Supporting Information

Fuel properties of pongamia (*Milletia pinnata)* seeds and pods grown in Hawaii

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LECO TGA801 System Program for Proximate Analysis

~1 g samples were loaded in individual ceramic crucibles. The LECO TGA 801 system was programed for:

(A) moisture content determination:

(1) heat the crucibles without lids under nitrogen atmosphere (flow = 10.0 L/min) from 25.0°C to 105.0 °C at 6 °C/min

(2) hold at 105.0 °C for 15 min

(3) repeatedly weigh the crucibles until reaching constancy (i.e. mass change between successive measurements is < 0.5 mg)

(B) volatile matter content determination:

(1) place lids on the crucibles

(2) heat the crucibles with lids under nitrogen atmosphere (flow = 10.0 L/min) from 105.0°C to 950.0 °C at 45 °C/min

(3) hold at 950.0 °C for 7 min

(4) weigh the crucibles

(C) ash content determination:

(1) cool the system from 950°C to 450 °C and remove the crucible lids

(2) heat the system under oxygen atmosphere (flow = 3.5 L/min) to 600 °C , and then ramp from 600 °C to 750°C at 3 °C/min

(3) hold at 750.0 °C for 75min

(4) repeatedly weigh the crucibles until reaching constancy (i.e. mass change between successive measurements is < 0.5 mg)

Table S1. Properties of pongamia seeds.

Properties	Bachman			Foster			Ke`ehi			Kunia			Haleiwa		
C% wt	51.07	±	0.26	51.14	±	0.22	51.83	±	0.14	53.64	±	0.86	56.88	±	0.25
H% wt	7.70	±	0.10	8.01	±	0.05	7.98	±	0.05	8.61	±	0.13	8.77	±	0.05
N% wt	3.47	±	0.06	3.89	±	0.02	4.16	±	0.00	3.30	±	0.38	3.09	±	0.05
S/ppm	1616	±	14	2031	±	9	1978	±	15	2500	±	199	2460	±	29
M % wt	4.74	±	0.03	6.05	±	0.01	5.20	±	0.04	6.86	±	0.10	3.87	±	0.05
VM % wt	83.5	±	0.05	83.22	±	0.19	83.57	±	0.09	85.17	±	0.12	86.03	±	0.22
A % wt	2.6	±	0.01	3.30	±	0.02	3.01	±	0.01	2.49	±	0.02	2.47	±	0.03
FC % wt	13.8	±	0.06	13.48	±	0.19	13.42	±	0.09	12.35	±	0.13	11.50	±	0.21
HHV MJ	23.23	±	0.22	22.91	±	0.15	23.34	±	0.12	24.67	±	0.36	26.54	±	0.14

Note: (1) M, VM, A and FC are moisture, dry volatile matter, dry ash, and dry fixed carbon content, respectively; (2) FC was calculated by subtracting the VM and A percentages from 100; (3) results are given as the mean ± standard error of three analyses; (4) values of Kunia samples are averages of seven sample batches.

Table S2. Properties of pongamia pods from current study and from Prasad et al. [1].

Properties	Bachman	Foster	Ke`ehi	Kunia	Haleiwa	Pod [1]
C% wt	43.27 ± 0.28	41.26 ± 0.25	42.36 ± 0.05	42.65 ± 0.47	45.13 ± 0.23	46.02
H% wt	6.05 ± 0.03	5.98 ± 0.03	6.04 ± 0.02	6.34 ± 0.10	6.21 ± 0.02	5.58
N% wt	0.84 ± 0.01	1.28 ± 0.01	1.02 ± 0.03	0.86 ± 0.19	0.47 ± 0.01	0.23
S/ppm	617 ± 10	1004 ± 14	697 ± 0	1169 ± 221	739 ± 26	N/A
M % wt	6.35 ± 0.01	8.04 ± 0.02	7.36 ± 0.01	9.96 ± 0.04	9.87 ± 0.02	N/A
VM % wt	72.88 ± 0.34	74.77 ± 0.15	73.16 ± 0.14	72.56 ± 0.23	73.28 ± 0.08	80.13
A % wt	5.36 ± 0.01	6.12 ± 0.03	6.18 ± 0.00	6.67 ± 0.08	4.09 ± 0.05	6.45
FC % wt	21.76 ± 0.34	19.11 ± 0.14	20.67 ± 0.13	20.78 ± 0.21	22.63 ± 0.13	13.42
HHV MJ kg^{-1}	16.86 ± 0.16	16.01 ± 0.07	16.65 ± 0.06	16.45 ± 0.42	17.07 ± 0.15	N/A

Note: (1) M, VM, A and FC are moisture, dry volatile matter, dry ash, and dry fixed carbon content, respectively; (2) FC was calculated by subtracting the VM and A percentages from 100; (3) results are given as the mean ± standard error for three analyses; (4) values of Kunia samples are averages of seven sample batches.

Table S3. Summary of XRF results for pongamia seeds.[a]

Element	Bachman/ppm			Foster/ppm			Lagoon/ppm			LOD/ppm
Na (11)	480	±	143[b]	349	±	58[b]	359	±	246[b]	125
Mg (12)	1,077	±	143	1,147	±	249	930	±	149	47
P (15)	3,840	±	360	3,505	±	523	2,808	±	182	19
S (16)	1,415	±	116	1,668	±	179	1,435	±	58	12
Cl (17)	623	±	67	773	±	67	747	±	48	25
K (19)	9,718	±	541	12,300	±	668	9,913	±	278	21
Ca (20)	2,680	±	113	2,740	±	265	2,310	±	65	29
Fe (26)	39.0	±	3.0	57.1	±	7.5	56.5	±	41.5	8
Cu (29)	15.6	±	2.7[b]	16.9	±	11.5[b]	22.8	±	2.2	5
Zn (30)	34.9	±	2.8	28.9	±	4.7	33.8	±	2.4	5
Rb (37)	17.1	±	0.8	34.7	±	1.9		<LOD		4
Sr (38)	19.4	±	1.6	21.9	±	1.9	60.8	±	2.8	4
Ru (44)	49.1	±	8.7[b]	23.8	±	27.5[b,c]	34.6	±	24.5[b]	14
Pd (46)	21.8	±	25.2[b,c]	14.8	±	29.5[b,c]	24.1	±	48.3[b,c]	18

Note: (a) Element concentration are calculated with $C_6H_{10}O_5$ matrix as the mean ± standard error of six analyses (3 pellets and 2 sides);

(b) Measured value is less than the lower limit of quantification (LOQ); LOQ=4*LOD.

