

Supplementary Materials: Comparative Analysis of Universal Protein Extraction Methodologies for Screening of Lipase Activity from Agricultural Products

Jisu Ha, Jun-Young Park, Yoonseok Choi, Pahn-Shick Chang and Kyung-Min Park

This document file contains Supplementary Data (S1–S5).

Supplementary Data S1. Screening of lipase activity in 87 kinds of domestic agricultural products

Classification	Source name	Scientific name	Concentration ¹ (mg/mL)	Specific activity ² (μU/mg)	Specific activity ³ (μU/mg)
Potatoes	Potato	<i>Solanum tuberosum</i>	3.06	757.52	135.64
	Jerusalem artichoke	<i>Helianthus tuberosus</i>	4.93	74.41	24.20
Nuts and seeds	Acorn	<i>Quercus serrata</i>	3.52	201.81	15.51
	Ginkgo nut	<i>Ginkgo biloba</i>	12.99	155.39	19.46
	Chestnut	<i>Castanea crenata</i>	8.74	253.15	27.25
	Peanut	<i>Arachis hypogaea</i>	14.29	128.15	6.31
	Watermelon seed	<i>Citrullus lanatus</i>	5.52	140.95	9.21
	Hemp seed	<i>Cannabis sativa</i>	13.72	191.46	25.06
	Chia seed	<i>Salvia hispanica</i>	8.15	31.30	2.66
	Perilla	<i>Perilla frutescens</i>	8.34	182.49	43.02
	Cotton seed	<i>Gossypium hirsutum</i>	14.96	7.15	1.09
	Sesame	<i>Sesamum indicum</i>	12.87	73.79	7.70
	Pumpkin seed	<i>Cucurbita moschata</i>	12.32	20.23	9.15
	Sunflower seed	<i>Helianthus annuus</i>	5.82	131.91	1.26
	Pine nut	<i>Pinus gerardiana</i>	11.39	84.58	35.54
	Walnut	<i>Juglans regia</i>	12.75	28.69	5.48
Cereals	Rice (non-glutinous)	<i>Oryza sativa</i>	6.18	16.19	6.45
	Barley	<i>Hordeum vulgare</i>	5.85	164.92	19.25
	Wheat	<i>Triticum aestivum</i>	7.30	83.25	21.27
	Rice (glutinous)	<i>Oryza sativa</i>	5.82	71.93	9.88
	Foxtail millet	<i>Setaria italica</i>	5.85	111.11	6.96

	Sorghum	<i>Sorghum bicolor</i>	4.04	47.18	10.09
	Job's tears	<i>Coix lacryma-jobi</i>	8.25	76.95	8.33
	Rhy	<i>Secale cereale</i>	4.05	36.70	4.62
	Proso millet	<i>Panicum miliaceum</i>	5.80	447.67	18.10
	Brown rice	<i>Oryza sativa</i>	5.25	127.13	20.18
	Quinoa	<i>Chenopodium quinoa</i>	4.41	55.61	27.32
	Oat	<i>Avena sativa</i>	7.09	85.73	32.76
	Hulled barley	<i>Hordeum vulgare</i>	7.01	176.33	32.28
	Amaranth	<i>Amaranthus viridis</i>	4.47	65.92	16.51
	Buckwheat	<i>Fagopyrum esculentum</i>	9.22	106.29	22.34
Fruits	Kiwifruit	<i>Actinidia deliciosa</i>	4.68	8.85	0.30
	Blueberry	<i>Vaccinium corymbosum</i>	3.32	13.53	2.63
	Kumquat seed	<i>Citrus japonica</i>	5.78	127.40	6.06
	<i>Gyulohyang</i>	<i>Citrus reticulata</i>	3.35	8.34	5.00
	Apple	<i>Malus pumila</i>	3.60	60.64	5.33
Peas	Adzuki bean	<i>Vigna Savi</i>	14.78	91.19	13.79
	Sword bean	<i>Canavalia gladiata</i>	13.24	162.91	8.92
	Pea	<i>Pisum sativum</i>	15.20	98.20	20.10
	Kidney bean	<i>Phaseolus vulgaris</i>	12.91	148.72	7.45
	Mung bean	<i>Vigna Savi</i>	13.65	86.09	10.74
	Lentil	<i>Lens culinaris</i>	14.58	262.08	15.63
	Chickpea	<i>Cicer arietinum</i>	15.53	26.98	7.68
	<i>Jwinunikong</i>	<i>Rhynchosia Nulubilis</i>	14.24	51.56	5.11

