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Performance evaluation of electric rice cookers and pressure cookers

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Abstract
Pressure cookers and rice cookers are used in day to day cooking by almost all the households / families in south India as rice being the staple food .Now – a- days both the spouses are busy with personal as well professional related work, so be it working or not working, women would like to adopt work simplification techniques. Cookers simplify the work as they cook multiple items at a time, save time due to fast cooking, comfortable to use as they don't require any attention while items are being cooked etc. The present study was conducted in Telangana State to assess the performance evaluation of different branded electric rice cookers and pressure cookers. The present study reveals that in Telangana State 31.46 per cent of the consumers were using panasonic branded electric rice cooker and prestige pressure cooker (32.67%). The electric rice cookers named Butter fly, Panasonic and Prestige with a capacity of 300 watts consumed 0.3 kilowatts of electricity for cooking 200 grams rice while 1000 watts electric rice cookers named Panasonic, Ganga, Prestige, Bajaj, Kanchan Ganga and Keeline consumed 1.0 kilowatt electricity for cooking standardized 200 grams of rice with 1:2 ratio of water. The results of electric rice cooker indicated that less wattage of electric rice cookers were consuming less electricity and more wattage of electric rice cookers were consuming more electricity. Whereas time taken for cooking rice was found less for Butterfly 450 watts, Panasonic 700 watts and Protact 400 watts electric rice cookers. Futura brand pressure cooker with 5 liters capacity has taken less time and the Aryan; Universal brands have taken more time for cooking standardized quantity of rice. With regard to the quality of rice, cent per cent of the respondents stated that well cooked rice was observed in Butterfly, Ganga, Tulasi Ganga, Bajaj and Preethi Electric Rice Cookers. Where as in Pressure Cookers well cooked rice was observed in Green Chef, Preethi, Usha and Panasonic.

Keywords: electric rice cookers, pressure cookers, consumer, brands, energy consumption, time taken for cooking rice

Introduction
The Usage of Electric Rice Cookers and Pressure Cookers in the kitchen has become common today due to the increase in percentage of working women when compared to the past few decades. Thus to save the time and effort, labour saving devices are being used by the families. The Electric Rice Cookers and Pressure Cookers are being used by the working women and the homemakers to reduce the strain and spend less time in the cooking activity.

There are several brands of Electric Rice Cookers available in different capacities with different wattages. Those are Butterfly, Bajaj, Candle Wood, Crompton, Ganga, Green Chef, Kanchan Ganga, Keeline, Kent, Krystal, Panasonic, Philips, Pigeon, Preethi, Prestige, Protact, and Tulasi Ganga. Whereas in Pressure Cookers also different brands are available viz Aryan, Bajaj, Butterfly, Futura, Ganga, Green chef, Hari Ganga, Hawkins, Panasonic, Pegion, Preethi, Prestige, Surya, Unique, Universal, Usha and Vishwas. The Electric Rice Cookers and Pressure Cookers performance is varying from brand to brand based on their wattage and capacity. The present study was conducted with the following objectives.

1. To understand the usage of different branded Electric rice cookers and Pressure cookers by the consumers.
2. To study the energy consumption, time taken for cooking rice in Electric rice cookers and Pressure cookers
3. To assess the quality of rice cooked and different recepies cooked in Electric rice cooker and Pressure cooker

Review of Literature
Le *et al.* (2019) [1] conducted a study on electrical appliance use and energy consumption in Vietnamese households in United Kingdom.

The study highlighted that the average energy consumption was 4492KWH per household per year in which electricity and liquefied petroleum gas had accounted for 74.4 per cent and 25.6 per cent respectively. The current energy consumption of kitchen appliances was found to be 18.5 per cent.

Roy *et al*. (2010) [4] explored the cooking properties of different forms of rice cooked with an automatic induction heating system rice cooker in Japan. Study revealed that cooking time, temperature and energy consumption profiles, and the cooking properties of rice were dependent upon the form of the rice, the water – rice ratio and the preset cooking mode.

Ponniran *et al.* (2007) [5] assessed the electric energy usage in the residential area. It was found that most of the consumers used electric energy inefficiently in terms of the usage of inefficient electrical appliances due to lack of knowledge to use them.