(c) Average measured value is less than measurement uncertainty.

Table S4. Summary of XRF results for pongamia pods.[a]

Element	Bachman/ppm	Foster/ppm	Lagoon/ppm	Kunia/ppm[d]	Haleiwa/ppm	LOD/ppm
Na (11)	2,910 ± 122	1,955 ± 50	4,495 ± 177	1,265 ± 46	1,163 ± 93	125
Mg (12)	1,390 ± 77	2,383 ± 90	1,458 ± 35	825 ± 22	1,458 ± 50	47
Al (13)	<LOD	52.6 ± 61.1[b,c]	82.5 ± 57.7[b]	131 ± 15	<LOD	30
Si (14)	880 ± 79	1,165 ± 33	648 ± 42	320 ± 11	199 ± 23	23
P (15)	326 ± 24	464 ± 26	391 ± 7	368 ± 7	208 ± 8	19
S (16)	624 ± 23	1,027 ± 28	673 ± 26	996 ± 18	673 ± 19	12
Cl (17)	11,825 ± 96	5,458 ± 33	11,225 ± 96	7,149 ± 135	2,275 ± 36	25
K (19)	22,000 ± 294	19,100 ± 141	27,625 ± 96	34,331 ± 398	17,783 ± 232	21
Ca (20)	5,100 ± 57	12,900 ± 141	5,818 ± 76	3,936 ± 20	5,648 ± 78	29
Mn (25)	<LOD	<LOD	<LOD	17.9 ± 3.5[b]	194 ± 5	9
Fe (26)	33.2 ± 7.8	111.3 ± 5.9	96.2 ± 2.0	114.0 ± 3.0	24.2 ± 3.3[b]	8
Cu (29)	9.0 ± 6.0[b]	6.7 ± 7.7[b,c]	10.7 ± 7.3[b]	14.7 ± 3.3[b]	20.8 ± 1.8	5
Zn (30)	<LOD	9.0 ± 6.0[b]	<LOD	9.3 ± 2.8[b]	5.2 ± 2.7[b]	5
Br (35)	61.3 ± 3.2	82.2 ± 2.8	103.3 ± 4.9	115 ± 1	51.4 ± 1.1	5
Rb (37)	14.3 ± 1.1[b]	20.7 ± 0.8	<LOD	7.1 ± 1.0[b]	17.8 ± 0.4	4
Sr (38)	54.1 ± 1.4	134 ± 2	169 ± 3	29.8 ± 0.3	67.1 ± 1.4	4
Mo (42)	5.8 ± 11.7[b,c]	9.8 ± 11.3[b,c]	5.2 ± 10.4[b,c]	16.6 ± 4.2	21.6 ± 1.0	4
Ru (44)	29.7 ± 19.8[b]	<LOD	30.9 ± 22.8[b]	46.0 ± 6.4[b]	39.1 ± 19.6[b]	14
Pd (46)	<LOD	<LOD	<LOD	21.3 ± 3.9[b]	<LOD	18

Note: (a) Element concentration are calculated with $C_6H_{10}O_5$ matrix as the mean ± standard error of six analyses (3 pellets and 2 sides);

(b) Measured value is less than the lower limit of quantification (LOQ); LOQ=4*LOD.

(c) Average measured value is less than measurement uncertainty.

(d) The data for Kunia samples are averages of 42 analyses from seven sample batches (3 pellets and 2 sides from each sample batch).

Table S5. Fatty acid composition of pongamia oil determined by converting to corresponding fatty acid methyl ester.

Properties	Bachman-ME[a]	Bachman-CSE[a]	Foster-CSE[a]	Ke`ehi-CSE	Kunia-CSE	Haleiwa-CSE	Canola-Oil
C16:0 % wt	9.56 ± 0.14	9.71 ± 0.01	12.79 ± 0.38	12.67 ± 0.16	9.45 ± 0.23	8.99 ± 0.11	4.02
C18:0 % wt	7.21 ± 0.28	7.69 ± 0.12	9.41 ± 0.16	8.81 ± 0.08	5.42 ± 0.84	5.23 ± 0.07	3.14
C18:1 % wt	47.36 ± 0.02	48.03 ± 0.20	53.90 ± 0.65	52.09 ± 0.58	58.55 ± 2.50	60.06 ± 0.21	73.74
C18:2 % wt	26.61 ± 0.20	26.04 ± 0.40	13.79 ± 0.22	16.32 ± 0.14	19.74 ± 1.69	16.92 ± 0.25	11.84
C18:3 % wt	5.76 ± 0.14	5.67 ± 0.06	6.65 ± 0.23	7.39 ± 0.11	3.48 ± 0.51	4.37 ± 0.10	7.27
Saturated %wt	17.39 ± 0.18	17.91 ± 0.01	22.99 ± 0.17	22.08 ± 0.12	14.87 ± 0.98	14.22 ± 0.19	7.15
Unsaturated %wt	82.61 ± 0.18	82.09 ± 0.01	77.01 ± 0.17	77.92 ± 0.12	81.77 ± 1.63	81.35 ± 0.56	92.85
Others %wt	3.49 ± 0.17	2.87 ± 0.80	3.45 ± 1.64	2.71 ± 0.58	3.36 ± 1.00	4.44 ± 3.72	N/A

Note: (1) ME and CSE represent mechanical and conventional solvent extraction, respectively; (2) results of pongamia oil are given as the mean ± standard error of three analyses; (3) the number of analysis for canola oil = 1;

Table S6. Properties of pongamia cake obtained through conventional solvent extraction.

