



Analysis of protein-constituting amino acids in Grains (Protein Hydrolyzate Analysis Method)

Grains are divided into staple grains, miscellaneous grains, pulses, and pseudocereals. Staple grains refer to the staple crops rice, wheat, and corn, while miscellaneous grains are a general term for the small caryopsis-bearing crops of the Gramineae family, such as barnyard millet, foxtail millet, and millet. Miscellaneous grains were once an important staple crop in Japan, but when rice production increased during the economic growth period, consumption and production of miscellaneous grains decreased. However, due to the growing health consciousness in recent years, the high nutritional value of miscellaneous grains has been reevaluated, and they are now used as a health food. Miscellaneous grains are also important staple crops, mainly in arid regions where it is difficult to grow rice and are mainly produced and consumed in large quantities in India and African countries.

This report introduces examples of protein-constituting amino acid analysis of staple grain (Non-glutinous rice) and three types of miscellaneous grains (Foxtail millet, Pilled millet, and Japanese barnyard millet). The analysis was performed using LA8080 HIGH SPEED AMINO ACID ANALYZER (AminoSAAYA) with Protein Hydrolyzate Analysis Method.

The results showed that miscellaneous grains are highly nutritious foods because they contains more protein-constituting amino acids than non-glutinous rice. Knowing the amino acid content of nutritional components through amino acid analysis is useful for the nutritional evaluation of foods.



