

SORGHUM 'THE WONDER CROP'

Understanding its Qualities and Importance as a Cereal Food

by Dr Hooshang Nassery, Head of Technical



What's in this Insight

This Insight discusses Sorghum and the work being undertaken to make it a more desirable food crop, whilst also educating people about its qualities and benefits for the food supply chain.

Overview

Sorghum is the world's 5th most important cereal crop and is grown as the staple crop of some 300 million people living in the semi arid tropics. Sorghum is known as a 'poor man's crop', often grown on marginal lands where other cereals are not so successful. As far as its plant physiology goes, sorghum is described as a C4 plant, and as such can tolerate high temperatures and drought. Sorghum, along with millet, is certainly the most drought-tolerant of cereals, and this drought tolerance is partly due to its higher water use efficiency when compared to other cereals (i.e. those that belong to the designated C3 group of plants), such as wheat, barley and oats.



Sorghum's Plant Physiology and Research

About 95% of all crop plants are referred to as C3 plants. Sorghum is referred to as a C4 plant.

(Edwards *et al.*, 2010) tells us that "the C4 photosynthetic carbon cycle is an elaborated addition to the C3 photosynthetic pathway. It evolved as an adaptation to high light intensities, high temperatures, and dryness. Therefore, C4 plants dominate grassland floras and biomass production in the warmer climates of the tropical and subtropical regions".

C3 plants have the normal photosynthetic pathway in which the CO₂ is first fixed into a 3-carbon compound. In C4 plants, the first compound after CO₂ fixation is a 4-carbon compound.

The C4 plants of importance in agriculture are sugar-cane, corn, sorghum and millet.

In C3 species the rate of photosynthesis increases with rising CO₂, while in C4 plants that have a more efficient system of utilising and storing CO₂, the response to high levels of CO₂ in atmosphere is much less, (e.g. these plants photosynthesise faster at normal CO₂ levels and therefore have a higher water use efficiency than C3 plants, and also better tolerance to heat and drought).

With the challenge of global warming requiring attitudinal change and industry innovation in the world's cropping systems, sorghum cultivars are ideal crops to be trialled in the sub-tropical regions, and especially those regions experiencing more than their normal cycle of drought and heat.

For instance, in July 2015, ABC Rural News posted a story from Queensland, Australia titled '*Sorghum beats wheat as Queensland's most valuable cereal crop*'. A spokesperson for the Queensland Alliance for Agriculture and Food Innovation Professor David Jordan acknowledged the benefits of nearly 50 years of study and research into this crop. The full story can be read [here](#).



As far back as fifteen years ago in 2001, scientists working at the University of Queensland published a paper to the journal *Phytogen* (Vol.3 No.2, September 2001) pressing sorghum's claim as a more desirable food crop.

Sorghum's History

The origin and early domestication of sorghum took place in North-Eastern Africa, and the earliest known record of sorghum has been dated at 8,000 B.C. This recording comes from an archeological dig near the Egyptian-Sudanese border. From here it spread throughout Africa and became adapted to a wide range of environments, including those in India and China. Eventually it worked its way into Australia, where it has a considerable profile as animal pasture, but is now becoming part of the burgeoning human food market.



Sorghum Facts and Figures

- The inherent tolerance of sorghum to marginal lands and harsh environmental conditions, its versatility as both a human food and animal feed grain, and its ability to produce high yields, ensures its relevance and role in the lives of millions of people throughout the world.
- Sorghum is related to both sugar cane and millet, and is called 'Great Millet' in some areas of West Africa. It is an important staple food of the upland, drier parts of Africa and India where no other cereal crop can successfully be raised.
- Sorghum is able to grow in soils that are poorly nourished or those with an unreliable water supply.
- Different varieties of sorghum range in colour from white or pale yellow to deep red, purple and brown.
- Sorghum is the third largest crop produced in Australia. It is produced primarily in the northern growing regions of Australia with an average annual production of over 2 million tonnes.
- Sorghum is consumed as bread and porridge and is used for making beer.
- Increased prevalence and diagnosis of diseases associated with the gut and immune functions has led to strong demand for sorghum in the gluten-free products market. Sorghum is considered a key component of this developing niche market and it is projected that millions of people world-wide will benefit from this growing awareness of its nutritional benefits.
- Chickens, unlike ruminants, can extract more of the carbohydrate and protein energy from sorghum than any other cereals.

