

Empyra®
Geolife technology

Chemical-free program for craft beers



Bioma®

Bioma is dedicated to improving the quality of people' and animals' life, rebalancing the natural system, solving food and environmental problems with a tangible and sustainable impact for the world and future generations. We work with our clients as a true partner, optimizing productivity to help them generate economic and environmental sustainability and adapting our services to the specific conditions in which they operate. Our solutions are inspired by nature itself, a power that has been fostering life and balance on earth since the dawn of time. Therefore, all our products are chemical-free, GMO-free, and risk-free. All our solutions are based on an extremely simple philosophy: to replicate, in a natural way, an optimal environment for life.

OPTIMIZATION OF CRAFT BEER PRODUCTION

MICRO AND MINI BREWERIES

The phenomenon of craft breweries was born in the United States in the 1980's, in a phenomenon known as the "American Renaissance": European immigrants preserved many of their traditional products that would have otherwise been lost.

In Europe, including Italy, this trend has been developed with the purpose of providing customers high quality handcrafted products.



ARTISANAL BEER PRODUCERS CAN BE DIVIDED INTO THREE CATEGORIES

- **Micro-brewery:** They usually don't have a bar and the production is entirely or largely for sale in premises and stores.
- **Pub brewery:** I.e. premises brewing beer for in-house consumption, often associated with catering and foodservice activities.
- **Artisanal breweries:** I.e. pre-existing installations converted to the production of craft beer, usually for third parties, enabling volumes hardly reachable with a normal domestic installation.

PRODUCTION OF CRAFT BEER

Craft beer is thus a beer that is produced by a medium-sized or small-sized brewery, mainly with malted cereals.

The product is neither pasteurized nor filtered. This often leads to problems of strong organoleptic differences between the various batches of production and their stability over time. This may create difficulties for the development of customer loyalty.

Physical and microbiological stability as well as the maintenance of organoleptic characteristics over time is the primary goal to conquer new market shares and gain visibility on online sales platforms.

ITALIAN LEGISLATION ON CRAFT BEER

Since 2016, the Craft Beer Law (154/2016) defines "craft beer" as beer produced by independent breweries (legally and economically) that use their own production facilities that don't produce more than 200'000 hectoliters of beer per year; on the other hand, the beer cannot be processed by pasteurization and microfiltration.



Empyra®

Bioma has developed a 100% "chemical-free" product range with the aim of optimizing the fermentation phases and the stability of craft beers.

The Empyra® product range consists of 3 hydroalcoholic solutions containing vegetable polyphenols that are integrated into traditional brewing processes.

Empyra® 1 is added in the first fermentation prior to the inoculation of the yeasts and is used to stimulate proper growth and optimize the yeast's fermentation activity.

Empyra® 2 is added during the secondary fermentation phase:

- If the secondary fermentation occurs in an autoclave, it must be added before the new yeast inoculum is added.
- If the secondary fermentation occurs in the bottle, it must be added during the foaming process.

Empyra® 3 is added during the bottling of the finished product only in case of an autoclaving refermentation.

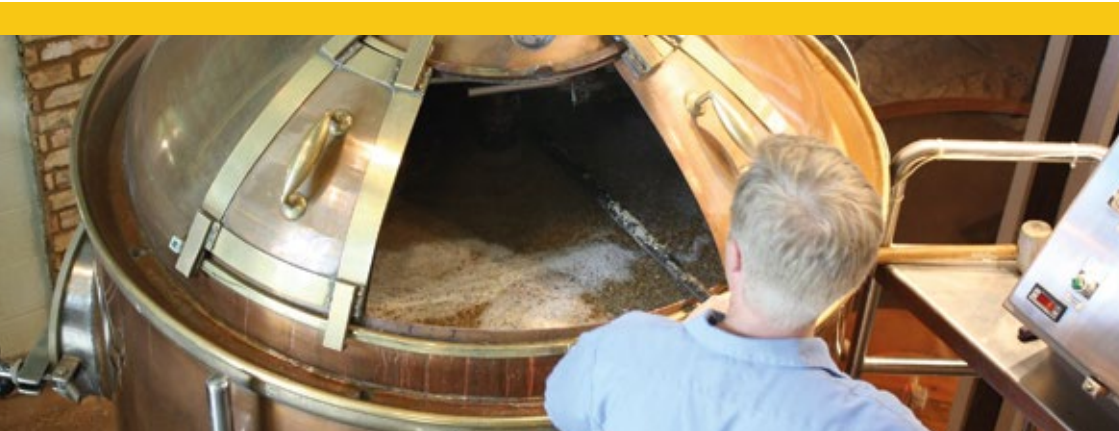
Using Empyra®, a natural adjuvant, in addition to optimizing fermentation processes, allows microbiological control and physical stability over time. It enables craft beers to better express the characteristics of the used raw materials and to improve their quality by preserving them from the negative effects of conservation and transport processes

COMPOSITION

Empyra® 1: Liquid product. Demineralized water, Ethanol-96% ORGANIC, ORGANIC grape seed extract.

