

Side-by-Side Tests of Eight Solar Cookers

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A fundamental measure of a solar cooker is how fast it can boil a liter of water. However, it is difficult to establish a standard test for solar cookers, because sunlight, air temperature, and wind conditions vary by season and by latitude. Even at the same latitude, conditions vary from day to day and within each day. Moreover, for cookers that do not precisely "track" the sun, the shape and configuration of each cooker may affect the amount of heat generated at different times during the day.

In an effort to control these variables, we conducted side-by-side boiling tests of multiple cookers at different times of the day during four days in August 11-13, 2015 in Del Mar, California. On the first day, we compared the Hot Pot, Cookit, Sun Oven, and the Haines Solar Cooker.



Haines

Hot Pot

Cookit

Sun Oven

Each cooker was set up in the shade, with one liter of water and a probe thermometer in each pot. All were then placed in the sun at 1:26 p.m. At the beginning of the test, the ambient air temperature was 75 degrees F. (24 C.). Two hours later it was 77 degrees F. (25 C.). There was an occasional light breeze during the test.

Test instruments. Four "probe" meat thermometers, like the one shown in the photo, were used to measure the temperature of the water in each solar cooker. Before the test, the thermometers were calibrated with each other by placing the probes together in a pan of water that was heated on an electric stove. During the test, a probe was placed in the pan of water in each solar



cooker, with the cable running out to the display, so the temperature could be read without disturbing the pots during the test.

Cooking Pans. For the Cookit and Sun Oven, we used the standard 3½-liter "Graniteware" round pot recommended on many solar cooking web sites. For the Cookit, we set the pan on a 2 cm. high wooden trivet, and enclosed it inside a hi-temp plastic cooking bag. For the Hot Pot, we used the Hot Pot's special 3½-liter pan inside its glass enclosure. For the Haines, we used its recommended 4-liter Teflon Haines Dutch Oven, with its glass-and-silicone lid.

Test results. The Haines boiled water twice as fast as the other cookers, taking only an hour to achieve a rolling boil. The Sun Oven took two hours to boil a liter of water, and the other two cookers never reached the boiling point—leveling off after two hours at about 200 F.

Time 8/11/15	Haines	Hot Pot	Cookit	Sun Oven
1:26 pm	81 F. (27 C.)	81 F.	81 F.	81 F.
1:34	101	96	89	86
1:41	122	114	102	99
1:45	133	127	111	104
1:52	149	141	121	118
2:01	167	159	137	130
2:09	183	170	149	146
2:17	197	179	161	160
2:26 (1 hour)	212 Boiling	188	172	172
2:36	212 (100 C)	194	183	183
2:46	212	197	191	194
3:00	212	197	197	202
3:15	212	199	200	210
3:33 (2+hrs)	212	199	201	212 Boiling

Second test. The following morning, August 12, 2105, we set out the Haines and Hot Pot, and added three more solar cookers for comparison—Copenhagen, SunFlair and All Seasons. The ambient temperature was 77 F. (25 C.) with more of a light breeze than the previous day.

We used the same "probe" meat thermometers as the previous day. The pans for the Copenhagen and All Seasons cookers were "Graniteware" 3½ liter round pots, enclosed in high-temp plastic cooking bags. The pan for the SunFlair was its own 1-liter collapsible black silicone pan with a silicone lid.



Haines AllSeasons Hot Pot SunFlair Copenhagen

Second Test Results. The results of this second test were consistent with the first—the Haines boiled water in a little over an hour. The Hot Pot was slower and never quite reached boiling temperature, reaching 206 F. after three hours at 2:05 p.m. None of the other cookers were able to heat the water to boiling, although all reached cooking temperatures.

Time	Haines	Hot Pot	Copenhagen	AllSeason	SunFlair
10:48 am	79 (26 C.)	79	79	79	79
10:55	105	92	90	93	90
11:12	147	119	117	118	106
11:26	174	140	136	140	144
11:51	210	172	166	160	158
11:53	212 Boiling	175	168	162	158
12:05	212 (100 C)	195	177	165	163
12:17	212	197	185	170	169
12:30	212	195	190	173	172
12:41	212	195	192	174	176
12:56	212	199	194	174	181
1:08	212	199	195	176	180
1:33	212	203	198	175	181
1:47	212	203	191	179	181
2:05	212	206	192	180	178

Third Test. There remained one popular cooker that we had not tested—the Solavore Sport Oven. So on August 14, 2015, we conducted a side-by-side test of the Haines Solar Cooker and the Solavore Sport Oven (with its reflector) beginning at 10:45 in the morning. The ambient temperature when the test began was 81 F. (27 C.) and 83 F. (28 C.) when the test ended. There was a light breeze. For the Solavore pot, we used the standard 3½ liter Graniteware pot.



