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The Effect of Blanching on Drying of Green Peas

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***Abstract*—Samples of green peas (Pisum sativum) were exposed to combined treatments of blanching and drying. The drying parameters of green peas under different temperatures with different diameters are analyzed using blanching technique before drying. It is observed that the combined processes of blanching and drying play a vital role in the reduction of the moisture content under different temperatures. Increasing drying temperature resulted in greater moisture loss. Fluidized bed dryer was used for drying purpose. The dryer was operated at different temperatures.**

Keywords—Air temperature; Blanching; Drying of green peas; Drying of vegetables; Fluidized bed dryer.

I. INTRODUCTION

Drying is an important operation used in numerous industries. Drying of food preserves nutrients and protects it by removing the moisture that microbes need to live. Each microorganism requires an optimum temperature for the growth however increasing temperature above certain value stops the growth. Each microbe needs minimum quantity of moisture to grow. It is one of the most cost-effective methods of preserving foods of all variety which involves removal of moisture by application of heat. Drying is a complex process involving transient transfer of heat and mass, physical or chemical transformations, which, in turn, may cause changes in product quality. It Inhibits bacteria, yeast and mold growth which prevents food spoilage and slows down enzymatic activity [1].

K. A. Taiwo and O. Adeyemi studied the influence of blanching on the drying of banana slices and examined the effect of blanching at 60°C for 10 min followed by drying at 50 - 80°C and had shown that the impact of blanching was not significant ($P > 0.05$) on shrinkage, moisture loss however it still improved mass and solid transfer through the samples [2]. Filho et al. studied the dehydration of green peas under atmospheric freeze drying conditions using fluidized bed dryer [3]. Severini et al. investigated the effects of different combined systems of blanching and dehydration on dehydration speed, color characteristics and the behavior during rehydration of cubed potatoes and had shown that blanching was useful [4].

In recent years various emerging drying technologies and strategies have been developed to improve product quality. Many studies has been carried out, from which the contributions of Chancellor (1968); Jariwara and Hoelscher (1970); Taracatac, Flores and Chaudhry (1985); Kirkwood and Olson (1986); Laguerie and Gibert (1987); Abid, Gibert and Laguerie (1990); Lee and Kim (1993, 1999); Cobbinah, Grabowski, Muzumdar, Ramaswamy and Strumillo (1994); Zhou, Mowla, Wang and Rudolph (1998) are worth mentioning [5].

Drying of food products has been a very important method for many years. It makes foods lighter which take up less space and cost less to ship. It is an essential operation before storage as the green peas have high initial moisture content. Fluidized bed dryers are one of the most widely used dryer types used for decades because of the high heat and mass transfer rates. Fluidized bed dryers are used extensively in food industry for drying of food products [6].

The objective of the work is to investigate the effect of blanching on drying of green peas. The temperature of drying is taken within 60 degree Celsius to 80 degree Celsius with diameter having a range of 5 mm to 10mm.

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Nomenclature

T	temperature (°C)	Mc	moisture content (gm/gm db)
t	time (min)	FBD	fluidized bed drier
V	air velocity of drying air	D	diameter (mm)
rd	rate of drying	W_i, W_f	initial and final weight (gm)

II. MATERIALS AND METHODS

A. *Blanching*

Blanching is a pretreatment before drying to prevent microbial growth, oxidation and discoloration. It slows down the enzyme activity and removes gas from the surfaces and intercellular spaces (Rahman and Perera, 1999). Blanching is performed by treating vegetables with hot water, by steam (Kidmose & Martens, 1999) for several seconds or minutes.

B. *Fluidized bed dryer*

Fluidized bed dryers are one of the most common and widely used dryer types used for drying. At high pressure hot air or gas is passed through a perforated bottom of the container of the fluidized bed dryer. Inside the container products which are to be dried are placed. In this case the products are green peas. Every green pea is surrounded by hot air coming out from the perforated bottom. Therefore, green peas are uniformly dried. The temperature of the entering hot air and exit air can be monitored.

C. *Experimental procedure*

Three different diameters of green peas (*Pisum sativum*) were used. Green pea pods were obtained from the local market. The pods were shelled manually after the removal of damaged and unsuitable dry pods. Blanching was done in boiling water for 2 minutes. Initial weight W_i of the green peas to be dried was measured and recorded, after the drying process the final weight W_f was obtained. The moisture content of the product could be calculated by two processes, wet basis and dry basis. The samples were then fed to the fluidized bed dryer for drying.

