



Review of the HotPot Solar Cooker

Hannah Rolland

An efficient and user-friendly panel solar cooker

Through my experience with the HotPot I have found that it is a very efficient and easy to use solar cooker. In my experiments testing its ability to pasteurize water, the HotPot has thus far performed on par with, or better than, the other two solar cookers tested. On sunny days, the HotPot has been able to heat 2.5 liters of water to pasteurization temperature (65°C) therefore making it safe to drink, within approximately 1 hour, and even on partly cloudy days within 2 hours. On mostly cloudy days the HotPot did not heat the water to pasteurization temperature, but under the majority of solar conditions it successfully pasteurized water. The graph below illustrates the data gathered and the relationship between solar irradiance levels and the time it takes to pasteurize water in the HotPot.

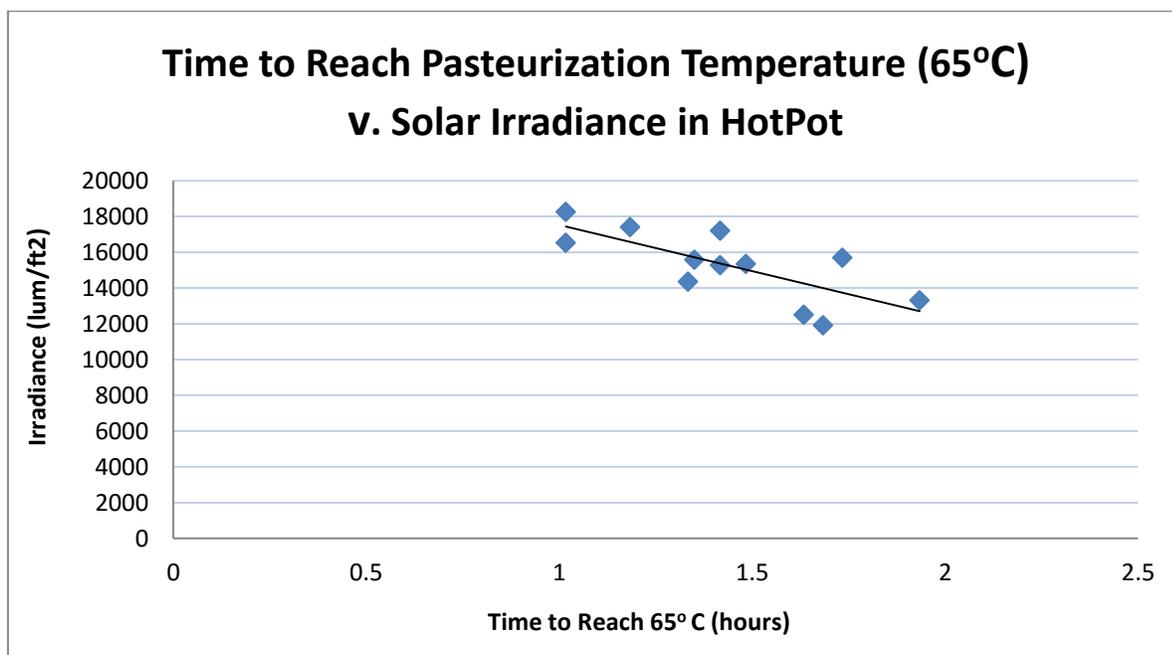


Figure 1 HotPot Pasteurization Performance

The chart below provides an approximation of the sun conditions that correlates with the given lum/ft² value to allow better understanding of the relationship between solar conditions and time to pasteurization temperature.

Average Lum/ft ² ranges	Sun Condition
18,000+	Sunny (90-100% sun)
16,000-18,000	Mostly Sunny (80-90% sun)
14,000-16,000	Partly Sunny (60-80% sun)
12,000 - 14,000	Partly Cloudy (40-60% sun)
10,000 - 12,000	Mostly Cloudy (20-40% sun)
10,000 and under	Cloudy (20-0% sun)

Figure 2 Approximate Sunlight Conditions

In these experiments, solar irradiance was measured by a HOBO Pendant Temperature/Light Logger (found at this website <http://www.onsetcomp.com/products/data-loggers/ua-002-08>). Water temperature data was collected using HOBO Stainless Temperature Data Loggers, model U12-015 (found on this website <http://www.onsetcomp.com/products/data-loggers/u12-015>). A glass candle holder was used to suspend the probe in the middle of the water within the HotPot.



Figure 3 Irradiance Measurement Tool

In addition to water pasteurization, the HotPot performs very well cooking food. I have had great success cooking combined meals such as chili and beef stew, as well as simple foods such as rice and baked potatoes. Cooking meals such as chili and beef stew are so simple since you leave them out in the sun for a few hours, and at the end have a whole meal hot and ready. Staples such as rice and potatoes were also easily cooked and required very little effort. At first I was a little nervous about cooking meat but making BBQ chicken was very easy and it was fully cooked within 2 hours. Cornbread was another of my favorites since it was so easy and moist thanks to the HotPot.

All meals were easy to make and required little attention besides rotating the HotPot toward the sun every 1-2 hours. Cleanup is also a breeze due to the 3 part design and the easily removable inside bowl. Through the meals I have cooked so far I am confident that many other meals and foods can be successfully cooked within the HotPot! Recipes and directions for the meals cooked are available in the Appendix.

Overall, I found that the HotPot is a very efficient solar cooker to use for both pasteurizing water as well as cooking. It is very easy to use, easy to clean, requires limited supervision, and allows the power of the sun to be used to provide clean drinking water and cook good food. The HotPot is a solar cooker that has great potential for use within the US and on the international level in sustainable development projects.

