Jurnal Reaksi (Journal of Science and Technology)
Jurusan Teknik Kimia Politeknik Negeri Lhokseumawe
Vol. 20 No.02, Desember 2022 ISSN 1693-248X

APPLICATION OF DRYING BLOWER OVEN TECHNOLOGY TO SPICES FOR THE PRODUCTION OF INSTANT SEASONING POWDER

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ABSTRAK

Di Aceh, banyak bumbu instan masakan Aceh yang dijual dalam bentuk bumbu basah. Bumbu instan basah ini menjadi pilihan masyarakat Aceh untuk mempersingkat waktu memasak. Bumbu instan basah ini tidak dapat dipasarkan ke luar daerah karena umur simpannya yang tidak tahan lama dan tidak praktis untuk dibawa-bawa. Dengan inovasi masakan Aceh bumbu instan berupa bubuk kering dapat mendorong industri makanan lokal Aceh. Teknologi yang digunakan adalah Oven Drying Blower yang akan digunakan sebagai teknologi pengeringan bahan baku bumbu menjadi bumbu masak yang praktis Penelitian ini bertujuan untuk mengetahui karakteristik pengeringan rempah-rempah dengan mengukur perubahan suhu, kelembaban relatif, penurunan berat bahan, laju aliran udara, laju aliran volume udara, kadar air bahan terhadap waktu, laju pengeringan terhadap waktu, dan laju pengeringan terhadap kadar air. Bumbu instan Aceh Spices juga akan dilakukan persyaratan yang sesuai dengan pengujian kadar abu, pengujian kadar air, dan pengujian organoleptik. Penelitian ini menggunakan metode deskriptif proses pengeringan dipakai suhu di bawah 55˚C diulang sebanyak 3 (tiga) kali sampai mencapai kadar air 8 – 10 %bk. Hasil pengamatan menunjukan bahwa selama proses pengeringan tercatat Rh luar alat pengering antara 83,28%-89,50%. Juga Rh di dalam alat pengering diamati dan dicatat berkisar antara 86,58%-97,91%. Kadar cabai merah selama proses pengeringan mengalami penurunan dari 38,75% turun hingga rata – rata 18,05% dengan perincian pada ruang satu dan dua mencapai 17,4%, ruang tiga dan empat 16,95% dan ruang lima dan enam 16,6%. Dengan waktu pengamatan selama 4 jam.

Kata Kunci : Rempah Aceh, Drying blower oven, Rempah-rempah kering, Instant seasoning powder.

ABSTRACT

In Aceh, many instant seasonings of Acehnese cuisine are sold in the form of wet seasonings. This wet instant seasoning is the choice of the people of Aceh to shorten the cooking time. This wet instant seasoning cannot be marketed outside the region due to its not long-lasting shelf life and is impractical to carry around. With the innovation of Aceh cuisine instant seasoning in the form of dry powder can encourage Aceh's local food industry. The technology used is The Oven Drying Blower which will be used as a drying technology for spice raw materials into practical cooking seasonings. This study aims to determine the drying characteristics of spices by measuring changes in temperature, relative humidity, decrease in material weight, air flow rate, air volume flow rate, moisture content of the material against time, drying rate against time, and drying rate against moisture content. Aceh Spices instant seasoning will also be carried out suitable requirements with ash content testing, water content testing, and organoleptic testing. This study used a descriptive method. The result shows that the effective drying process of red pepper at a temperature of 60 °C is repeated twice until it reaches a moisture content of 8-10%bk. The results showed that during the drying process it was recorded that the rh outside the dryer was between 83.28%-89.50%. Also

Rh inside the dryer was observed and noted to range from 86.58%-97.91%. The moisture content of red chili during the drying process decreased from 38.75% down to an average of 18.05% with the details in rooms one and two reaching 17.4%, room three and four are 16.95% and space five and six are 16.6%. The observation time is carried out for 3 hours.

Keywords: Aceh Spices, Drying blower oven, Dry Spices, Instant seasoning powder.