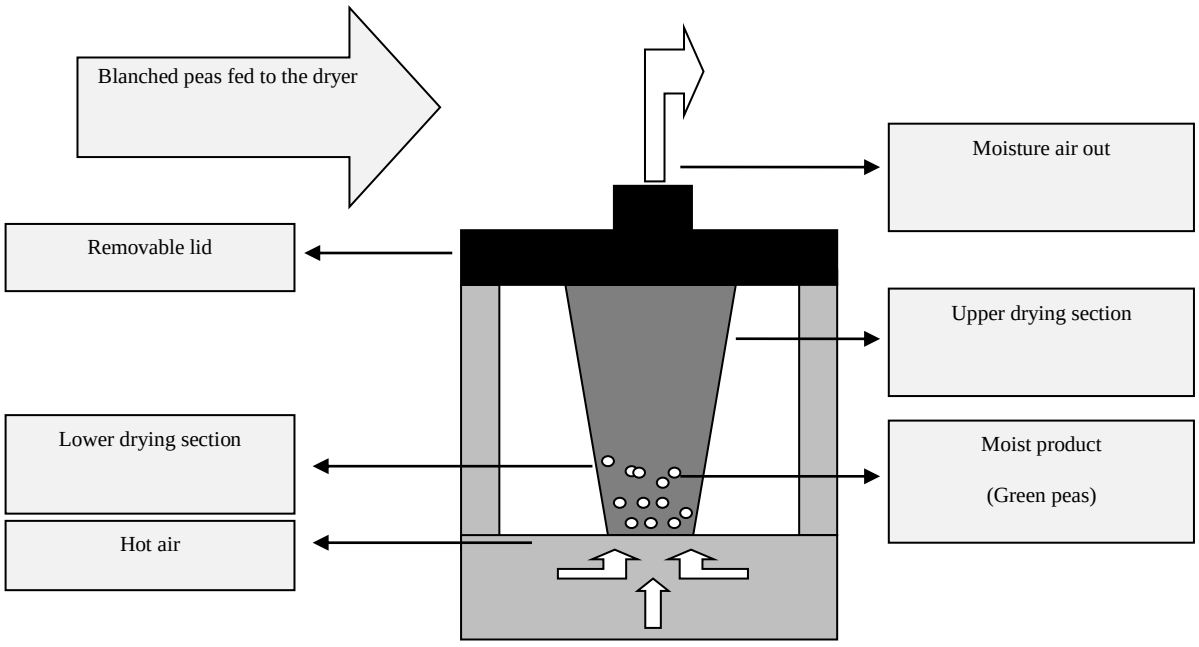

Fig. 1. Diagram of fluidized bed dryer.

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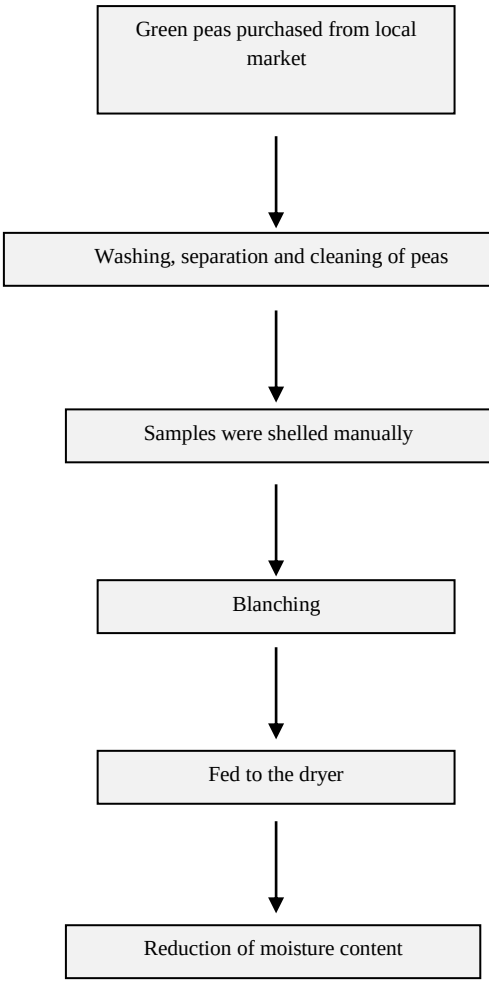

Fig. 2. Flow chart expression of the procedure.

