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EFFECT OF VARIOUS DRYING METHODS ON PHYSIOCHEMICAL PROPERTIES OF CURRY LEAVES

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Abstract: Curry leaf is used in very small quantities for its distinct aroma due to the presence of volatile oils. Curry leaves are rich in carbohydrate, fibres, minerals like phosphorus, calcium, iron, zinc, potassium and manganese and vitamins like B vitamin, niacin and water-soluble vitamin and retinol and also rich in several bioactive compounds such as polyphenols, alkaloids, and flavonoids that exhibited multiple bioactive functions such as antioxidant, anticancer, antimicrobial, antidiabetic, etc.The study is aimed to explore the effect of pre-treatment and different drying methods on the physicochemical properties of curry leaves. The leaves were pre-treated in with salt solution before various drying process viz. hot oven drying (60-100°C for 8 Hr), sun drying, microwave drying (180-450W for 15 minutes) and vacuum oven (60-100°C) drying. The obtained result of dried curry leaves were evaluated for nutritional properties.

Index Terms **- Curry leaves, Pre-treatment, Drying, Nutritional Value**

1. INTRODUCTION

Curry leaf (Murrayakoenigii) is a crucial veggie. Curry leaves have intensive use in food and medicine applications in the southern parts of India to produce flavor to the curries, vegetables, pickles, chutneys, soups, buttermilk, and southern Indian sambar preparation also in non-vegetarian products, but are mostly utilized in vegetarian foods. Additionally, to the food value, they raisethe smell and taste of the food [1]. Curry leaf is in addition used in several of the Indian Ayurveda and Unani prescriptions. Due to the highly useful effects, there's a growing marketplacefor this leaved spice, if acceptable and viable methodologies for the process also as preparation of bioactive preserve (antioxidant / radical scavenging) are created. This might establish potential uses in food systems. However, curry leaves are the most ingredient in several processed food products, their biological importance has been familiar and therefore the applications or industrial processes of varied technological constraints haven't been absolutely explored. Despite their huge usage, the consumption of the leaves is limited due to their spoilable nature and short time period [2-5]. Its dried form has inferior aroma and color therefore it's usually not most well-liked. Drying is a feasible method of preservation of curry leaves. It increases shelf life of leaves by reducing their moisture content and therefore making their consumption possible in the off-season. Further, an appropriate pretreatment can help to retain quality of leaves effectively. Therefore, preservation of the recent variety of leaves is important for taking care of its color, aroma, and nutrient content. whereas taking care of the standard factors, typical techniques used for preservation of the leaves, like sun drying, microwave drying, hot air oven drying, and vacuum oven drying etc. With an increase in civilization, there is increasing demands of better quality of foods both satisfying nutritional benefits along with being economical. So thermal treatment of foods processing constitutes an important and most widely adopted process for microbial inactivation used for preservation in the food industry [8-10]. Though the application of heat during the blanching of leafy vegetables, like curry leaves, can cause degradation in color, texture, area shrinkage, and nutrient loss,

consumers always prefer thermally processed food, in view of their potential of thermal treatment to inactivate harmful microorganisms [3].

2. MATERIALS AND METHODS

2.1 Procurement and Processing of Curry Leaves

Brought fresh curry leaves (Murrayakoenigii) from local shop Nagpur city Maharashtra. The undesirable, damaged and contaminated parts were removed manually. Leaves were washed with normal water till they were free of dirt and soil and kept for drying. Pretreatment were given to leaves by blanching. For blanching (Fig. 2.1.1) curry leaves were dipped for 30 seconds in a solution of warm water at 80°C having 0.5% KMS and cooling immediately in tap water. Fig. 2.1.2 shows blanched leaves. Pretreatment prior to drying was primarily done to make enzymes inactive which would otherwise result in undesirable changes in color, texture, flavor and nutritive value of the products during processing and storage.

Figure 2.1.1: Blanching Process

Figure 2.1.2: Blanched Leaves

2.2 Drying Methods

All the control and pretreated curry leaves sample were subjected separately to four different drying techniques to obtain best possible quality dried product. Various techniques used have been described as follows:

2.2.1 Open Sun Drying

Conventional sun drying techniques have been used. Separated leaves from the stalks were washed with running water and pre-treated. Weighed quantity of curry leaves were kept at terrace in perforated trays so that air could pass through the leaves from the bottom also and drying could take place at a faster rate. The material was kept for drying for time period of 8 hours. After drying leaves were collected, weighed and packed into a polyethylene bag. Sun dried samples were used for nutritional analysis.

2.2.2 Hot Air Oven Drying

The known quantity of curry leaves were subjected in hot air oven at temperatures (60°C, 80°C, 100°C) for 8 hours.

