

Human  
Industry players,  
**INSIST ON  
STAR-SORGHUM**





# Sorghum is a crop IN TUNE WITH THE TIMES



“ Sorghum represents 5 to 10% of the total of my production surface depending on the year. It’s an economic and ecological culture which can achieve great results.

Hervé Clamens, farmer in France  
Learn more at: [www.sorghum-id.com](http://www.sorghum-id.com)

## SORGHUM

**IS A RUSTIC and STRONG CEREAL**, shoulders broad enough to resist predators of all kinds, sober like a camel, low on inputs and above all, generous. It has everything to seduce our times and meet its expectations. Based on this observation, European breeders have created new varieties that are even more resistant, even more sober, even more generous and even more economical. Varieties, whose yields have been increasing steadily for 30 years, and which amply deserve their stars.

## SORGHUM

### SINCE TIME IMMEMORIAL, THE CEREAL OF THE FUTURE

Among the major cereals, Sorghum is the one with the greatest development potential. Sorghum has been a staple food for centuries in Africa and Asia, now it is being warmly welcomed in the USA and has also seduced the agricultural world of the old European continent, which is thirsty for productive, profitable and sustainable crops. And sorghum can boast of being an ecologically virtuous plant:

#### Low-water-need crop

Thanks to its CO<sub>2</sub> absorption mechanism which gives it better photosynthetic yield even in dry conditions and to its dense and deep root system capable of extracting and using water and nutrients from the soil more efficiently, sorghum has little need in water.

#### Low in input

Sorghum is able to use efficiently fertilizers from the soil so it does not need further fertilization. In addition, it is little exposed to diseases and pests so requires little phytosanitary treatment. The icing on the cake: it plays the role of an antiparasitic in rotations because its presence in a succession of cultures breaks the cycle of parasites.

## Insist on Star-sorghum! It is productive, profitable and sustainable.

A big thank you to European breeders who, for thirty years, have been producing high quality sorghum whose yields are progressing steadily.

#### Why?

Because this sorghum-star has the double merit of meeting all the criteria of the animal feed manufacturers and of being productive, which encourages producers to cultivate it and secures supplies.

+1%/ year\* since 1990. That is the increase in yield generated by early- and semi-early hybrid genetics produced in Europe.

\*example from France,  
source: Arvalis 2015



## PORTRAIT OF A SORGHUM GRAIN

The sorghum variety intended for the production of animal feed is the sorghum grain: a small sorghum selected for grain production. This species is known for its high yield potential and excellent resistance to lodging-related diseases.

#### Colours and sizes

The sorghum grain of sorghum is round and pointed. It presents a great diversity of hue and size (diameter from 4 to 8 mm). Its TKW (Thousand-kernel-weight) varies from 6 to 70 g\*.



\* According to Geneviève Fliedel,  
Researcher in food science, CIRAD Montpellier.



## A CULTURE GROWING, GROWING AND GROWING

More and more farmers in Europe grow sorghum. Sorghum is a crop which gives them both an opportunity for diversification and an agronomic response to global warming (let's not forget that 85% of agricultural land is not irrigated!). Another convincing argument: thanks to star-sorghum genetics, yields are increasing.

Surfaces are growing which reinforces supply security. In 2019, for the 2nd consecutive year, the surface cultivated in sorghum increased very significantly in Europe. In the EU28, the average increase compared to the previous year is +10%, with variations depending on the country (+ 9% in Italy, + 14% in France, + 18% in Romania, + 30% in Austria, + 50% in Hungary...). In Ukraine, the cultivated surface increased by 25%.

This surface increase, as well as good yield levels, especially in Central and Eastern Europe, made it possible to reach an overall production (EU28 + Ukraine and Russia) of 1.3MT, which constitutes a good level of production, superior to previous harvest results.

This trend should continue because (among other things) sorghum benefits from Community funds intended for its promotion across Europe. It's Sorghum ID that is piloting this project. The success of the 2nd European Congress, held in Milan in 2018 on its initiative, confirmed the interest that producers and industrialists took in this cereal.



