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THE PLANT

CHILI: Beyond spicy

The fruit of the botanical genus *Capsicum* plays a key role in the well-being, health and nutritional efficiency of animals. It contains molecules that have anti-microbial, anti-inflammatory and gastroprotective properties.

Chili is the world's most highly consumed spice. Green pepper is produced mainly in China, Mexico and Turkey, while India is the main producer of dried red pepper. Historically consumed for millennia, it was even used in the traditional chocolate and unsweetened Aztec drink, the « *Xocoalt* ». This fruit of the botanical genus *Capsicum*, from the *Solanaceae* family includes both sweet (bell) and pungent peppers. Five species are the most cultivated: *C. annum*, *C. chinense*, *C. frutescens*, *C. baccatum* and *C. pubescens*. Generally one to two meters high, with varied shapes and colors fruits, these plants thrive in warm, humid climates. The spicy taste of chili peppers is due to capsaicinoids, a family of molecules mainly represented by capsaicin. Capsaicinoids have anti-microbial, repellent and antifun-

gal properties, and are involved in the health properties of pepper fruits themselves. The protective effects of capsaicinoids in plants have led to study of potential health benefits in animals. Indeed, they have been shown to be involved in various processes including anti-oxidant, anti-diabetic^{1,2}, anti-inflammatory, and gastro-protective processes, and they have even been shown to prevent some types of cancer³. It is now known that chili can play a key role in the well-being, health and nutritional efficiency of animals. Also found in sweet and pungent peppers are carotenoids including capsorubin and capsanthin. Both of these carotenoids are powerful antioxidants responsible for the red color, as well as flavonoids and vitamins C and E.

These molecules, called phytoalexins, are synthesized and regulated by the plant for its survival and defense, in response to attacks by pathogens, diseases or environmental constraints. Importantly, once the fruit is harvested and during processing, the active molecules in the plant continue to change. Therefore the conditions of cultivation, storage, and plant processing are all critical to optimizing the concentration and activity of active molecules - and therefore the nutritional quality - that the peppers provide to the animal.

Marion SCHILLING, ID4FEED



Capsicum annum fruit is rich in carotenoids and other health-benefic compounds

1. Sricharoen, P. et al. Phytochemicals in *Capsicum* oleoresin from different varieties of hot chili peppers with their antidiabetic and antioxidant activities due to some phenolic compounds. *Ultrasonics Sonochemistry* doi:10.1016/j.ultsonch.2016.08.018.
2. Park, M.-S., Zhu, Y. X., Pae, H.-O. & Park, S. H. In Vitro and In Vivo α -Glucosidase and α -Amylase Inhibitory Effects of the Water Extract of Leaves of Pepper (*Capsicum Annuum* L. Cultivar Dangjo) and the Active Constituent Luteolin 7-O-Glucoside. *Journal of Food Biochemistry* 40, 696-703 (2016).
3. Guil-Guerrero, J. L., Martínez-Guirado, C., Rebolloso-Fuentes, M. del M. & Carrique-Pérez, A. Nutrient composition and antioxidant activity of 10 pepper (*Capsicum annum*) varieties. *Eur Food Res Technol* 224, 1-9 (2006).

World of botanicals

Plants and antibiotic resistance

Resistance to antibiotics in pathogenic bacteria is a real health problem for both humans and animals. Researchers have shown that some plant metabolites can potentiate the effects of antibiotics: different mechanisms are involved. For instance, in some colistin resistant bacteria, eugenol is able to interact with the enzyme (mcr-1) responsible for the resistance, making the bacteria sensitive again. The synergy can down-regulate the expression of mcr-1 gene. Wang et al, 2018, *Antimicrobial resistance and infection control*, 7:17.

