Enzymes for Yeast Extract Production

Yeast extract is a soluble concentrate extracted from yeast and contains nutritional components including amino acids, nucleotides, vitamins, and minerals. Yeast extract is used in the food industry as a flavor enhancer, as a component of media for cell growth in the fermentation industry, as well as in pet foods, cosmetics materials, plant nutrition products, etc..

Yeast extract is generally manufactured by two methods, autolysis or the enzymatic treatment of *Saccharomyces* species (Brewer's yeast, Baker's yeast) and *Torula* yeast. Autolysis is the traditional method for production of yeast extract and is prepared by the degradation of yeast with their own endogenous enzymes. Yeast extract made by exogenous enzymatic treatment under controlled conditions is characterized as a flavor enhancer and is rich in delicious flavor components such as the ribonucleotides 5'-Guanylic acid (5'-GMP:guanosine-5'-monophosphate) and 5'-Inosinic acid (5'-IMP:inosine-5'-monophosphate), amino acids and peptides, as shown in Table 1. These components of yeast extract contribute to a delicious taste and enhance flavors that make it a good seasoning. Recently, enzymatic yeast extracts have been commercialized and extensively used as new flavor enhancers in the food industry.

At Amano, various enzymes for yeast extract production are available, as shown in Figure 1. Enzymatic yeast extract, rich in flavor enhancer nucleotides such as 5'-GMP and 5'-IMP, is produced in three steps:

1. Yeast cell lysis and RNA extraction
2. RNA hydrolysis
3. Conversion of 5'-AMP to 5'-IMP

Table 1:Comparison of properties of yeast extract prepared by Autolysis and Enzymatic Hydrolysis

	properties
Autolysis	The yeast smell is strong.
	Free amino acids rich.
	Classic manufacturing method
	Replacement of HVP
Enzymatic Hydrolysis	The yeast smell is few.
	Small peptides rich
	New manufacturing method
	The extraction of a useful element can be designed.
	5'-nucleotides rich
	Flavor enhancers rich such as 5'-GMP and 5'-IMP
	Amino acid pattern near beef extract
	Replacement of Seasoning

Enzyme YL-NL "Amano" for Yeast Lysis

YL-NL "Amano" contains a neutral protease, produced by *Bacillus subtilis* fermentation, capable of lysing yeast cells by hydrolysis of the proteins in the yeast cell wall. YL-NL "Amano" lyses Brewer's yeast, Baker's yeast and *Torula* yeast as shown in Table 2. This result demonstrates the wide rage utility of YL-NL "Amano" independent of the type of yeast. Yeast lysates prepared by YL-NL "Amano" are more clear compared to lysates prepared by β-glucanase and in addition the lysates are much less bitter.

Table 2:The Yeast Lysis Effect of YL-NL "Amano"

YL-NL "Amano" (w/yeast dry weight)	Lysis ratios of yeast cells(%)		
	Brewer's yeast	Baker's yeast	*Torula* yeast
0.0 (%)	14	15	27
0.1	52	40	70
0.3	63	44	78
0.5	72	56	80
1.0	80	67	81
2.0	82	74	87

