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## A Field Study Comparing Cooking Energy Use in Various Technologies

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## Summary

This field study examines the energy usage and cooking time of five different cooking technologies—an insulated Crock-Pot, two insulated pressure cookers, an electric resistance hotplate and an electric induction hotplate—when cooking a standardized amount of chickpeas. The research team found that insulated cookware used nearly identical amounts of average energy—an average of 36 Watt hours—regardless of pressurization, while the uninsulated cookware on an induction hot plate used an average of 3.5 times more energy (128 Watt hours), and resistance used an average of 4.5 times more energy (164 Watt hours) to perform the same cooking work.

## Methods and Materials

The standard food used for each experiment was chickpeas (aka garbanzo beans), which helpfully show a distinct color change when completely cooked. However, the color change is still a subjective evaluation and resulted in some variance between repeated trials. For each experiment one cup of dried chickpeas was soaked for 8 hours, drained and then added to the cookware with 4 cups of room temperature water.

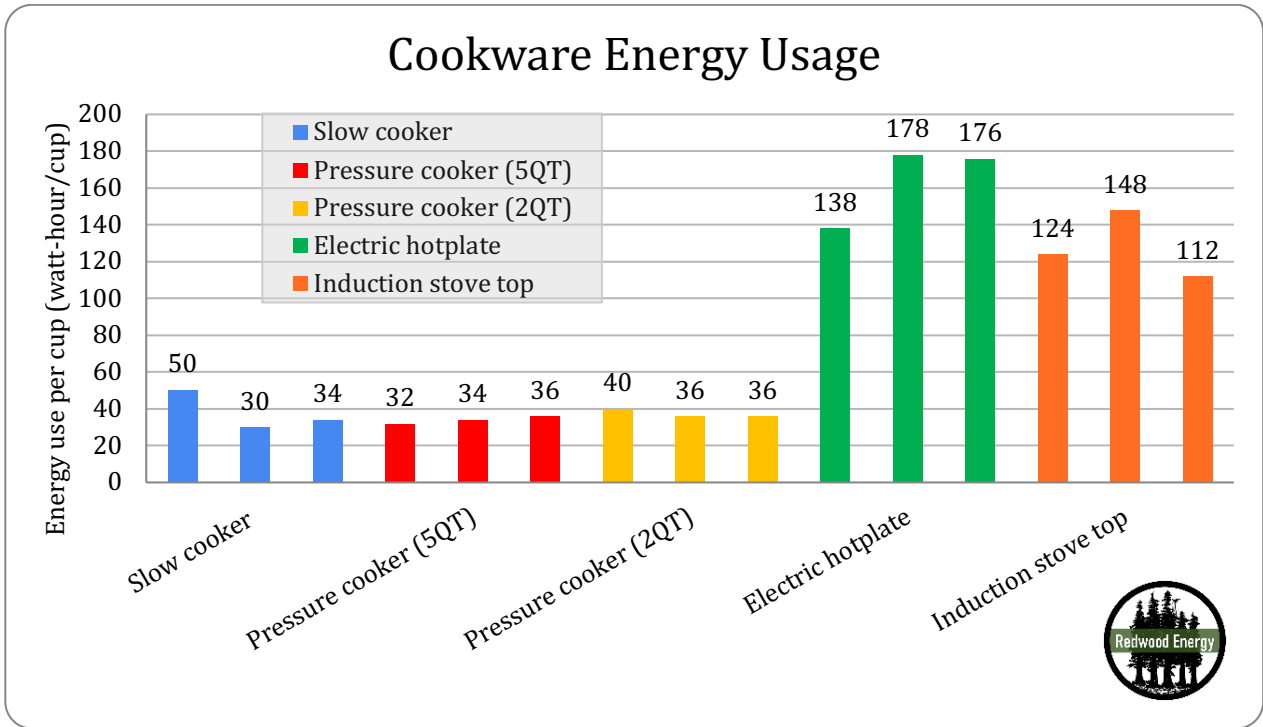
For both stovetop methods—resistance and induction—the pot of water was brought to a boil and then left to simmer until the chickpeas cooked to completion, indicated by the entire bean turning a yellow color. After experimenting to determine a consistent methodology a total of 15 tests were performed, three tests for each cookware type. For each test the total energy use, length of cooking required and vessel volume were recorded. A P3 P4400 Kill A Watt Electricity Usage Monitor was used to measure energy use.

