

SUPPLEMENTARY MATERIAL

Table S1. Test data for an atomizer with a fan blade angle of 35°

Fan blade angle of 35°										
Flow rate = 5.0 L/min						Flow rate = 10.8 L/min				
Wind speed v	Traction	$D_{v,1}$	$D_{v,5}$	$D_{v,9}$	Droplet distribution span R_s	Power FV	$D_{v,1}$	$D_{v,5}$	$D_{v,9}$	Droplet distribution span R_s
m/s	N	μm	μm	μm	-	W	μm	μm	μm	-
50.11	31.6	34.11	119.2	222.1	1.343	1583.476	43.09	136.1	285.5	1.537
50.46	31.8	33.1	118.9	214.2	1.346	1604.628	39.28	124.9	280.9	1.495
50.82	32.0	34.53	116.32	225.36	1.347	1626.24	37.13	121.8	275.5	1.572
51.18	32.2	34.0	115.4	213.2	1.380	1647.996	37.72	118.4	259.9	1.519
51.54	32.6	33.76	113.9	205.6	1.347	1680.204	36.19	121.9	255.3	1.500
51.9	32.8	32.41	112.4	211.2	1.347	1702.32	38.11	126.1	255.6	1.500
52.27	33.2	31.73	110.9	211.2	1.358	1735.364	35.97	110.4	266.2	1.540
52.63	34.0	32.21	113.4	194.2	1.351	1789.42	36.27	117.2	255.2	1.537
53	34.2	30.77	112.9	216.3	1.363	1812.6	36.25	113	244.4	1.491
53.37	34.6	30.54	110.5	205.0	1.352	1846.602	34.15	110.5	235.4	1.577
53.73	35.2	30.1	109.48	194.3	1.364	1891.296	36.38	117.2	235.7	1.498
54.1	35.6	29.5	108.4	201.48	1.359	1925.96	34.24	106.9	222.2	1.508
54.46	36.0	29.05	106.8	200.5	1.369	1960.56	34.66	111.2	240.6	1.522
54.83	36.4	30.34	105.5	198.6	1.365	1995.812	34.7	112.4	239.6	1.503
55.2	36.8	27.25	104.2	197.0	1.370	2031.36	34.43	107.6	211.1	1.516
55.56	37.2	29.01	104.8	196.5	1.381	2066.832	34.15	113.1	216.3	1.515
55.93	37.8	27.6	104.2	194.3	1.383	2114.154	31.53	105.9	218.6	1.535
56.3	38.2	26.52	103.5	190.5	1.379	2150.66	31.09	100.5	210.5	1.516
56.66	38.8	28.08	103.8	188.4	1.373	2198.408	32.74	103.9	223.6	1.609
57.02	39.4	26.6	104.2	189.54	1.378	2246.588	32.31	104.0	211.5	1.512
57.39	40.0	26.5	102.2	186.7	1.376	2295.6	32.14	104.9	217.9	1.516
57.75	40.2	26.32	101	188.3	1.384	2321.55	31.96	102.9	206.6	1.524
58.12	40.6	26.01	100.8	185.5	1.383	2359.672	31.05	98.66	206.1	1.518
58.49	41.0	26.35	100.5	186.3	1.38	2398.09	32.14	101.8	209.2	1.525
58.85	41.6	27.21	99.1	180.3	1.385	2448.16	31.57	101.0	204.7	1.518
59.21	42.4	26.15	99.5	183.2	1.379	2510.504	32.95	98.1	199.6	1.515
59.58	42.8	25.86	98.1	176.0	1.382	2550.024	30.92	106.1	199.4	1.549
59.95	43.2	25.71	97.7	179.6	1.382	2589.84	31.65	107.0	192.1	1.531
60.31	43.6	25.41	97.1	178.3	1.385	2629.516	30.61	103.2	195.2	1.563
60.68	44.0	25.1	96.8	176.5	1.384	2669.92	29.6	101.4	197.5	1.543
61.05	44.4	24.98	96.6	175.0	1.379	2710.62	27.24	103.0	191.3	1.552
61.41	45.2	24.65	95.1	173.2	1.387	2775.732	26.67	102.7	192.5	1.527

* $D_{v,1}$, $D_{v,5}$, and $D_{v,9}$ are the droplet diameters such that 10, 50, and 90 percent, respectively, of the spray volume is in droplets of smaller diameter. $D_{v,1}$ is the droplet diameter where 10% of the spray volume is contained in droplets smaller than this value. $D_{v,9}$ is the droplet diameter where 90% of the spray volume is contained in droplets smaller than this value.

