TRIACON

ILSA
The green evolution

SECTION 1

Introduction

TRIACON comes from the combination of two technologies: enzymatic hydrolysis and supercritical extraction.

The raw material is totally plant-derived and OGM-free. It is alfalfa (*Medicago sativa*) grown in Italy by selected farms, under a biological regime and according to specific provisions from ILSA.

The dehydrated alfalfa is sent to two different plants:

- In the first plant the alfalfa is hydrolysed using selected enzymes, at low temperature so not to damage the active molecules found in it;
- In the second plant the raw material is introduced in specific extractors through which passes CO_2 in the supercritical state, capable of extracting a Triacontanol-rich concentrate.

The hydrolysate and the extract are, finally, appropriately dosed in order to obtain the different products of the **TRIACON** line (Figure 1).

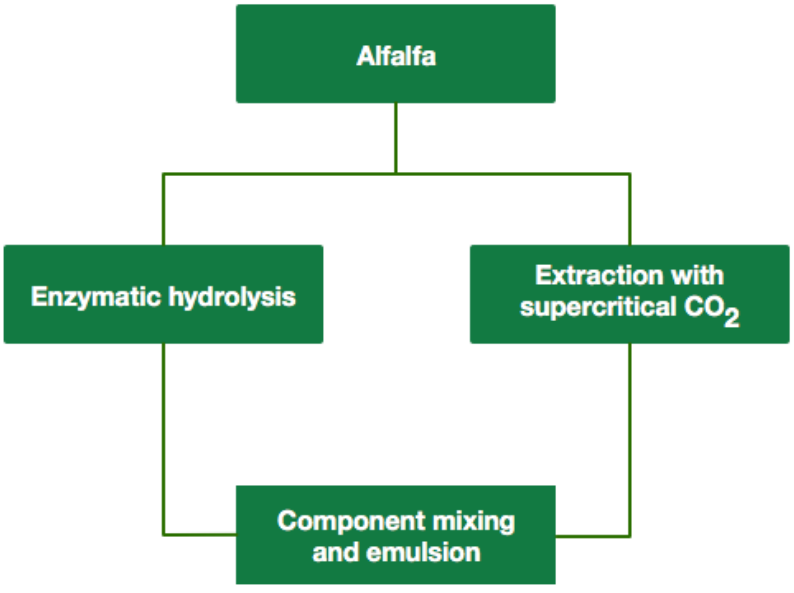

Figure 1 Triacon production flow chart

TRIACON is a line of products designed for the biostimulants industry.

These are enzymatic hydrolysates of Fabaceae with different Triacontanol concentrations:

TRIACON 5000
TRIACON 2500
TRIACON 200
TRIACON 100
TRIACON 10

PRODUCT LINE
Triacon

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SECTION 2

Production process

The products of the TRIACON line are derived from three complementary processes.

2.1 ENZYMATIC HYDROLYSIS - FCEH® PROCESS

The enzymatic hydrolysis is characterised by a tendency to release amino acids mainly in the L-form, biologically more active and useful to plants. The alfalfa is dispersed in water inside continuously stirred bioreactors provided with temperature and pH control (Figure 2).

Figure 2 Enzymatic hydrolysis plant (FCEH® process)

Subsequently, a selected enzymatic pool is introduced, made of specific proteolytic enzymes, which cut proteins catalysing protein hydrolysis, and cellulolytic enzymes, which allow the splitting of biomass cellulose and facilitate the breaking of cell walls (Figure 3).

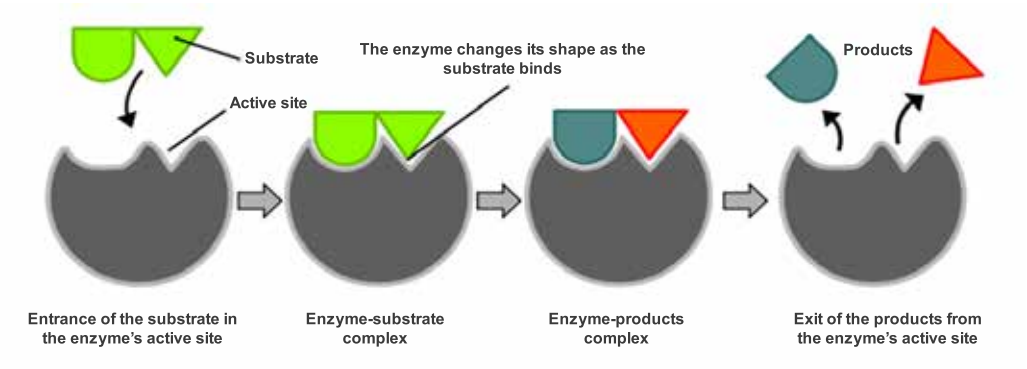


Figure 3 Example of an enzyme-substrate reaction

The mixture obtained is maintained under constant stirring at a temperature of 45-50°C and pH 5-6 so to facilitate the activity of enzymes. The time necessary to complete this stage of the process varies according to the raw material used and the desired end product and may last up to a maximum of 12 hours.