Properties	Bachman			Foster			Ke`ehi			Kunia			Haleiwa			Soybean Cake [2]
C% wt	44.06	±	0.07	44.47	±	0.23	46.25	±	0.53	42.18	±	0.81	42.97	±	0.47	55.89
H% wt	6.45	±	0.01	6.55	±	0.02	6.83	±	0.08	6.85	±	0.16	6.76	±	0.08	6.57
N% wt	5.16	±	0.02	5.82	±	0.02	5.56	±	0.07	5.30	±	0.56	4.98	±	0.04	9.29
S/ppm	2304	±	57	3014	±	20	2699	±	60	3224	±	208	3090	±	14	N/A
M %wt	5.82	±	0.06	5.50	±	0.03	5.49	±	0.03	7.25	±	0.28	12.10	±	0.70	8.38
VM % wt	78.11	±	0.04	78.98	±	0.09	79.76	±	0.19	79.02	±	0.15	79.22	±	0.16	78.15
A % wt	3.68	±	0.01	4.23	±	0.01	3.93	±	0.01	3.90	±	0.02	4.31	±	0.03	6.14
FC% wt	18.21	±	0.03	16.79	±	0.09	16.30	±	0.18	17.07	±	0.16	16.47	±	0.13	15.71

Note: (1) M, VM, A and FC are moisture, dry volatile matter, dry ash, and dry fixed carbon content, respectively; (2) FC was calculated by subtracting the VM and A percentages from 100; (3) results are given as the mean ± standard error of three analyses; (4) values of Kunia samples are averages of seven sample batches.

Table S7. Summary of XRF Results for Pongamia seed cakes[a]

Element	Bachman Cake/ppm	Foster Cake/ppm	Lagoon Cake/ppm	Kunia/ppm[d]	Haleiwa/ppm	LOD/ppm
Na (11)	160 ± 186[b,c]	462 ± 53[b]	610 ± 41	<LOD	<LOD	125
Mg (12)	795 ± 65	1,408 ± 71	1,025 ± 21	1,598 ± 35	1,510 ± 27	47
Si (14)	<LOD	<LOD	<LOD	59.1 ± 12.7[b]	109 ± 22	23
P (15)	3,343 ± 279	4,743 ± 182	3,025 ± 122	4,068 ± 49	3,937 ± 55	19
S (16)	1,548 ± 50	2,268 ± 98	1,703 ± 57	2,670 ± 28	2,717 ± 42	12
Cl (17)	592 ± 37	1,080 ± 65	885 ± 35	1,075 ± 10	2,078 ± 53	25
K (19)	9,745 ± 892	16,575 ± 299	12,200 ± 183	13,164 ± 53	15,300 ± 126	21
Ca (20)	3,605 ± 73	3,643 ± 102	2,970 ± 14	3,877 ± 24	5,245 ± 68	29
Mn (25)	<LOD	21.5 ± 6.0[b]	9.5 ± 11.0	45.8 ± 0.7	234 ± 5	9
Fe (26)	45.3 ± 3.2	61.2 ± 4.0	41.1 ± 2.5	87.3 ± 13.1	126 ± 1	8
Ni (28)	<LOD	9.4 ± 6.3[b]	13.6 ± 1.5	21.0 ± 1.2[b]	33.6 ± 3.0	6
Cu (29)	17.4 ± 2.4[b]	23.4 ± 0.9	18.8 ± 1.6	25.9 ± 5.0	27.9 ± 1.8	5
Zn (30)	41.9 ± 2.5	41.6 ± 2.9	35.6 ± 1.9	58.7 ± 1.0	69.2 ± 2.1	5
Br (35)	<LOD	<LOD	<LOD	<LOD	11.9 ± 5.8[b]	5
Rb (37)	21.2 ± 1.5	46.0 ± 0.7	<LOD	9.1 ± 0.2[b]	32.5 ± 1.0	4
Sr (38)	28.5 ± 1.3	28.9 ± 1.5	67.2 ± 2.4	14.1 ± 0.4[b]	36.0 ± 1.3	4
Mo (42)	4.0 ± 8.1[b,c]	8.5 ± 9.9[b,c]	10.9 ± 12.6[b,c]	12.3 ± 3.5[b]	6.4 ± 7.0[b,c]	4
Ru (44)	40.9 ± 7.4[b]	41.0 ± 7.5[b]	38.7 ± 5.1	34.9 ± 3.1[b]	33.6 ± 3.4[b]	14
Pd (46)	35.1 ± 25.6[b]	<LOD	<LOD	<LOD	22.6 ± 24.8[b,c]	18

Note: (a) Element concentration are calculated with $C_6H_{10}O_5$ matrix as the mean ± standard error of six analyses (3 pellets and 2 sides);

(b) Measured value is less than the lower limit of quantification (LOQ); LOQ=4*LOD.

(c) Average measured value is less than measurement uncertainty.

(d) The data for Kunia samples are averages of 42 analyses from seven sample batches (3 pellets and 2 sides from each sample batch).

Table S8. Properties of seven batches Pongamia seeds from location (4).

