

TRANSFERM[®]

Yield+

Featuring MGT[®] technology by MASCOMA

PRODUCT SHEET

DESCRIPTION AND USE:

TRANSFERM[®] Yield+ is an advanced strain of *Saccharomyces cerevisiae* that expresses glucoamylase (GA) enzyme and reduces glycerol production. It is used in the production of fuel ethanol from liquefied grains. Fuel ethanol production facilities using TRANSFERM Yield+ may experience a yield gain of up to 4% in ethanol, a reduction in glycerol of approximately 30% and may reduce separately purchased GA enzyme.

PERFORMANCE:

TRANSFERM Yield+ performance is illustrated in Figures 1, 2, & 3. The specific benefits and results that an ethanol production facility will experience using TRANSFERM Yield+ will depend on production plant design, operational parameters and process conditions.

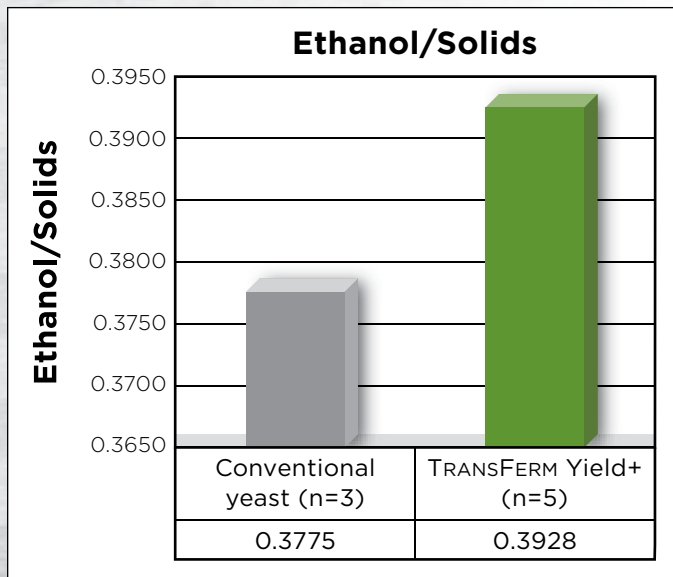


Figure 1: Performance of TRANSFERM Yield+ at reduced GA (70% of total GA) in a commercial 34% total solids whole corn mash, compared to conventional yeast, with a standard amount of exogenous GA (100% GA). The results demonstrate a 4.06% yield increase.

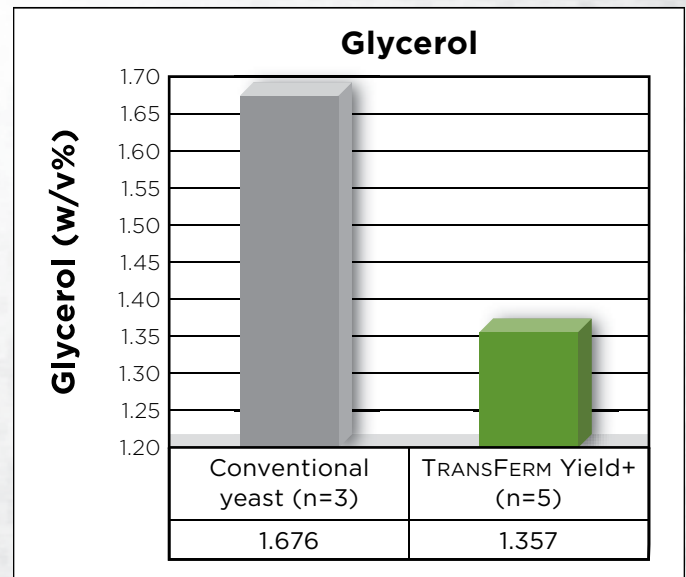


Figure 2: Performance of TRANSFERM Yield+ at reduced GA (70% of total GA) in a commercial 34% total solids whole corn mash, compared to conventional yeast, with a standard amount of exogenous GA (100% GA). The results demonstrate a 30.2% reduction in glycerol. (Based on initial glycerol of 0.6%)