Sukarno *et al.* (2014) [3] explored the factors affecting residential energy consumption in regional cities of Indonesia. The study found that largest electric energy usage was for cooking activities especially in the use of a rice cooker, refrigerator and water dispenser. Therefore selecting the efficiency of electrical appliances is a good way to reduce electricity consumption at home. From the results, it was understood that a decrease of residential energy consumption could increase the efficiency of home appliances, promote electricity saving behavior, increase public awareness for energy saving, and apply energy efficiency labeling for home appliances.

Lakshmi *et al.* (2019) [2] assessed the electrical appliance usage and electricity consumption pattern at household level. The results revealed that respondent households used a greater number of miscellaneous appliances as compared to the other appliances used for different purposes like cooking, heating, cooling, laundry etc. From the results it was understood that majority of the households stood in the low consumption level (0 - 250 units/month) of electricity, classified as per the study. Majority spent Rs. 1 – Rs. 1000/- month as an expenditure for the electricity consumed, which was considered as a low level of expenditure.

Materials and Methods

The present study was conducted in Telangana State to explore the use of best brand of Electric rice cookers which is consuming less electricity per anum, and less cooking time for cooking rice.

Survey cum lab experimental method was adopted to collect the data. Random sampling technique was used to select the sample for survey. About 90 households from Adilabad, Bhadradri Kothagudem, Gadwal, Hyderabad, Jagityal, Janguon, Jayashankar Bhoopalpalli, Karimnagar, Khammam, Mahabubabad, Manchiryal, Medak, Medchal, NagarKarnool, Nalgonda, Narayanpet, Nirmal, Nizambad, Peddapalli, Rajannasirisilla, Rangareddy, Sangareddy, Siddipet, Suryapet, Warangal rural, Warangal urban and Yadadri Bhongiri. A questionnaire was prepared to conduct the survey. The respondents were instructed to conduct cooking experiment in Electric rice cooker and in Pressure cooker that they owned. The rice quantity and water ratio were standardized for all 90 respondents. The quantity of rice was 200grams and the water ratio 1:2 was given to cook rice in Electric rice cooker and pressure cooker. A Google form was sent to the respondents to collect the data.

The data collected for the Electric rice cooker and Pressure cooker was analysed by using simple statistical techniques like percentages, frequencies and average scores.

Based on the wattage of electric rice cookers, electricity consumption for cooking 200gms of rice was calculated. The unit cost considered was Rs.1.45/- which is the slab rate (Upto 50 units) charged by Telangana state electricity board.

Results and Discussion

Results were presented in the following tables as per the objectives framed for the study. Information on types of brands possessed or owned by the respondents was collected.

Table 1: Brand wise Electric Rice Cookers used by the respondents
N = 90

S. No	Brand	Frequency	Percentage
1.	Butterfly	07	7.87
2.	Panasonic	29	31.46
3.	Ganga	11	12.36
4	Philips	01	1.12
5	Green cheff	01	1.12
6	Prestige	24	26.97
7	Tulasi Ganga	02	2.22
8	Keeline	01	1.12
9	Candle wood	01	1.12
10	Bajaj	03	3.37
11	Kent	01	1.12
12	Preethi	04	4.49
13	Pigeon	01	1.12
14	Crompton	01	1.12
15	Krystal	01	1.12
16	Kanchan ganga	01	1.12
17	Protact	01	1.12

Table 1 revealed that nearly 17 different brands of electric rice cookers were owned and used by the respondents. About 31.46 per cent of the respondents used Panasonic electric rice cooker followed by 26.97 per cent using Prestige, 12.36 per cent using Ganga. However negligible per centage have used other brands like Butterfly, Preethi, Philips, Green cheff etc.

Table 2: Electricity Consumed by Panasonic Electric rice cooker

S. No	Brand name of the Electric Rice Cooker	Wattage of the Electric Rice Cooker	Time Taken for cooking Minutes	Units of Electricity consumed (KW)	Expenditure for Electricity consumption per month (Rs)	Expenditure for Electricity consumption per Annum (Rs)
1	Panasonic	300	15	0.3	3.26	39.69
2	Panasonic	310	20	0.31	4.49	54.69
3	Panasonic	400	20	0.4	5.80	70.57
4	Panasonic	450	15	0.45	5.80	70.57
5	Panasonic	550	60	0.55	23.93	291.09
6	Panasonic	660	30	0.66	14.36	174.65
7	Panasonic	700	10	0.7	5.08	61.75
8	Panasonic	1000	15	1	10.88	132.31

As per the data in Table 2, the eight different capacities of Panasonic electric rice cookers used by the respondents were 300,310,400,450,550,660,700 and 1000 W. Less time was taken for cooking rice in 700W Panasonic rice cooker and less electricity was consumed in Panasonic 300W electric rice cooker.