	Soybean	<i>Glycine max</i>	15.26	53.89	3.84
	<i>Seoritae</i>	<i>Glycine max</i>	14.84	33.07	4.60
	Yellow soybean	<i>Glycine max</i>	14.89	37.60	5.21
	Brown soybean	<i>Glycine max</i>	16.89	120.93	12.66
Mushrooms	Shiitake mushroom	<i>Lentinula edodes</i>	6.01	24.64	13.11
	Cordyceps	<i>Cordyceps militaris</i>	4.52	829.36	117.03
	Eryngii	<i>Pleurotus eryngii</i>	5.17	633.42	101.77
	<i>Agrocybe aegerita</i>	<i>Agrocybe aegerita</i>	3.47	386.08	74.04
	Lion's mane mushroom	<i>Hericium erinaceus</i>	4.55	48.03	60.63
	Cremini mushroom	<i>Agaricus bisporus</i>	7.48	107.20	2.80
	Wood ear mushroom	<i>Auricularia auricula-judae</i>	3.66	88.42	11.23
Vegetables	Onion	<i>Allium cepa</i>	4.41	44.86	7.51
	Paprika	<i>Capsicum annuum</i>	3.91	35.62	6.00
	Pumpkin	<i>Cucurbita moschata</i>	5.23	182.80	30.47
	Balloonflower	<i>Platycodon grandiflorus</i>	4.27	121.00	49.21
	Angelica	<i>Angelica archangelica</i>	4.82	53.52	9.76
	Pleurospermum	<i>Pleurospermum albimarginatum</i>	12.81	134.47	6.62
	Lotus root	<i>Nelumbo nucifera</i>	5.11	328.74	11.72
	Red pepper	<i>Capsicum annuum</i>	11.04	-17.92	0.71
	Red pepper seed	<i>Capsicum annuum</i>	5.64	344.09	98.25
	Garlic	<i>Allium sativum</i>	8.62	377.90	6.20
	Soybean sprout	<i>Glycine max</i>	5.08	53.62	9.58
	Ussuri thistle	<i>Cirsium japonicum</i>	13.61	68.80	3.44
	Cheese pumpkin	<i>Cucurbita moschata Duchesne</i>	3.34	147.66	12.98
	Toona sinensis	<i>Toona sinensis</i>	6.29	113.09	18.14

Cabbage seed	<i>Brassica oleracea</i>	4.47	188.80	26.08
Broccoli	<i>Brassica oleracea</i> var. <i>italica</i>	5.08	325.37	83.86
Aster glehnii	<i>Aster glehnii</i>	4.43	86.51	4.31
Mugwort	<i>Artemisia vulgaris</i>	3.75	176.86	17.07
Goat's-beard	<i>Aruncus dioicus</i>	3.36	88.04	11.70
Rough aster	<i>Eurybia radulina</i>	3.53	40.73	2.42
Eggplant	<i>Solanum melongena</i>	4.23	49.82	16.08
East Asian harebell	<i>Campunula rotundifolia</i>	3.74	42.78	132.09
Butterbur	<i>Petasites japonicus</i>	3.29	28.46	2.92
<i>Chamnamul</i>	<i>Pimpinella brachycarpa</i>	4.77	139.19	17.71
Chinese cabbage	<i>Brassica rapa</i>	4.42	97.67	7.97
Rapeseed	<i>Brassica napus</i>	11.27	24.56	4.78
Bamboo shoot	<i>Bambusa vulgaris</i>	5.18	58.30	6.11
Fischers ragwort	<i>Ligularia fischeri</i>	4.35	29.12	1.48
<i>Deodeok</i>	<i>Codonopsis lanceolata</i>	4.36	92.87	55.88
Radish seed	<i>Raphanus sativus</i>	12.19	34.43	2.96
Nettle-leaf mint	<i>Urtica dioica</i>	4.26	56.60	6.05
Bracken	<i>Pteridium esculentum</i>	5.50	748.99	41.67