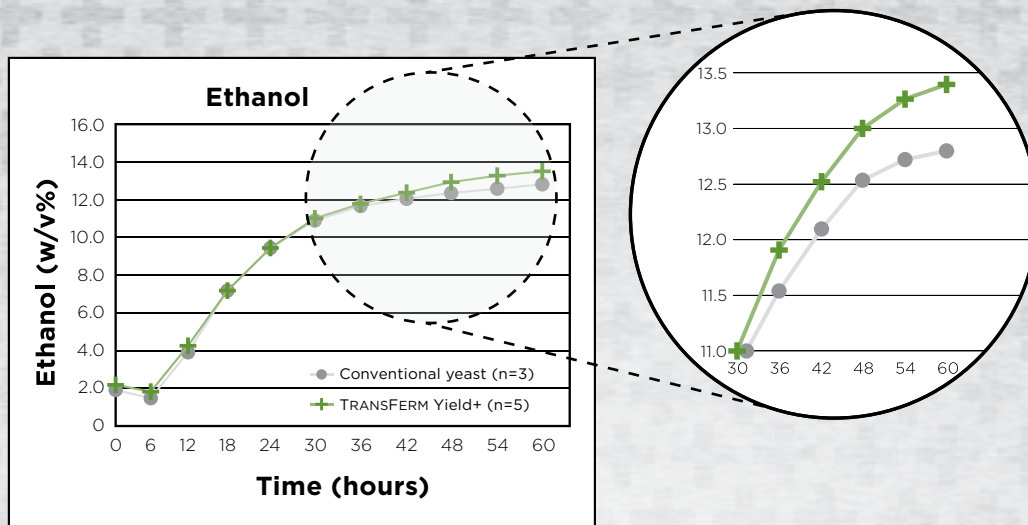


Figure 3: Ethanol profile of TRANSFERM Yield+ at reduced GA (70% of total GA) in a commercial 34% total solids whole corn mash, compared to conventional yeast, with a standard amount of exogenous GA (100% GA). The results demonstrate an ethanol productivity boost from 30 hours onward.

DIRECTIONS FOR USE:

In a propagation tank with 6-10 hours fermentation time, the recommended dosage is 50-100 kg/batch (0.1-0.20% w/w) into the prop tank. This should be sufficient to provide 200-400 x 10⁶ viable cells/mL at the end of propagation. 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 concentration is high. The ideal pH range for fermentation is 4.0 to 5.5.

The yeast should be provided sufficient nitrogen to ensure a robust and complete fermentation. In a whole-corn mash it is preferable to have added nitrogen, supplied for instance as 500-1500 ppm urea or 200-700 ppm of ammonia, or a combination of the two. Use of mash with a lower amino nitrogen content such as fractionated mash may require further added nutrients.

GUIDELINES FOR PRODUCT STORAGE:

TRANSFERM Yield+ 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 (40°F, 4°C). The product is stable for approximately 1 week when removed from refrigeration and stored at plant temperatures (86°F, 30°C).

QUALITY SPECIFICATIONS:

Percent Solids	Viable Yeast Cells per mL	Total Bacterial Count per mL
20-24%	>5 x 10 ⁹	<10 ⁵

REGULATORY COMPLIANCE:

Pursuant to 21 CFR § 170.30, Mascoma Corporation has determined through scientific procedures that TRANSFERM Yield+ is GRAS (Generally Recognized as Safe) for the production of Distillers' co-products, such as DDGS, for use in animal feeding applications. This product is only to be used as a processing aid in the production of fuel ethanol and distillers co-products and is not to be used as a direct addition to food or animal feeds.

Facilities using intergeneric microorganisms are subject to premanufacturing review procedures under the Toxic Substances Control Act (TSCA) 40 CFR § 725. Mascoma's bioengineered *Saccharomyces cerevisiae* strain in TRANSFERM Yield+ has met the review requirements via completion of a Microbial Commercial Activity Notice (MCAN). For further information, please contact Mascoma.