INTRODUCTION

Spices are the dried, pleasantly aromatic parts of the plants. More specifically, as defined by the Food and Drug Administration organization (FDA), spices are: "aromatic vegetable substances, in the whole, broken, or ground form, whose significant function in food is seasoning rather than nutrition" [1]. Herbs and spices have played, and continue to play, important roles as flavoring agents, food preservatives, and medicines for centuries [2]. Flavoring food is one of the most common uses for spices, almost each spice is related to a specific flavor and they are basic for culinary proposes around the world. Depending on the region, different spices are used for flavoring foods bringing a distinguish flavor to each food style that even gives culinary identity [3].

Aceh cuisine is contain a lot of spices. It is because aceh cuisine effected by India, Persia, and Melayu cuisine that came from past. Nowdays in Aceh, people tend to cook using instant seasoning for practical and shorten the cooking time. Instant seasoning is a mixture of various spices with a certain composition and can be directly used as a cooking spice for certain dishes [4]. The instant seasonings that sold in market are in form of wet or paste. So, the instant seasoning can not be stored in long time and traveled.

Seasoning powder product contained enough amounts of I, Fe and cobalamin and that was contributed positive effect on human health. Seasoning powder produced had low water content and it might show the stability of product during storage [5]. Therefore, a innovation of instant seasoning in the form of instant seasoning powder is a solution and it can encourage Aceh's local food industry at the national level and increase the utilization of Aceh's spice farmer's crops.

To make seasoning powder, a drying blower oven is being used. If drying spices process using sun heat it can take 3-5 days depending on the type of spice being dried, it also depends on weather conditions. Even in extreme conditions the drying process can reach 10 days, resulting in a decrease or even damage to spices. Application of drying blower oven can meet the quality standart of dry powder seasoning, shorten production time, and no longer depend on sun light. According to SNI 01-2974-1996 in this instant seasoning product, the moisture content should not exceed 8-10% w/w, the maximum ash content is 3% w/w, protein is at least 8% w/w, resistance to microbes is a maximum of 10x105 colonies/gram, metal contamination (using AAS), and organoleptic testing on food.

METHODELOGY

This study used an drying blower oven. The heat source is obtained from the electricity. The Oven temperature ranges from 50-80°C. The number of trays is 45 with a distance between trays is 7.3 cm.

Drying blower oven is a upgrade version of oven. The oven is a set of drying machines as a substitute for sunlight in drying a product. The working system of this drying oven machine is drying product at the desired temperature (the temperature can be set constantly)[6]. Drying system of this machine by using a stream of hot air at high speed, with the help of an exhaust blower saturated air is sucked in and flows out. The drying system with this drying machine is called drying with artificial heating (artificial drying).

Drying with artificial heaters has several types of tools where heat transfer takes place by conduction or convection, although some can also be by radiation. Dryers with convectionary heat transfer generally use hot air that is flowed, so that the heat energy is evenly distributed throughout the material. Dryers with heat transfer by conduction generally use a solid surface as a conductor of heat. One of the drying tools for materials that are often used on an industrial scale is an electric oven. The working principle of this tool is to lower the moisture content in the material by draining heat from the element (which converts from electrical energy into caloric energy) with air as the medium. The commercial scale of the food industry, electric ovens are set at a speed of 2.45 x 10 rps [6]. Heating is obtained from the movement of particles caused by alternating current (AC

current), besides that electric ovens are often used as drying tools for laboratory purposes because they can be used for moisture research methods from several different materials. Therefore, electric ovens are categorized as cabinet dryers .

Drying that is carried out mechanically, namely by using an artificial drying device (artificial drying) can make it easier to control factors in the drying process. Air temperature regulation, for example, can produce a much more homogeneous and regular product when the temperature of the dryer air is set according to the properties of the material and the desired result.

This drying blower oven is designed using food grade stainless steel. So, it is safe to use for food ingredients. This drying blower oven is designed with 9 cabinets, 9 blower fans and, 45 drying trays for capasity 80-90 kg of spices.

The ingredients used are red chilli, shallot, garlic, asam sunti, candlenut, coriander, cardamom, and pepper.