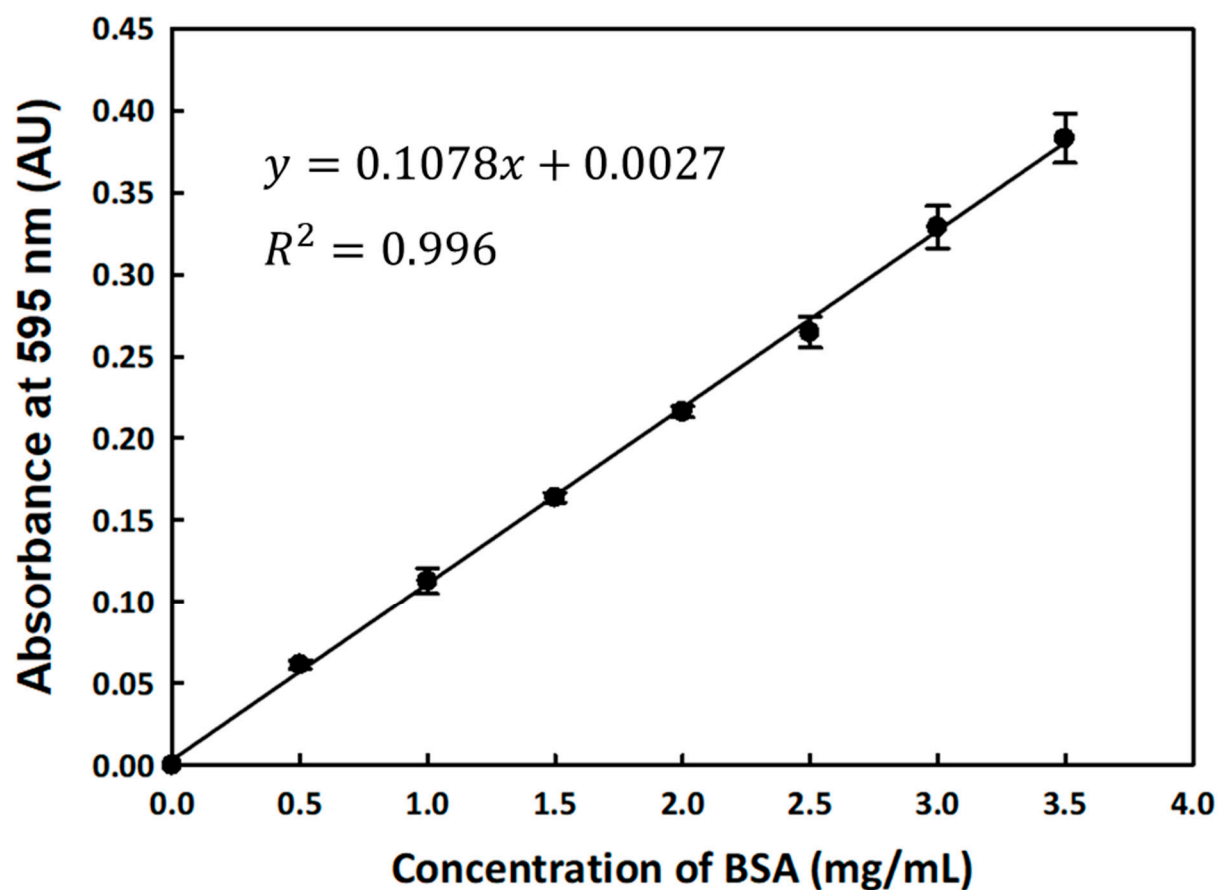
¹ Protein concentration after extraction by Pierce™ Plant Total Protein Extraction Kit (Thermo Fisher Scientific Co.).

² Evaluated by the spectrophotometric assay.

