

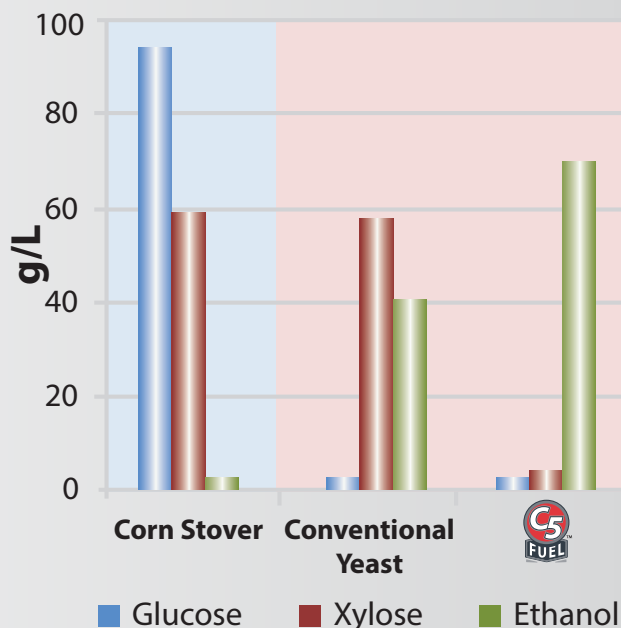


C5 FUEL™ is an advanced strain of *Saccharomyces cerevisiae* able to ferment xylose with a high ethanol yield in the presence of inhibitory compounds. It is used in the production of fuel ethanol from cellulosic substrates.

C5 FUEL ATTRIBUTES:

- Rapid xylose fermentation
- Can reach ethanol titers above 100g/L
- Low pitch ≤0.5 g/L dry cell weight
- Ferments xylose in the presence of significant concentrations of inhibitors commonly found in cellulosic substrates (e.g. furfural, HMF, acetic acid, vanillin, ferulic acid, coumaric acid)
- Temperature range 30- 35°C, pH range 4.5 to 6.5
- Ethanol yields between 0.44 and 0.47 g/g consumed sugar
- Tested on cellulosic substrates derived from the following materials: corn stover, corn fiber, bagasse, hard wood, softwood, wheat straw, switchgrass, paper sludge
- Tested on substrates pretreated with dilute acid, dilute ammonia, ensilage, and additional proprietary pretreatments

Figure 1: C5 FUEL Performance



C5 FUEL compared to conventional yeast in a commercial 25% total solids pretreated corn stover fermentation. C5 FUEL is able to ferment 97% of the available glucose and xylose in less than 48 hours with an ethanol yield of 0.47 g/g sugar consumed reaching an ethanol titer above 70 g/L.

Figure 2: C5 FUEL provides excellent performance on a range of cellulosic substrates and process conditions

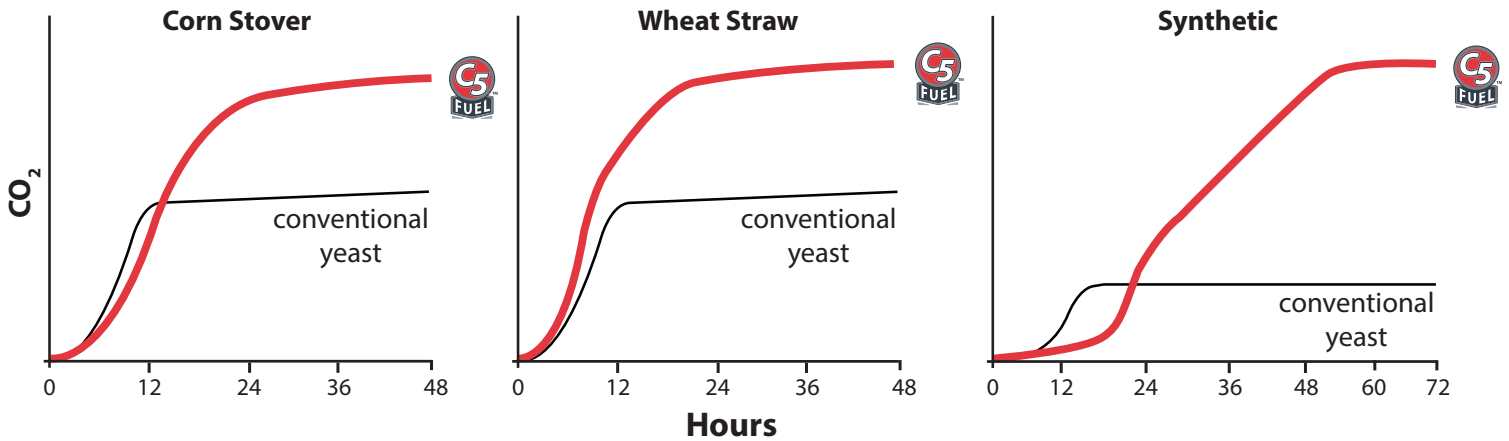
Substrate	g/L			Fermentation			Ethanol at 48 Hours	
	Glucose	Xylose	Acetic Acid	pH	°C	hours*	titer (g/L)	yield (g/g)
Corn Stover	91	61	3.5	4.9	35	32	71	0.47
Wheat Straw	48	36	4.0	5.3	32	28	38	0.46
Synthetic [^]	30	75	9.0	5.5	32	56	39	0.47

*time to consume >95% glucose and xylose

[^]synthetic media with high concentrations of inhibitors commonly found in cellulosic substrates

Figure 3: C5 FUEL outperforms conventional yeast, no matter the substrate

Performance of C5 FUEL in three different cellulosic substrate fermentations compared to conventional yeast. C5 FUEL is able to ferment >95% of available glucose and xylose. CO₂ measurements are plotted as an integral over time and are an indirect readout of sugar consumption and ethanol production.



DIRECTIONS FOR USE:

Due to the variety of different substrates and pretreatment conditions, dosing of C5 FUEL will vary from condition to condition. Please consult your local technical sales representative for more detailed information for your specific plant.

The optimal temperature range for fermentation is 86°F-95°F (30°C-35°C). The yeast are able to tolerate short temperature excursions up to 100°F (38°C), though this is to be avoided especially in the later stages of fermentation when ethanol and inhibitory compound concentration is high. The ideal pH range for fermentation is 5 to 6.

The yeast should be provided sufficient nutrients to ensure a robust and complete fermentation. Due to more inhibitory compounds that are liberated from various pretreatments, a nutrient package may be necessary to complete fermentation.

GUIDELINES FOR PRODUCT STORAGE:

C5 FUEL is supplied as a stabilized cream yeast (20% solids) packaged in 1000 kg (2205 lb) totes. The product is stable for up to 3 months from date of manufacture when stored at refrigeration temperatures (33.8 - 40°F, 1- 4°C). The product is stable for approximately 1 week when removed from refrigeration and stored at plant temperatures (86°F, 30°C).

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