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An Efficient Way of Energy Saving in Case of Cooking using E-Bag

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Cooking is an important part of our daily life. E-bag (Energy saving Bag) is a way of energy saving in cooking process. This amazing heat retention bag cooks healthy, tasty food by saving energy. Fantastic one-pot meals can be cooked with minimum fuss and maximum flavor. E-Bag saves the average family fuel usage by around 30% and helps by saving money and time also. Another remarkable benefit is food remains warm for a longer period inside the E-bag.

Field of Research: Energy efficient cooking.Heat retention bag.

1. Introduction

E-Bag can be a simple catalyst for global change. The E-Bag is developed to ease the social, economic and environment impacts of the current global circumstances. In villages, people use blanket or thick cloths for keeping the cooking food hot. So, this concept is used to develop this project. E-bag is non-electric insulated bag designed to reduce the amount of fuel required during cooking (wikipedia 2015). E-Bag means energy saving bag. E-bag is a simple but revolutionary stand alone, portable slow cooker (amazon n.d.). This bag can be used in rural areas, refugee camps or any other areas where fuel is costly or fuel supply is limited or gathering of fuel is cumbersome. After completion of cooking-preparation, cooking is started in usual conventional method. The required food elements are put on a cooking pot and then placed on stove or any kind of heating source. After a short interval of cooking when the food temperature rises hot enough, the cooking pot is removed from the heating source and transferred into the E-Bag. The top cover is then tightened firmly. E-bag's clever insulation allows food that has been brought to the required highest temperature, to continue slow cooking and keep warm in the bag. Different types of cooking need different time spans to complete the cooking. E-Bag uses the principle of thermal insulation to continue cooking, and keeps food warm without any additional fire heat. It is a worry free cooking process because no need to plug in or control the heat of the stove to complete the cooking. The food never gets overcooked or burnt, because it is not on direct heat. So, there is no fuss and

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tension. Even no monitoring is required. E-bag is perfect for bringing delicious home cooked meals to dinner parties or camping. E-bag is perfect for holidays when stove and counter space are at a premium. It is very essential for those, who carry lunch with them and have it 4 or 5 hours later. In Bangladesh as well as in other South Asian countries employees carry their lunch with them in their working place. Similarly it is applicable for the peasant or for the field workers who takes food at working place. This bag can help for reduction of deforestation or natural reserves (mailonline 2015). It frees up those who would spend their time gathering the extra wood for fire fuel. In some countries this is a matter of safety as well where people gather wood by themselves from the unsafe jungles (Treehugger 2013).

Heat retention technique for cooking is a new idea. There are some cooking ideasimilar to cooking in E-bag. But, there is not enough research data available.

This paper is comprises the sections: Section 2. Materials and Methods, Section 3. Results &Discussion and Section 4. Conclusion and future works.

2. Material and Methods

2.1. Fabrication of E-bag

E-bag is a concept which traps the heat of the cooking pot and retains the heat for a longer time. This method is used in many countries for keeping the food hot during winter season. For this experiment, two types of E-bag are made with different fabrics and insulation. One E-bag is manufactured using 180 GSM, 100% cotton single jersey knit fabric and named it E-bag 1. Another E-bag is manufactured using 100 GSM, 100% polyester single jersey knit fabric and named it E-bag 2. Two layers of fabric is cut and sewed according to the desired shape. Insulation is used to trap the heat in the E-Bags. The insulation can be recycled polystyrene, garments cotton, coconut fiber etc. Recycled materials such as wool blankets, old sweaters, Newspaper can be used as good insulation material for fabricating this bag. In this experiment polystyrene is used as insulating material which is filled inside the two layers of fabric. The shape of the E-bag is made for medium size pot. The properties of two bags are listed below:

Table 1: E-Bag 1 and E-Bag 2 Specification:

	E-bag 1	E-bag 2
Fabrics	cotton	polyester
GSM	180	100
Insulation	Polystyrene (small size)	Polystyrene (medium size)
Size	50 cm (radius)	50 cm (radius)
Cost	Relatively High	Relatively Low

Pictures of E-bags

2.2. Working Procedure

The locally made two E-bags (E-bag 1 & E-bag 2) were tested by cooking rice, pulse, chicken curry, boiled eggs and potatoes. For cooking boiled egg, four identical pots were taken. 1 egg and 500 ml water were put in each of the pots. Almost same flow rate of gas in the burner was set and cooking was started after firing. After 4 minutes, water in each of the pots started boiling. After two minutes heating at the boiling temperature, two of the pots were removed from the stove and were placed in the E-bags, one was removed from burner and was put on the ground and the last one was kept on heating on the burner as regular cooking. The temperature reading of water in the pots were taken by digital thermometers.

