JP500

Rapid Micronutrient Elemental Analysis in Food

Quantification of Micronutrient Elements By Monochromatic Excitation XRF

JP500 is a monochromatic energy-dispersive x-ray fluorescence analyzer using a monochromatic excitation beam. It delivers unprecedented Limit of Detection (LOD) taking advantage of superior signal/background (S/B) ratio. It can rapidly survey and quantify low-level micronutrient elements in food with no or minimal sample preparation.

FP Approach Calibration

JP500 applies fundamental-parameters (FP) approach to calibrate the system, using reference materials to refine FP parameters. The FP approach allows JP500 to measure various types of food with one calibration curve. Custom calibration curves can also be established to further improve accuracy for some specific sample types. Figure 2 and 3 shows Zn and Fe in rice flour and milk powder.

Micronutrient Elemental Analysis in Maize Hybrids

World hunger and malnutrition has been a long-term problem in human history. The United Nations Food and Agriculture Organization (FAO) estimates that over 10% of the world population is suffering from chronic undernourishment in 2016. In Guatemala, this problem for children and pregnant women reaches the very worrying 50% level. Dr. Fredy Longo, R&D manager at Semilla Nueva Guatemala, focused on developing maize seeds of hybrids cultivars with elevated micronutrient elements content, such as potassium, calcium, iron, and zinc, to contribute to diminish the huge malnutrition problems. Using JP500, he phenotypes maize genetic materials on its Zinc and Iron content more rapidly and efficiently. Comparing to Inductively Coupled Plasma (ICP), JP500 delivers comparable precise results within much shorter time at much lower cost and much less sample preparation, as shown in Figure 1.

Figure 1. Minimal Sample Preparation

Corn seeds

Grind and Mix using Retsch Mill

Powder in Sample cup

Figure 2. Zn in Rice and Milk Powder

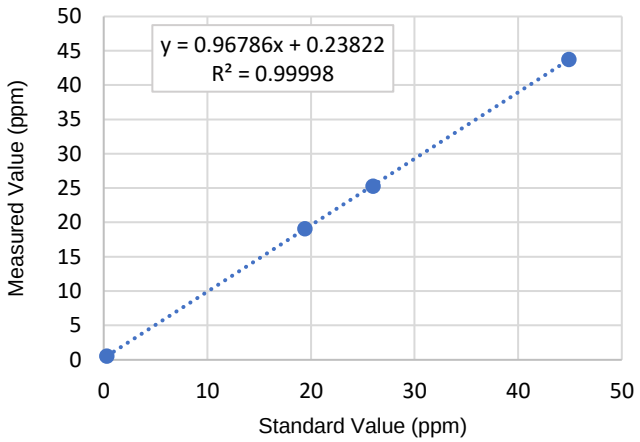
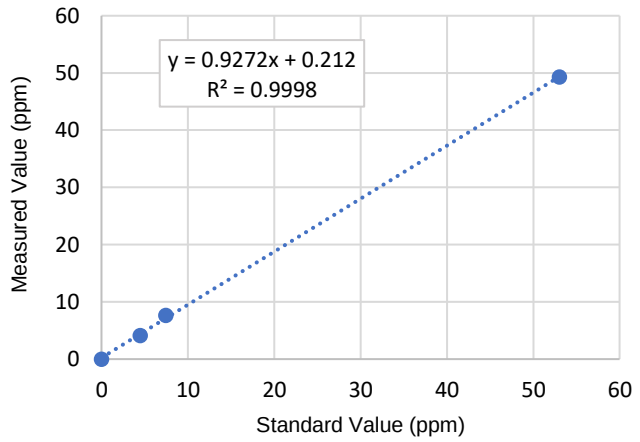


Figure 3. Fe in Rice and Milk Powder



Accuracy

Table 1 shows the comparison results of micronutrient elemental analysis using lab ICP and JP500 MXRF analyzer on a large quantities of corn-seed samples at Semilla Nueva. This demonstrates JP500 high accuracy for quantifying micronutrient elements in food, comparable with ICP.

Table 1. Micronutrient Elemental Analysis in Corn Seeds **RDF: Relative Difference Factor**

Sample	Zn (unit: ppm)			Fe (unit: ppm)		
	Lab ICP	MXRF	RDF	Lab ICP	MXRF	RDF
1	32.94	34.58	5.0%	10.59	11.57	8.5%
2	22.39	22.85	2.1%	13.38	13.83	3.3%
3	25.88	25.28	-2.3%	14.52	16.77	13.4%
4	18.38	18.56	1.0%	15.40	15.71	2.0%
5	22.33	21.25	-4.8%	17.45	18.32	4.7%
6	21.52	22.64	5.2%	17.73	17.48	-1.4%
7	19.27	19.06	-1.1%	17.94	17.70	-1.4%
8	16.98	16.77	-1.2%	18.12	19.29	6.1%
9	21.41	23.38	9.2%	18.31	19.75	7.3%
10	22.75	21.95	-3.5%	18.53	19.29	3.9%
11	29.77	28.20	-5.3%	19.10	21.02	9.1%
12	20.63	20.77	0.7%	19.11	21.53	11.2%
13	29.65	31.03	4.7%	19.17	19.73	2.8%
14	21.84	21.13	-3.3%	19.62	19.73	0.6%
15	20.97	21.11	0.7%	20.32	19.99	-1.7%
16	20.20	20.98	3.9%	20.66	22.21	7.0%
17	23.17	22.83	-1.5%	21.21	21.65	2.0%
18	35.12	37.43	6.6%	21.42	24.36	12.1%
19	23.04	22.83	-0.9%	21.97	21.86	-0.5%
20	35.96	35.81	-0.4%	22.20	23.09	3.9%
21	21.74	21.29	-2.1%	22.64	23.65	4.3%
22	20.08	18.21	-9.3%	23.36	22.16	-5.4%
23	19.91	19.94	0.2%	24.05	22.12	-8.7%