.<br>Schedule last irrigation to leave soil at refill point at defoliation.<br>Use appropriate timing, product and rate for defoliation. | |
| Reducing the incidence of neps | Variety selection. | | | | Spindles and doffers maintained daily.<br>Reduce spindle twist by not picking too wet. |
| Delivering clean white cotton with no stickiness | Weed management. | Weed management. | | Fertiliser, irrigation and defoliant management as above.<br>Refer to IPM guidelines for aphid and whitefly management. | Follow guidelines for module placement, construction, tarping and transport.<br>Keep good module records. |
| Preventing contamination | Farm hygiene to avoid contamination during havest later.<br>Weed management. | Weed management. | | | Farm hygiene.<br>Picking height.<br>Hydraulics on pickers and builders checked and maintained. |

## Managing for improved fibre quality post-harvest

Maintain quality, optimising yield and contain the costs of ginning. Appropriate ginning and handling practices post the farm gate maximise returns for growers and maintain industry reputation for high quality. Good communication between growers and ginners is a key factor in assisting this process.

| Objectives | At the gin |
|---|---|
| Maintaining fibre length | In the gin, fibre length can be preserved and short fibre contents reduced, by reducing the number of lint cleaner passages (depending on quality of seed cotton) and ensuring fibre moisture is between 5 and 7 per cent over the gin and between 5 and 6 per cent through the lint cleaners. Lower combing ratios (ratios between 19 and 23) between feed rollers and the saw of lint cleaners also reduces the amount of fibre breakage. |
| Reducing the incidence of neps | Lint cleaners are responsible for most of the neps found in baled cotton. Reducing the number of lint cleaners reduces neps. Maintenance of prescribed setting distances, e.g. feed and grid bar distances to the lint cleaner saw reduces fibre loss and nep creation, as does close and proper setting of the doffing brush to the saw. Preservation of fibre moisture as prescribed for length preservation also helps reduce nep creation. |
| Preventing contamination | Clean gravelled module storage yards. Frequent inspection of tarps on modules. Appropriate bale covering/wrap. Storage and handling to avoid country damage. |