PROCEDURE

2.2.1 Moisture content test

The process of drying aims to reduce their moisture content to a certain extent, so as not to cause damage due to metabolic activity by microorganisms [7]. Water reduction decreases weight and reduces food volume thereby reducing transportation and storage costs. Drying also facilitates handling, packaging, transportation and consumption [8].

Moisture content testing begins with washing all the ingredients. The moisture content of the sample was measured at the beginning and at the end of the study. Next, measure the total weight of the material in each tray. Each ingredient is put in a tray weighing 100 grams for a total of 5 kg per spice ingredients. After that, put the tray containing red chilli, shallot, garlic, asam sunti, candlenut, coriander, cardamom, and pepper into the oven drying blower.

This study was conducted to drying the spices at 3 temperatures, that are T1 60°C, T2 70°C, and T3 80°C. The sample material is reweighted for weight loss. This observation is carried out every 2-3 hours with a check every 1 hour for each spices.

a. Sample Variables of Moisture Content Test

Table 1. Samples of spices with high moisture content

Spices	Massa (kg)	Drying time (hour)	Temperature (^oC)
Red chilli	5	2,3	60, 70, 80
Shallot	5	2,3	60, 70, 80
Garlic	5	2,3	60, 70, 80
Asam sunti	5	2,3	60, 70, 80

Table 2. Samples of spices with low moisture content

Spices	Massa (kg)	Drying time (hour)	Temperature (^oC)
Candlenut	5	2,3	60, 70, 80
Coriander	5	2,3	60, 70, 80
Cardamom	5	2,3	60, 70, 80
Pepper	5	2,3	60, 70, 80

In this case, there are two methods to determine the moisture content of the material, namely based on dry weight (dry base) and based on wet weight (wet basis).

a. Wet-based moisture content can be determined by the following equation [9]:

$$m = \frac{Wm}{Wm+Wd} \times 100\%$$

Where:
m = wet based water content (%)
Wm = moisture content in the ingredient(gr)
Wd = final weight of dry ingredient (gr)

b. Dry-based moisture content can be determined by the following equation [9]:

$$M = \frac{Wm}{Wd} \times 100\%$$

Where:
M= dry based water content (%)
Wm = water content in the ingredient (gr)
Wd = final weight of dry ingredient (gr)

2.2.2 Relative Humidity of Environmental Air and Air Drying Device

Relative humidity data of environmental air and dryers are obtained by plotting data on the temperature of dry balls and wet ball temperatures on psychometric charts or can also use Psychometric Calculation.

2.2.3 Organoleptic Test

Organoleptic testing is called sensory assessment which is a method of assessment by utilizing the five human senses to observe the texture, color, shape, aroma, taste of a food, beverage or medicinal product [10]. This study aims to obtain the best extraction method to obtain instant seasoning powder products that have preferred sensory properties based on organoleptic tests.

a. Organoleptik Test Variable

Score	Colour	Taste	Smell
1	Dark Brown	Very Savory	Very fragrant
2	Brown	Savory	Good fragrant
3	Medium brown	Less Savory	Not fragrant
4	Light brown	Not Savory	Not fragrant

2.2.4 Ash Content Test

Ash is an inorganic substance left over from the combustion of a food ingredient. The ash content and its composition depend on the type of material and the way it is powdered [11]. Most of the food ingredients, which are about 96% consist of organic matter and water. The rest is inorganic material in the form of minerals called ash.

The determination of ash content is carried out by weighing the sample and then putting it into a porcelain dish that has been pre-contended [12].

The calculation of ash content can be calculated by the following formula [12]:

% Kadar abu (dry) = % kadar abu (wet basis) x 100 (100 - % Kadar air)

SNI 01-3709-1995 the maximum permissible ash content is 7%.