Table S2. Test data for an atomizer with a fan blade angle of 45°

Fan blade angle of 45°										
Flow rate = 5.0 L/min						Power FV	Flow rate = 10.8 L/min			
Wind speed v	Traction	$D_{v,1}$	$D_{v,5}$	$D_{v,9}$	Droplet distribution span R_s		$D_{v,1}$	$D_{v,5}$	$D_{v,9}$	Droplet distribution span R_s
m/s	N	μm	μm	μm	-	W	μm	μm	μm	-
50.11	30.4	54.35	144.9	277.1	1.537	1523.344	55.26	152.5	315.5	1.573
50.46	30.6	53.28	141.6	264.8	1.495	1544.076	55.26	153.3	310.9	1.654
50.82	31.2	53.35	143.5	278.9	1.572	1585.584	54.47	151.8	305.3	1.653
51.18	31.4	52.28	139.1	263.6	1.519	1607.052	52.77	145.4	289.9	1.576
51.54	31.6	51.11	136.3	255.6	1.500	1628.664	52.32	145.7	285.3	1.566
51.9	31.8	50.69	135.9	254.5	1.500	1650.42	53.24	141.7	285.6	1.574
52.27	32.2	50.87	136.6	261.2	1.540	1683.094	51.13	143.8	286.2	1.635
52.63	32.6	50.32	134.6	257.2	1.537	1715.738	49.84	138.5	270.6	1.593
53.0	33.0	49.17	130.8	244.2	1.491	1749	49.33	137.8	266.5	1.575
53.37	33.4	48.99	131.5	256.3	1.577	1782.558	48.2	135.1	265.7	1.610
53.73	33.8	48.05	127.7	239.2	1.498	1816.074	48.39	134.7	264.8	1.606
54.1	34.2	47.13	127.0	238.7	1.508	1850.22	47.33	131.5	252.2	1.558
54.46	34.6	16.61	125.7	238	1.522	1884.316	47.49	134.9	281.6	1.565
54.83	35.0	46.07	123.6	231.8	1.503	1919.05	47.62	133.5	279.6	1.581
55.20	35.4	46.04	122.6	232	1.516	1954.08	46.13	129	241.1	1.588
55.56	35.8	45.04	120.9	228.3	1.515	1989.048	45.47	126.8	246.3	1.583
55.93	36.2	44.53	120.0	229.9	1.535	2024.666	44.4	127	248.6	1.608
56.30	36.6	44.63	121.2	234.4	1.516	2060.58	44.59	124.35	240.5	1.574
56.66	37.0	44.54	120.0	237.6	1.609	2096.42	45.89	131	288.7	1.654
57.02	37.4	43.27	117.8	225.7	1.512	2132.548	43.55	122.5	241.5	1.616
57.39	37.8	12.89	115.2	215.8	1.516	2169.342	44.13	124.7	247.9	1.634
57.75	38.4	42.59	114.9	216.8	1.524	2217.6	42.94	120.5	236.6	1.607
58.12	39.0	42.24	113.8	215.7	1.518	2266.68	42.05	119.5	236.1	1.624
58.49	39.4	41.9	112.9	213.36	1.525	2304.506	42.84	121	239.2	1.605
58.85	39.8	41.39	110.9	210.5	1.518	2342.23	42.26	119.3	234.7	1.613
59.21	40.2	41.03	110.3	208.2	1.515	2380.242	41.35	115.5	222.6	1.569
59.58	40.8	40.98	109.9	211.3	1.549	2430.864	41.42	117.2	232.9	1.634
59.95	41.2	40.05	108.6	206.2	1.531	2469.94	40.86	114.7	223.2	1.607
60.31	41.6	39.26	106.2	205.2	1.563	2508.896	40.88	115.6	225.2	1.669
60.68	42.2	39.01	105.3	203.3	1.543	2560.696	39.89	112.7	227.1	1.631
61.05	42.6	38.8	104.7	201.3	1.552	2600.73	39.54	110.3	211.2	1.556
61.41	43.2	38.34	103.39	197	1.527	2652.912	39.14	110.8	222.6	1.665