**LA8080 HIGH SPEED
AMINO ACID ANALYZER
(AminoSAAYA)**

Analysis of Amino Acid Standard Solution

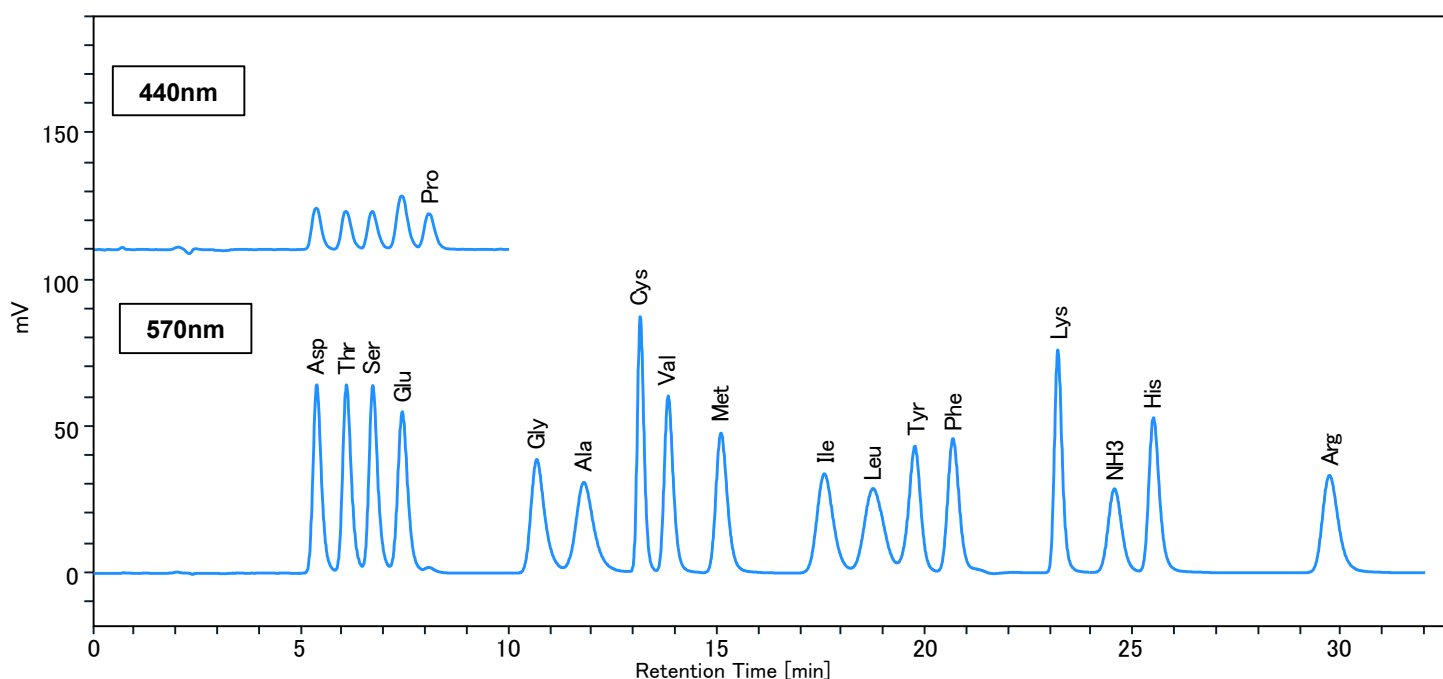


Fig.1 Analysis of Amino Acid Standard Solution

Table 1 Analytical Conditions

Column	#2622PH 4.6 mm I.D. × 60 mm	Reaction reagent	Ninhydrin Coloring Solution Kit for HITACHI (*)
Guard column	#2619F 4.0 mm I.D. × 5 mm	Reaction reagent flow rate	0.35 mL/min
Ammonia filter column	#2650L 4.6 mm I.D. × 40 mm	Reaction temperature	135 °C
Eluent	MCI BUFFER™ PH Kit (*)	Detection wavelength	VIS 440 nm、570 nm
Flow rate	0.40 mL/min	Injection volume	20 µL
Column temperature	57 °C	(*) FUJIFILM Wako Pure Chemical Corporation	

The standard solution is Amino Acids Mixture Standard Solution, Type H (High Range) (*)



Analysis of samples

- ✓ Miscellaneous grains contains more protein-constituting amino acids than Non-glutinous rice.
- ✓ Using Amino Acid Analyzer makes it possible to evaluate nutritional value with high precision.

