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Review Article

An Analysis of Energy Savings Bag Made of Different Fabrics in Efficient Cooking System

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Abstract

All energies are not able to be maintained at the current rate or level as the need of the world. Utilizing energy in an efficient way and saving energy in every sector became prime objective of researchers. Cooking is a most important part of our daily life. To prepare our everyday meal we use different types of energy resources such as gas, wood, liquid fuel, electricity, etc. Energy savings bag (E-bag) can be a simple catalyst for global change. This amazing heat retention bag cooks healthy, tasty food. It is made of fabric with insulation inside. In this process, cooking is started in usual manner. After completion of cooking preparation, the food is boiled for a few minutes and then the pot is put into the E-bag. The required heat for completion of the remaining part of the cooking is served by the E-Bag. The E-Bag retains the heat of the cooking pot and completes the cooking process, without requiring further heating by conventional method. Thus E-Bag cuts the average family fuel usage by around 30% and helps to save money and time. Another remarkable benefit is- food remains warm for long periods inside E-bag. As because of cooking in E-bag, everyone uses less energy.

Keywords: Cooking; E-bag; Energy conservation; Heat retention bag; Fuel efficient cooking

Abbreviations

E-Bag: Energy Saving Bag; GSM: Gram Per Square Meter

Introduction

E-bag is a non-electric thermally insulated bag designed to reduce the amount of fuel required during cooking. E-bag is a simple but effective stand alone, portable passive cooker. The name has a very significant meaning E-Bag means energy saving bag [1,2]. 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 [3]. Insulation of E-bag hold required temperature to continue passive cooking while hot pot in the bag [1,4]. Cooking time depends on cooking types and E-bag continue cooking without additional heat energy [5,6]. E-bag provides hassle free cooking process because of no need to connect with energy souce. Alongside, food never gets overcooked or burnt.

In Bangladesh and also in South Asian countries employees can take their lunch with them to the office. 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 [2]. In some countries this is a matter of safety as well where people gather wood by themselves in the dangerous jungles [7].

Fabrication Process of E-Bag

E-bag looks like a hollow bag with a separate bag lid and a draw string. The fabrication process of E-bag starts with collection of raw materials and other purchased items. The E-Bag consists of an inner layer of insulation containing recycled polystyrene balls or other insulation materials, with an outer, draw-string covering of poly-cotton textiles or other fabrics [8]. The Concept of E-Bag is similar to the thermal cooking pots which has been available on the market since the 1990s. The benefit of the E-Bag is that in theory, it can work with various pot sizes as opposed to the traditional thermal cookers where a supplied pot is used.

For experiment five types of E-bags are made with different

Properties	Number of E-Bag				
	E-bag-1	E-bag-2	E-bag-3	E-bag-4	E-bag-5
Fabrics	100% Cotton	100% Polyester	65% Polyester 35% Cotton	65% Polyester 35% Cotton	65% Polyester 35% Cotton
GSM	180	100	100	100	100
Insulation	Polystyrene	Polystyrene	Polystyrene	Recycle cotton	Coconut fiber
Diameter	100 cm	100 cm	100 cm	50 cm (radius)	50 cm (radius)
Cost	Relatively high	Relatively low	Relatively lower	Relatively lower	Relatively lower
Picture of E-bag					

Table 1: Types of E-bags are made with different fabrics and insulation.

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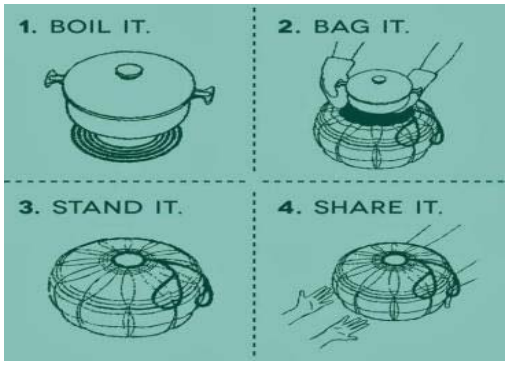

Figure 1: Experiment process of E-bag.

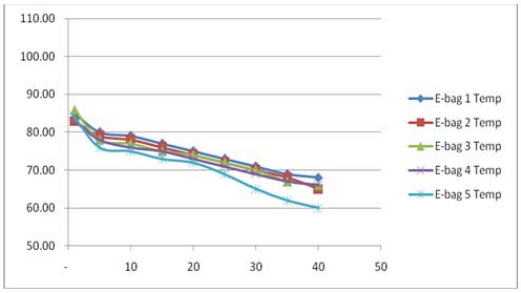

Figure 2: Temperature profile during rice cooking.