The author Hannah Rolland is a senior at Elon University in North Carolina, majoring in Environmental Studies and International Studies. She is currently conducting research regarding the potential to use solar cookers to pasteurize water to provide clean drinking water in developing countries. This review of her findings from the independent testing of the HotPot was submitted as part of a summer internship with Solar Household Energy. For questions or more information please contact the author directly: hrolland@elon.edu.

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As a component of our research, SHE makes measurements of solar cookers and attempts to explain and/or model their performance and features. However, SHE is by no means a testing facility and these measurements are not to be interpreted as official or certified in any way. We only provide research information which we hope is helpful to the solar cooking community, but in any case full disclaimers apply. It should also be recognized that all real-world measurements are subject to various types of errors, random and systematic, known and unknown."

APPENDIX - RECIPES

Solar Cooker Beef Stew

Recipe adapted from <http://www.solarcooker-at-cantinawest.com/solarcookingrecipes-stew.html>

Ingredients:

- 4 medium potatoes
- 1 cup cut carrots
- 1 small onion
- 1 lb beef or pork boneless ribs
- 1 package brown gravy mix
- 1 tablespoon oil
- 1 cup water
- 1 tablespoon of salt (more or less if desired)
- 1 dash of black pepper (more or less if desired)
- 1 tablespoon corn starch
- Dash of oregano

Steps

- Cut meat into cubes
- Add meat and oil to the HotPot, stir to coat, and let sit in sun for about 30min (alternate option is to pre-cook meat on traditional stove)
- While meat is cooking, peel and chop potatoes, carrots and onion
- Place all together in a bowl and add salt, pepper and oregano
- Prepare gravy mix with 1 cup cold water
- When meat is cooked, add the bowl of chopped veggies and the gravy to the HotPot, stir and let cook in sun
- After 1 hour, add cornstarch to mixture and stir all ingredients
- Continue cooking in sun for about 4 hours or until potatoes and carrots are tender and stew is fully cooked

Tips:

- Stir infrequently since removing the cover releases heat and delays cooking
- Adjust HotPot every 2 hours to maximize solar energy captured



Solar Baked Potatoes

Wash potatoes and use a fork to puncture a few small holes in each potato. Place potatoes in the HotPot and set in direct sun. Cooking time will vary depending on the number and size of potatoes as well as on the amount of sunlight, but estimate about 1-1.5 hours per potato. Check occasionally to test doneness.



Note: To make mashed potatoes, peel and cube potatoes then place in HotPot and cover with water. Place in sun and cook, checking every hour for doneness. When potatoes are tender, drain and mash as normal. (Without water the potatoes will not cook well and will dry out.)

Barbeque Chicken

Ingredients

- 2 large chicken breasts
- ½ cup BBQ sauce (more if desired)

Steps

- Cut chicken into 1-1.5 inch cubes
- Place chicken in bowl, add BBQ sauce and stir to coat
- Pour chicken into the HotPot and place in sun
- Stir after 1 hour and add more BBQ sauce if needed
- Chicken should be done after 1.5 to 2 hours depending on sunlight



Note: In first photo chopped potatoes were wrapped in foil to attempt cooking alongside chicken. I found that it would be best to cook the potatoes alone by boiling in water rather than in foil in the HotPot. The chicken cooked very well regardless of the potatoes, and would likely cook faster without the potatoes in the HotPot.

Rice

Ingredients

- 1 Cup Jasmine Rice
- 1 ½ Cups water
- (Other types of rice would work as well, simply follow directions on package for rice to water ratio)

Steps

- Place both rice and water in HotPot
- Stir to mix
- Set cooker in sun and cook for approximately 1.5 hours



Cornbread

(Recipe adapted from original Betty Crocker Cookbook)

Ingredients

- 1 cup yellow cornmeal
- 1 cup all-purpose flour
- 3 tablespoons sugar
- 4 teaspoons baking powder
- ½ teaspoon salt
- 1 cup milk
- ¼ cup shortening
- 1 egg

Steps

- Blend all ingredients together, mixing vigorously for 1 minute
- Grease the bottom and sides of HotPot
- Pour batter into HotPot and place in sun
- Bake for about 1.5 hours or until toothpick comes out clean



Veggie Chili

Ingredients

- 1 (15oz) can black beans
- 1 (15oz) can dark red kidney beans
- 1 (6oz) can tomato paste
- 2 (15oz) cans tomato sauce
- 1 (15oz) can diced tomatoes (OR dice your own tomatoes)
- 1 cup chopped carrots
- 1 zucchini
- 1 summer squash
- 1 medium head of broccoli
- 1 green pepper
- 1 small onion
- ½ cup brown sugar
- 1-2 tablespoons chili powder (more if desired)

Steps

- Chop carrots and add them to HotPot along with ¼ cup water
- Set in sun to cook for 30 min to begin cooking (they take the longest to cook so it's best to start them earlier)
- In the meantime, chop the remaining vegetables
- When carrots are partly cooked, drain the water and add the remaining vegetables (except the tomatoes) to the HotPot
- Cook veggies for approximately 45 minutes – 1 hour
- Meanwhile, drain and rinse beans
- In separate bowl, mix together tomato sauce, tomato paste, brown sugar and chili powder
- After veggies are mostly cooked, add beans, tomatoes, and tomato sauce mixture to HotPot
- Stir and let sit for about 1-2 hours more, depending on preference for veggie tenderness



Cooking Carrots



Adding other veggies



Combining all ingredients



Cornbread and Chili
A Completely Solar Cooked Meal!