Fluidized bed dryer consists of four different sections, heater control, temperature control, air flow rate control and drying test sections. Three different sample sizes of diameters D 7.64 mm, 9.13 mm, 9.64 mm were considered at three different temperatures T 60°C, 70°C, 80°C. The velocity of drying air was kept constant. The experiments were performed at an interval of 10 minutes. The fluidized bed dryer is a trouble-free equipment as it is efficient enough to show the inlet and outlet temperatures for constant monitoring. During dehydration, samples were withdrawn at regular intervals until the samples showed constant weights.

III. RESULTS AND DISCUSSION

A. Drying curves

The variation in the drying curves on increasing the drying air temperature from 60°C-70°C-80°C has been shown in Fig. 3. It is observed that on increasing the temperature there is an acceleration of the drying procedure. The effect of drying air temperature is considered important.

B. Color

It is important to keep the original color of the dried product intact, so color is a necessary quality parameter. The enzyme activities are responsible for undesirable colors. The color of the samples blanched in hot water did not undergo great changes during drying process. Thus enzyme activities can be prevented by exposing green peas in hot water i.e. blanching before drying.

C. Mathematical modeling

Weight loss was calculated using the following equation:

$$W_f = W_i \times \frac{100 - MC_i}{100 - MC_f}$$

W_i = Initial weight (g)

W_f = Final weight (g)

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D. Statistical measures

The data obtained from the experiments were subjected to statistical analysis. Analysis of variance (ANOVA) was performed to analyze the data. Randomized block design was used, a process in which the experimental units are first separated into groups consisting of *k* units. It was done in such a way that the units within each group were as similar as possible. The treatments were then randomly allocated within any particular group, so that each unit in a group receives a different treatment.

Two-way analysis of variance (ANOVA) was used to evaluate the significant differences of the data. Green peas sample of 7.64 mm diameter seems to dry faster than the 9.13 mm diameter which is again takes less time to dry than 9.94 mm diameter.

There is a significant effect of temperature on drying, as evident from the statistical analysis. Drying air temperature has significant influence on drying curve. The variations in moisture content with time at different temperatures ranging from 60°C to 80°C were plotted for three different diameters.