Properties	H605			H605 B#2			H609			H637			H648			H650 dried			H662		
HHV (MJ kg^{-1})	24.15	±	0.03	24.20	±	0.09	24.57	±	0.02	24.90	±	0.07	24.46	±	0.04	25.03	±	0.11	25.05	±	0.12
C% wt	52.94	±	0.29	52.44	±	0.52	52.92	±	0.25	54.20	±	0.31	53.88	±	0.10	54.46	±	0.22	54.65	±	0.11
H% wt	8.51	±	0.04	8.59	±	0.06	8.71	±	0.07	8.69	±	0.05	8.58	±	0.02	8.39	±	0.04	8.76	±	0.06
N%wt	3.57	±	0.03	3.54	±	0.07	3.40	±	0.04	2.96	±	0.07	2.58	±	0.01	3.70	±	0.03	3.35	±	0.04
S/ppm	2776	±	24	2642	±	40	2548	±	24	2317	±	8	2577	±	28	2101.4	±	24	2545	±	20
H/C	1.93	±	1.93	1.92	±	0.01	1.94	±	0.01	1.91	±	0.00	1.94	±	0.01	1.85	±	0.00	1.92	±	0.01
Oil Content	27.13			25.45			25.76			25.68			30.22			25.33			28.43		
M %wt	7.93	±	0.11	6.35	±	0.05	6.77	±	0.01	6.35	±	0.03	8.33	±	0.34	5.14	±	0.06	7.16	±	0.08
VM % wt	85.14	±	0.19	84.97	±	0.15	85.12	±	0.20	85.24	±	0.14	84.53	±	0.01	85.01	±	0.05	86.14	±	0.12
A % wt	2.68	±	0.01	2.60	±	0.02	2.41	±	0.01	2.54	±	0.02	2.42	±	0.03	2.32	±	0.10	2.44	±	0.02
FC% wt	12.18	±	0.19	12.42	±	0.17	12.47	±	0.19	12.21	±	0.16	13.05	±	0.05	12.67	±	0.05	11.42	±	0.10

Note: (1) M, VM, A and FC are moisture, dry volatile matter, dry ash, and dry fixed carbon content, respectively; (2) FC was calculated by subtracting the VM and A percentages from 100; (3) results are given as the mean ± standard error of three analyses; (4) the number of analysis on oil content equals 1.

Table S9. Properties of seven sample batches of pongamia pods from location (4).

Properties	H605	H605 B#2	H609	H637	H648	H650	H662
HHV (MJ kg^{-}	16.21 ± 0.01	16.24 ± 0.11	16.26 ± 0.02	16.21 ± 0.11	16.09 ± 0.15	16.85 ± 0.14	17.23 ± 0.04
C %wt	42.75 ± 0.49	42.69 ± 0.23	42.37 ± 0.02	42.33 ± 0.28	43.10 ± 0.19	43.29 ± 0.06	42.05 ± 0.06
H %wt	6.32 ± 0.09	6.20 ± 0.04	6.39 ± 0.03	6.49 ± 0.01	6.37 ± 0.10	6.32 ± 0.01	6.31 ± 0.06
N %wt	1.38 ± 0.02	1.18 ± 0.01	1.35 ± 0.03	1.03 ± 0.03	1.14 ± 0.02	0.99 ± 0.00	0.96 ± 0.01
S/ppm	1542 ± 39	1452 ± 35	1178 ± 52	1092 ± 38	942 ± 43	1029 ± 8	1002 ± 34
H/C	1.77 ± 0.00	1.74 ± 0.00	1.81 ± 0.01	1.84 ± 0.01	1.77 ± 0.02	1.75 ± 0.01	1.80 ± 0.01
XRF Ash %wt	5.96 ± 0.11	5.70 ± 0.03	6.39 ± 0.17	5.96 ± 0.14	7.76 ± 0.09	5.27 ± 0.08	6.57 ± 0.23
M %wt	10.41 ± 0.01	10.22 ± 0.02	9.80 ± 0.03	9.85 ± 0.07	10.66 ± 0.04	9.02 ± 0.03	9.76 ± 0.04
VM %wt	72.92 ± 0.06	72.99 ± 0.12	73.36 ± 0.23	73.38 ± 0.09	71.51 ± 0.91	71.88 ± 0.10	71.85 ± 0.11
A %wt	6.78 ± 0.04	6.56 ± 0.04	6.68 ± 0.05	6.26 ± 0.02	8.71 ± 0.28	5.81 ± 0.01	5.88 ± 0.10
FC %wt	20.31 ± 0.07	20.45 ± 0.16	19.96 ± 0.25	20.36 ± 0.10	19.78 ± 0.63	22.31 ± 0.10	22.27 ± 0.15

Note: (1) M, VM, A and FC are moisture, dry volatile matter, dry ash, and dry fixed carbon content, respectively; (2) FC was calculated by subtracting the VM and A percentages from 100; (3) results are given as the mean ± standard error of three analyses.

Table S10. Summary of XRF Results for seven batches pongamia pods and cakes from location (4).[a]