Haines Solar Cooker

Solavore Sport Oven

Third Test Results: Consistent with our earlier tests, the Haines reached the boiling point in an hour. The Solavore performed very well, reaching the boiling point after 1½ hours. The results are shown below:

Time August 14, 2015	Haines	Solavore
10:45	81 F. (27 C.)	81
10:48	100	84
11:05	143	117
11:16	167	138
11:35	201	173
11:45	212 F. Boiling (100 C.)	189
12:04	212	205
12:15	212	212 F. Boiling (100 C.)

Overall Conclusion. Our tests showed that the Haines cooker consistently heated a liter of water from room temperature to boiling in about an hour. The next-fastest cooker, the Solavore, took 1 ½ hours to boil a liter of water, and the Sun Oven took two hours. The other cookers did not reach boiling in these tests. **Important caveat:** From personal experience, we know that most of the other cookers tested are capable of boiling water. Our tests simply suggest that when conditions are right for them to boil water, the Haines

will boil faster. Only side-by-side testing in other locations under other conditions can determine this.

Differences in cookpot and "greenhouse" configurations. We were curious to know whether the Haines' superior performance was due simply to the superiority of the Haines Dutch Oven and polycarbonate cooking sleeve. So, to control for the type of pot and "greenhouse," we chose two types of cookers—the CookKit and the Haines, and compared them in side-by-side tests. One pair of cookers used a standard 3 ½ liter round graniteware pot, on a wooden trivet inside a plastic cooking bag. The other pair used a Haines Dutch Oven with glass lid, in a Haines cooking sleeve. As a further control, we added two Hot Pot reflectors—one with the recommended 3 ½ liter steel pan in a Pyrex Glass bowl with a glass lid, and the other with a Haines Dutch Oven and polycarbonate cooking sleeve. For good measure, we added a Haines Cooker with a standard African Aluminum pot (27 cm. inside diameter) in a Haines Cooking Sleeve (not in photo).



The test was conducted on September. 6, 2015 in Del Mar California. We set up all the cookers in the shade, with one liter of water and a probe thermometer in each. For this test, we used a matched set of brand-new Taylor wire probe cooking thermometers and confirmed pre-test that they matched each others' temperature readings.

At 11:50 am, all cookers were moved into the sun. Ambient temperature was 28 C. (83 F.), and there was an occasional breeze.



“Greenhouse” Test Results: The results again showed that the Haines Cooker with a Haines Dutch Oven outperformed the others. The detailed results are as follows:

Time	Haines w/Dutch	Haines w/Bag	CooKit w/Dutch	CooKit w/Bag	Hot Pot Original	Hot Pot w/Dutch	Haines w/Alum
9/6/15							
11:50am	28 C.	28 C.	28 C.	28 C.	27 C.	27 C.	27
12:02pm	51	37	48	43	47	51	46

12:38	91	69	78	80	86	88	85
12:51	98	78	83	87	90	89	91
1:01	100 Boil	83	84	90	91	90	95
1:28	100	93	84	95	94	90	98
2:11	99	95	87	97	95	92	100Boil
2:44	100	96	87	96	96	94	100

As can be seen, the Haines with Dutch Oven reached boiling in an hour and 10 minutes. The Haines with the African Aluminum pot finally boiled in 2 hours and 20 minutes, while none of the others boiled the water, even after 3 hours.

Of course, food cooks well below the boiling point of water, so the ability to boil water is not critical. More important is the speed at which a cooker heats water to cooking temperature. The Haines with Dutch Oven reached 91 C. in 48 minutes. The Hot Pot was not far behind, at 86 C. and the Cookit was a respectable 80 C. Both leveled off in the mid-90s—making them more than adequate. Equally important, however, each of the other cookers performed better with its own pot and "greenhouse" than with the Haines Dutch Oven and cooking sleeve.

“Greenhouse” Conclusion: Even when controlled for different “greenhouse” configurations, the Haines Cooker with its Haines Dutch Oven and Haines Cooking sleeve heated water faster than any other solar cooker tested. Of the “greenhouse” configurations tested, the Hot Pot’s special pot is a close second. The Solavore and Sun Oven performed well without the need for a special “greenhouse” to insulate the pot from the surrounding air. The Cookit performed almost as well, but cardboard versions of the Cookit are not durable, and its “greenhouse” is an expensive, disposable plastic bag that is inconvenient to use.