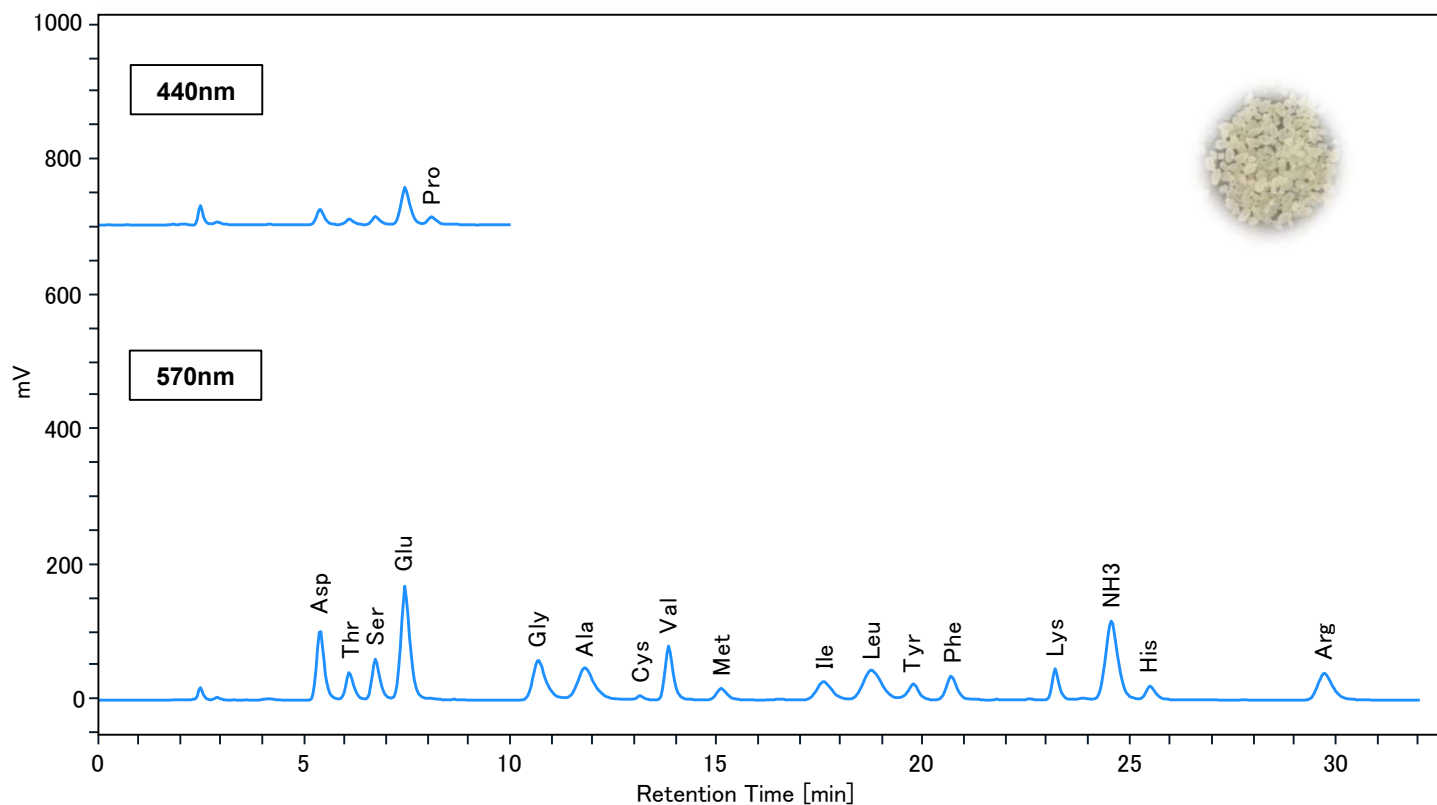


Fig.2 Analysis of Non-glutinous rice sample

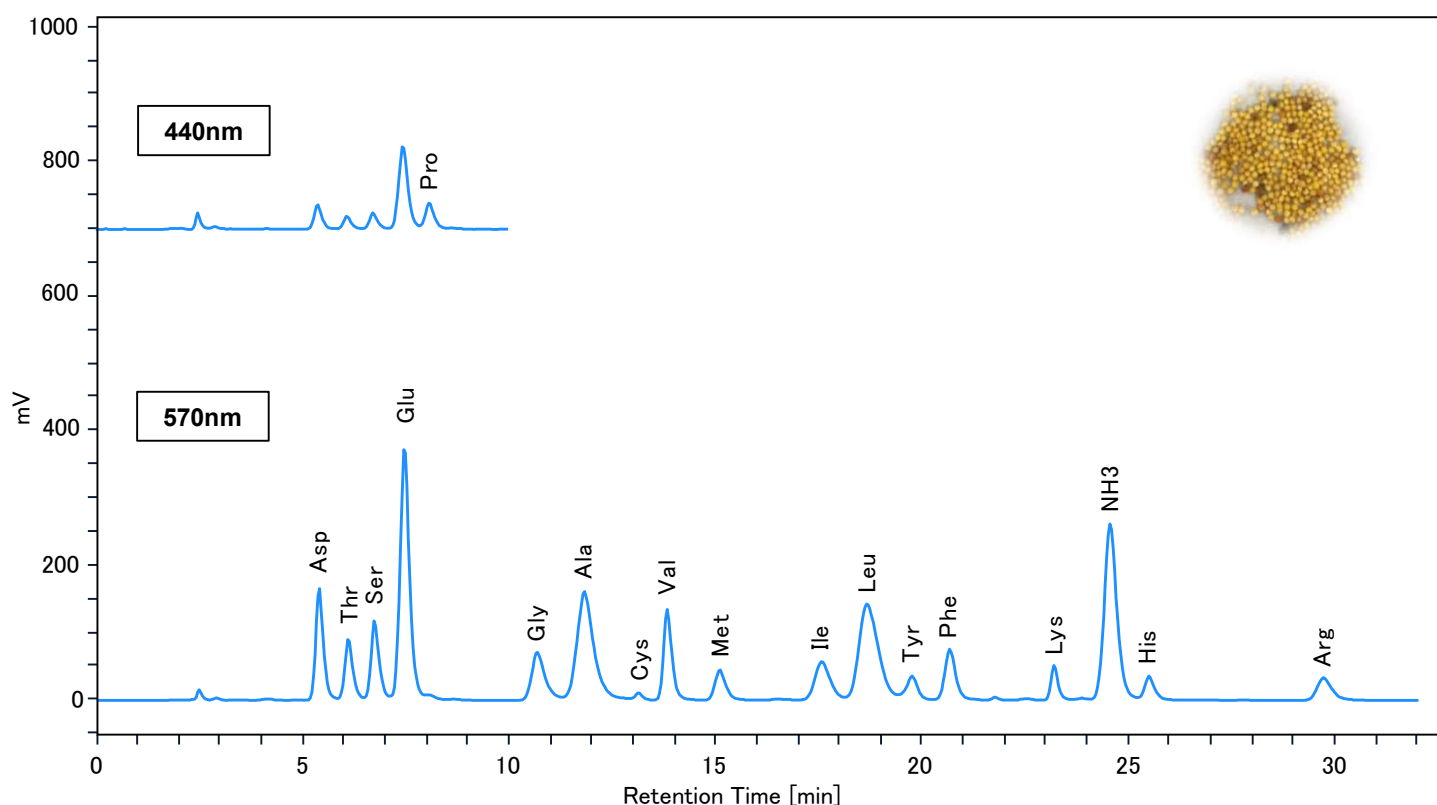


Fig.3 Analysis Foxtail millet sample



Analysis of samples

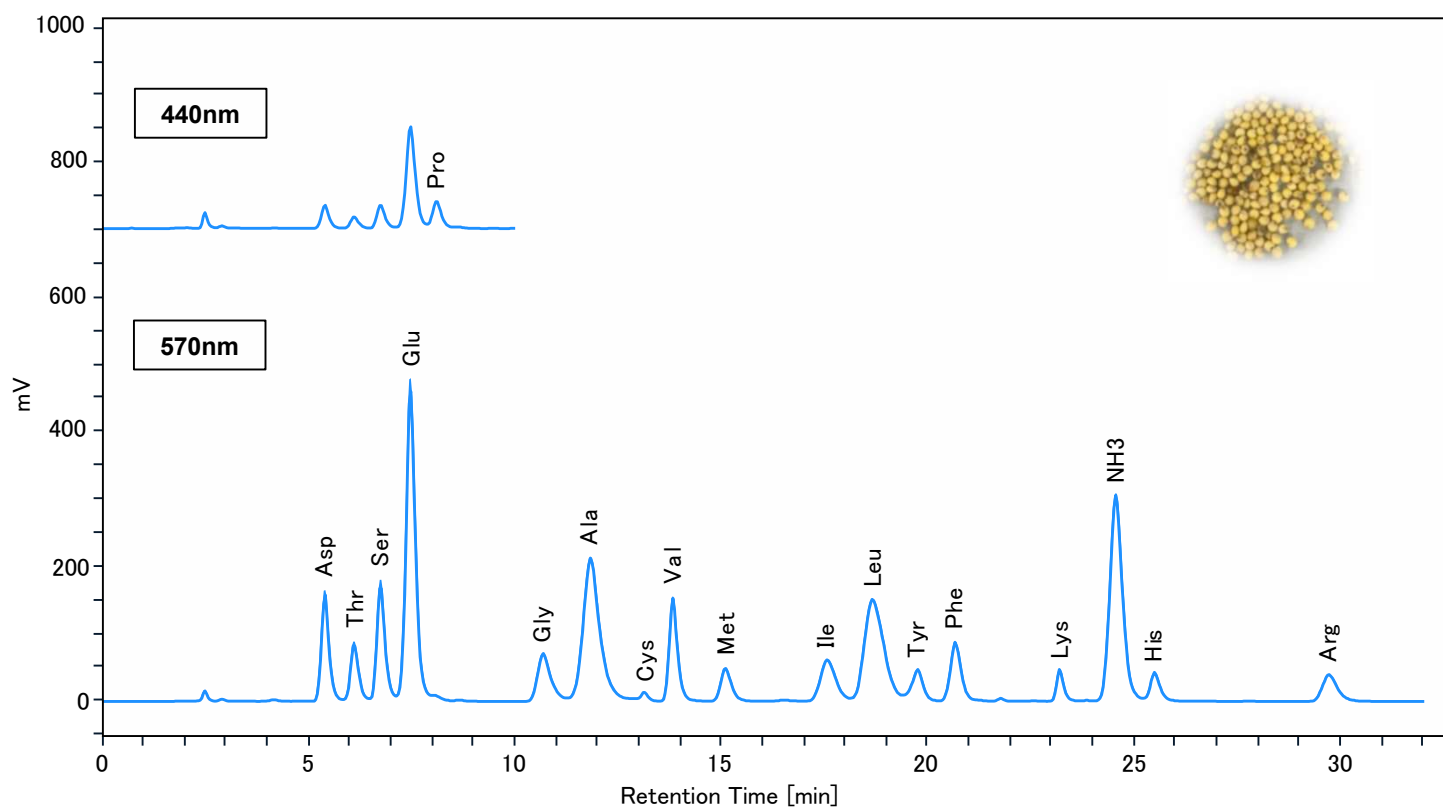


Fig.4 Analysis of Pilled millet sample