In all the cookers, standard quantity of rice i.e 200gms was cooked with 1:2 Rice and water ratio. Based on the wattage of the cooker, time taken for cooking, electricity consumption was calculated per month and per anum, if it is used every day to cook 200gms of Rice. It was found that 550 wattage Panasonic cookers were most expensive in terms of using as they consumed the highest electricity expenditure i.e. Rs.291/. Results imply that lower capacities were meant for cooking small quantity hence they consume less electricity. In other words, bigger capacities wattage cookers if used to cook small quantity will consume more electricity.

Table 3: Electricity Consumed by Prestige Electric rice cooker

S. No	Brand name of the Electric Rice Cooker	Wattage of the Electric Rice Cooker	Time Taken for cooking Minutes	Units of Electricity consumed (KW)	Expenditure for Electricity consumption per month (Rs)	Expenditure for Electricity consumption per Annum (Rs)
1	Prestige	300	15	0.3	3.26	39.69
2	Prestige	310	20	0.31	4.50	54.69
3	Prestige	400	20	0.4	5.80	70.57
4	Prestige	700	18	0.7	9.14	111.14
5	Prestige	750	20	0.75	10.88	132.31
6	Prestige	1000	20	1	14.50	176.42

The data obtained from table 4 revealed that Prestige electric rice cooker of 300W has taken 15 minutes time for cooking rice and money spent on electricity consumption per annum was also found less i.e 39.69 rupees when compared with all other capacities of Prestige electric rice cookers.

It can be concluded that both Panasonic and Prestige brands with 300 W consumed less electricity to cook 200gms of rice as they were designed to cook small quantity only.

Table 4: Electricity Consumed by Ganga Electric rice cooker

S. No	Brand name of the Electric Rice Cooker	Wattage of the Electric Rice Cooker	Time Taken for cooking Minutes	Units of Electricity consumed (KW)	Expenditure for Electricity consumption per month (Rs)	Expenditure for Electricity consumption per Annum (Rs)
1	Ganga	200	10	0.2	1.45	17.64
2	Ganga	700	20	0.7	10.15	123.49
3	Ganga	720	10	0.72	5.22	63.51
4	Ganga	900	12	0.9	7.83	95.27
5	Ganga	1000	12	1	8.70	105.85

While 700W cooker took more time i.e 20mn to cook 200 gm rice and consumed more electricity which revealed that Rs.123.49/- per annum had to be spent if they cook 200gms of rice every day.

The data given in table 4 revealed that four different capacities of Ganga electric rice cooker used by the respondents were 200,700,720,900 and 1000 W. Less time (10min) was taken for cooking rice in 200W Ganga rice cooker and which in turn reduced the electricity consumption. While 700W cooker took more time i.e. 20mn to cook 200 gm rice and consumed more electricity which implies that family needs to spend Rs.123.49/- per annum if they use it for cooking 200 gms rice every day.

Table 5: Electricity Consumed by Butterfly Electric rice cooker

S. No	Brand name of the Electric Rice Cooker	Wattage of the Electric Rice Cooker	Time Taken for cooking in Minutes	Units of Electricity consumed (KW) per use	Expenditure for Electricity consumption per month in Rs	Expenditure for Electricity consumption per Annum Rs
1	Butterfly	300	23	0.3	5.00	60.86
2	Butterfly	450	10	0.45	3.26	39.69
3	Butterfly	700	29.33	0.7	14.79	181.00

Table 5 depicts that three different capacities of butter fly electric rice cooker were used by the respondents i.e 300,450 and 700 W. Less time (10 min) was taken for cooking rice in 450 W butterfly electric rice cooker and less electricity was consumed. Surprisingly 300 W butterfly cooker took more time in cooking and consuming more electricity than that of 450 W.