The liquid suspension obtained is finally centrifuged, clarified, filtered and concentrated in a falling film vacuum evaporator, which allows obtaining a liquid, homogeneous and perfectly stabilised product free from suspended solids.

The product gets temporarily stored in a sterile environment, waiting for being mixed with the Triacontanol concentrate.

2.2 EXTRACTION WITH SUPERCRITICAL CO_2 - SFE PROCESS

The extraction of the Triacontanol concentrate obtained in the alfalfa takes place using as extraction fluid, in supercritical conditions, Carbon Dioxide (CO_2). The solvent power of CO_2 can be regulated by increasing or reducing the conditions of pressure (which can reach 1000 bar) and/or temperature (in this case never greater than 80°C) (Figure 4).

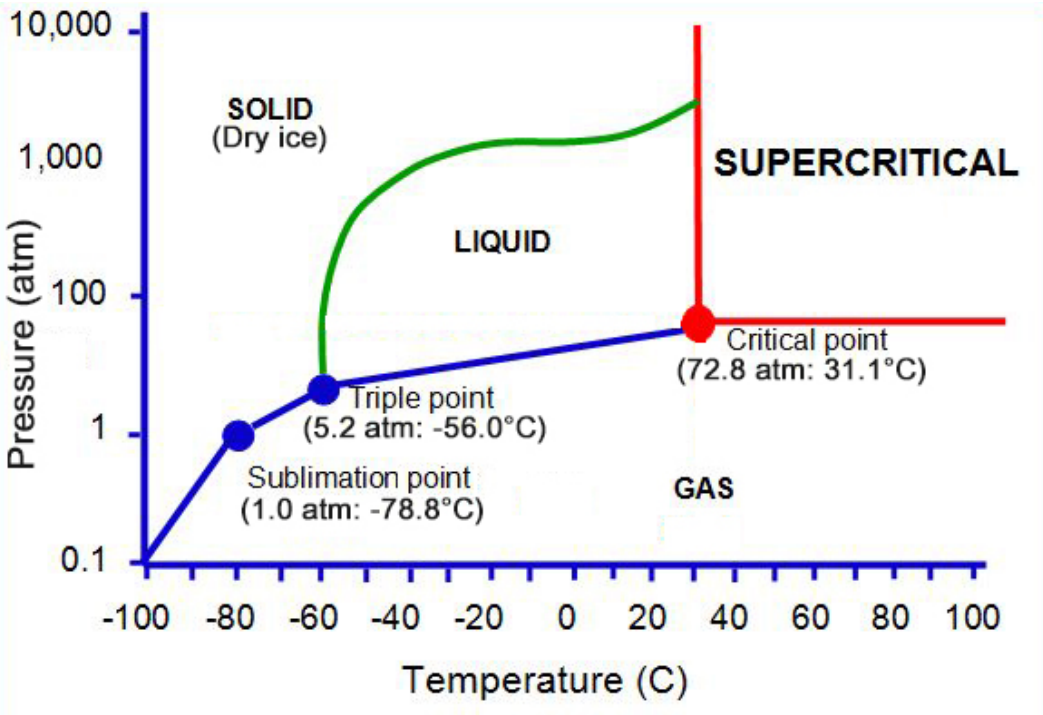


Figure 4 Carbon Dioxide shows four different phases: the solid, the liquid and the gaseous as well as the supercritical

The alfalfa is introduced in the two extractors through which passes Carbon Dioxide in its supercritical stage; the extraction stage is thus started and ends with the reduction of pressure inside the extraction plant (Figure 5) in a way so that CO_2 loses its solvent force releasing the extracted substances in specific containers. The concentrate achieved is microbiologically stable, which means it is not necessary to add preservatives. This extraction process, differently from conventional processes, does not entail thermal stress for the raw material or the extracted substances and, above all, does not require the use of organic solvents. Because of its very low environmental impact, the U.S. Food and Drug Administration has given this industrial process the GRAS (Generally Recognized as Safe) designation, recognising it as safe for use in the food sector.