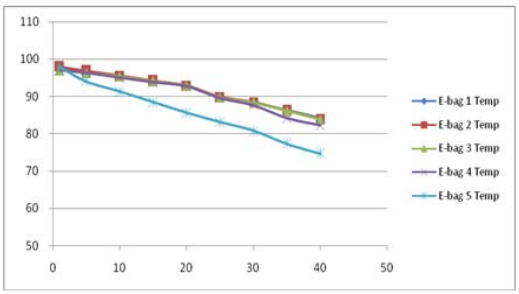

Figure 3: Temperature profile during potato boiling.

fabrics and insulation (Table 1). The first one is manufactured using 180 GSM, 100% cotton single jersey knit fabric, polystyrene insulation and named it E-bag-1 [9]. The second E-bag is manufactured using 100 GSM, 100% polyester single jersey knit fabric, polystyrene insulation and named it E-bag-2. Third E-bag is manufactured using 100 GSM, 65% polyester 35% cotton fabric, polystyrene insulation and named it E-bag-3 [10]. Fourth E-bag is manufactured using 100 GSM, 65% polyester 35% cotton fabric, recycle cotton insulation and named it E-bag- 4 [10]. Fifth E-bag is manufactured using 100 GSM, 65% polyester 35% cotton fabric, coconut fiber insulation and named it E-bag 5 [10]. Two layers of fabric is cut and sewed according to the desired round shape. polystyrene, recycle cotton and coconut fiber are used as insulating material which is filled inside the two layers of fabric [10-12]. The shape of the E-bag is made for medium size pot. The properties of five E-bags are listed below:

Components of E-Bag

Based on the types, the E-Bags have variations in the details of

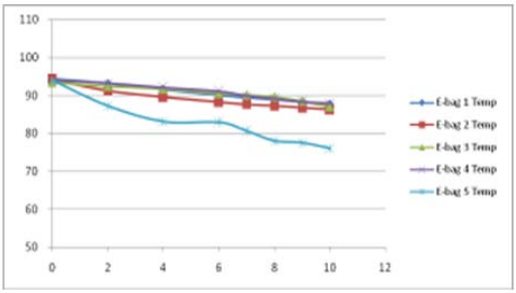

Figure 4: Temperature profile during egg boiling.

their construction. Some important components are as follows:

Inner layer: Inner layer of the E-bag is made of reflective type fabric.

Outside layer: Outside layer of the E-Bag is made of absorptive fabric.

Insulation: Insulation is placed between the inside and outside layers.

Working Procedure

The five E-bags were tested by cooking rice, pulse, chicken curry, boiled egg and potato. For cooking five identical pots were taken. 225 gm rice and 0.5 L 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 8 minutes water in each of the pots started boiling. After 4 minutes heating at the boiling temperature, all of the pots were removed from the stove and placed in the E-bags. The temperature reading of water in the pots were taken by digital thermometers [13]. While cooking egg, pulse, chicken curry and boiled potato; the pots were heated in the burner for two third of the normal cooking time and then the pots were removed from burner and placed in the E-bags. Then the bag was closed tightly, so that the heat rejection rate becomes low, until the dish is ready to be eaten. The temperatures inside of E-bag were also recorded during the cooking. The (Figure 1) shown in below shows the process of cooking of the E-bag [13].

Experiment Result

Experiment results in case of rice cooking, potato boiling, egg boiling, pulse cooking and chicken cooking are shown here.

Rice Cooking

Rice: 225 gm

Water: 0.5 Liter

Heat in stove: 8 minutes

Ambient temperature: 29.5˚C

Conventional cooking time (at observed heating): 12 minutes (Figure 2).

Potato Boiling

Potato: 1 piece (~70 gm)

Water: 0.5 Liter

Heat in stove: 12 minutes

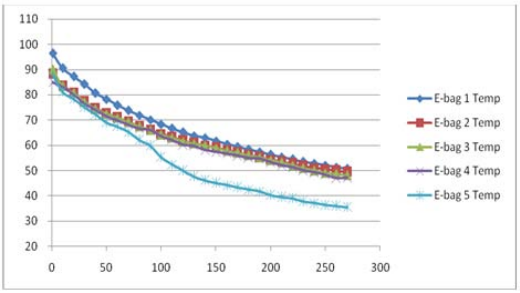

Figure 5: Temperature profile during pulse cooking.