* $D_{v,1}$, $D_{v,5}$, and $D_{v,9}$ are the droplet diameters such that 10, 50, and 90 percent, respectively, of the spray volume is in droplets of smaller diameter. $D_{v,1}$ is the droplet diameter where 10% of the spray volume is contained in droplets smaller than this value. $D_{v,9}$ is the droplet diameter where 90% of the spray volume is contained in droplets smaller than this value.

Table S3. Test data for an atomizer with a fan blade angle of 55°

Fan blade angle of 55°										
Flow rate = 5.0 L/min						Flow rate = 10.8 L/min				
Wind speed v	Traction	$D_{v.1}$	$D_{v.5}$	$D_{v.9}$	Droplet distribution span R_s	Power FV	$D_{v.1}$	$D_{v.5}$	$D_{v.9}$	Droplet distribution span R_s
m/s	N	μm	μm	μm	-	W	μm	μm	μm	-
50.11	29.6	75.5	181.9	335.3	1.428	1483.256	78.01	191.5	346.2	1.401
50.46	30.2	74.6	178.9	321.0	1.377	1523.892	77.52	190.2	344.8	1.406
50.82	30.6	72.56	175.5	315.6	1.385	1555.092	77.42	189	343.6	1.408
51.18	31.0	73.19	175.4	315.0	1.379	1586.58	76.21	187.1	340.2	1.411
51.54	31.4	71.01	172.1	309.3	1.384	1618.356	75.05	184.9	337.2	1.418
51.9	31.8	69.42	168.6	303.8	1.390	1650.42	74.59	182.8	332	1.408
52.27	32.2	69.06	169.6	308.9	1.414	1683.094	72.73	180.2	327.7	1.419
52.63	32.6	67.63	165.9	298.7	1.392	1715.738	72.30	178.8	326	1.434
53.00	33.0	68.37	166.6	300.4	1.393	1749	71.57	179.1	328.4	1.427
53.37	33.4	66.59	163.2	295.6	1.403	1782.558	70.71	174.9	319.4	1.454
53.73	33.8	65.23	160.4	290.4	1.403	1816.074	69.32	172.8	316	1.427
54.10	34.2	65.18	160.2	292.36	1.418	1850.22	68.41	171.6	315.1	1.453
54.46	34.6	64.28	157.1	284.0	1.399	1884.316	67.48	169.4	309.8	1.440
54.83	35.0	63.55	155.8	283.2	1.410	1919.05	66.64	167.1	306.4	1.430
55.20	35.4	62.61	154.4	280.0	1.408	1954.08	65.24	163.7	303.2	1.431
55.56	35.8	62.54	153	276.4	1.398	1989.048	64.72	162.4	298.8	1.447
55.93	36.2	61.46	150.9	273.6	1.405	2024.666	63.87	160.4	300.7	1.444
56.30	36.6	60.51	149.6	271.2	1.409	2060.58	62.61	157.2	294.7	1.437
56.66	37.0	60.21	148.5	268.9	1.405	2096.42	62.48	156.6	287.6	1.445
57.02	37.4	58.52	146	264.9	1.414	2132.548	61.11	154.8	286.5	1.440
57.39	37.8	58.02	145.4	267.2	1.438	2169.342	61.03	153.9	285	1.445
57.75	38.4	57.45	143.3	260.2	1.415	2217.6	60.51	152.7	283.2	1.459
58.12	38.8	56.81	142	258.7	1.422	2255.056	59.21	150.5	280	1.451
58.49	39.6	56.01	140.2	254.4	1.416	2316.204	58.89	149.4	276.7	1.435
58.85	40.0	54.61	138	253.4	1.441	2354	58.01	147.7	274	1.451
59.21	40.4	54.54	136.8	249.3	1.423	2392.084	57.93	157.5	271.4	1.453
59.58	40.4	53.82	135.6	247.6	1.428	2407.032	56.57	144.5	273.2	1.451
59.95	40.8	53.26	134	244.7	1.422	2445.96	55.47	143.1	266.1	1.454
60.31	41.2	53.04	133.1	242.7	1.425	2484.772	55.22	141.6	263.7	1.427
60.68	41.6	51.66	129.1	235.9	1.427	2524.288	54.10	139.4	260.8	1.451
61.05	42.0	51.02	127.7	233.0	1.425	2564.1	53.24	137.9	256.8	1.437
61.41	42.6	51.04	129.6	236.8	1.434	2616.066	52.89	136.5	253.7	1.428