P3 P4400 Kill A Watt Electricity Usage Monitor	Crock-Pot model SCR200-R 2-Qt slow cooker	COSORI C3120-PC 2-Qt pressure cooker	Redmond 5-Qt electric pressure cooker	SUNAVO model CB-H21 electric hotplate	Avantco IC1800 countertop induction range
					

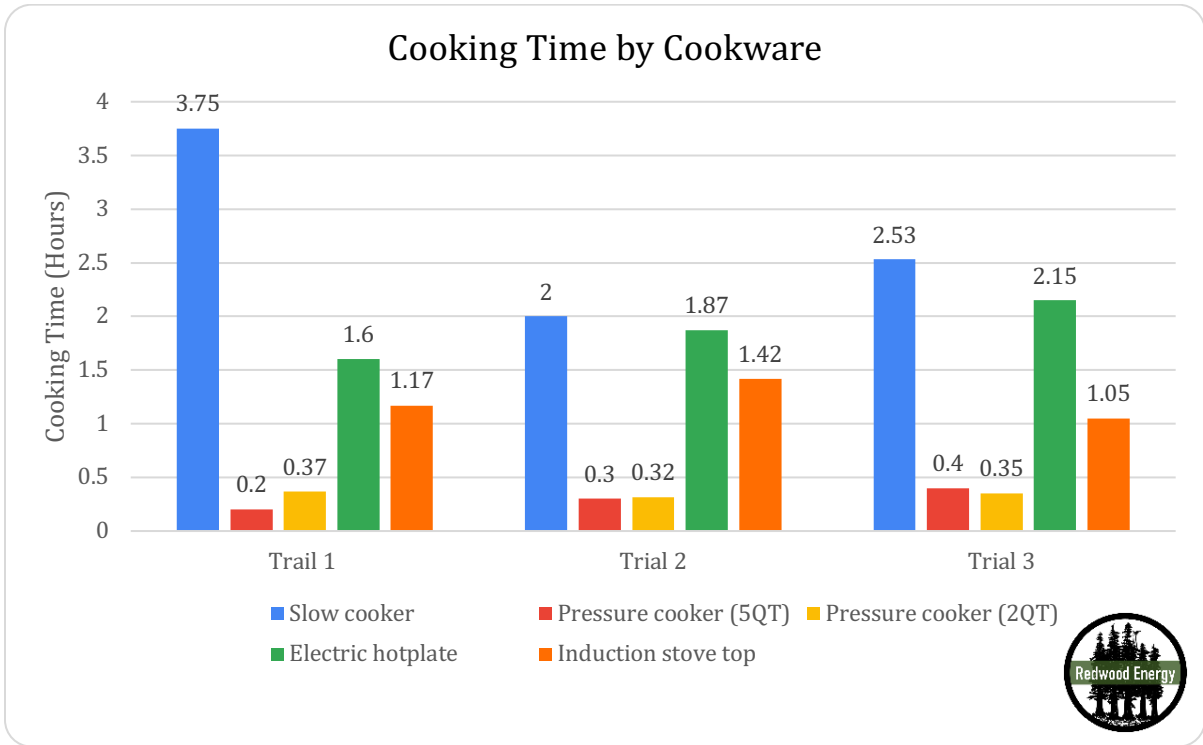
## Results

Energy use in the field study is clearly determined by the presence or absence of insulation, not by pressurization, and secondarily by the efficiency of electric resistance vs. induction hot plates. The insulated cookware used the least amount of energy per cup of cooking material, averaging 36 Watt hours, compared to the average of 128 Watt hours using an uninsulated pot on an induction hot plate (3.5 times more) and 164 Watt hours with uninsulated cookware on a resistance hot plate (4.5 times more). It was determined that the volume of the cookware (2 quarts vs. 5 quarts) did not significantly impact the cooking energy required.

Pressurized cooking consistently took an average of .32 hours (20 minutes), while unpressurized cooking time varied more widely but averaged 2 hours (120 minutes), six times longer.



**Figure 1: Watt-hours used per cup of cooking material for each of the five cooking vessels; three trials each.**



**Figure 2: Cooking time by trail for each cookware.**

**Table 1: The summary of test results for each trail run.**

Method	Trial	Energy Use (kwh)	Watt Hours/cup	Cooking Time (hours)	Material volume (cups)	Vessel volume (cups)
Slow cooker	1	0.25	50	3.75	5	8
	2	0.15	30	2		
	3	0.17	34	2.53		
Pressure cooker (5QT)	1	0.16	32	0.2	5	20
	2	0.17	34	0.3		
	3	0.18	36	0.4		
Pressure cooker (2QT)	1	0.2	40	0.37	5	8
	2	0.18	36	0.32		
	3	0.18	36	0.35		
Electric Stove Top	1	0.69	138	1.6	5	10.57
	2	0.89	178	1.87		
	3	0.88	176	2.15		
Induction Stove Top	1	0.62	124	1.17	5	10.57
	2	0.74	148	1.42		
	3	0.56	112	1.05		