RESULT AND DISCUSSION

1.1 Material Weight Loss

Table 3. The result of changes in the weight of ingredients in spices with high moisture content

Material	T(°C)	Time (hour)	Weight (kg)	Final weight (kg)	Loss (kg)
Red Chilli	60	2	5	3,5	1,5
		3		3	2
	70	2	5	2	3
		3		1,5	3,5
	80	2	5	1	4
		3		0,9	4,1
Shallot	60	2	5	3	2
		3		2,9	2,1
	70	2	5	2	3
		3		1,2	3,8
	80	2	5	1	4
		3		0,8	4,2
Garlic	60	2	5	3,4	1,6
		3		2,9	2,1
	70	2	5	2	3
		3		1,5	3,5
	80	2	5	1	4
		3		0,9	4,1
Asam sunti	60	2	5	3,4	1,6
		3		2,9	2,1
	70	2	5	2	3
		3		1,6	3,4
	80	2	5	1	4
		3		0,7	4,3

Table 4. The result of changes in the weight of ingredients in spices with low moisture content

Material	T (°C)	Time (hour)	Weight (kg)	Final weight (kg)	Loss (kg)
Candle nut	60	2	5	3,1	1,9
		3		2,8	2,2
	70	2	5	2	3
		3		1,5	3,5
	80	2	5	1	4
		3		0,8	4,2
Coriander	60	2	5	3,2	1,8
		3		2,9	2,1
	70	2	5	2,1	2,9
		3		1,6	3,4
	80	2	5	1	4
		3		0,9	4,1
Cardamom	60	2	5	3	2
		3		2,5	2,5
	70	2	5	1,9	3,1
		3		1,3	3,7
	80	2	5	0,9	4,1
		3		0,7	4,5
Pepper	60	2	5	3,3	1,7
		3		2,7	2,3
	70	2	5	2	3
		3		1,5	3,5
	80	2	5	1	4
		3		0,8	4,2

Based in Table 4, it can be seen in spices that have a low water content obtained the best temperature in 70°C at 2 hours, the average water content loss rate is 60-65%.

Based on tables 3 and 4, the results of the analysis carried out for the water content loss test are in accordance with SNI 01-2974-1996 for this instant seasoning product, the moisture content less than 8-10%.

1.2 Relative Humidity of Environmental Air and Air Drying Device

The results showed that during the drying process, the relative humidity outside the dryer was recorded ranging from 83.28% - 89.50%. Also the relative humidity inside the dryer is observed and noted ranges from 86.58% - 97.91%. The results of this observation, both from wet and dry thermometers plotted on the psychometric chart, data on humidity outside and humidity in the drying room were obtained, there was a difference between the humidity outside the dryer was an average of 86.11% and the humidity in the dryer was an average of 88.17%. This humidity occurs because the process energy produced by the fan is fully opened at the speed at which air enters the dryer at an average of 12 m/s which forcibly enters the dryer chamber to touch the material convectionly in the drying chamber. The difference between the outside and inner humidity of the dryer creates space for the weight of the water that evaporates from the material then passes into the drying air.

1.3 The Relationship of Water Content to Time

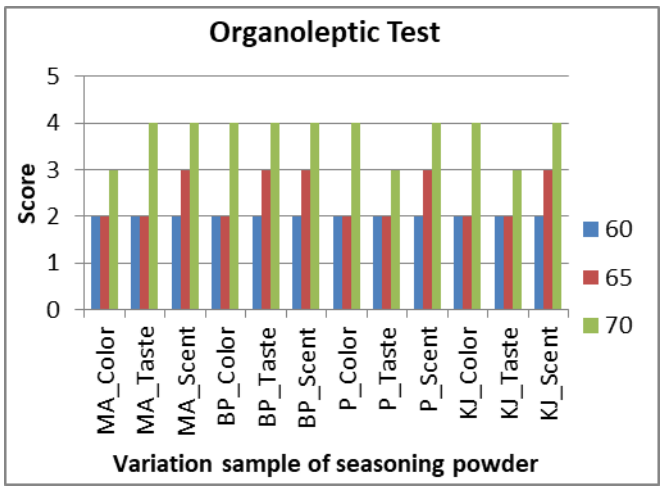
The decrease in moisture content in red peppers is relatively rapid at the beginning of drying, then decreases slowly until it approaches the specified moisture content. Based on the results of the study, the minimum moisture content of red chili in rooms one and two reached 17.4%, rooms three and four 16.95% and rooms five and six 16.6%.