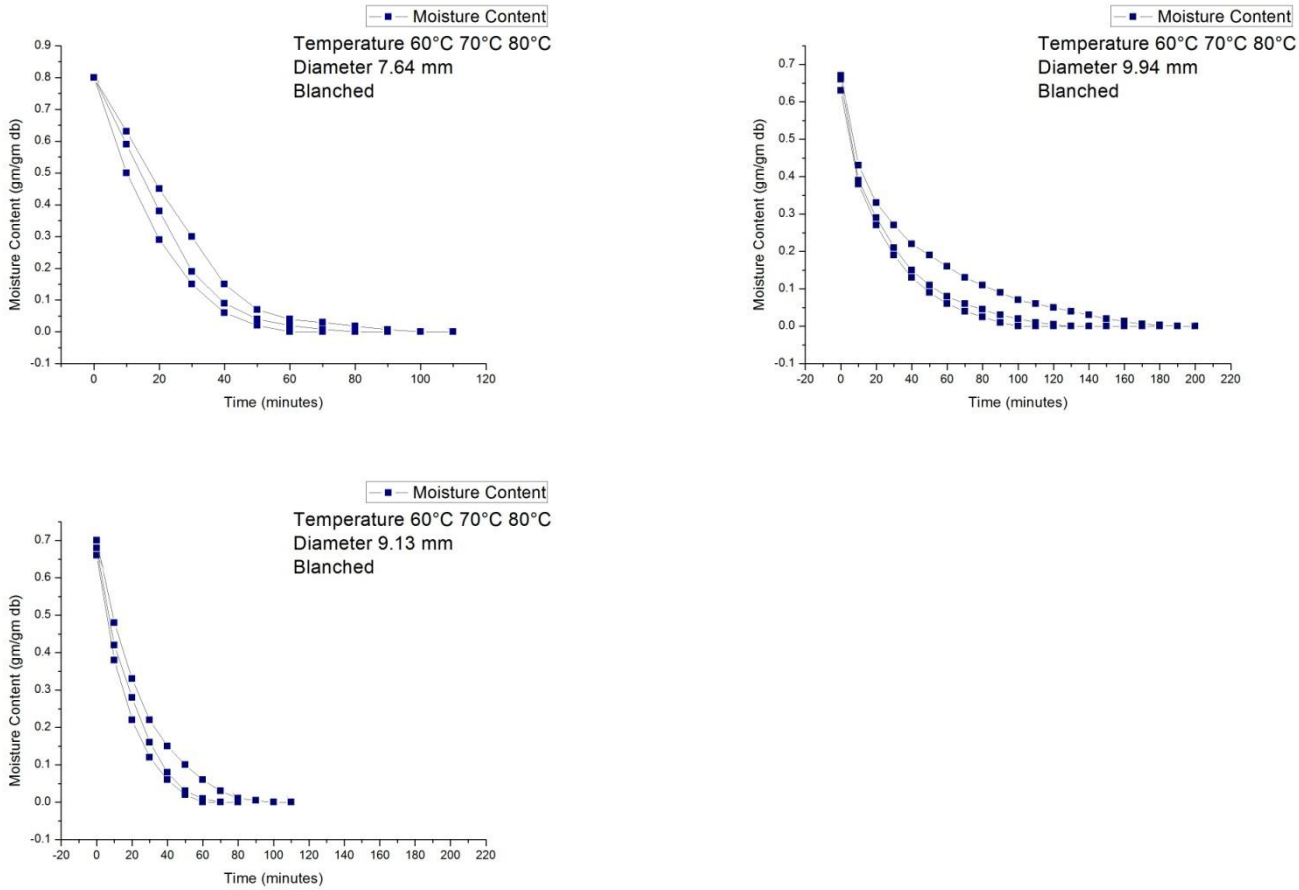

Fig. 3. Plot between moisture content and time.

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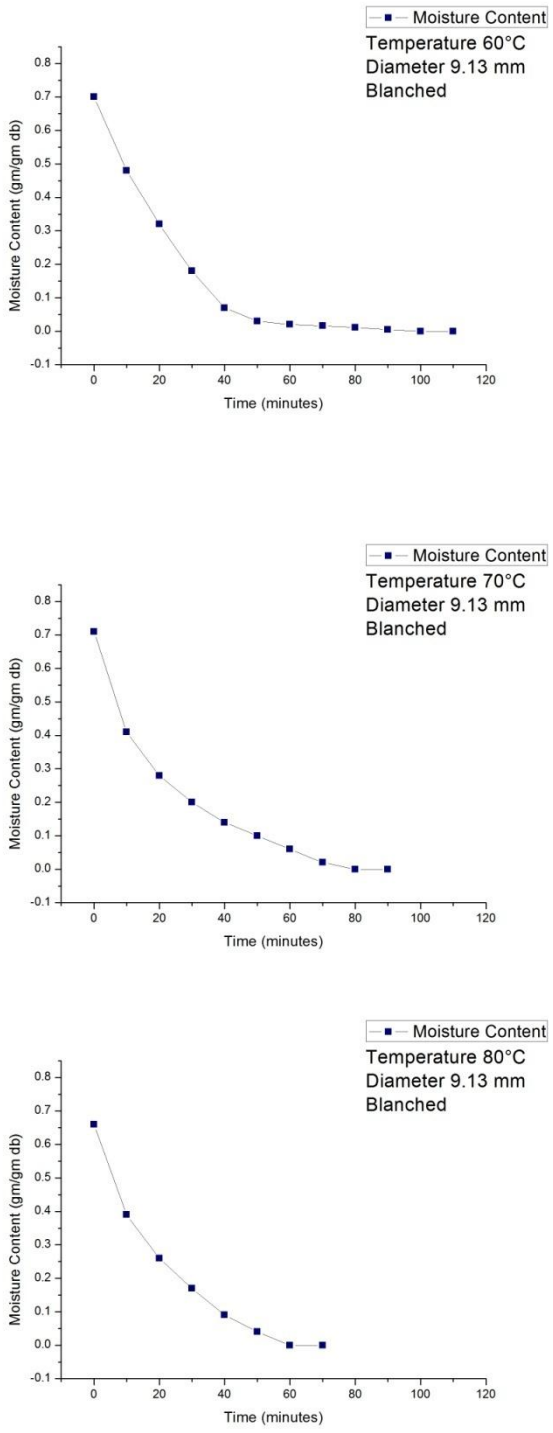

Fig. 4. Plot between moisture content and time.

IV. CONCLUSION

This study examined the influence of blanching and drying temperature on drying process of green peas. Increasing drying temperature (60 - 80°C) facilitated greater moisture loss. The drying curves shown above clearly indicate the effect of drying air temperature and also the particle size as the diameter increases on the drying kinetics. The sample size also has corresponding effect on the drying progress. Blanching also helped to maintain the color quality.

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