Table 6: Electricity Consumed by other Electric rice cookers

S. No	Brand name of the Electric Rice Cooker	Wattage of the Electric Rice Cooker	Time Taken for cooking Minutes	Units of Electricity consumed KW	Electricity consumption per month (Rs)	Electricity consumption per Annum (Rs)
1	Bajaj	400	30	0.4	8.70	105.85
2	Bajaj	750	23	0.75	12.51	148.19
3	Bajaj	1000	15	1	10.88	132.31
4	Candlewood	700	25	0.7	12.65	154.01
5	Crampton	500	16	0.5	5.80	70.39
6	Green chef	700	18	0.7	9.14	111.14
7	Kanchan Ganga	1000	15	1	10.88	132.31
8	Keeline	1000	12	1	8.70	105.85
9	KENT electric rice cooker	700	15	0.7	7.61	92.62
10	Krystal	900	20	0.9	13.05	158.78
11	Philips	650	20	0.65	9.43	111.14
12	Pigeon	400	20	0.4	5.80	70.39
13	Preethi	700	19.25	0.7	9.77	118.55
14	Protact	400	10	0.4	2.90	34.93
15	Tulasi Ganga	1000	12.67	0.10	0.92	11.11

Table 6 revealed that among fifteen different capacities of different branded rice cookers - Tulasi Ganga branded rice cooker of 1000W consumed less electricity (Rs.11.11). Whereas Krystal 900W cooker consumed highest electricity ((Rs. 158.78) and Crampton 500W, Pigeon 400W rice cookers consumed more electricity charges of Rs70.39 per annum. Cookers with same wattage have taken varied timings to cook rice.

Table 7: Quality and varieties of the rice cooked in different Brands of Electric rice Cookers

S. No	Brand name of the Rice Cooker	Percentage of the Quality of the Rice Cooked		Variety of the Rice Cooked	Recipes cooked in Electric Rice cooker
		Well Cooked	Partially Cooked		
1	Butterfly	100	-	Sona masoori, Matta, Vijaya Masoori, Jai sri ram	plain Rice
2	Panasonic	93.10	6.89	BPT, Bangaru Theegalu, Kurnool sona Masoori, Jai sri ram, Soubhagya	plain Rice
3	Ganga	100	-	BPT, Hamsa, HMT, Vijaya Masoori	Rice, Sweet Rice, Vegetable rice
4	Prestige	100	-	HMT, BPT, Kuruva, Kurnool sona Masoori, Samba, Annapurna, Jai Sri ram, Basmathi	plain Rice
5	Tulasi Ganga	100	-	Jai Sri ram	plain Rice
6	Bajaj	100	-	BPT	plain Rice
7	Preethi	100	-	Basmathi	plain Rice

Data given in table 7 revealed that rice cooked in Butterfly, Ganga, Prestige, Tulasi Ganga, Bajaj and Preethi was found to be well cooked and the varieties of rice used were Sona masoori, Matta, Vijaya Masoori, Jai sri ram, BPT, Hamsa, HMT, Kuruva, Kurnool sona Masoori, Samba, Annapurna, Basmathi. Different recepies cooked in electric rice cookers were plain rice, sweet rice and vegetable rice. It was also found that mainly Ganga electric rice cooker was used for cooking different types of rice preparations. Rest of the brands were used only for cooking plain rice.

Table 8: Different brands of Pressure Cookers used by the respondents

S. No	Name of the Brand used by the people	Frequency	Percentage
1.	Ganga	23	22.77
2.	Hawkins	04	3.96
3.	Prestige	33	32.67
4	Butterfly	06	5.94
5	Hari ganga	01	0.99
6	Futura	01	0.99
7	Green cheff	02	1.98
8	bajaj	01	0.99
9	Preethi	02	1.98
10	Pegion	13	12.87
11	Usha	05	4.95
12	Surya	02	1.98
13	Panasonic	03	2.97
14	Aryan	02	1.98
15	Universal	01	0.99
16	Unique	01	0.99
17	Vishwas	01	0.99

When it comes to the Pressure cookers, 17 different brands were used by the respondents**.** Table 8 revealed that 32.67 per cent of the respondents used Prestige electric rice cooker followed by 22.77 per cent using Ganga, 12.87 per cent using Pigeon, 5.94 per cent using Butterfly. However negligible per cent have used other brands like Usha, Hawkins, Panasonic, Green chef, Surya, Aryan, Hari Ganga, Futura, Bajaj, Universal, Unique, and Vishwas.