While cooking rice, pulse, chicken curry and boiled potato; the pots were heated in the burner for one third of the normal cooking time and then the pots were removed from burner and placed in the E-bags. The top cover was tighten firmly so that the heat does not escape. At the time of slow cooking, temperature readings were also recorded.

Figure 1: Experimental Procedure (The image of experimental procedure is collected from brit.co)

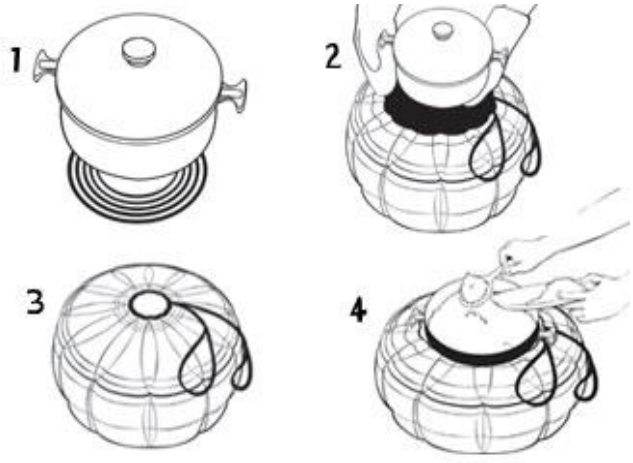


Figure 2: Experimental Setup

Figure 3: Condition of Cooked Egg

1 = Cooked in E-bag,
2 = Fully cooked in stove,
3 = removed from burner after 2 minutes

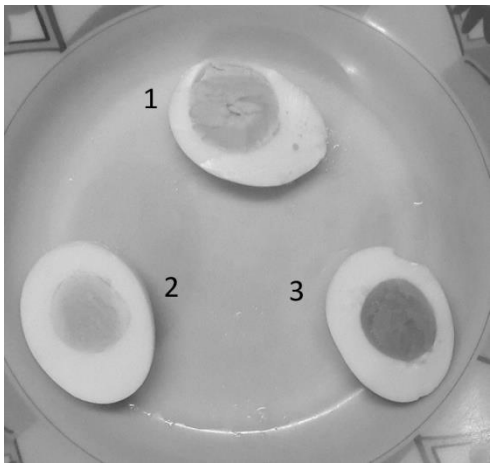


Figure 4: Temperature Profile of Cooked Food (Egg) in TheE-Bags.

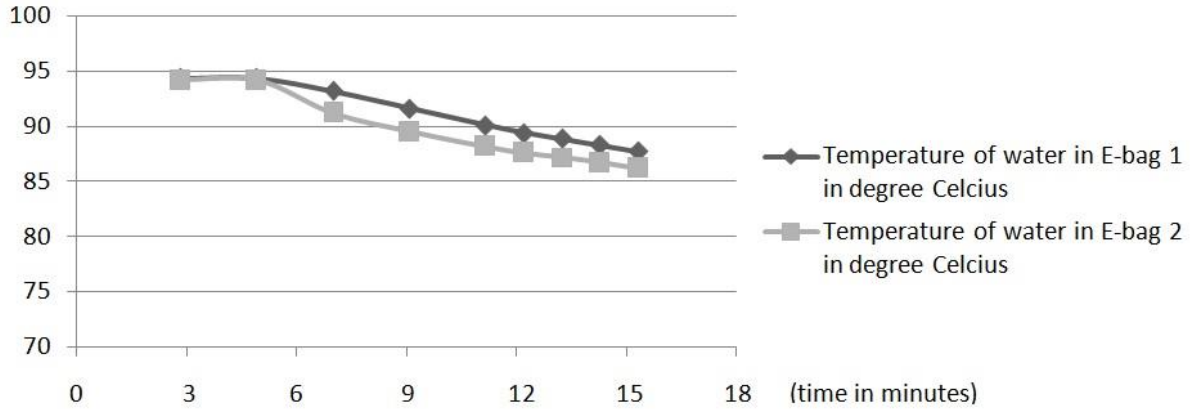


Figure 5: Temperature Profile of Cooked Food (Rice) in the E-Bags.

