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Foam Mat Drying of Banana (*Musa acuminate*) Pulp

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ABSTRACT: The good way for the dehydration of liquids and semi liquid foods in short times is foam mat drying process. This process can be successfully applied for drying of various varieties of fruit juice and pulps such as banana, tomato, mango and guava etc. Soya protein and hen's egg albumin were used as foaming agents. Acetone and hexane were used in the ratio of 1:10 w/v for defatting of soy as foaming agent. Soy centrifugation performed after defatting and dried at room temperature. Soy flour 85 grams mixed with distilled water 1700 ml in 1:20 respectively. By addition of NaOH in 0.1M/N amount, pH changes 9 to 10 as well as large nutrients are denatured. Centrifugation performed again at 9000 rpm for 20 mints. After HCl like acid addition performed centrifugation which have similar rate as that were performed for addition of base. Moisture determination performed for control sample along with foaming agent samples such as soy protein isolate and hen's egg albumin which are 15.341, 13.3885 and 11.504 respectively. For drying of banana pulp, it was concluded that the eggs albumin was better than soy isolate. For the production of fruits and vegetables at the sensible cost under the experimental conditions, the foam mat drying process will be performed.

Keywords: Foam mat drying, Banana (*Musa acuminate*), Pulp

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INTRODUCTION

Drying is complicated method which is intricate for hotness and mass transporting along with considerable rate procedure, such as the alteration of physical and chemical that indication to altering the quality of product as well as heat and mass transmission pathways (Mujumdar, 2008). Wetness will be discarding from the pulp of fruit for containing allowed flowering powder in the foam-mat drying method successfully. For the replacement of humidity, drying method achieved for heat and mass transfer instantaneously.

Physical condition of the food, temperature, structure as well as early humidity content governed the transmission rate humidity. Food materials are dried by air-drying method which essential high energy, time and sometime materials poor product. Due to frequent collapse of foam bubbles layers those eliminating surface for hotness and mass transfer, drying method achieved (Kandsamy *et al.,* 2012). Pathogenic deteriorations will be lower or higher conquest by drying. During assessment and assemblage, pathogenic development happened.

For example fungi, insects, bacteria and protozoa are pathogenic ruin (Mujumdar, 2004). In foam-mat drying method, the fluid products will be changed by the adding of foaming agent into steady foam. Rate of drying are abundant in this method relatively due to cumulative phase of fluid gas. It necessity be famous that the foams persist steady and preserve such type of construction that dry quickly at frenzied drying air. During the decrease of foam which indications to inference of the produce quality, drying charges will be bigger (Sankat and Castaigne, 2004). Food drying analyzed by consuming it as foam-mat drying become modest method. By using warm air, foam can be extent into thin piece. By associating foam-mat drying method to freeze drying and bunch drying, it is not complex because it is a cheap, has no difficulty and required least time (Febrianto *et al.,* 2012). Temperature drying alone is unchanging that effects decrease at that time in which the product is in rubbery condition at great material of the moisture level. Investigational finding from the drying of banana fault is less 4% was documented by not taking into reason drying temperature (Talla *et al.,* 2004). The purpose of current study was aimed to investigate the foam mat drying of Banana pulp.

MATERIALS AND METHODS

The current study was completed in National Agriculture Research Center (NARC) with following experimental steps.

A. Isolation and preservation of soy protein

First up all 200gms of Soy grains/seeds have been selected and make powders from these Soy grains by grinding process. When the soy was isolate then kept at refrigerator from microbes safety and dust from where sample (soy) becomes impure. The sample was kept when isolated.

B. Selection of hen eggs and Banana fruit

The whitish material of hen egg and fresh, ripe Banana were selected for experiment. The banana fruits were cut into small pieces. The yellow aril manually was separated and discards. Bananas without yellow arils were thoroughly mixed whose weight is 398 grams.

C. Preparation of Banana pulp and foam with soy isolate

Banana pulp was prepared by scooping out the pulp from fruits. Remove peel from banana fruits. From banana pulp shaking, prepared banana pulp. This pulp was then smoothly blended in a mixer. Creamy white pulp having uniform shape obtained as shown in figure 1. Soy isolate mix with banana pulp after isolation of Soy used as foaming agent. Sample was put at heat radiant oven by using a tray for drying purposes. Aluminum foil is used to cover the tray because dust (ferrous) present in the tray cannot harm/damage the sample and becomes dry flow sheet in Fig. 2.

D. Foam at hot air oven

In single tray, took banana pulp foamed with soya protein isolate while at the other tray was banana pulp foamed with egg albumin. Put the aluminum foil to separate banana pulp from dust trays (ferrous) in both trays. Kept both trays in hot air oven at 70°C for three days to dry the banana pulp foamed with soya protein isolate and banana pulp foamed with egg albumin.

E. Moisture determination

The critical moisture content of the material is a function of drying conditions and determined by 2 gram of sample was taken in pre-weighed moisture dish. A sample in the moisture dish was dried in an oven, until the constant weight is reached at 130°C for 1hour.

The moisture of the samples was determined by the following formula.

$$\text{Moisture} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Sample weight}} \times 100$$

Fig. 1. Shape of banana pulp.

Fig. 2. Aluminum foil easily separate from banana pulp.

RESULTS AND DISCUSSION

Dried powders were made from banana pulp by using foam mat drying technology. In foam mat drying technology, the behavior of banana pulp remains same. The powders have highly recomposed in water. The drying of material depends upon the density of the particles. The drying rate of less dense particles will be higher drying rates.

A. Time differences

It was found that T1 and T2 dried within three days while T° cannot dry until sample lift within heat radiant oven for the eight days. It means by using foam, fruits and vegetables will dry otherwise in the absences of foam, fruits and vegetables cannot dry.