Element	H648 5/5/16	H650 8/14/18	H609 5/27/16	H662 7/7/17	H637 6/9/16	H605 5/27/16	H605 (B2) 5/5/16	LOD
Pod								
Na (11)	1,895 ± 107	1,612 ± 117	458 ± 36[b]	1,520 ± 122	2,263 ± 135	533 ± 56	577 ± 20	125
Mg (12)	687 ± 33	543 ± 37	629 ± 35	785 ± 38	951 ± 25	1,135 ± 91	1,043 ± 42	47
Al (13)	256 ± 21	70.5 ± 35.7[b]	153 ± 26	201 ± 5	143 ± 15	44.0 ± 51.3[b,c]	47.2 ± 24.3[b]	30
Si (14)	441 ± 38	208 ± 27	218 ± 12	544 ± 5	348 ± 19	270 ± 18	214 ± 17	23
P (15)	454 ± 15	322 ± 16	383 ± 32	315 ± 19	284 ± 14	442 ± 14	378 ± 12	19
S (16)	829 ± 12	828 ± 11	1,103 ± 59	775 ± 19	909 ± 16	1,302 ± 45	1,223 ± 22	12
Cl (17)	11,133 ± 281	5,908 ± 188	5,078 ± 195	8,430 ± 465	8,947 ± 412	5,075 ± 160	5,472 ± 102	25
K (19)	41,267 ± 463	29,933 ± 294	37,883 ± 970	36,567 ± 1,294	30,817 ± 621	32,300 ± 518	31,550 ± 138	21
Ca (20)	5,312 ± 47	2,563 ± 37	4,517 ± 76	3,397 ± 65	2,975 ± 78	4,583 ± 91	4,208 ± 45	29
Mn (25)	19.9 ± 2.1[b]	22.6 ± 3.2[b]	12.5 ± 6.8[b]	15.8 ± 1.9[b]	20.9 ± 2.8[b]	13.6 ± 11.0[b]	20.2 ± 1.5[b]	9
Fe (26)	188 ± 11	88.2 ± 5.0	124 ± 4	160 ± 10	107 ± 5	68.2 ± 4.3	61.5 ± 3.6	8
Cu (29)	9.5 ± 7.4[b]	15.1 ± 1.2[b]	26.5 ± 8.9	17.4 ± 1.2[b]	19.1 ± 1.3[b]	<LOD	11.4 ± 5.6[b]	5
Zn (30)	6.9 ± 3.7[b]	8.7 ± 0.6[b]	11.7 ± 8.1[b]	10.6 ± 0.7[b]	8.6 ± 4.4[b]	10.5 ± 5.4[b]	8.2 ± 6.4[b]	5
Br (35)	141 ± 4	125 ± 1	132 ± 4	167 ± 5	112 ± 3	62.2 ± 2.2	66.2 ± 1.8	5
Rb (37)	4.5 ± 6.2[b,c]	9.2 ± 7.2[b]	10.3 ± 8.0[b]	<LOD	7.8 ± 6.6[b]	7.2 ± 5.7[b]	7.0 ± 5.5[b]	4
Sr (38)	37.1 ± 0.9	21.5 ± 0.5	37.3 ± 0.9	25.3 ± 1.3	19.7 ± 1.1	35.3 ± 1.3	32.0 ± 1.4	4
Mo (42)	13.4 ± 10.4[b]	17.5 ± 8.6	17.2 ± 8.4	17.0 ± 8.3	20.5 ± 1.4	10.4 ± 11.4[b,c]	20.5 ± 0.8	4
Ru (44)	48.0 ± 8.7[b]	51.2 ± 2.4[b]	44.4 ± 9.1[b]	49.9 ± 5.9[b]	53.1 ± 4.3[b]	26.9 ± 21.7[b]	48.2 ± 5.9[b]	14
Pd (46)	31.1 ± 34.6[b,c]	21.8 ± 34.3[b,c]	<LOD	<LOD	21.2 ± 32.9[b,c]	29.0 ± 32.0[b,c]	23.1 ± 36.3[b,c]	18
Cake								
Na (11)	143 ± 77[b]	<LOD	<LOD	136 ± 70[b]	132 ± 68[b]	<LOD	<LOD	125
Mg (12)	1,275 ± 69	2,153 ± 83	1,457 ± 69	1,807 ± 67	1,845 ± 144	1,090 ± 52	1,562 ± 31	47
Si (14)	104 ± 41	<LOD	78.3 ± 41.5[b]	59.6 ± 24.7[b]	66.3 ± 34.6[b]	45.4 ± 6.3[b]	43.0 ± 23.6[b]	23
P (15)	2,320 ± 101	4,668 ± 83	3,973 ± 92	4,060 ± 122	4,193 ± 211	4,202 ± 87	5,057 ± 61	19
S (16)	2,467 ± 68	2,687 ± 37	2,623 ± 24	2,973 ± 114	2,587 ± 56	2,513 ± 61	2,838 ± 58	12
Cl (17)	1,915 ± 43	811 ± 16	946 ± 27	1,223 ± 29	1,100 ± 18	736 ± 20	793 ± 35	25
K (19)	14,950 ± 187	11,517 ± 214	14,283 ± 133	13,383 ± 271	13,167 ± 121	11,850 ± 138	13,000 ± 167	21

Ca (20)	3,498 ± 63	3,473 ± 54	4,272 ± 58	4,275 ± 111	3,682 ± 34	4,038 ± 52	3,903 ± 54	29
Mn (25)	42.3 ± 3.1	54.7 ± 1.4	30.3 ± 1.7[b]	53.7 ± 2.1	56.2 ± 3.0	41.2 ± 1.8	41.9 ± 2.9	9
Fe (26)	76.8 ± 26.3	107 ± 18	93.3 ± 4.3	72.7 ± 2.0	84.1 ± 32.5	62.9 ± 3.0	114 ± 28	8
Ni (28)	16.0 ± 3.7[b]	20.2 ± 1.8[b]	20.1 ± 0.4[b]	25.3 ± 1.6	21.6 ± 2.6[b]	18.8 ± 1.1[b]	25.3 ± 3.5	6
Cu (29)	29.7 ± 14.5	26.6 ± 0.9	22.8 ± 0.7	25.6 ± 1.5	22.6 ± 1.0	26.7 ± 1.8	27.1 ± 1.7	5
Zn (30)	46.5 ± 3.1	53.1 ± 1.7	58.7 ± 2.0	65.2 ± 2.8	52.6 ± 0.9	69.5 ± 4.0	65.2 ± 2.7	5
Br (35)	7.1 ± 1.2[b]	<LOD	6.1 ± 3.0[b]	9.4 ± 0.7[b]	<LOD	<LOD	<LOD	5
Rb (37)	6.3 ± 1.1[b]	7.8 ± 0.7[b]	8.5 ± 0.4[b]	11.5 ± 0.8[b]	11.1 ± 0.5[b]	9.8 ± 0.8[b]	8.4 ± 1.0[b]	4
Sr (38)	14.9 ± 1.5[b]	10.2 ± 1.4[b]	16.3 ± 0.7	12.8 ± 0.8[b]	10.6 ± 0.5[b]	19.5 ± 0.6	14.6 ± 0.5[b]	4
Mo (42)	18.4 ± 4.5	11.1 ± 5.6[b]	12.7 ± 0.6[b]	10.8 ± 5.3[b]	12.1 ± 1.1	10.2 ± 11.2[b,c]	10.6 ± 5.2[b]	4
Ru (44)	38.9 ± 5.6[b]	35.6 ± 3.8[b]	34.9 ± 5.4[b]	29.3 ± 6.4[b]	25.9 ± 13.1[b]	43.1 ± 6.6[b]	36.6 ± 3.9[b]	14
Pd (46)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	22.1 ± 24.5[b,c]	18