Empyra® 2: Liquid product. Demineralized water, Ethanol-96% ORGANIC, ORGANIC grape seed extractl.

Empyra® 3: Liquid product. Demineralized water, Ethanol-96% ORGANIC, ORGANIC grape seed extract.



EXPERIENCE IN THE PRODUCTION OF CRAFT BLOND BEER WITH Empyra®

The test was carried out at the MOSTOITALIANO brewery (Rome).
Two trials of 100 liters c/u of beer with refermentation occurring in the bottle were produced at the same time and Empyra® 1 and Empyra® 2 were added to one of them.
Beer production was obtained in two fermentation phases. The first one in stainless steel tanks with gas evacuation and the second one (foaming) in 33 cl bottles.
For the trial with Empyra®, Empyra® 1 was added at the first stage of fermentation and Empyra® 2 at the bottling stage (for the foaming).

The production of the fermentation base took place as follows:

- Composition: 3 parts sterile water and 1 part clear malt.
- The mixtures have not been filtered but only drained through the barley in order to preserve the integrity of all elements.
- The sugar concentration was found to be 12% in both worts.
- 200 grams of flowering hops were added to the solution and immediately boiled at 100°C for 60 minutes.
- The pH was brought to 5.2 with phosphoric acid.
- After completion of boiling, carrageenan algae were added in a dose of 0.2 g/l for deproteinization.
- The 100 liter c/u wort was then cooled to 18°C and 100g of yeast paste as well as 8 ppm of filtered sterilized oxygen were added.
- In one of the two, which we will now call "Empyra®", 30 ml of Empyra® 1 was added.
- At a density of 2.4° P, the worts were decanted and 6 g/l dextrose were added to both for a total development of 1.5 bar pressure in the bottle.
- 30ml of Empyra® 2 were then added to the Empyra® wort.
- Both beers were bottled simultaneously in dark 33 cl bottles for the final fermentation.

Starting data for both trials:

- Pre-fermentation density = 12° P.
- Pre-fermentation pH = 5.2.
- Creamed yeast, inoculum rate = 1g/l.
- Inoculant temperature = 18°C.
- Ambient temperature = 18°C.
- Imposed fermentation temperature = 21.5°C.
- Dissolved oxygen at yeast inoculation = 7 ppm.

The fermentation started immediately and the table below shows the temperature and sugar reduction values, expressed in density degrees for both trials.
The density did not decrease.

LIGHT BEER		Empyra®	
	T °C Density	T °C Density	
1st day	22,0°C 9,7° P	21,8°C 8,8° P	
3rd day	22,2°C 5,8° P	21,4°C 2,9° P	
5th day	21,9°C 3,4° P	20,2°C 2,4° P	
7th day	20,8°C 2,4° P	19,8°C 2,4° P	

The trial with Empyra® reached the sugar value of 2.4° P two days earlier than the traditional method.

305 bottles from each trial were produced and stored in a dark fermentation chamber under a constant temperature of 23°C.

After 4 weeks, they were wrapped and packed in 6x33 ml boxes and the Empyra® trial boxes were marked with an "E".

In January 2019, two bottles from each trial were sent to the Vassanelli laboratory in Bussolengo for microbial load tests and the results are the following

Tests January 15, 2019

BEER	TRADITIONAL METHOD	Empyra®
Yeasts and molds at 25°C	752.000 CFU/g	290.000 CFU/g

Certificates of original tests are available upon request.

In June 2019, 7 months after the bottling, new microbiological tests of both trials were carried out at the Lambda laboratory of Villafranca in Verona.

Tests of June 6, 2019

BEER	TRADITIONAL METHOD	Empyra®
30°C microorganism count	<100 CFU/g	<100 CFU/g
total fungal load	>6.000 CFU/g	200 CFU/g
Yeast count	>6.000 CFU/g	200 CFU/g
Mold count	<10 CFU/g	<10 CFU/g

Certificates of original tests are available upon request.



CONCLUSION

Empyra® optimizes and accelerates the fermentation processes by fostering polyphenolic polymerization to improve and stabilize the organoleptic characteristics of craft beer over time.

The Empyra® trial, for example, produced the sugars three days earlier than the traditional trial without increasing the temperature and, more importantly, the total microbial load. After 40 days in the bottle, yeasts and molds are about one third of those in the traditional trial.

7 months after bottling, the analysis of yeasts and molds indicates values higher than 6000 CFU/g in the traditional trial (not calculable because the growth plate is fully colonized), whereas the Empyra® trial is at optimum. In fact, for beers, the yeast and mold rate should be between 200 CFU/g and 2,000 CFU/g (200 CFU/g is the best value).

These conditions were also obvious during the tasting, which highlighted the cleanliness and absence of unpleasant odors of the Empyra® trial compared to the traditional trial.

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I am chemical free