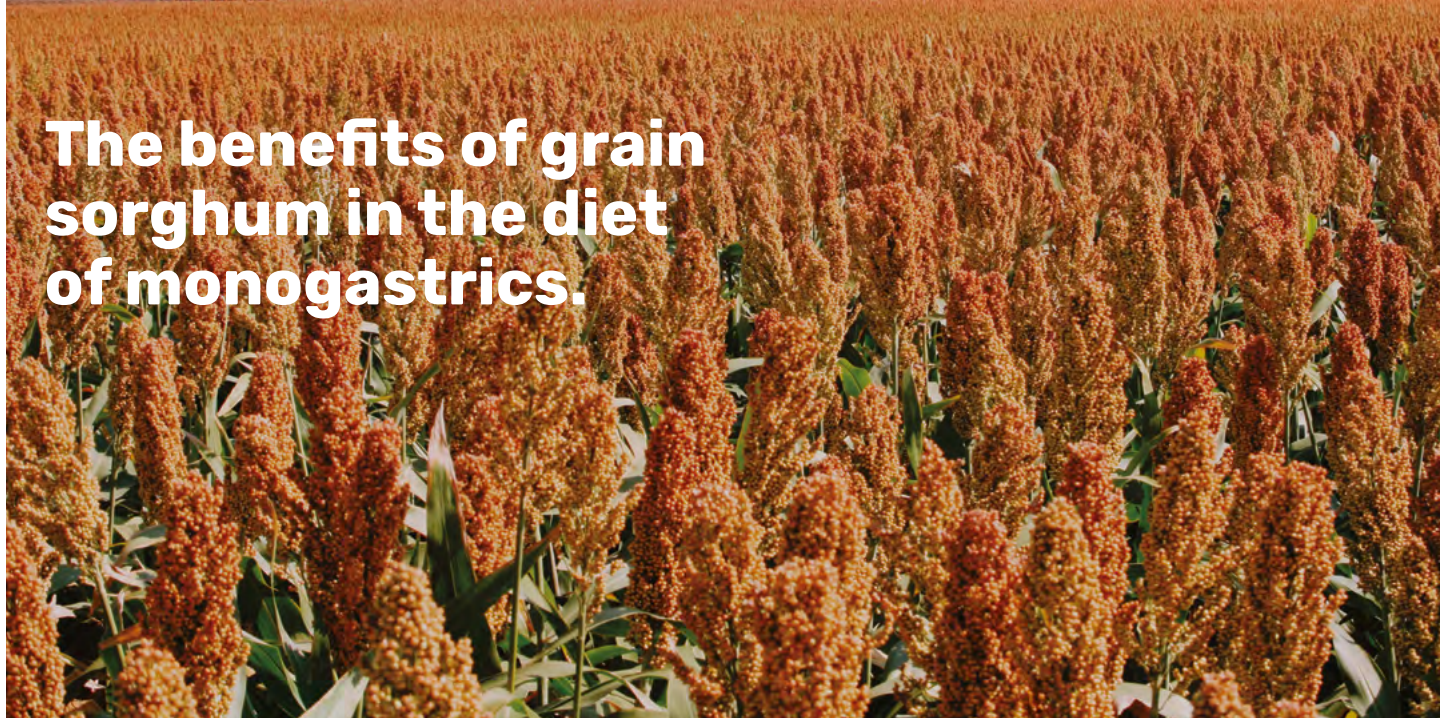# The benefits of grain sorghum in the diet of monogastrics.

Due to its chemical composition, energetic value, high protein content and low exposure to myco-toxins, sorghum has significant advantages in animal nutrition. It fits perfectly into monogastric rations like cattle.

Favorable chemical composition

The ARVALIS Institute, in collaboration with FranceAgri-Mer, analyzes grain sorghum every year. It shows that its chemical composition is similar to that of other cereals, such as wheat and maize (see Table 1: average chemical composition of sorghum, wheat and maize).

- Its starch content, which is a source of energy, represents 74% of the dry matter. It is superior to that of wheat and equivalent to that of corn.