*"I have been growing sorghum every year since 2014. It is a crop that requires less water and the root system of which helps to limit land erosion. It is a culture that can be of interest to agriculture, industry and human food at the same time."*

Cristian Spiridon, farmer in Romania.  
Learn more at: [www.sorghum-id.com](http://www.sorghum-id.com)

## ANATOMY OF A SORGHUM KERNEL CARYOPSISIS

### ① GERM

The germ is located at the back and bottom of the kernel. It contains lipids (unsaturated fatty acids), B vitamins, low molecular weight proteins and minerals.

- 1 • Radicle
- 2 • Scutellum
- 3 • Plumule

### ② ENDOSPERM

The endosperm accounts for 75-85% of the kernel. It is the storage tissue. The aleurone layer contains large amounts of proteins (protein bodies, enzymes), minerals (phytin inclusion), lipids (sphaerosomes). Outer, vitreous and mealy endosperm, on the other hand, store starch and proteins as strategic reserves.

- 4 • Outer endosperm pericarp
- 5 • Vitreous endosperm

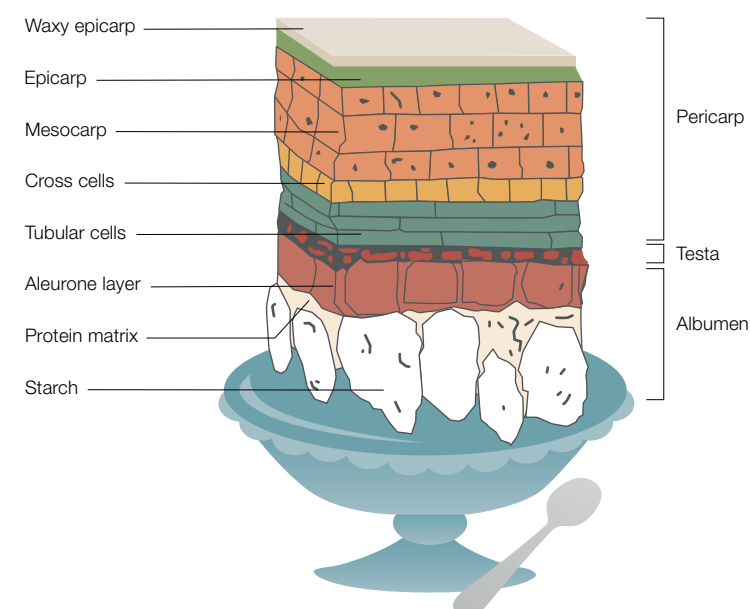
- 6 • Mealy endosperm
- 7 • Aleurone layer

### ③ TEGUMENT

Teguments represent 4 to 8% of the grain. The pericarp contains the fibres of the grain, mainly hemilcelluloses and starch. The testa contains rare polyphenols in cereals, with anti-oxidant effects.

- 8 • Seed coat (Testa)
- 9 • Pericarp

## SORGHO IS THE ONLY GRAIN OF CEREALS KNOWN TO HAVE STARCH IN ITS TEGUMENTS (for varieties with thick pericarp)



**Insist on star-sorghum! It is not very sensitive to mycotoxins and GMO-free.**

Sorghum is not attacked by borer insects, which are the gateway for fungi such as fusarium. In addition, the panicle and the grains being in the open air, the grain dries quickly which strongly limits the installation of Fungi.

Thanks to these characteristics, sorghum is safe from mycotoxins. In addition, it is GMO-free.

*\*Be careful, however, to harvest sorghum as soon as the grain is mature because if the harvest comes too late after the maturity of the grain, the development of mycotoxins can be significant.*






# Sorghum is a food IN TUNE WITH THE TIMES



Today's consumer is hungry for healthy, perfectly traced products, produced locally within environmentally friendly conditions. Sorghum is one of the virtuous crops that food professionals can trust. Sorghum is the fifth most cultivated cereal in the world, which is very popular in Africa and is in full development in Europe. And not without reason! The grain of sorghum is nutritionally comparable to the other main cereal grains in terms of protein, energy, vitamins and minerals. It is also a very rich source of fibre.