Table 9: Capacities and Time taken for cooking by different branded pressure cookers

S. No	Brand name of the Pressure Cooker	Capacity of the pressure cookers	Time Taken for cooking in mn
1	Ganga	2.14	14.59
2	Hawkins	3.88	17
3	Prestige	2.95	21.27
4	Butterfly	4.08	13.83
5	Futura	5	5
6	Green cheff	3	16.50
7	bajaj	2	21.50
8	Preethi	1.90	25
9	Pegion	4.91	17
10	Usha	0.40	12.80
11	Surya	1.75	12.50
12	Panasonic	3.87	18.33
13	Aryan	5	25
14	Universal	5	15
15	Unique	3	15
16	Vishwas	3	10

Capacity of the Pressure cookers varied from 1.75 lit to 4.9 lit. It was surprising to note that larger capacities like 5 lit and 10 lit was not owned by the respondents.

Results revealed that less time (5 min) was taken for cooking rice in Futura 5liters Pressure cooker and more time (25min) was taken by Preethi 1.90 liters and Aryan 5liters Pressure cooker (Table 9). Wide disparity was observed in terms of time taken for cooking ranged between 5 to 25 min in various brands of pressure cookers.

Table 10: Details of Rice cooked by different brands of Pressure cookers

S. No	Brand name of the Pressure Cooker	Percentage of the Quality of the Rice Cooked		Variety of the Rice Cooked	Recipes cooked in Pressure cookers
		Well Cooked (%)	Partially Cooked (%)		
1.	Ganga	95.65	4.16	HMT, Jai sri ram, BPT, Kurnool sona, Basmathi	Kitchidi, mutton, Pulses, Rice, Sambar, biryani, boiling Vegetables
2.	Prestige	94.59	5.40	BPT, Samba, Sona Masoori, Telangana Sona,Annapurna, Jai sri ram, Swarna, Krishna veni	Potatoes, Soups, Stews, Beans, Dhal, cakes, Rice, Tomato rice, Chicken and mutton curry, biryani rice, cake, vegetables, popcorn, kichidi, Sambar,
3.	Butter fly	83.33	16.66	Vijaya, Masoori, Basmathi, Asian rice	Chicken, pulses, mutton, rice, pulav, kichidi, idly, bones soup, boiling potato's
4.	Pigeon	92.85	7.14	Bangaru theegalu, Basmathi, Hamsa, Jai sriram,Sona masoori, Samba Masoori, Sowbhagya	Baagara rice, other curries, Rice, idli Pongal, Pulav, kichidi, egg biryani, aloo biryani, tomato rice
5.	Hawkins	75	25	Sona masoori, Samba Masoori	Rice, Vegetables, legumes, Meat
6.	Green Cheff	100	-	BPT	Rice, pulses, potato, Idli, vegetable biryani, halwa
7.	Bajaj	50	50	Basmathi,	Rice, curry, idly
8.	Preethi	100	-	Samba Masoori,	Rice, Curry,
9.	Surya	100	-	Kurnool Sona Masoori	Idli and biryani, Magi, plain rice, boiled eggs, potato boiling, colocasia.
10.	Usha	100	-	Sona masoori, Samba Masoori	Boiling vegetables, Briyani, idli, pulihora,
11.	Panasonic	100	-	Sona masoori, Samba Masoori	Boiled eggs, pasta & barley

It was further explored to find out types of rice used and types of items cooked. Cent percent users of the Green cheff, Preethi, Surya, Usha and Panasonic reported that rice was well cooked. However Bajaj Pressure cooker users have reported that either well cooked or partially cooked.

Varieties of rice used were BPT, Samba Masoori, Kurnool Sona Masoori and the items cooked in pressure cooker were Plain rice, curries, Idli, different flavoured rice like tomato rice, vegetable biryani, kichidi, seasoned rice etc. However maximum number of items were cooked in Prestige cooker, Pigeon cooker followed by other brands.

Conclusion

From this study, it can be concluded that various brands of electric and gas cookers in various capacities are being in use. Panasonic and Prestige electric rice cookers found to be used by majority of the sample. Among gas cookers/ Pressure cookers, Prestige and Ganga were more popular. Though electric rice cookers are used for cooking varieties of dishes. It also implied that for cooking less amount of rice, electric cookers with less wattage are better as they consume less electricity.

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