Note: (a) Element concentration are calculated with $C_6H_{10}O_5$ matrix as the mean ± standard error of six analyses (3 pellets and 2 sides);

(b) Measured value is less than the lower limit of quantification (LOQ); LOQ=4*LOD.

(c) Average measured value is less than measurement uncertainty.

Table S11. Properties of Pongamia oil obtained from seven batches location (4) seed.

Properties	H605	H605 B#2	H609	H637	H648	H650	H662
FFA %	0.70 ± 0.01	0.62 ± 0.01	0.83 ± 0.02	0.70 ± 0.01	0.70 ± 0.02	0.70 ± 0.01	0.69 ± 0.01
HHV (MJ kg^{-1})	38.01 ± 0.05	37.71 ± 0.20	38.16 ± 0.22	38.38 ± 0.05	38.28 ± 0.08	38.36 ± 0.12	38.47 ± 0.22
Iodine value	61.93 ± 0.80	62.4 ± 2.22	52.53 ± 1.45	49.65 ± 2.23	36.91 ± 1.64	69.25 ± 2.02	30.13 ± 2.03
C %wt	76.54 ± 0.34	76.55 ± 0.10	76.27 ± 0.31	76.19 ± 0.21	76.03 ± 0.13	76.57 ± 0.19	76.01 ± 0.12
H %wt	11.79 ± 0.05	11.87 ± 0.06	11.87 ± 0.06	11.71 ± 0.06	11.78 ± 0.03	11.62 ± 0.09	11.82 ± 0.02
O %wt	11.67 ± 0.39	11.58 ± 0.16	11.86 ± 0.36	12.10 ± 0.27	12.19 ± 0.16	11.81 ± 0.10	12.18 ± 0.13
H/C	1.85 ± 0.00	1.86 ± 0.01	1.87 ± 0.01	1.84 ± 0.00	1.86 ± 0.00	1.82 ± 0.02	1.87 ± 0.00
T_{onset}/°C	1.51	2.19	-0.08	2.23	1.58	1.11	1.04
T_{peak}/°C	0.28	1.03	-0.82	0.97	0.23	0.07	-0.03

Note: (1) results of pongamia oil are given as the mean ± standard error of three analyses; (2) one analysis reported for T_{onset} and T_{peak}.

Table S12. Fatty acid composition of seven batches Pongamia oil from location (4).determined by converting to corresponding fatty acid methyl ester.

Fatty Acid	H605			H605 B#2			H609			H637			H648			H650 dried			H662		
Palmitic acid	9.31	±	0.16	9.43	±	0.13	9.53	±	0.23	9.76	±	0.20	9.22	±	0.24	9.71	±	0.13	9.19	±	0.06
Stearic acid	5.57	±	0.09	5.80	±	0.05	6.05	±	0.10	4.83	±	0.17	4.58	±	0.08	6.69	±	0.60	4.44	±	0.08
Oleic acid	57.58	±	0.41	57.22	±	0.30	62.20	±	0.63	56.29	±	0.53	59.39	±	0.32	55.77	±	0.72	61.37	±	0.27
Linoleic acid	19.55	±	0.17	20.01	±	0.10	16.59	±	0.13	21.61	±	0.36	20.45	±	0.17	21.19	±	0.49	18.77	±	0.18
Linolenic acid	3.18	±	0.25	3.23	±	0.34	2.85	±	0.34	3.84	±	0.29	3.49	±	0.16	3.37	±	0.73	4.41	±	0.08
Saturated% wt	14.88	±	0.24	15.23	±	0.17	15.58	±	0.33	14.59	±	0.37	13.80	±	0.32	16.40	±	0.74	13.63	±	0.14
Unsaturated%	80.31	±	0.83	80.47	±	0.74	81.64	±	1.10	81.75	±	1.19	83.33	±	0.65	80.33	±	1.95	84.54	±	0.52
Other	4.81	±	3.84	4.30	±	4.83	2.78	±	2.60	3.66	±	3.56	2.87	±	1.83	3.27	±	1.84	1.83	±	2.03

Note: results of pongamia oil are given as the mean ± standard error of three analyses.

Table S13. Properties of seven batches Pongamia Seed Cake from location (4).