## ON ITS WAY TO CONQUER EUROPEAN PLATES AND GLASSES

After Africa, Asia and the USA, Europe is on its way to discover this resourceful cereal. We can say that sorghum can be eaten and drunk. It's a seed that tickles the imagination of many chefs and cooks. Sorghum is cooked much like rice or quinoa. We can consume it in a thousand and one ways. With vegetables, it's always a good choice. As comfortable with fish as it is with meat, sorghum also finds its place in homemade desserts or in our breakfast menus. Sorghum is a versatile cereal and can also be transformed into syrup, beer and alcohol. For your information, sorghum is one of the ingredients of Baijiu, a traditional Chinese strong drink served during major formal dinners and business lunches.

 *Gluten-free beer  
Ö from Mila  
has been  
recognized  
since its launch  
by the silver  
medal at  
the 2018  
agricultural fair.*

Charles-Antoine Courtois,  
Sorghum ID  
Learn more at:  
[www.sorghum-id.com](http://www.sorghum-id.com)

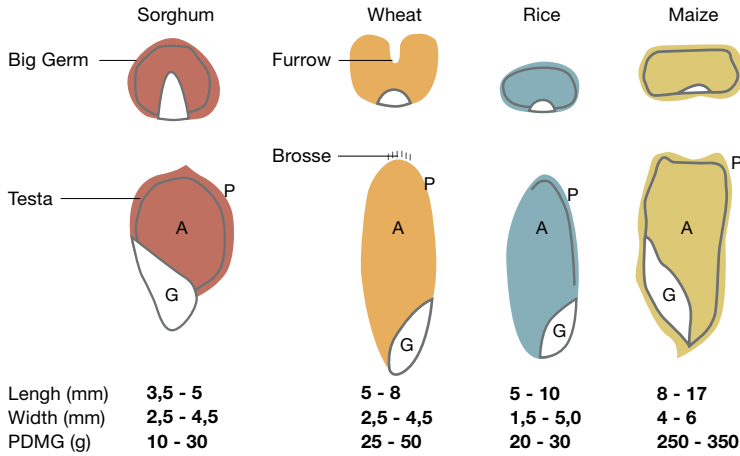
## Insist on star-sorghum! It is the result of rigorous seed production standards



### THE EUROPEAN SELECTION'S 7 PILLARS

- 1 Yield and stability
- 2 Early growth, as well as tolerance of low temperature during emergence and flowering
- 3 Drought tolerance
- 4 Lodging resistance, as well as its "stay green" character
- 5 Disease resistance
- 6 Predator resistance
- 7 Grain quality: very low tannin content, grain colour and texture, starch content, grain health quality, etc.

## COMPARATIVE MORPHOLOGY OF CEREAL GRAINS



Cereals	Mil	Sorghum	Wheat	Rice	Maize
Weight 1000 grains	4 - 10	20 - 35	30 - 50	25 - 35	250 - 350
Shape	No furrow ± Round	No furrow ± Round	Elongated furrow	Elongated balls	No Furrow
Germ	Important embedded	Important embedded	Unimportant	Unimportant	Important embedded
En	Friable	Friable	Soft	Breakable	Soft
Coloration	Testa				
Consequences	Grain abrasion Outside towards inside	Grain abrasion Outside towards inside Or Grinding Screening	Conditioning Grain opening Grinding Screening	Remove balls	Degerming Opening Grinding Screening
Transformation					
1 <sup>st</sup>	Hulling	Hulling and/or Grinding	Grinding	Processing = hulling whitening	Degerming Grinding