- The protein rate of sorghum, with an average of 11% can oscillate between 10 and 12 in the best cases, is also very interesting.

Table 1: chemical composition of sorghum, wheat and maize

%DM	Sorghum	Wheat	Maize
Starch	74	69	74
Protein	11	12	9
Fat	3.5	1.8	4.2
Cell wall	8	11.5	9.5
Total Sugar	1.3	2.9	1.9

Whether it is red or white, the physico-chemical characteristics of sorghum are identical
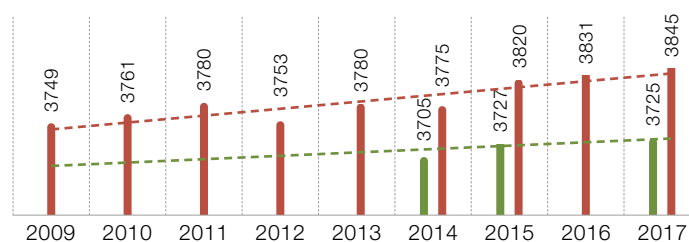
Very high energy value in poultry.

Not only does sorghum have a favorable chemical composition, but it is also the most energetic cereal for poultry. It can be incorporated up to 40% in feed formulations, while making sure to adapt this incorporation rate according to the growth or production stage. For example, during early phases, it is best to limit the incorporation rate to a maximum of 30%.
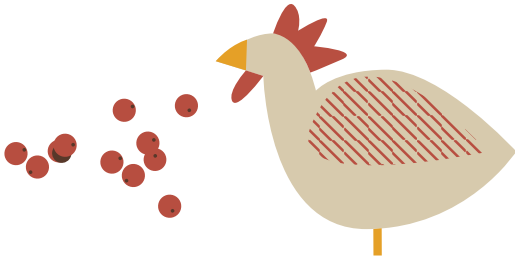
Energy value in kcal / kg DM of sorghum in rooster (red) compared to maize (green)

2009	2010	2011	2012	2013	2014	2015	2016	2017
3749	3761	3780	3753	3780	3775 / 3705	3820 / 3727	3831	3845 / 3725

Any impact on the quality of the meat? The presence of sorghum in the diet of poultry has little effect on the organoleptic quality of meat.

- Compared with maize, sorghum contains less xanthophyll, which induces the yellow coloring of the final product. Poultry fed on a diet rich in sorghum will produce meat less yellow than corn-fed poultry.

- However, some markets prefer white meat and, although the color of the meat can be changed, there is no effect on its taste!

What about pigs?

The nutritional qualities of sorghum in pork production are also very interesting.

- The nutritional value of sorghum has been proven. In the growth phase and when fattening pigs, the daily gain generated by sorghum is almost identical to that of maize. Sorghum can be introduced into the feed formulations with maize, wheat and barley. Compared with maize, sorghum nutrient levels are slightly higher in amino acids, with a little less energy.

- Sorghum can be used at every stage of pork production: during breeding, growth and fattening.

- Containing essential amino acids, sorghum offers interesting amounts of threonine and tryptophan. On the performance side, average daily gains range from 98% to 106% of the value of maize.

Milling: a step that should not be neglected.

Sorghum grains need to be processed properly so that its full potential is released. As it is smaller and harder than the maize kernel, to improve its digestibility it needs to be broken down into fine particles.

Milling is an important step.

- The digestibility of sorghum in food, as well as a better availability of starch (ie energy) is the result of milling the grain. **The finer the seed, the better it is exploited by animals.** However, excessive grinding can cause the opposite effects, namely making the nutrients less accessible. 2 mm is a good compromise. This increases the level of digestibility of the main amino acids compared to 4mm milling. The grinding equipment (grid), as well as the milling speed must be adapted to reach the size of 2mm. The grinding result must have a homogeneous texture that is easy to incorporate into the feed mixture.