Figure 5 Supercritical extraction plant (SFE process)

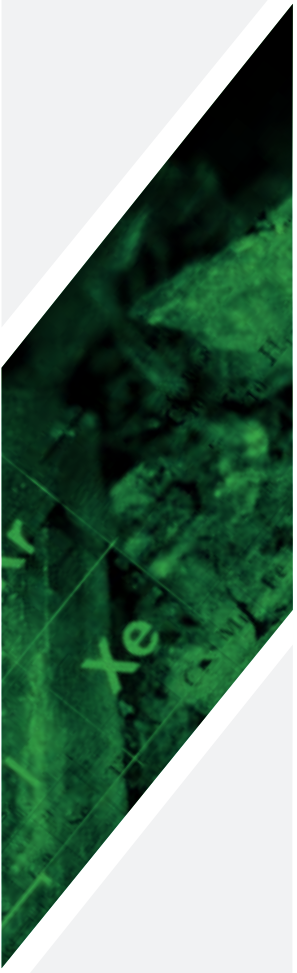
2.3 MIXING AND HOMOGENISATION

The hydrolysed product obtained with the FCEH® process and the concentrate extracted by SFE are appropriately dosed and introduced inside a homogenisation plant with balls for mixing (Cowles type) that allows a perfect emulsion and dispersion of polar and nonpolar components (Figure 6).

Figure 6 Refining / homogenisation plant with balls

SECTION 3

Triacontanol



Triacontanol (Figure 7), and in particular 1-Triacontanol ($C_{30}H_{62}O$), is a long linear chain alcohol, belonging to the family of policosanols (aliphatic alcohols), commonly found in nature in the cuticular waxes of plants and in beeswax.

There are many scientific works in the literature covering the use of Triacontanol on plants of different species, both at the root and the foliar level.

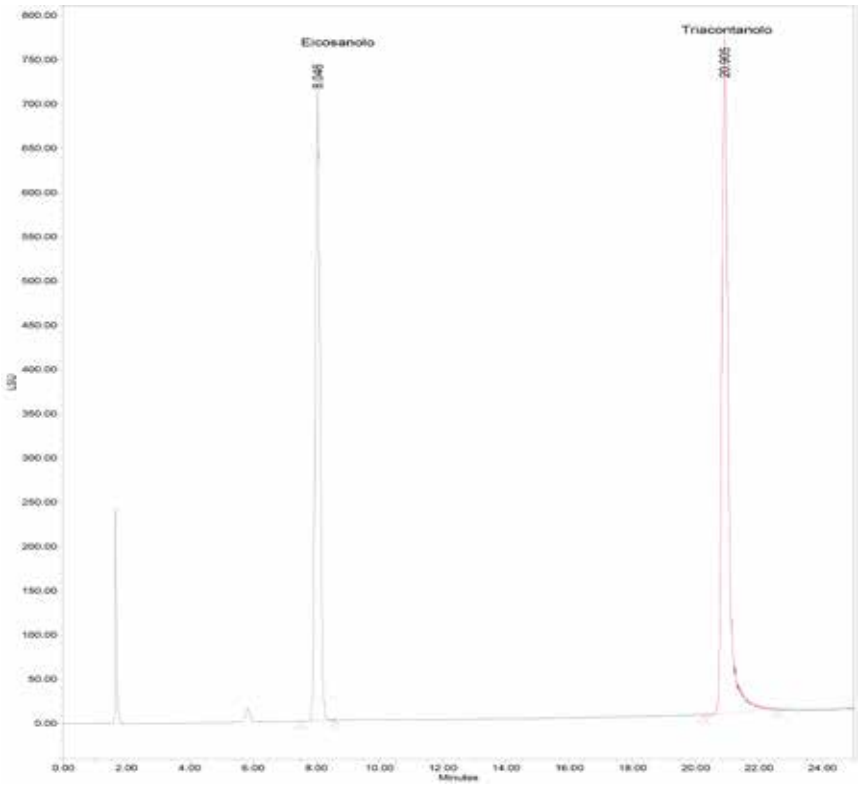


Figure 7 Example of chromatography graph: the two peaks indicate the molecules of Eicosanol (internal standard) and Triacontanol respectively. Chromatographic separation through HPLC (High Performance Liquid Chromatography) instrumental technique with ELSD (Evaporative Light Scattering Detector) detector.

The positive effects of this molecule on the primary and/or secondary metabolism of plants are numerous:

- promotes the absorption of minerals in the soil;
- increases permeability to water and other solutions and improves the capacity to retain humidity;
- supports natural enzymatic and hormonal activities;
- increases photosynthetic capacity;
- improves protein synthesis;
- promotes bud development;
- promotes tillering and branching;
- reduces leaf and flower fall and early fruit drop;
- increases biomass and the length of primary and secondary roots;
- brings forward fruit ripening.

SECTION 4

Industrial use of TRIACON

The TRIACON line is very stable and miscible with the major commercial formulations and substances used in the field of biostimulants and fertilizers.

THE PRODUCT CAN BE MIXED WITH*
Amino acids
Plant extracts
Humic acids
Algae
Organic fertilisers
Mineral fertilisers
Triazoles
Neonicotinoids
Strobilurins
Sulphonylureas
Phosphites

* Avoid mixing with products with extreme pH values.

For more information, see:

- **Technical Sheet**
- **Safety Data Sheet**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