Climate change will also have an influence on the market of botanicals

From changes to the times when plants are flowering, fruiting and harvested, to disruptions to nature's synchronization between plants and their pollinators, climate change, through drought, rain, heat and moisture favorable to diseases, is exerting a huge pressure on the botanical supply chain. As, of the roughly 3.000 herbs in global commerce, the majority of botanical species (greater than 2.000) are wild and not farmed, sourcing botanicals becomes a real challenge. From Stephen Daniells, 2018, *Nutra Ingredients.com*

THE INTERVIEW

FRANÇOIS GAUTIER: "Our passion: interaction between plants and animals"

François GAUTIER is the managing director of ID4FEED, a start-up created in June 2017 to develop and market natural innovative feed supplements.

BIOSIS: Who created ID4FEED ?
F. GAUTIER: ID4FEED was founded on June 1st, 2017 in France as the result of a technical collaboration that started in 2011 with the Spanish company BORDAS, one of the European leaders in the production of plant extracts and essential oils, based in Seville (Spain).

On top of its strong collaboration with BORDAS, ID4FEED has also created a network of other technical partners specialized in the production of plant extracts in France, the United States and Asia allowing the Company to propose a full range of solutions.

BIOSIS: What is your business?

F.G.: Innovative natural feed supplements based on plant and plant extracts (ID4FEED = IDEAS FOR FEED). We are looking for natural ways to improve farm animal performance and overcome their intestinal oxido-inflammatory cycle, in a context of over-use of antibiotics and increasing global concerns about resistance to antibiotics. Thanks to our research, we are able to offer innovative natural feed supplements rich in phytoalexins, which are secondary metabolites forming part of the defense arsenal of plants and having demonstrated beneficial properties for animals.

BIOSIS: What about your know-how and your specific technologies?

F.G.: With our industrial partners, we develop biotic substances from plants that positively modify animal health and performance. We have developed unique induction technologies to stimulate the production of specific active substances that form part of the



François GAUTIER, managing director of ID4FEED

defense arsenal of plants by the plants themselves and have demonstrated beneficial properties for animals. We also develop unique galenic and encapsulation technologies to protect the active substances and to ensure release at the site of action in the animal's gut.

BIOSIS: What are your values ?

F.G.: One of the strong values of ID4FEED is to conduct research on the interactions ("Biosis") that exist between the environment, the plant, the animal and its microbiota, and how these interactions may influence the whole animal. "Biosis" is also the name of our newsletter, a new tool for the feed industry that is dealing with this emerging science.

BIOSIS: What about your main projects?

F.G.: Our intention is to continue investing heavily in research dealing with the interactions that exist between plant and microbiota through specific phytoalexins. Our objective is to better understand the potential of these active substances produced by plant during controlled stimulation procedures on the optimization of eubiosis in farm animals.

Global

BORDAS newly certified with Fami-QS

ID4FEED is pleased to announce FAMI-QS certification of its historical partner DESTILACIONES BORDAS CHINCURRETA S.A. for additive and premixture production and additive trade. The Spanish group BORDAS (Sevilla) is considered as one of the EU leaders of essential oil and plant extract production. Equipped with 16 distillation towers, it produces plant extracts and aroma-chemicals. Since 1922, the company has promoted citrus fruit derivatives and aromatic plants like rosemary.

ID4FEED awarded at Viva Technology !

ID4FEED participated for the first time to the international VIVA Technology event, in Paris, from the 24th to the 26th of May 2018. ID4FEED was part of the Auvergne-Rhône-Alpes Region Lab where it was gratified by the Region to receive the first prize of the "Challenge Agri-Tech". This award highlights its disruptive innovation talking about resistance to antibiotics and more generally interactions between living organisms and their environment, also called "Biosis".

id4FEED
Ideas for animal feed



DIARY

SPACE in Rennes (France)
on Altis booth

11-14
Sept.

Clermont-Ferrand (France)
**Sommet de l'élevage
on the Auvergne
Rhône-Alpes booth**

3-5
Oct.

Hanover (Germany)
Eurotier exhibition

13-16
Nov.