Properties	H605			H605 B#2			H609			H637			H648			H650 dried			H662		
HHV (MJ	18.10	±	0.10	17.93	±	0.25	18.21	±	0.27	17.98	±	0.12	17.28	±	0.12	18.38	±	0.20	17.45	±	0.19
C% wt	43.39	±	0.27	42.08	±	0.16	42.36	±	0.09	40.86	±	0.72	42.10	±	0.01	42.73	±	0.24	41.72	±	0.37
H% wt	6.82	±	0.03	7.03	±	0.05	6.86	±	0.01	6.55	±	0.16	6.83	±	0.03	6.88	±	0.04	7.01	±	0.05
N%wt	5.76	±	0.06	5.44	±	0.08	5.67	±	0.01	4.85	±	0.21	5.76	±	0.06	5.62	±	0.03	5.60	±	0.03
S/ppm	3533	±	48	3302	±	28	3067	±	22	2907	±	45	3210	±	6	3146	±	20	3459	±	42
H/C	1.89	±	0.01	2.00	±	0.01	1.94	±	0.00	1.92	±	0.02	1.95	±	0.01	1.93	±	0.00	2.02	±	0.00
XRF	3.91	±	0.08	4.40	±	0.06	4.31	±	0.06	4.22	±	0.12	3.94	±	0.08	4.13	±	0.05	4.29	±	0.23
M %wt	6.74	±	0.03	8.94	±	0.01	8.81	±	0.02	13.92	±	1.34	1.72	±	0.07	9.29	±	0.45	1.36	±	0.04
VM % wt	79.90	±	0.24	79.09	±	0.18	78.73	±	0.10	79.86	±	0.18	77.22	±	0.08	79.28	±	0.23	79.09	±	0.06
A % wt	3.98	±	0.02	4.07	±	0.02	3.86	±	0.02	3.88	±	0.01	4.00	±	0.02	3.61	±	0.02	3.92	±	0.01
FC% wt	16.12	±	0.24	16.84	±	0.20	17.40	±	0.09	16.26	±	0.18	18.77	±	0.09	17.11	±	0.24	16.99	±	0.05

Note: (1) M, VM, A and FC are moisture, dry volatile matter, dry ash, and dry fixed carbon content, respectively; (2) FC was calculated by subtracting the VM and A percentages from 100; (3) results are given as the mean ± standard error of three analyses.

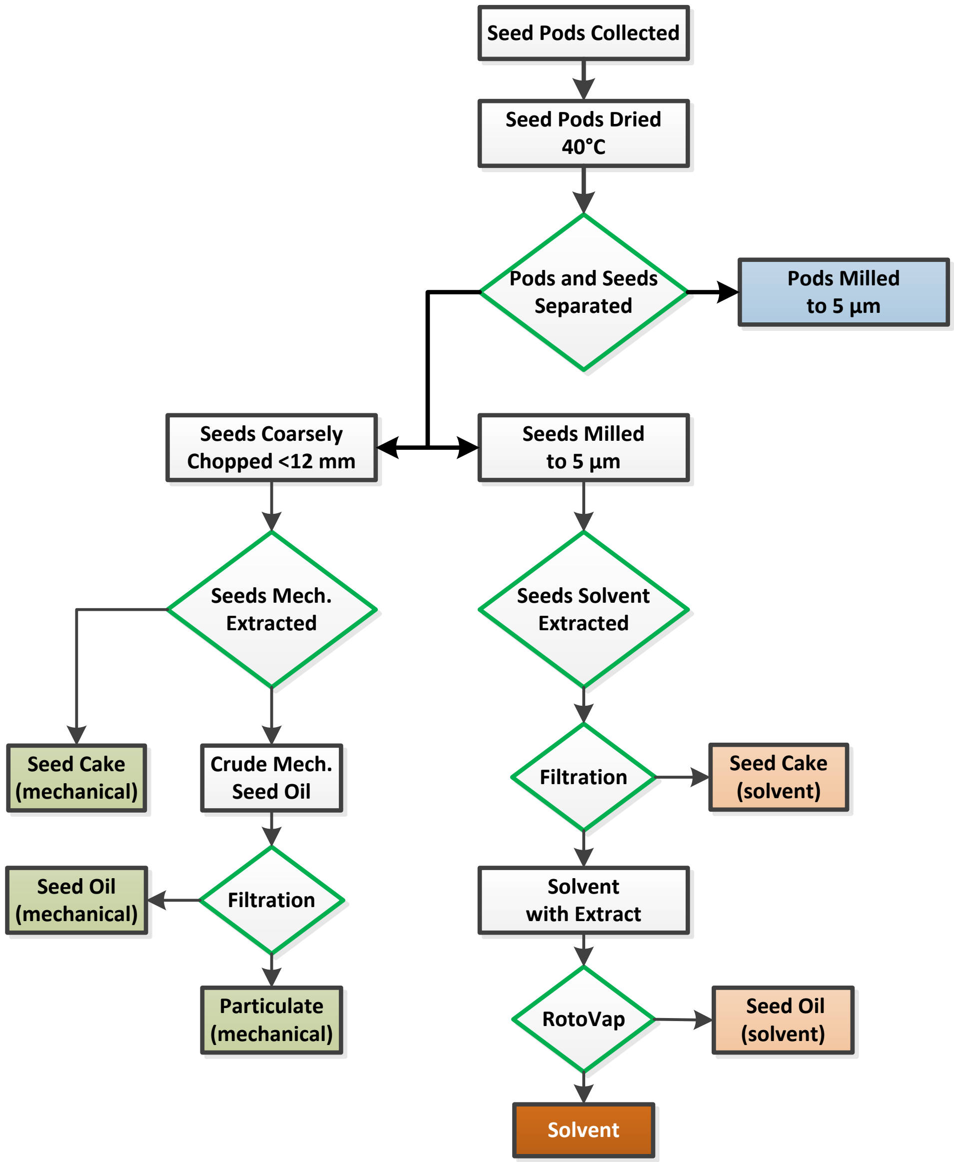

Figure S1. Schematic of sample preparation and oil extraction process.