Sorghum's Nutritional Value

Sorghum is a whole grain that provides many nutritional benefits.

It has an edible hull, unlike many other grains and it is commonly eaten with all its outer layers retained, thereby receiving the full benefit of its nutrient package.

Sorghum is grown from traditional hybrid seeds that are non modified by technology.

Some speciality sorghums are high in antioxidants, which are believed to help lower the risk of cancer, diabetes, heart disease and some neurological diseases. Pigmented and tannin sorghum varieties have high antioxidant levels that are comparable to fruits and vegetables. In addition, the wax surrounding the sorghum grain contains compounds called policosanols, that may have an impact on human cardiac health. Research is ongoing, however it is believed by some that policosanols have cholesterol-lowering potency.

The nutritional credentials of wholegrain sorghum include the following :

- rich in carbohydrates (mainly starch)
- moderate protein content, but low in lysine
- low in fat, most of which is unsaturated
- good source of dietary fibre
- high in potassium
- low in sodium
- gluten free
- contains B-group vitamins such as thiamin, riboflavin, niacin, vitamin B6 (pyridoxine), folate and pantothenic acid
- contains vitamin E
- contains iron, zinc, magnesium, phosphorus and selenium (depending on the soil content of selenium)
- contains small amounts of copper, manganese and calcium
- contains phytochemicals including lignans, phenolic acids, phytic acid, plant sterols and saponins



RLF Products that Benefit



Integrated Fertiliser Management

- sorghum responds to good levels of nitrogen and phosphorus
- zinc deficiency can sometimes reduce the crop yield, so this avenue should be explored
- in most parts of Australia, sorghum yields are about 2 tonnes per hectare. A generalised foliar program can be initiated for sorghum, however when other information such as fertiliser usage, paddock and soil detail and plant tissue analysis data is available, a fertiliser program can be modified for a targeted and even better response.

Based on yield averages in Australia and the crop responses to nutrients, the following Integrated Fertiliser Management (IFM) program is proposed for dryland sorghum.

1. Based on yield average in your location and the availability of water, apply granular fertiliser at suitable rates as top-dress or with the seed to match the target yield. Make sure that seeds are treated with **BSN Superstrike** in advance to maximise the yield potential of the grain by elevating nutrient levels in seed lot. **BSN Superstrike** is highly advantageous in sorghum since sorghum seeds show low level of trace elements and phosphorus with large variability of these nutrients in the seed lot.

2. Apply 0.5L of Crop Specific Foliar (e.g. **K-Komplex**, **Cereal Plus** or **Plasma Fusion**) along with an equal volume of a **Power N** product per tonne of target yield/h at 4 to 5 leaf stage. This mixture can be applied with 40-100 litres of water. Higher rate of water is beneficial in dry conditions.
3. If sorghum is grazed and then left for seed, or if higher yield is expected with irrigation or higher rainfall, a second application of the above mixture is beneficial at leaf stage 8 or later.



Conclusion

Sorghum should no longer be considered as simply 'animal feed', as it currently is in the majority of western and developed markets and food cultures.

As highly placed research continues to uncover many of Sorghum's qualities and benefits, with its important potential role in the human food chain as a health protecting cereal crop, so its place in the market will grow.

With global warming, and the issues of climate change bringing about management and crop-selection challenges and changes for the agricultural industry, sorghum should be factored into crop growing regimes. This is particularly so in areas that are undergoing consistent or prolonged increased temperature change and other weather and climate related changes. Its properties have been shown, because of its unique plant structure to be beneficial in this regard.

Sorghum rightfully can own its tag as a 'wonder crop', and understanding its qualities and benefits will only bring about better outcomes for global agriculture as it seeks to meet its food production goals. Sorghum is a crop for both humans and livestock that because of its unique qualities can adapt to the climate challenges ahead.



The content of this media page was accurate and current at the time that it was written. This media release is provided for interested customers and other parties, and will remain a matter of RLF's historical record. Viewed in this context RLF therefore undertakes no obligation to update either material or content.