

SPECTROPHOTOMETRIC ANALYSIS No. A221

Atomic Absorption Spectrophotometry of Plants Using a Hydrochloric Acid Extraction Method

Atomic absorption spectrophotometers, which are standard instruments for the determination of metal elements, are widely applied in the measurement of plant samples. As methods of pretreatment of plant samples, dry decomposition and wet digestion are applied. Dry decomposition has the problem of vaporization of targeted elements, while wet digestion involves such problems as generation of harmful gases from acids during decomposition under heating, danger of explosion during

treatment with perchloric acid and is time-consuming. To avoid such problems, the use of a hydrochloric acid extraction method was examined and comparison was made with samples treated by the usual wet digestion method. In Table 1, analytical values of K, Mg, Ca, Zn, Mn and Cu by wet method (W) and by hydrochloric acid extraction method (H) are compared, which indicates that both values are consistent with each other. Data for Ca, Mg and K from the measurements are introduced here.

Sample preparation

Sample was dried at 100°C, then pulverized.

Wet digestion – 10 ml of nitric acid and 2 ml of perchloric acid were added to 1g of sample, which was then allowed to decompose under heating until white fumes of perchloric acid evolved. Heating was continued until the residue dried.

After cooling, 20 ml of HCl (~12%) was added, the mixture boiled, then pure water was added to prepare 100 ml of sample solution.

Hydrochloric acid extraction method – 100 ml of 1N HCl was added, shaken for one hour, and after filtering, the filtrate was subjected to analysis.

Measurement of K

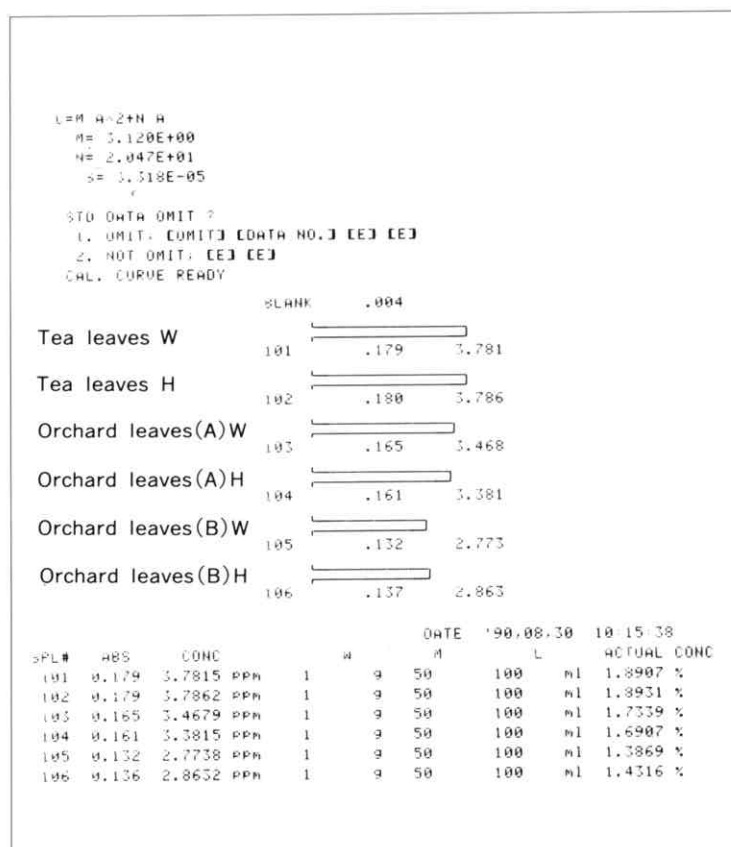
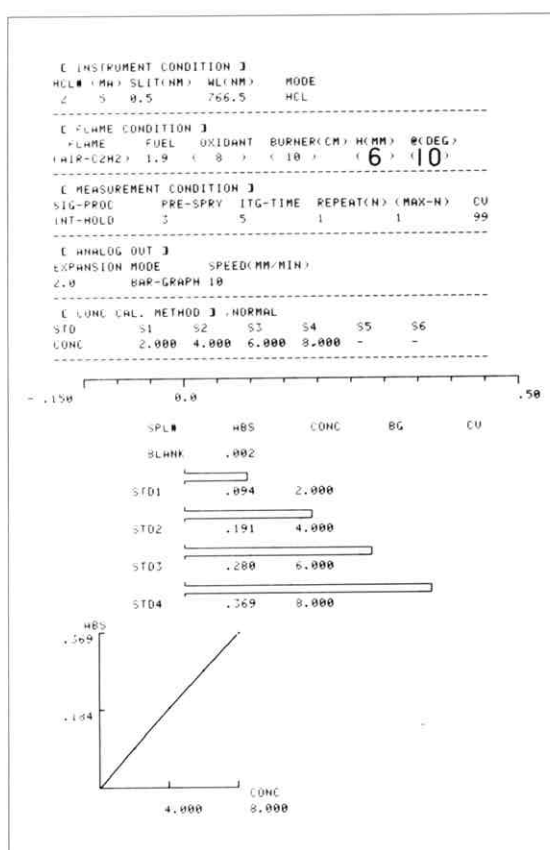