* $D_{v.1}$, $D_{v.5}$, and $D_{v.9}$ are the droplet diameters such that 10, 50, and 90 percent, respectively, of the spray volume is in droplets of smaller diameter. $D_{v.1}$ is the droplet diameter where 10% of the spray volume is contained in droplets smaller than this value. $D_{v.9}$ is the droplet diameter where 90% of the spray volume is contained in droplets smaller than this value.

Table S4. Test data for an atomizer with a fan blade angle of 65°

Fan blade angle of 65°										
Flow rate = 5.0 L/min						Flow rate = 10.8 L/min				
Wind speed v	Traction	$D_{v,1}$	$D_{v,5}$	$D_{v,9}$	Droplet distribution span R_s	Power FV	$D_{v,1}$	$D_{v,5}$	$D_{v,9}$	Droplet distribution span R_s
m/s	N	μm	μm	μm	-	W	μm	μm	μm	-
50.11	29.6	89.45	204.8	364.6	1.343	1483.256	91.57	216.3	390.3	1.384
50.46	30.0	87.63	202.3	360.1	1.346	1513.8	90.20	214.9	389.0	1.391
50.82	30.4	87.40	200.3	357.1	1.347	1544.928	88.89	211.5	384.0	1.395
51.18	30.8	86.37	199.38	362.0	1.38	1576.344	88.17	209.8	379.7	1.368
51.54	31.2	85.03	196.0	349.7	1.347	1608.048	86.58	206.1	373.8	1.394
51.90	31.6	85.21	196.1	349.4	1.347	1640.04	85.05	203.3	368.6	1.395
52.27	32.0	82.74	191.8	343.3	1.358	1672.64	83.86	200.6	363.8	1.396
52.63	32.4	82.77	190.8	340.5	1.351	1705.212	84.12	200.6	365.5	1.403
53.00	32.8	79.45	185.5	332.3	1.363	1738.4	81.96	197.2	359.6	1.407
53.37	33.2	81.25	187.4	334.5	1.352	1771.884	81.63	195.6	355.7	1.401
53.73	33.6	78.97	184.3	330.3	1.364	1805.328	79.64	192.5	350.6	1.408
54.10	34.0	78.925	183.5	328.2	1.359	1839.4	79.30	190.9	347.2	1.404
54.46	34.4	76.40	179.9	322.7	1.369	1873.424	77.46	187.7	341.3	1.406
54.83	34.8	76.70	179.7	321.9	1.365	1908.084	75.43	180.7	325.9	1.386
55.20	35.2	75.27	177.0	318.2	1.370	1943.04	75.47	184.6	336.6	1.414
55.56	35.6	72.85	173.8	312.9	1.381	1977.936	74.35	182.5	333.2	1.417
55.93	36.0	71.41	171.0	307.9	1.383	2013.48	73.06	180.4	329.5	1.422
56.30	36.6	72.11	171.0	307.9	1.379	2060.58	72.80	179.7	328.5	1.423
56.66	36.8	71.38	168.5	302.7	1.373	2085.088	71.77	177.5	324.2	1.423
57.02	37.2	70.33	167.2	300.8	1.378	2121.144	71.90	178.4	333.8	1.468
57.39	37.6	69.58	165.7	297.7	1.376	2157.864	70.04	173.8	317.8	1.426
57.75	38.2	68.57	163.6	295.0	1.384	2206.05	69.52	172.5	316.9	1.429
58.12	39.0	67.13	160.8	289.6	1.383	2266.68	68.93	172.0	315.2	1.432
58.49	39.4	66.77	159.8	287.4	1.380	2304.506	67.57	169.2	310.8	1.439
58.85	39.6	65.51	157.6	283.8	1.385	2330.46	66.84	168.4	308.5	1.438
59.21	40.0	65.90	157.5	283.1	1.379	2368.4	66.04	166.8	306.6	1.439
59.58	40.4	63.99	153.6	276.2	1.382	2407.032	65.17	163.4	300.1	1.442
59.95	40.8	63.39	153.6	276.2	1.382	2445.96	64.28	161.7	296.6	1.438
60.31	41.2	62.59	151.0	271.7	1.385	2484.772	63.97	159.1	290.7	1.437
60.68	41.6	62.22	149.7	269.36	1.384	2524.288	62.27	155.6	284.4	1.425
61.05	42.0	62.47	149.2	268.2	1.379	2564.1	61.34	154.5	282.5	1.427
61.41	42.4	61.27	147.8	266.3	1.387	2603.784	60.68	153.9	281.3	1.429