Digestibility of amino acids according to the size of the milling of sorghum seeds (in%)
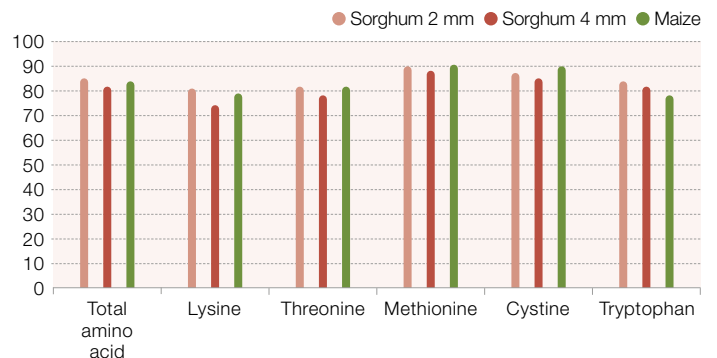
Since all animals do not have the same sensitivity, the quality of milling acts differently according to the species and stage of development.

- For pigs, there should be no unmilled seeds left as they will not be digested.

- For poultry, which are grain-eating, the opposite is true. However, for fast-growing poultry, grinding seeds is useful because it allows faster absorption of nutrients and increases their performance.
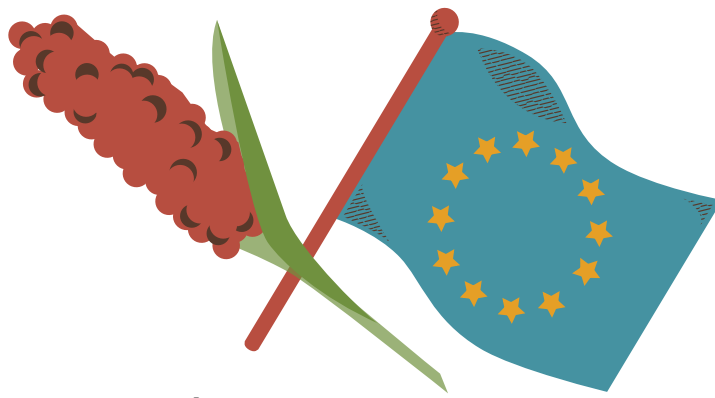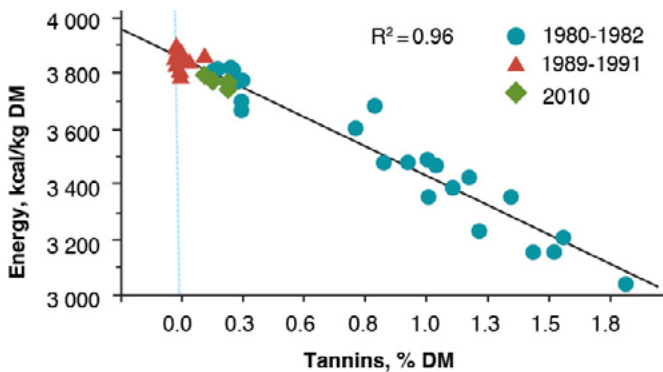
European varieties: no tannins, no mycotoxins, no GMOs.

Tannin contents <0.3

Sorghum has the reputation of displaying high tannin values, which hurts its image since the presence of tannins in animal feed is an important anti-nutritional factor in monogastrics. Thanks to the efforts of European breeders, **for 30 years European sorghum has been tannins-free.** And that is true whatever its color. To register a variety in the European catalogue, the tannin content must be under 0.3%. We can equate this threshold with «no tannin» because it is so low that it has no impact on the quality of food.

What are tannins?
Tannins (condensed) are polyphenols of vegetal origin. They possess the ability to precipitate proteins, forming enzyme-resistant complexes, that plants use as a chemical defense against pathogens and herbivores.

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 mushrooms. Thanks to these characteristics, sorghum is safe from mycotoxins. 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.

For 30 years, European sorghum has been tannin-free, as shown in the result below.

On this graph, each point corresponds to a European variety (in blue the varieties of the years 80/82, in red the varieties of the years 89/91 and in green, the varieties of 2010). Two lessons are clear :

• There is a strong correlation between tannin richness (≥ 0.3) and the energy value of the food produced.

• Since the end of the 1980s, European varieties have been free of tannins.

Both at European and at global levels, sorghum is a GMO-free species.