B. Moisture

It was found that T° has maximum moisture, T1 has minimum and T2 has average of T° and T1 moisture contents comparing these three data. The data available during the experiments indicates that the moisture contents vary with the passage of time. T° contains 15.341 % of the moisture; T1 contains 11.504 % of the moisture while T2 contain 13.3885 % of the moisture. The moisture contents are much in T° because it contains water contents and cannot dry completely. The drying rate of T1 (eggs albumin) are larger compared to other soy isolate and control sample. The egg albumin has less density than soy isolate protein which is used as a foaming agent (Fig. 3).

C. Lower density and time scale

Dryer mass load will be decreased by lowering foam-mat materials. The lower mass load is well compensated for by shorter drying time. Desired quality in technical acceptable time scale of about 3 hours will be obtain in foam-mat drying process while cannot occurred however control sample lift over for three days.

D. Lower density and quality of powder

Dryer mass load will be decreased by lowering foam-mat materials. The lower mass load is well compensated for by shorter drying time.Powder or fruit leathers formation occurred in foam-mat drying process while in control sample which contain no foam, powders formation impossible. The powders obtained by foam mat process have good quality and recompose in water.

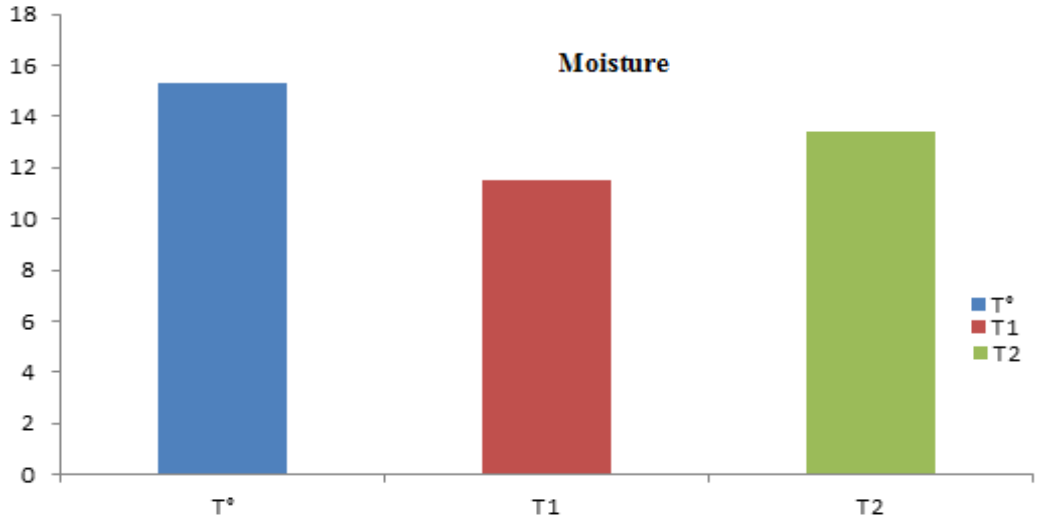

Fig. 3. Moisture determinations for T°, T1 and T2.

The process of drying and surface area is interdependent. By increasing the surface area it was found the drying process will be increased while by decreasing the surface area the process of drying will decreased. Like them, rate of drying process will also be effect by using foaming agents such as soy isolate and eggs albumin. By using soy isolate and eggs albumin as foam mat, the best foam mat for drying process is the eggs albumin. There has been 40 different type of protein exist in egg albumin while soy protein has single protein which was used during drying process. As in eggs white there were much protein therefore it must have different surface tension and ability of foam. The existence of protein interactions will be proves by whole eggs white which contain much protein as compared to isolated eggs white protein. By using different foaming agents such as soy isolate and egg albumin, different moisture rates are formed having different values. When use soy isolate as a foaming agent then moisture contents are while by using egg 11.504 % albumin as foaming agent then moisture contents are 13.3885 %.

For drying of banana pulp, it was found that eggs albumin was better than soy isolate. For the production of fruits and vegetables at the sensible cost under the experimental conditions, the foam mat drying process will be performed.

CONCLUSION

For drying of banana pulp, it was concluded that the eggs albumin was better than soy isolate. For the production of fruits and vegetables at the sensible cost under the experimental conditions, the foam mat drying process will be performed.

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CONFLICT OF INTEREST

All the authors declares that they have no conflict of interest.

REFERENCES

Kandasamy, P., Varadharaju, N., Kalemullah, S. and Moitra, R. (2012). Production of papaya powder under foam-mat drying using methyl cellulose as foaming agent. *Asian Journal of Food and Agro Industry*, **5**(05): 374-384.

Mujumdar, A.S., (2004). Dehydration of products of biological origin, Science Publishes, UK

Mujumdar, A.S., (2008). Guide to Industrial Drying: Principles, Equipments& New Developments, 3rd Ed; Three S Colors Publications, India.

Sankat, K.C. and Castaigne, F. (2004). Foaming and drying behavior of ripe bananas. *Journal of Food Science and Technology*, **37**: 517-518.

Febrianto, A., Kumalaningsih, S. and Aswari, A.W. (2012). Process Engineering of Drying Milk Powder with Foam-Mat Drying Method. A Study on the Effect of the Concentration and Types of Filler. Process. *Journal of Basic and Applied Scientific Research*, **2**(4): 3588-3591.

Talla, A., Puiggali, J.R., Jomaa, W. and Jannot, Y. (2004). Shrinkage and Density Evolution During Drying of Tropical Fruits: Application to Banana. *Journal of Food Engineering*, **64**(1): 103-109.