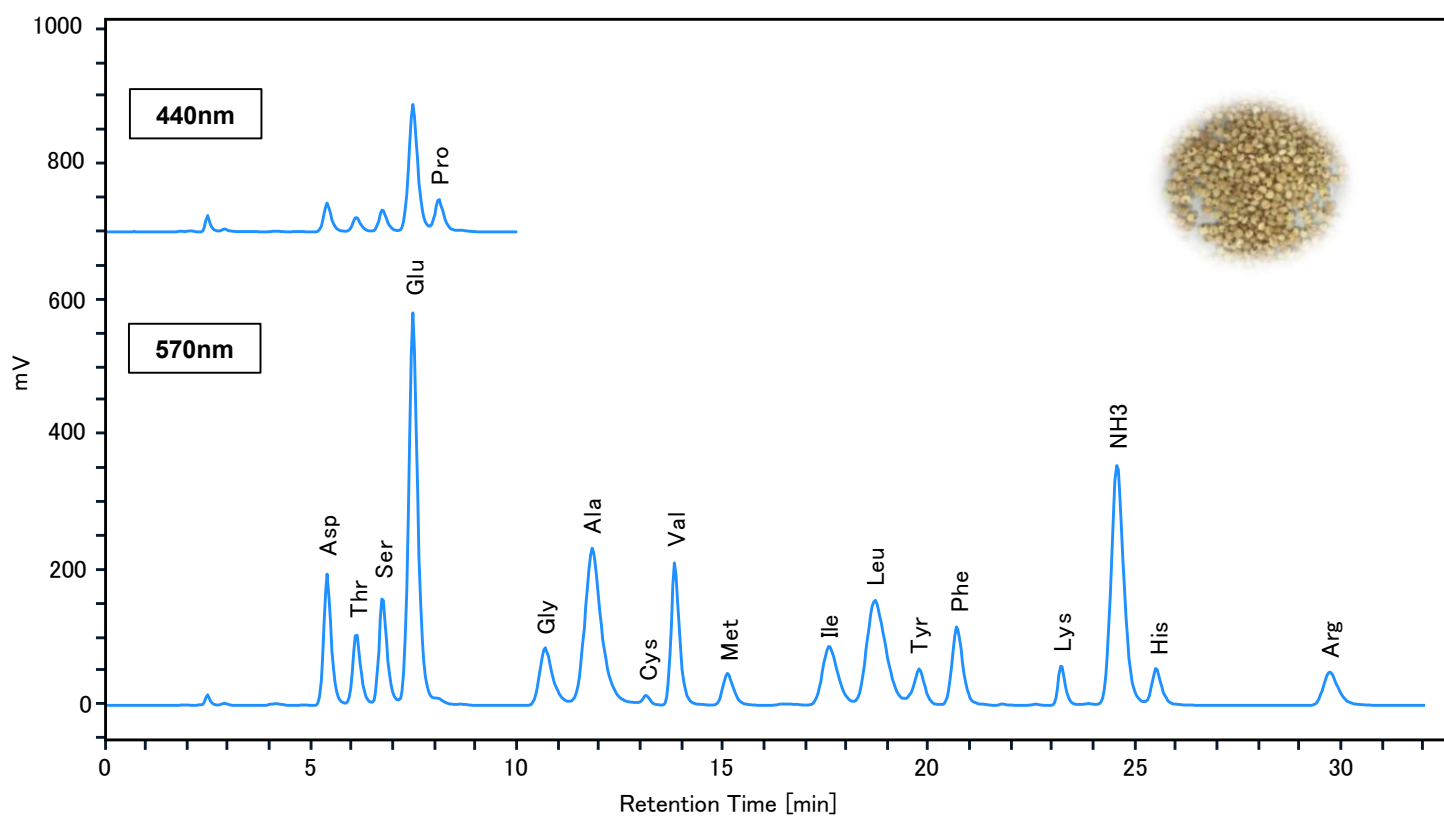


Fig.5 Analysis Japanese barnyard millet sample



Comparison of amino acid content

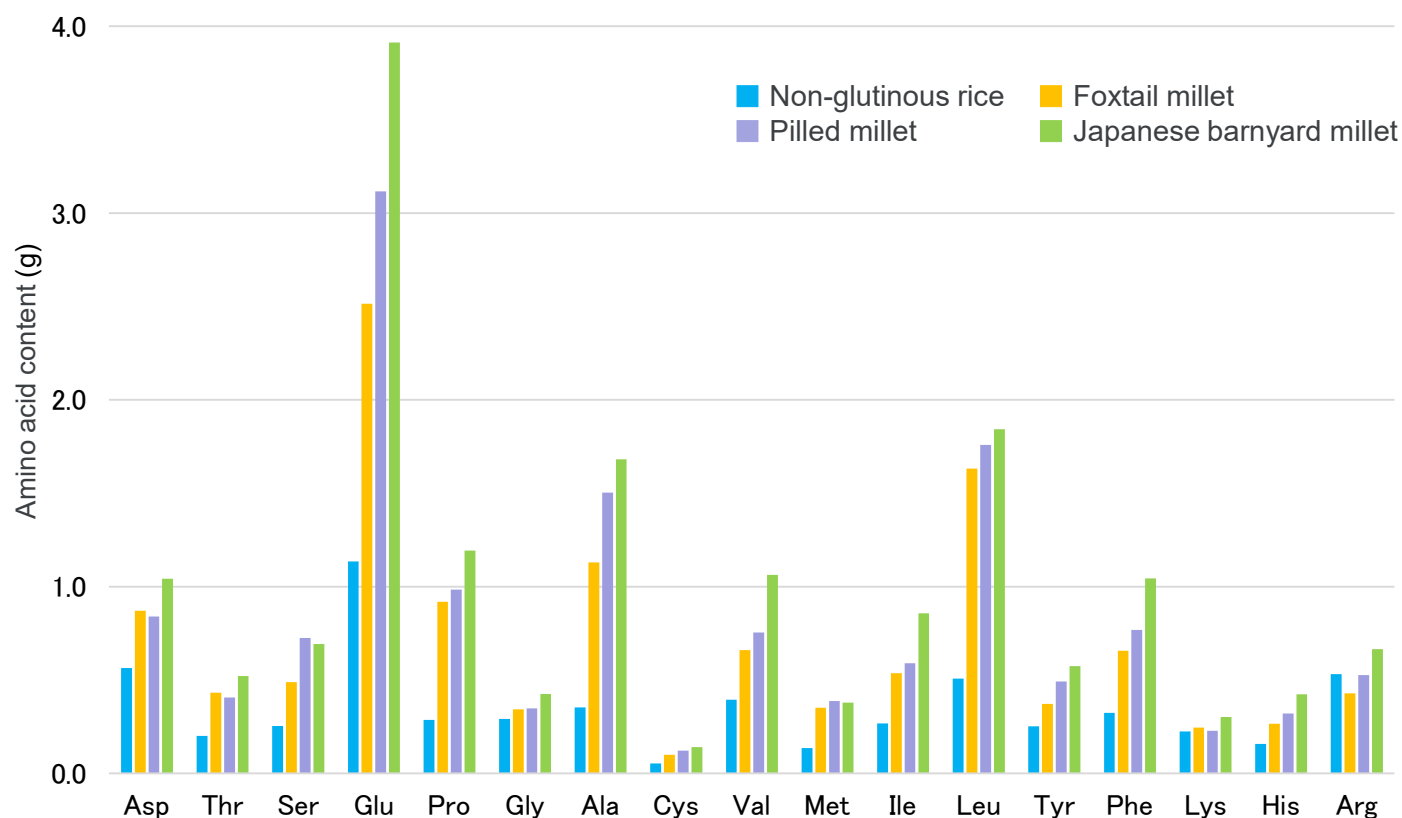
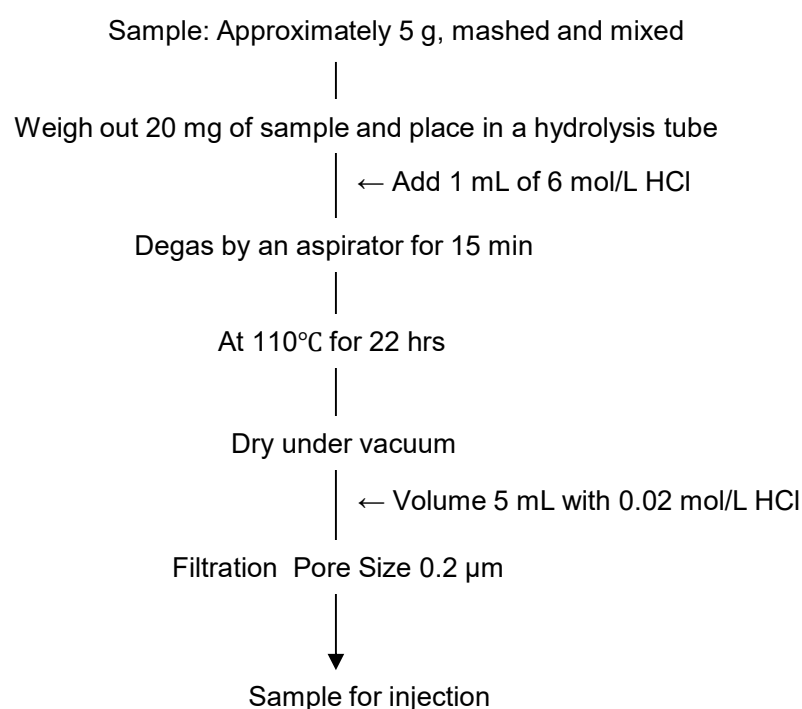


Fig.6 Protein-constituting amino acids per 100 g sample (g)

Sample Preparation





List of Amino Acids

Abbrev.	Amino acid	Molecular weight	Std. concentration (nmol/ 20 µL)
Asp	Aspartic acid	133.1	2
Thr	Threonine	119.1	2
Ser	Serine	105.1	2
Glu	Glutamic acid	147.1	2
Pro	Proline	115.1	2
Gly	Glycine	75.1	2
Ala	Alanine	89.1	2
Cys	Cystine	240.3	2
Val	Valine	117.1	2
Met	Methionine	149.2	2
Ile	Isoleucine	131.2	2
Leu	Leucine	131.2	2
Tyr	Tyrosine	181.2	2
Phe	Phenylalanine	165.2	2
Lys	Lysine	146.2	2
NH3	Ammonia	17.0	2
His	Histidine	155.2	2
Arg	Arginine	174.2	2

These data are an example of measurement; the individual values can not be guaranteed.

Specifications in this catalog are subject to change with or without notice, as Hitachi High-Tech Analysis Corporation continues to develop the latest technologies and products for our customers.