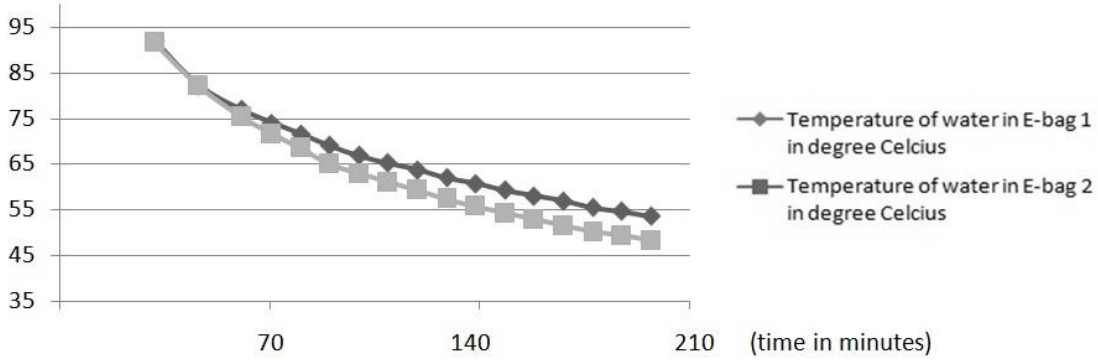
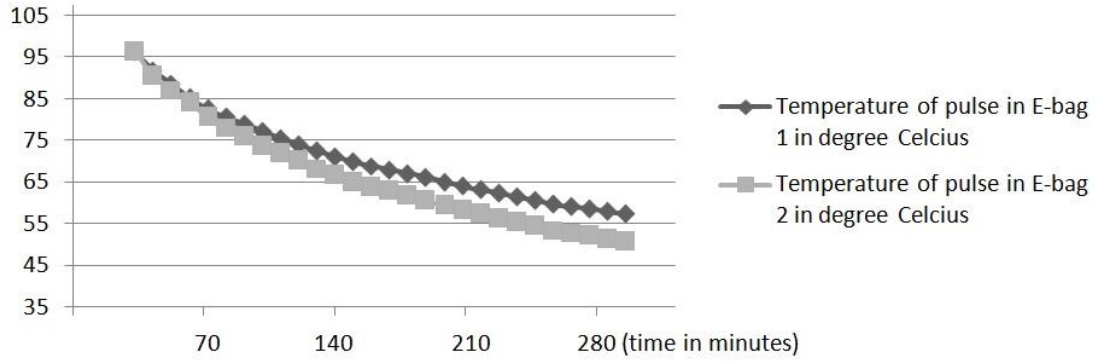


Figure 6: Temperature Profile Of Cooked Food (Pulse) in The E-Bags.



3. Results and Discussion

After visual inspection it was found that the eggs in the E-bags were fully boiled just like the other egg which was fully boiled in the stove. The egg which was neither placed in the E-bag nor heated further, found half boiled. The eggs cooked in the E-bags were tested and found delicious just like the egg fully cooked in stove. Cooking of rice, pulse, chicken curry and boiled potato in the E-bags has given the same result i.e. fully cooked and tasty. The temperature profile during cooking indicates that the heat retention capacity of the E-bag 1 is better than the E-bag 2. So from the temperature record it proved that the food will remain comfortably warm in the E-bags up to 7 to 8 hours. As the food is cooked for one third of the normal cooking time and then kept in the E-bag for completion of remaining part of cooking, we can conclude that E-bag saves almost 30% to 33% of fuel usage.

Benefits and Limitations of E-bag

Cooking in E-bag is very easy and worry-free cooking process. Rice, soups, vegetable curries, meat or any kinds of slow-cooked recipes can be cooked with an E-bag. E-bag can make our environment more green and livable.
E-bag has many benefits, some of these are

- Saves ~30-33% of fuel usage - saving money and easing poverty
- Reduces CO_2 emissions
- Less deforestation because families need less firewood for cooking
- It reduces toxic fumes which means less respiratory problems and other diseases, particularly in children
- It reduces time spent in cooking, giving more time to women for child-care and other activities
- It saves precious water. When the pot is insulated in a E-bag at a fairly constant temperature, less evaporation occurs, so less water is needed
- It can be carried anywhere.
- With an E-bag food is always hot and ready to eat.
- E-bag cooks food slowly allowing the food to maintain its nutritional values.
- The food cooked with E-bag is healthier and tastier.

E-bag has few limitations like:

- Required cooking time is more as compared to conventional cooking.
- Cannot be used for frying.

4. Conclusion and Future Works

It's actually a small cooking revolution. Its a new way of cooking.E-bag helps to save time, money and energy without changing cooking habits. E-bag is also an excellent product to keep food hot or cold. E-bag can be used for moving cold or frozen foods. If recyclable and environment friendly material is used then there is a possibility of cost reduction. Locally available low cost materials can be used for low fabrication cost. A further research in E-bag can be done to improve its performance. Combination of insulation materials can be used to improve performance.

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