Fig. 1 Measurement of K

■ Measurement of Mg

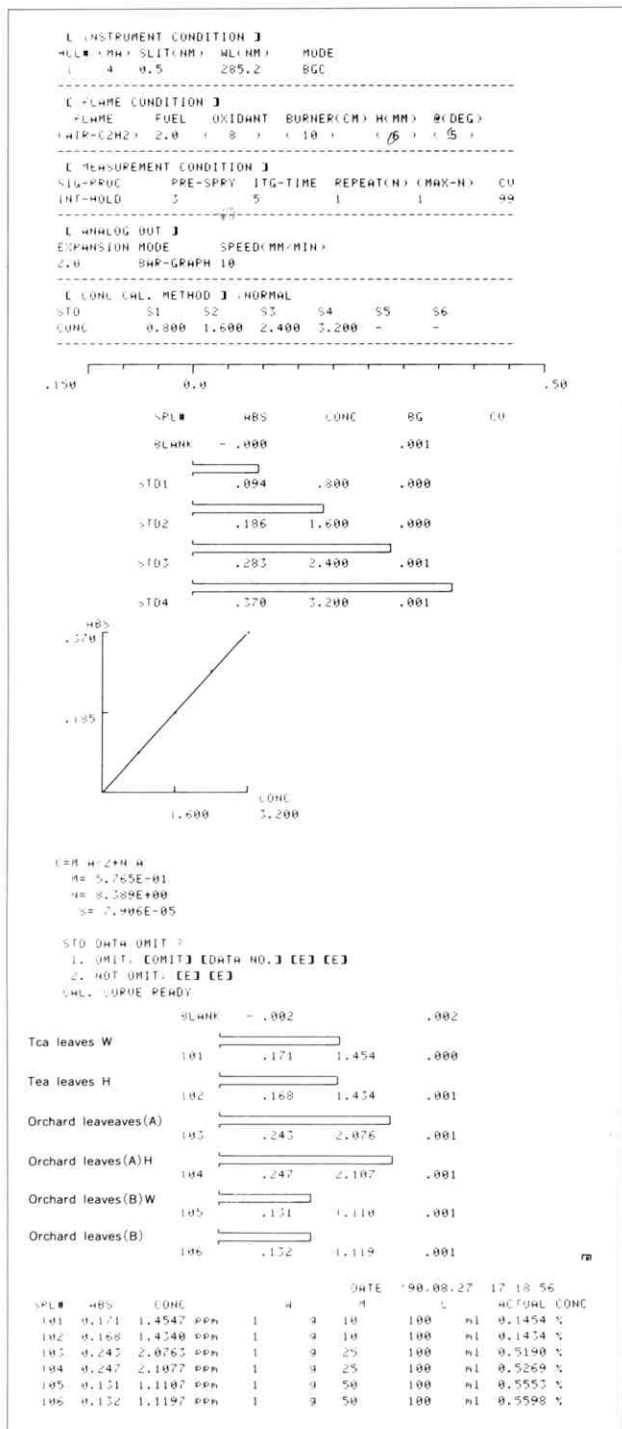


Fig. 2 Measurement of Mg

■ Measurement of Ca

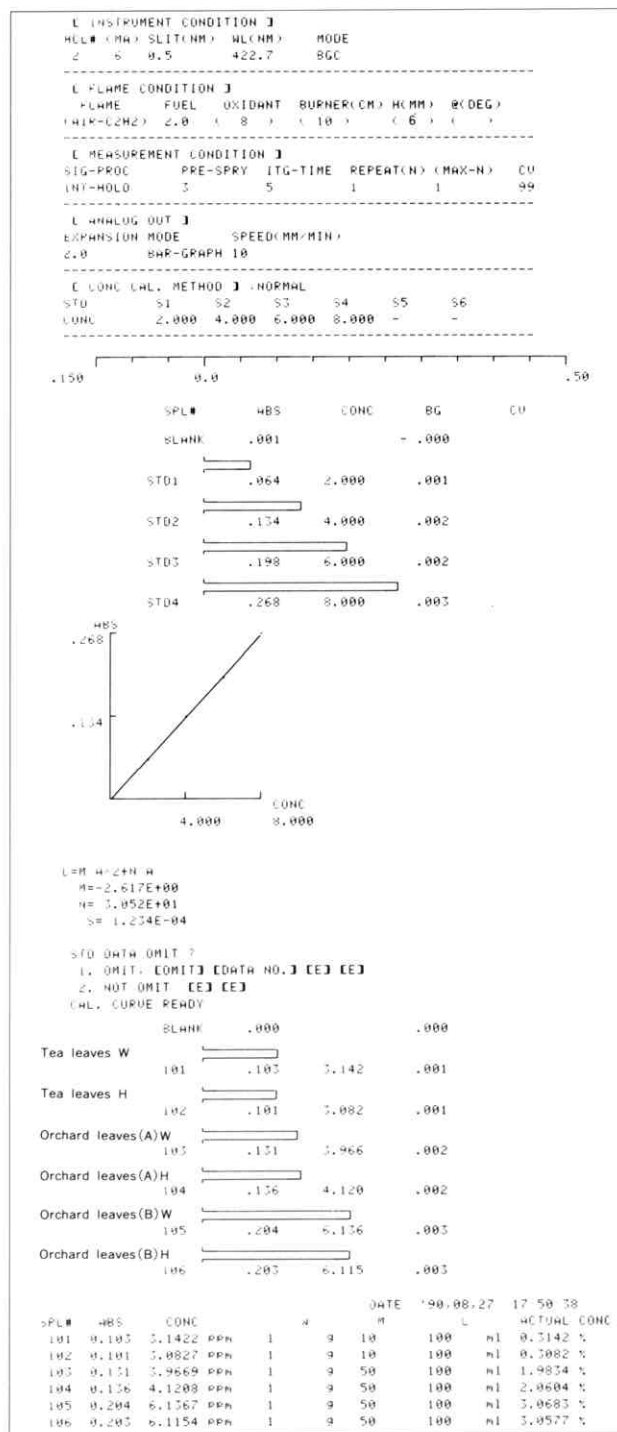


Fig. 3 Measurement of Ca

Table 1 Comparison of Data between Wet Digestion and Hydrochloric Acid Extraction

	Tea leaves		Orchard leaves (A)		Orchard leaves (B)	
	W	H	W	H	W	H
K	1.89%	1.89%	1.73%	1.69%	1.38%	1.43%
Mg	0.14%	0.14%	0.55%	0.56%	0.52%	0.53%
Ca	3.14%	3.08%	3.07%	3.06%	1.98%	2.06%
Zn	34 ppm	35 ppm	29 ppm	29 ppm	25 ppm	25 ppm
Mn	641 ppm	660 ppm	20.9 ppm	19.6 ppm	83.7 ppm	81.3 ppm
Cu	6.5 ppm	6 ppm	14.2 ppm	13.1 ppm	11 ppm	10 ppm

W: Wet digestion H: Hydrochloric acid extraction



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