* $D_{v,1}$, $D_{v,5}$, and $D_{v,9}$ are the droplet diameters such that 10, 50, and 90 percent, respectively, of the spray volume is in droplets of smaller diameter. $D_{v,1}$ is the droplet diameter where 10% of the spray volume is contained in droplets smaller than this value. $D_{v,9}$ is the droplet diameter where 90% of the spray volume is contained in droplets smaller than this value.

Figure S1. Trend line of droplet size and power at flow rate of 5.0 L/min

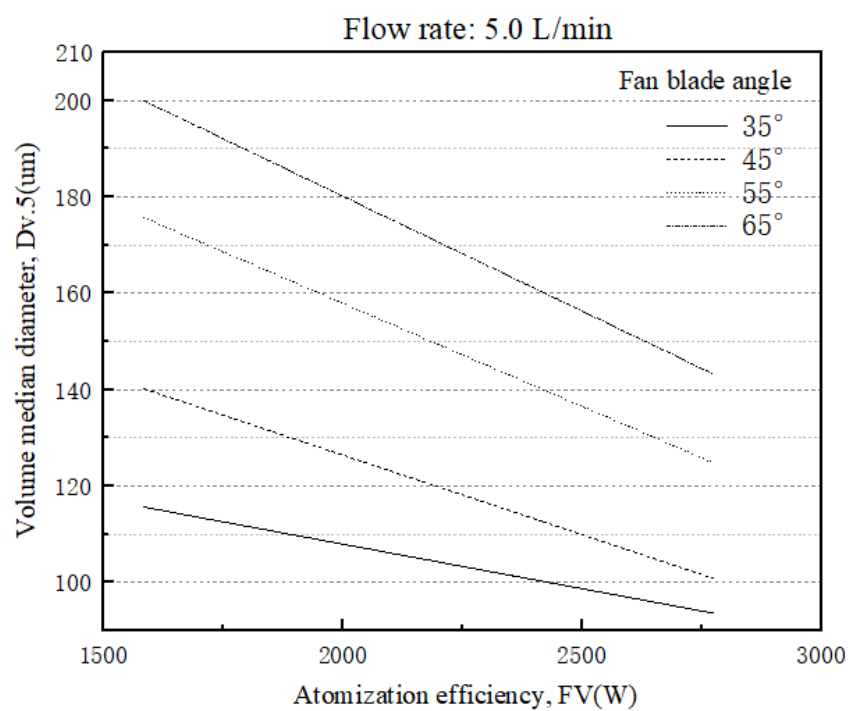


Figure S2. Trend line of droplet size and power at flow rate of 10.8 L/min