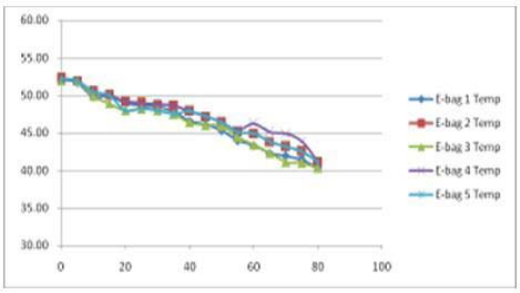

Figure 6: Temperature profile during chicken cooking.

Ambient temperature: 29.5˚C

Conventional cooking time (at observed heating): 18 minutes (Figure 3).

Egg Boiling

Egg: 1 piece

Water: 0.5 Liter

Heat in stove: 2 minutes

Ambient temperature: 30˚C

Conventional cooking time (at observed heating): 3 minutes (Figure 4).

Pulse Cooking

Pulse: 200 gm

Water: 0.5 Liter

Heat in stove: 7 minutes

Ambient temperature: 31.5˚C

Conventional cooking time (at observed heating): 10 minutes (Figure 5).

Chicken Cooking

Chicken: 300 gm

Water: 0.5 Liter

Heat in stove: 14 minutes

Ambient temperature: 30˚C

Conventional cooking time (at observed heating): 20 minutes (Figure 6).

Discussion

In this experiment, all the E-bags performed quite similarly. Temperature decreased slowly over time. The heat retention capacity is found relatively lower in coconut fiber insulated E-bag, otherwise performance is similar for different types of fabrics and insulation. The E-bag-4 made of 65% polyester 35% cotton fabric and recycle cotton insulation gave the optimized result considering cost and performance.

Benefits of E-bag

The process of Cooking in E-bag is very easy and it is very useful to make our world greener. E-bag has many benefits, some of these are given below:

E-bag can reduce CO_2 emissions.

It can reduce the use of wood for cooking.

Cooking in E-bag needs less amount of water. So it saves precious water.

E-bag is suitable for carrying anywhere.

E-bag cooks food slowly, allowing the food to maintain its nutritional values and also food is always hot and ready to eat.

Limitations of E-bag

E-bag has a very few limitations which are:

- E-bag cannot be used to fry (cook).
- E-bag needs more time for cooking than conventional cooking.

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References

1. Hasan MF, HI Hassan, M Sayeed-Ur-Rahim. An Efficient Way of Energy Saving in Case of Cooking using E-Bag. Journal of Modern Science and Technology. 2015; 3: 96.
2. Wonder bag. Wonderbag Non Electric Slow Cooker. 2018.
3. Amazon shop wonder.
4. Soares N, Costa JJ, Gaspar AR, Santos P. Review of passive PCM latent heat thermal energy storage systems towards buildings' energy efficiency. Energy and buildings. 2013; 59: 82-103.
5. Hasnain S. Review on sustainable thermal energy storage technologies, Part I: heat storage materials and techniques. Energy conversion and management. 1998; 39: 1127-1138.
6. Aste N, Angelotti A, Buzzetti M. The influence of the external walls thermal inertia on the energy performance of well insulated buildings. Energy and buildings. 2009; 41: 1181-1187.
7. Tyagi V, Panwar NL, Rahima NA, Richa Kothari. Review on solar air heating system with and without thermal energy storage system. Renewable and Sustainable Energy Reviews. 2012; 16: 2289-2303.
8. Veiseh S, AA Yousefi. The use of polystyrene in lightweight brick production. Iranian Polymer Journal. 2003; 12: 323-330.

9. Kane C, U Patil, P Sudhakar. Studies on the influence of knit structure and stitch length on ring and compact yarn single jersey fabric properties. Textile Research Journal. 2007; 77: 572-582.

10. Hussain U, et al. Comfort and Mechanical Properties of Polyester/Bamboo and Polyester/Cotton Blended Knitted Fabric. Journal of Engineered Fabrics & Fibers (JEFF). 2015; 10.

11. Fernandes EM, Correlo MV, Mano FJ, Reis LR. Novel cork-polymer composites reinforced with short natural coconut fibres: effect of fibre loading and coupling agent addition. Composites science and technology. 2013; 78: 56-62.

12. Sharma P. Textile recycling-creating a new industry, in Sustainability in Fashion and Apparels. WPI Publishing. 2018; 60-65.

13. Wonder bag Heat Retaining Slow Cooker: How it works. 2014.

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