



Enzymes for Olive Oil Extraction

From Novozymes

 **Univar**Solutions

Enzymes in Olive Oil Extraction

Get More From your Olives

Olive oil has made a valuable contribution to human nutrition for more than 2000 years. As today's consumers are increasingly health conscious, the consumption of olive oil has steadily increased in recent times.

Get more out of your valuable olives with Novozymes' solutions. When your olives and harvest vary, Novozymes enzymes help squeeze out the most valuable oil while ensuring optimum quality, enhancing processing and reducing losses.

The recommendations in this brochure have been validated by tests carried out at the "Instituto de la Grasa" in Spain and we bring our global expertise to your olive oil production in North America.

Key Benefits

- Improving the production process with smoother and more stable operation of machines and equipment.
- Faster, more effective oil and water separation
- Increased oil yield typically 5-10% more oil
- Less residual oil in the pomace
- Quicker, better oil clarification
- Works with all extraction systems
- No change in the oil quality
- Can start harvesting earlier in the season without losing yield. This also allows fresh olive oil to be available in the marketplace earlier in the season & blending with last season olive oil



Secondary Benefits

- Elimination or reduction of incorporation of water to the malaxer and thus avoiding the elimination of polyphenols.
- Can end harvesting earlier in the season and allows the olive tree to start flowering earlier thus increasing yield for next year.
- Having a lower energy consumption of the machinery; malaxer; pumps, etc.

Maturity Index

A simple visual method of evaluating the state of evolution of the fruit is the measurement of Maturity Index.

Maturity Index Guide



0



1



2



3



4



5



6



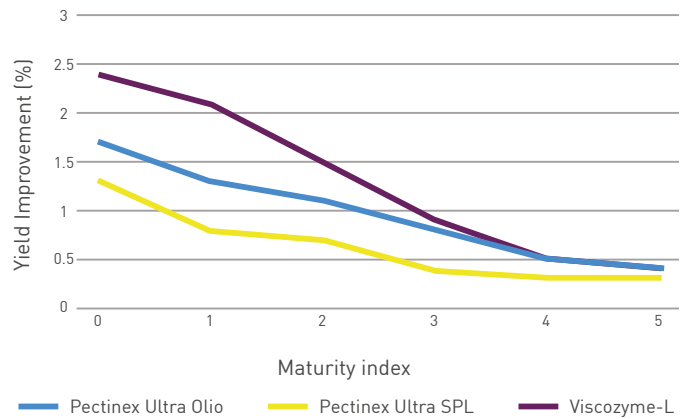
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Numerical references of each of the states to evaluate the Fruit Maturity Index



Studies with different enzymes teach us that the yields obtained change over of the harvest season depending on the evolution of the maturity index.

Yield Improvement vs Control (%)



— Pectinex Ultra Olio — Pectinex Ultra SPL — Viscozyme-L

Dosage Guide

Based on our global experience from the last few harvest seasons, we have established the recommendation of enzymes and dose depending on the maturity index of your olives.



MATURITY INDEX ARBEQUINA/ARBOSANA

0-1	1-2	2-4	>4
500-600 ppm Viscozyme® L + 60 ppm Ultimase BWL 40	370 ppm Viscozyme® L + 180 ppm Pectinex® Ultra Olio + 50 ppm Ultimase BWL 40	230 ppm Pectinex® Ultra Olio + 170 ppm Viscozyme® L	250 ppm Pectinex® XXL* + 50 ppm Viscozyme® L

MATURITY INDEX PICUAL

0-1	1-2	2-4	>4
500-600 ppm Viscozyme® L + 30 ppm Ultimase BWL 40	330 ppm Viscozyme® L + 240 ppm Pectinex® Ultra Olio + 30 ppm Ultimase BWL 40	280 ppm Pectinex® Ultra Olio Pectinex XXL* + 120 ppm Viscozyme® L	300 ppm Pectinex® XXL*

Practical considerations when to use and test enzymes:

Dose evaluations are necessary to understand the potential of using enzymes.

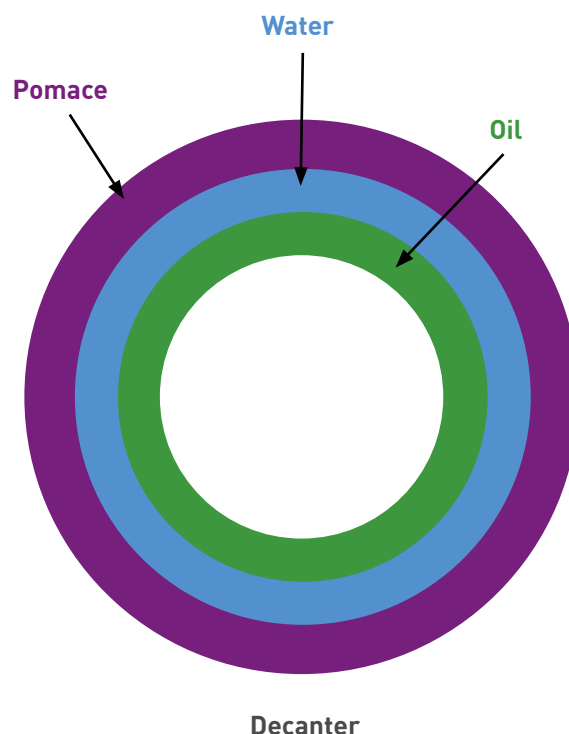
- Abencor's transition to industrial application requires a profitability analysis.
- In-depth analysis is required when performing Abencor tests. The volume of oil and interface is key to understanding enzyme activities in the olive paste. Abencor is not an equipment designed to evaluate the efficiency of enzymes.
- Olives of small size, low maturity, low humidity and/or low content of oil will require increasing the dosage of enzymes to counteract high viscosity of the paste.

Possible adjustments to the machinery:

- In general, the combination of enzymes with 0.2-0.4% micro talc is beneficial, depending on the humidity in the olive.
- Due to the decrease of viscosity in the malaxer, it may be necessary to lower or stop the addition of water.
- The use of enzymes increases both the amount of released oil as well as the ring size of oil formed inside the decanter.
- Increase the plates settings on the decanter to capture extra oil released by the enzyme.
- Consider injecting 3-4% water into the decanter to help separate the oil



- Keep in mind that the best separation of phases results in a much drier pomace, therefore it is important to inspect the discharge of pomace from the decanter frequently.
- Enzymes increase the fluidity of the paste, which increases the flow of the pump by 4-5% (at the same Hertz value). This could require slowing down the pumping to maintain flow rates, thus decreasing Hertz value.



The influence of fruit condition on the viscosity of the paste:

- The viscosity of the paste in Arbequina and Arbosana should be evaluated as a factor of dose adjustment whenever:
 1. The average fruit weight is less than the average for the variety
 2. The humidity of the fruit is low
 3. The oil content is below the average for the variety.
 4. The fruit is still very green.
- If some of these characteristics of the fruit are presented in combination form then it is highly recommended to consider the increased enzyme dose to counteract high paste viscosity resulting.



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