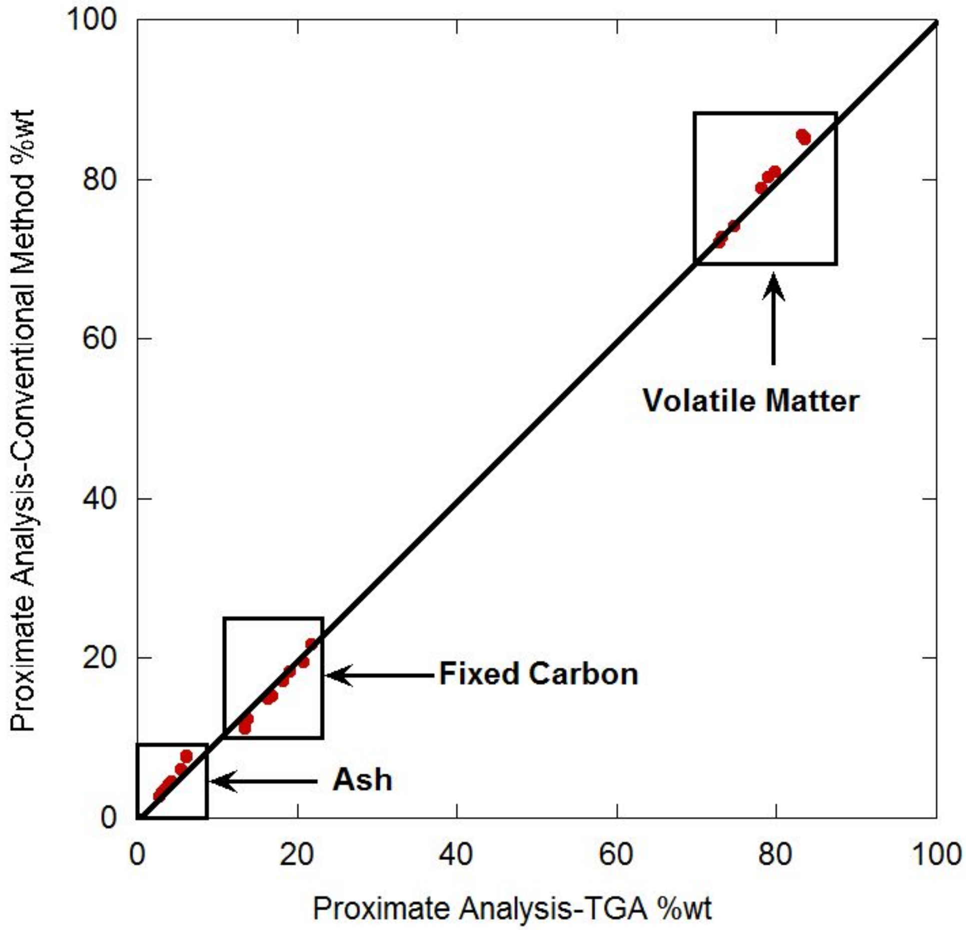

Figure S2. Comparison of the proximate analysis results (i.e. volatile matter, fixed carbon, and ash content of pongamia samples) obtained using the LECO TGA801 and conventional ASTM methods.

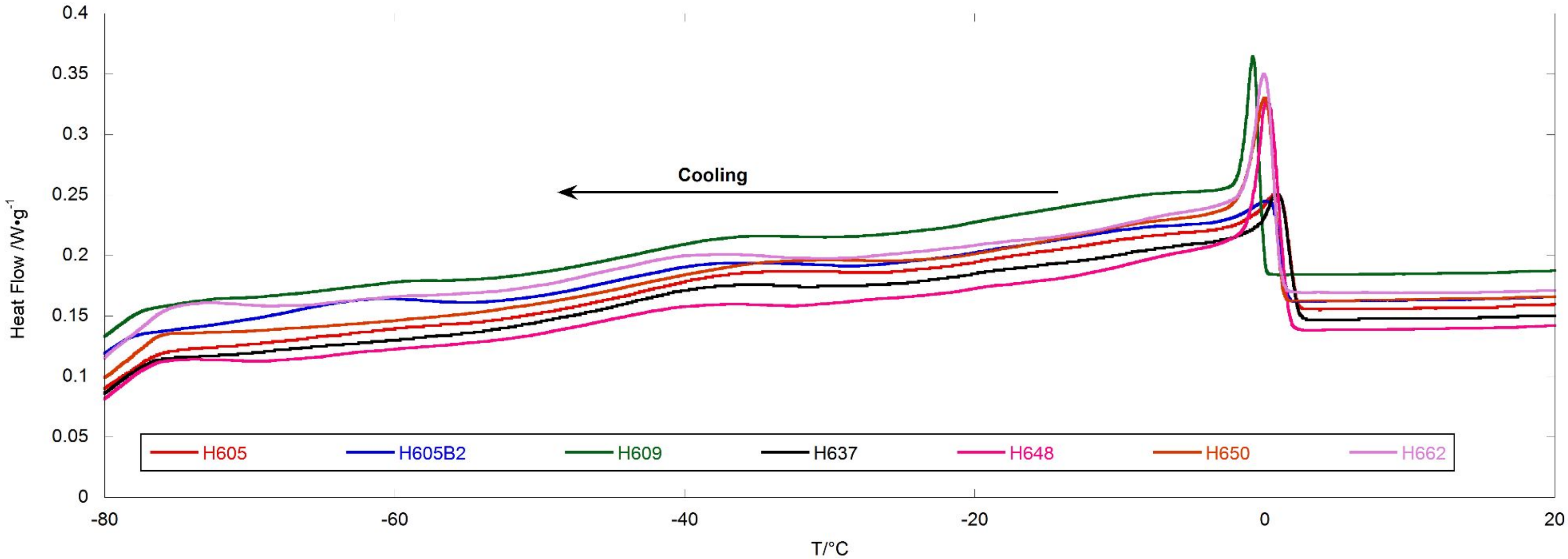

Figure S3. DSC of Pongamia oil obtained from seven sample batches from location (3), Kunia.

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