Enzyme RP-1 for RNA hydrolysis

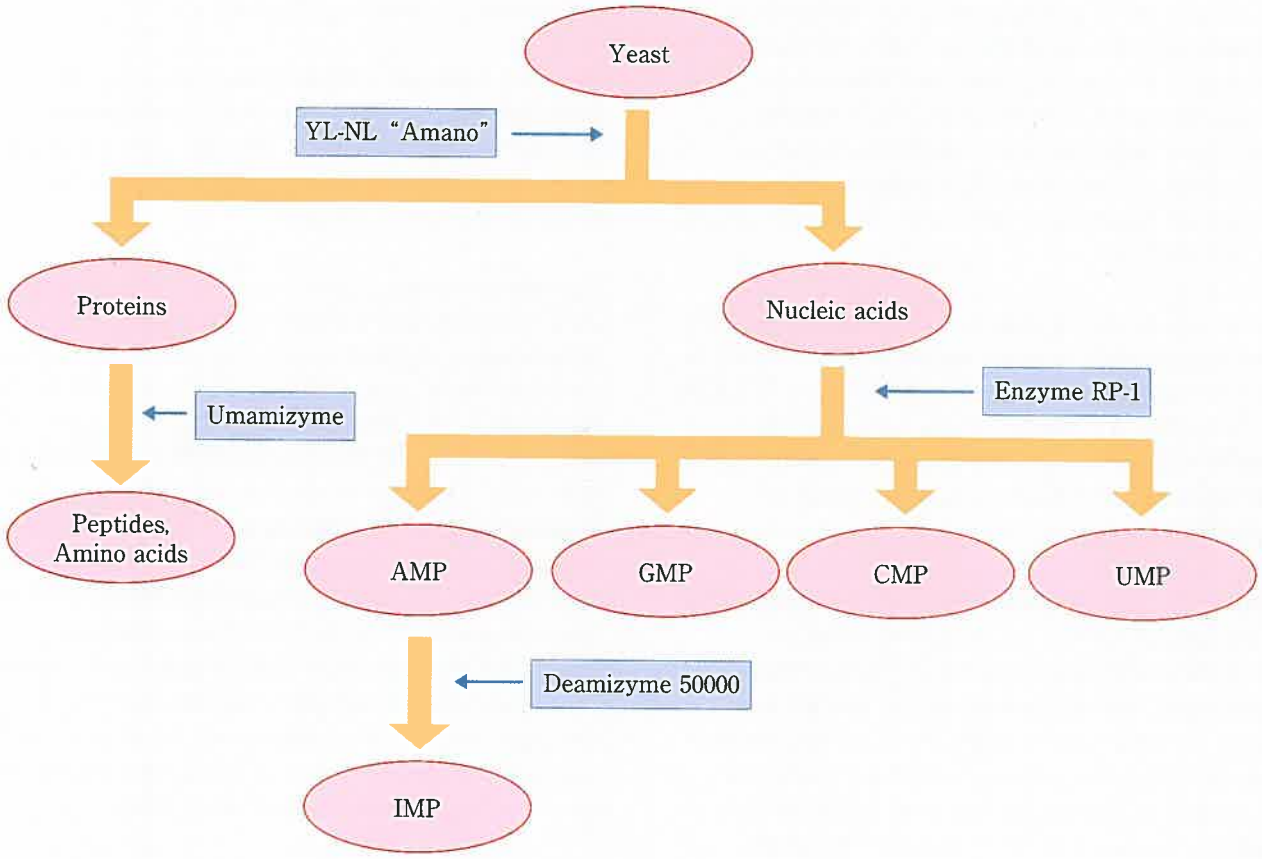
Enzyme RP-1 is a 5'-phosphodiesterase preparation produced by *Penicillium citrinum* fermentation. Enzyme RP-1 hydrolyzes RNA to 5'-nucleotides at a high level yielding adenosine-5'-monophosphate (5'-AMP), cytosine-5'-monophosphate (5'-CMP), uridine-5'-monophosphate (5'-UMP) and the flavor enhancer 5'-GMP. The advantages of Enzyme RP-1 include: absence of bacteria contamination because of the high reaction temperature (70℃), no side activity of other enzymes (phosphatase and 3'-nuclease) at 70℃ and addition of zinc sulfate is not necessary to activate nuclease activity. (In contrast, zinc sulfate is always added to malt root extract nuclease.)

Deamizyme 50000 for conversion of 5'-AMP to 5'-IMP

"Deamizyme 50000" is a 5'-adenylic deaminase produced by *Aspergillus melleus* fermentation. This enzyme has strong 5'-adenylic deaminase activity, which converts 5'-AMP into the flavor enhancer 5'-IMP as shown in Figure 2. Yeast extract containing 5'-IMP shows intense flavor enhancement, which cannot be produced by Autolysis.

Not only 5'-GMP and 5'-IMP but also amino acids (especially glutamic acid) and peptides play an important role as flavor enhancers in yeast extract. In combination with 5'-GMP and 5'-IMP, amino acids (glutamic acid) have

Figure 1 : Typical manufacture Scheme of Yeast Extract Using Amano enzymes



a synergistic effect on flavor enhancement; moreover, amino acids and peptides are useful for the creation of new reaction products by the interaction of amino acids and sugar (Maillard reaction)

Umamizyme and Peptidase R are suitable for the production of small peptides and amino acids including glutamine from yeast proteins. In addition, **"Glutaminase Daiwa"** can convert glutamine to the flavor enhancer glutamic acid.

Amano enzymes for yeast extract production have proven to be valuable in the creation of new flavor enhancers.

Figure 2 : Conversion of 5'-AMP to 5'-IMP by 5'-Adenylic deaminase