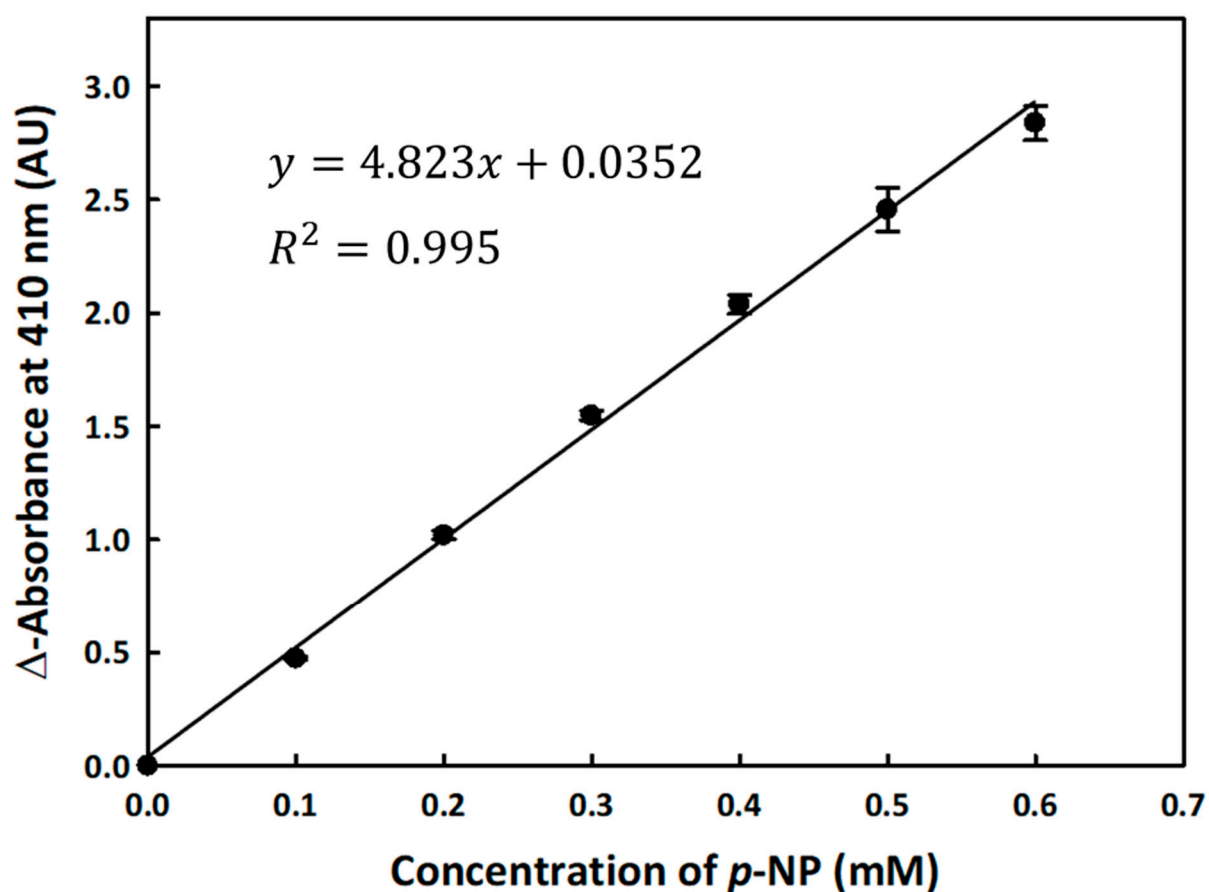
³ Evaluated by the fluorometric assay.

Supplementary Data S2. Final candidates of domestic agricultural products (24 kinds)