This decrease in moisture content is due to the drying process where the red chili material from agriculture absorbs heat energy from the drying air in the sense that there is a convection heat transfer process from the drying air absorbed by materials containing water by 38.75%. Then the water evaporates slowly from the material to the drying air, this can be interpreted to mean that when the evaporation process occurs, the red chilli material from agriculture slowly loses its mass or in theory is called mass transfer. The water content in the material consists of 3 types of water, namely firstly the free water content, secondly the water content bound to the material and thirdly the water content that is chemically bound in the material this amount of water will evaporate after receiving or absorbing thermal energy from the drying air.

The greater the temperature difference (between the heating medium and the material) the faster the heat transfer process will take place, resulting in the evaporation process getting faster as well. The more humid the air in the drying chamber, the longer the drying process will be dry, and vice versa [13].

Initially evaporating water is free water then followed by bound water and then finally chemically bound water. The difference in moisture content occurs due to the position of space, namely space one and two receive heat earlier then followed by space three and four and space four and five. In addition, there may be differences in the size of the material and there may even be differences in water content between one grain and another. No less important is the difference between the position of the material to the air flow rate and the amount of energy present in the drying air so that the moisture content is different.

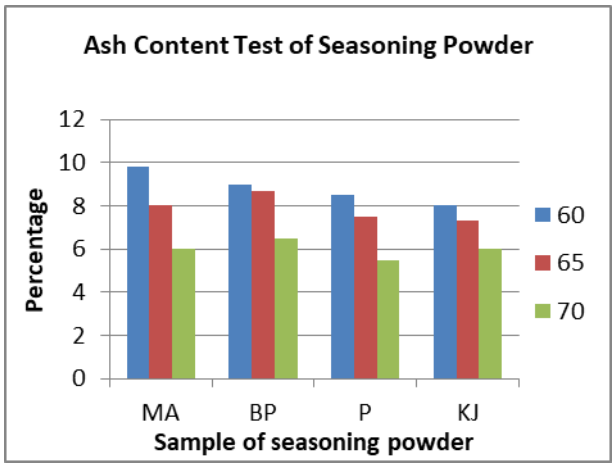
1.4 Organoleptic Test



The results of the observations in the chart on the color, taste and scent with temperatures of 60°C, 65°C and 70°C at a drying time of 2 hours. Given to 15 panelists, showing the highest scores of color, taste, and smell with a rating scale of 1-5 found in the MA, BP, P, and

KJ at a temperature of 70℃ with an average score of 4.

1.5 Ash Content Test



The results of testing the ash content in instant seasoning powder showed the highest value at a temperature of 70°C with an average ash content of 5.5% to 6.5% and this result was in accordance with the standard of SNI 01-3709-1995 the maximum permissible ash content is 7%.

The ash content in food ingredients indicates the presence of inorganic mineral content in these food ingredients. Differences in ash content can be caused by differences in the type of organism, and the living environment of the organism [11].

The higher the temperature and time used in drying, the percentage of ash content will increase, because the water that comes out of the material is greater [14].

The increase in the percentage of ash content is inversely proportional to the increase in the percentage of moisture content in the seasoning. The lower the moisture content, the higher the ash content of the seasoning [15].

CONCLUSION

Based on the research that has been carried out, the results obtained are:

1. The best result of drying spices that have a high moisture content is obtained at a temperature of 70 ℃ with 3 hours of drying time and 2 hours for spices that have a low moisture content. The result is accordance SNI 01-2974-1996 for this instant seasoning product, the moisture content should less than 8-10%.
2. The content during the drying process decreased from 38.75% down to an average of 16.98% with details in rooms one and two reaching 17.4%, rooms three and four 16.95% and rooms five and six 16.6%. With an observation time of 3 hours.
3. The relative humidity outside the dryer is an average of 86.11%. Also the relative humidity inside the dryer is an average of 91.33%.
4. The result of organoleptic test showed best color, taste, and smell found in the MA, BP, P, and KJ at a temperature of 70℃ with an average score of 4.

2. The results of testing the ash content in instant seasoning powder showed the highest value at a temperature of 70 ℃ with an average ash content of 5.5% to 6.5% and this result was in accordance with the standard of SNI 01-3709-1995 the maximum permissible ash content of 7%.

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