2.2.3 Vacuum Oven Drying

The known quantity of fresh curry leaves were subjected in vacuum oven at temperatures (60°C, 80°C, 100°C) for 8 hours.

2.2.4 Microwave Drying

Curry leaves were subjected in glass fiber sheet of microwavable plate and dried at 180W, 300W and 450W for 15 minutes.

3. Result and Discussion

3.1 Moisture Content

Moisture content gives information about the amount of water present in plant and which play an important role in the growth and activities of plants. Drying at 80°C and at 100°C results in lower moisture content. Table 3.1.1 shows moisture content of curry leaves by different drying methods. The moisture content of fresh curry leaves was found to be 78 percent. Curry leaves had moisture content in range between 8-10%. Lowest moisture content was observed in microwave drying technique

Table 3.1.1: Moisture Content (%) of Curry Leaves

Drying Methods	Temperature (°C)		
	60°C	80°C	100°C
Hot Air Oven	8.9	8.7	8.5
Vacuum Oven	9.6	9.4	9.1
Microwave (Watt)	Power in Watts		
	180 W	300W	450W
	8.5	8.4	8.3
Sun Dry 32°C	8.9		
Fresh Leaves	78		

3.2 Ascorbic acid (Vitamin C)

Ascorbic Acid is essential compound in our daily biological activities. A minimum of 60 mg of ascorbic acid is required for the human body as per the US standards.Vitamins C are strong anti-oxidants. They are good in fighting cancer through their scavenging of free radicals [6]. Ascorbic Acid of fresh and pretreated curry leaves as shown in table 3.2.1. Vitamin C content in fresh curry leaves was observed as 94.6 mg/100 g while in dehydrated curry leaves it was significantly decreased so it is seen that as temperature increase the ascorbic acid in curry leaves was decreases [7]. At temperature 80-100°C ascorbic acid content is less as compare to 60°C. In vacuum oven drying ascorbic acid range between 31.5-22.5 mg/100g which is less loss as compare to other drying methods.

Table 3.2.1: Ascorbic acid of Curry Leaves (mg per 100 Gram)

Drying Methods	**Temperature (°C)**		
	60°C	80°C	100°C
Hot Air Oven	22.5	13.5	9
Vacuum Oven	31.5	27	22.5
Microwave Oven	Power in Watt		
	180W	300W	450W
	27	18	9
Sun Drying (32°C)	26		
Fresh leaves	94.6		

3.3 Chlorophyll

Chlorophyll Content of curry leaves as shown in Table 3.3.1. It is Observed that chlorophyll content increase as the temperature increase. Considering all drying treatment used in this project the microwave has maximum amount of chlorophyll retained at 300 watts is 6.098 mg/ml (total chlorophyll) compare to the methods and lowest retention in hot air oven at 100°C is 1.877 mg/ml.

Table 3.3.1: Chlorophyll Content (mg/ml) of Curry Leaves

Method of Drying	**Temperature**		
	60°C	80°C	100° C
Hot Air Oven	1.877	4.408	4.374
Vacuum Oven	0.793	3.387	4.249
Sun Drying	4.055		
Microwave	Power in Watts		
	180 W	300 W	450 W
	4.329	4.675	6.098
Fresh Leaves	9.111		

3.4 pH

pH of curry leaves as shown in Table 3.4.1. There was not significantly large difference in pH of fresh and processed curry leaves. Fresh curry leaves have pH found to be 6.3 and processed leaves has pH range from 6-6.4.

Table 3.4.1: pH of Curry Leaves

Drying Methods	**Temperature (°C)**		
	60°C	80°C	100° C
Hot Air Oven	6.0	6.0	6.1
Vacuum Oven	6.3	6.4	6.4
Microwave	Power in Watts		
	180W	300W	450 W
	6.1	6.2	6.4
Sun Drying (32°C)	6.2		
Fresh Leaves	6.3		

4. Conclusion

The objective of the work is to study the effect of various drying methods such as vacuum oven, microwave, sun drying and hot air oven drying on physical and chemical properties of curry leaves. In this work, experiment is carried out and tested for different drying methods to determine the moisture content, chlorophyll content, ascorbic acid and pH. It was observed that moisture content decreases as temperature increase. Maximum moisture present in vacuum oven and lowest moisture content was observed in microwave oven. Ascorbic acid maximum retained in vaccum oven. Chlorophyll content increased with increase in temperature. The maximum chlorophyll present in microwave followed by hot air, vaccum oven and sun drying. In pH parameter there is no significant change in pH value. Microwave dried followed by vaccum oven dried curry leaves had maintained nutritional constituents upto acceptable limit with superior green colour and uniform structure than those obtained from sun drying and hot air drying. Dehydrated curry leaves showed good consumer acceptance and shelf life.

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