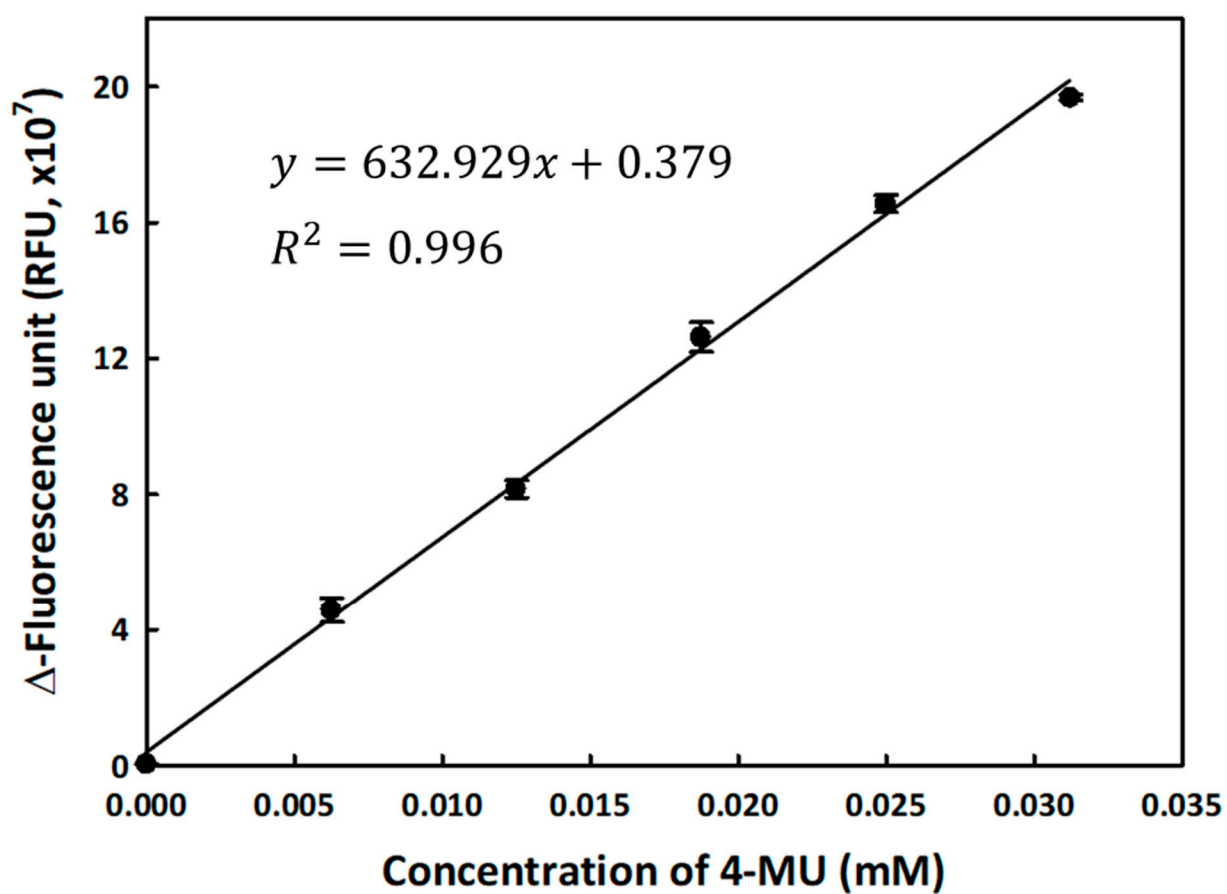
Number	Source name	Scientific name
1	Potato	<i>Solanum tuberosum</i>
2	Ginkgo nut	<i>Ginkgo biloba</i>
3	Chestnut	<i>Castanea crenata</i>
4	Hemp seed	<i>Cannabis sativa</i>
5	Perilla	<i>Perilla frutescens</i>
6	Pine nut	<i>Pinus gerardiana</i>
7	Wheat	<i>Triticum aestivum</i>
8	Oat	<i>Avena sativa</i>
9	Hulled barley	<i>Hordeum vulgare</i>
10	Buckwheat	<i>Fagopyrum esculentum</i>
11	Adzuki bean	<i>Vigna Savi</i>
12	Pea	<i>Pisum sativum</i>
13	Mung bean	<i>Vigna Savi</i>
14	Lentil	<i>Lens culinaris</i>
15	Brown soybean	<i>Glycine max</i>
16	Cordyceps	<i>Cordyceps militaris</i>
17	Eryngii	<i>Pleurotus eryngii</i>
18	Agrocybe aegerita	<i>Agrocybe aegerita</i>
19	Pumpkin	<i>Cucurbita moschata</i>
20	Balloonflower	<i>Platycodon grandiflorus</i>
21	Red pepper seed	<i>Capsicum annuum</i>
22	Broccoli	<i>Brassica oleracea var. italica</i>
23	Deodeok	<i>Codonopsis lanceolata</i>
24	Bracken	<i>Pteridium esculentum</i>



Supplementary Data S3. Standard curves of bovine serum albumin (BSA) concentration versus absorption unit (AU) referring to the absorbance at 595 nm for Bradford assay.



Supplementary Data S4. Standard curves of *p*-nitrophenol (*p*-NP) concentration versus absorption unit (AU) referring to the absorbance at 410 nm.



Supplementary Data S5. Standard curves of 4-methylumbelliferone (4-MU) concentration versus relative fluorescence unit (RFU) referring to the emission fluorescence at 455 nm.