TO THE HEALTH OF THE HEALTH

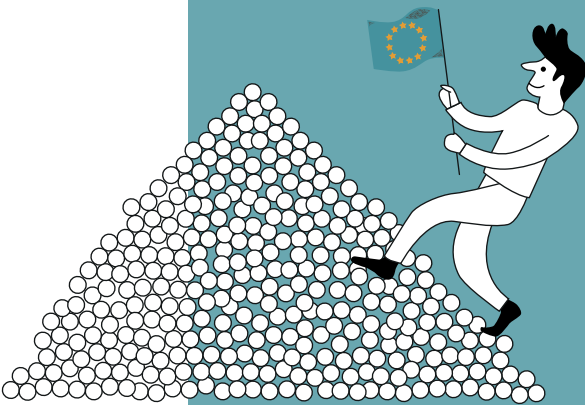
Sorghum falls into a category called “smart foods”: it is an intelligent food which has several advantages and which is not only a gourmet commodity suitable for all culinary fancies: it is good for our health. It is a source of vegetable proteins, iron, vitamins B6, niacin, phosphorus, and potassium. Sorghum is energizing, rich in antioxidants, gluten-free so safe for allergy sufferers. It is also a source of dietary fibres.

Sorghum is ideal for diabetics. It contains a small quantity of soluble sugars only, (1 - 5%) but more slow sugars. In addition, we know that it fights various gastrointestinal pathologies. Africans use it against gallstones, gastric ulcers and colitis and in China, it is prescribed to control choleriform diarrhea.



“Today, we only produce pancakes, cookies, flour, beer and vegetable drinks. However, I believe that sorghum can be used for all types of products: cereal bar, or all ordinary gluten-free products (...)

Monia Caramma,  
Director of Agricultura Biologica company, Italy  
Learn more at : [www.sorghum-id.com](http://www.sorghum-id.com)



**Insist on star-sorghum! It has an exceptional seed quality.**

European seed production meets very demanding specification requirements.

MINIMUM GERMINATIVE FACULTY  
80% purity of seeds  
(90% on average in the European Union)

MAXIMUM MOISTURE  
14% of the weight

MINIMUM SPECIFIC PURITY  
98% of the weight  
(99% on average in the EU)

MAXIMUM NUMBER CONTENT OF SEED OF OTHER SPECIES 0

These very strict and minimum standards also apply for basic and pre-basic seeds.

PROTEIN COMPOSITION OF DIFFERENT CEREALS \*

Cereals	Proteins (% DM)	Albumins	Globulins	Prolamins	Glutelin
Wheat	10 – 15	3 – 5	6 – 10	40 – 50 gliadins	39 – 40
Rice	8 – 10	Traces	2 – 8	1 – 5 oryzins	85 – 90
Maize	7 – 13	Traces	5 – 6	50 – 55 zeins	30 – 45
Sorghum	9 – 13	5	5	50-60 kafirins	30 – 40
Rye	9 – 14	5 – 10	5 – 10	30 – 50 secalins	30 – 50
Barley	10 – 16	3 – 4	10 – 20	35 – 45 hordeins	35 – 45
Oat	8 – 14	1	80	10 – 15 avenins	5

\* According to Joël Abecassis, technician, INRA Montpellier



## SORGHUM IN ALL ITS FORMS



## NUTRITIONAL VALUE OF SORGHUM\*

- 10 - 16% of DM protein, Lysine essential amino acid deficiency
- 3 - 4% of lipids, 80% in the germ, the rest in the aleurone and pericarp layer, unsaturated FA
- 1.5 - 3% of mineral substances concentrated in the pericarp, the aleurone layer and the germ: Phosphorus, Potassium, no Calcium, no Sodium
- B vitamins in the germ and the aleurone layer, Vitamin E and K in the germ, no vitamin C
- 2 - 3% of soluble sugars: sucrose, glucose, fructose
- 2 - 4% fibre (hemicellulose)
- 65 - 75% starch

\* According to Geneviève Fliedel,  
Researcher in food science, CIRAD Montpellier.

“*Breeders have made important efforts and now early varieties are available that we can harvest a month earlier, and it is profitable.*”

Yvon Paraire, Farmer in France.  
Learn more at: [www.sorghum-id.com](http://www.sorghum-id.com)

### SOURCES:

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*SORGHUM THE SAFE BET FOR THE FUTURE*

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