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Production of raisin from local seedless grapes using different methods

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Introduction

Raisin is a popular dry fruit item with shelf life of around 6 months if stored properly. Apart from use as a dry fruit item, it is used in large quantities in many sweet preparations, some farsan items and desserts.

Raisins are basically dry grapes popularly known as kishmish, bedana, manuka or dried fruit. They are primarily prepared by sun drying of different varieties of grapes and are small, dark, wrinkled in appearance. They are sweet in taste & their sweetly flavor is similar to the grapes from which they are made. High concentration of sugars, low moisture contents as well as low pH makes them as naturally stable foods. Raisins are good source of nutritional elements like Carbohydrates (sugars), folic acid and pantothenic acid, Vitamin B6 & minerals (calcium, magnesium, and phosphorus. Additionally, iron, copper, zinc etc.), and hence this fruit is considered a healthy snack. Raisins are eaten as choice food and used in many productions for flavor in bread, cake, sweets, and wine (Nath, P., Kale, S.J. and Sharma, A.K., 2019)

Grapes are one of the most popular and palatable fruits in the world. The preservation of grapes by drying is a major industry in many parts of the world where grapes are grown. Drying practices vary with geographical locality and with the variety of grapes. Drying grapes, either by open sun drying, shade drying or mechanical drying, produces raisins. Air-drying of solar energy has been demonstrated to be cost-effective and could be an effective alternative to traditional and mechanical drying systems, especially in locations with good sunshine during the harvest season.

The traditional air-drying shelter of grapes has been used for thousands of years in Asia and other places around the world (Sharma, A.K., 2013.)

The quality of the dried products implies that several desirable changes (physical, chemical, and biochemical) must occur during the drying process. These changes are influenced by drying conditions and physico-chemical characteristics of the targeted material. Some specific characteristics of grapes (i.e., size of the berries, sugar content, and the presence of an outer waxy cuticle) play a significant role both in the drying process itself and in post-drying operations such as washing, cleaning, and finish-drying. Prevailing temperature, wind velocity, exposure of grapes to sunlight, humidity are major environmental factors which affect the quality of dries grape. Other than these factors the berry size also affect water loss rate during drying process (Pawar, et al., 2023).

Characters of Good Raisin

Good and uniform appearance of produce in terms of its color (perfectly green or grey-green), size (round) and smooth texture. More pulp content and a pleasing taste free from injuries so that no sugar coat outside and intactness of skin (Feng, X.U.E et al. 2023).

Global Raisin Production

USA, Turkey and South Africa are the largest raisin producers at the global level besides Greece, Australia, Iran, Afghanistan, China, Russia and others. India has achieved the raisin production level i.e. in the range of 55,000 to 65,000 tons next to Turkey at world level although there is no price stability for raisin production in last two years due to saturation of production.

Efforts on improvement in quality of the Indian raisins vis-à-vis the imported of product is yet to be initiated for the export market by the Indian industry (Sharma, A.K. and Adulse, P.G., 2007).

Drying Methods

Drying of grapes varies in different parts of the world, depending on the cultivation conditions. There are three main methods that are used in raisin production; sun drying, shade drying, and mechanical drying. The sun drying method has several disadvantages including, the possibility of environmental contamination due to dust and insect infections, physical microbial deterioration caused by rain, and color deterioration due to intense solar radiation. Moreover, removal of contaminants (e.g., small stones, soil, leaves, dust, etc.) collected for the period of raisin gathering is tedious during the raisin cleaning process. Hence, using this method, raisins of low quality are produced due to uncontrolled drying conditions and environment. (Wang, J., et al., 2016).

Pre-treatment

The quality of dried grapes as a semi-processed product and raisin (the final product) are evaluated in terms of the appearance, texture, free-flow (having nonstick surface), cleanliness (for dried grapes that easily could be processed with minimum damage), flavor, and nutritional value. Apart from varieties and pre-harvest conditions, the quality of dried grapes/raisins largely depends on operating, pretreatment, drying, processing, and storage conditions.

The quality of different varieties of grapes after drying in similar operating conditions had not been identical due to differences in texture and composition. Fruit maturity has a direct influence on the appearance, texture, flavor and food value so that raisins produced from low-maturity fruit are skinny, coarse-wrinkled, hard, light in weight, and tend toward a lighter, more reddish color. The texture of fruit is influenced by pre-harvest factors such as environmental, cultural, physiological, and genetic factors. Both color and texture greatly influence the marketability of the product.

Color of the final product could be influenced by the state of the fresh fruit. Sunlight exposure affects grape composition, especially the phenolic compounds in the skin, which play a significant role in browning of grapes on drying. Several times colour parameters chosen as an index to evaluate the quality of dried grapes (Patidar, A., et al., 2021).

Aim of this study

This study was aimed at determining the effect of different treatment in drying grapes to produce raisins.

Materials and methods

Materials:

Chemical reagents and instruments

The chemical reagents and instruments which were used showed in Table 2.1–and 2.2- as below:

Table (2.1): The chemical reagent used in the experiments.

No.	Material	Formula
1	Sodium Hydroxide standard (0. N)	NaOH

Table (2.2): Instruments and equipment used in testing and analysis.

No.	Equipments
1	Dehydrator: A dehydrator was built using
a	Wood
b	Mesh wire
c	Portable heater and fan
d	Electrical wires
e	Thermostat
2	Desiccator
3	Muffle furnace
4	Hand Held Refractometer
5	Oven
6	pH-meter
7	Refrigerator
8	Sensitive balance
9	Water distillatory ion
10	Water bath

Methods

Grapes sample

A total of sample was obtained from (Local market) Erbil city_ KRG during the period October 2023; the samples were delivered directly to the laboratory then preserved at cold refrigerator 4-5 C.

The sample was analyzed and in duplicate for grape sample

Sample preparation and analysis for Grapes:

1-Moisture content:

Weigh accurately about 3 gm of well mixed sample in a previously dried and taredmoisture dish (about 75 mm wide and 25 mm deep). Place the dish inan air oven maintained at 100 ±2°C and dry at least for 2-3h, cool in adessicator andweigh.Repeat the process of heating,cooling and weighing untilthe differencebetween two successiveweighings is less than 1 mg Record thelowest weight (Chandrasekhar, U., 1984).

The percentage of moisture was calculated by used:

$$\% \text{ Moisture} = \frac{W2 - W3}{W2 - W1} \times 100$$

Where:

W1=mass in gm of dish, W2=mass in gm of dish + sample

W3= mass in gm of dish + dried test sample

2-Determination of Total Ash –

1. Weigh 3 – 5 gm samples in a crusble dish (7 to 8 cm dia),dry inan air oven and ash in a muffle furnace at 525- 550°C for (4 –6 hr) hrs till a white ash is obtained. Cool the dish and weigh. Keep in muffle furnace again for 1 hr, cool and weigh. Note the lowest weight and calculatetotal ash. (ISO 2173: 1978).

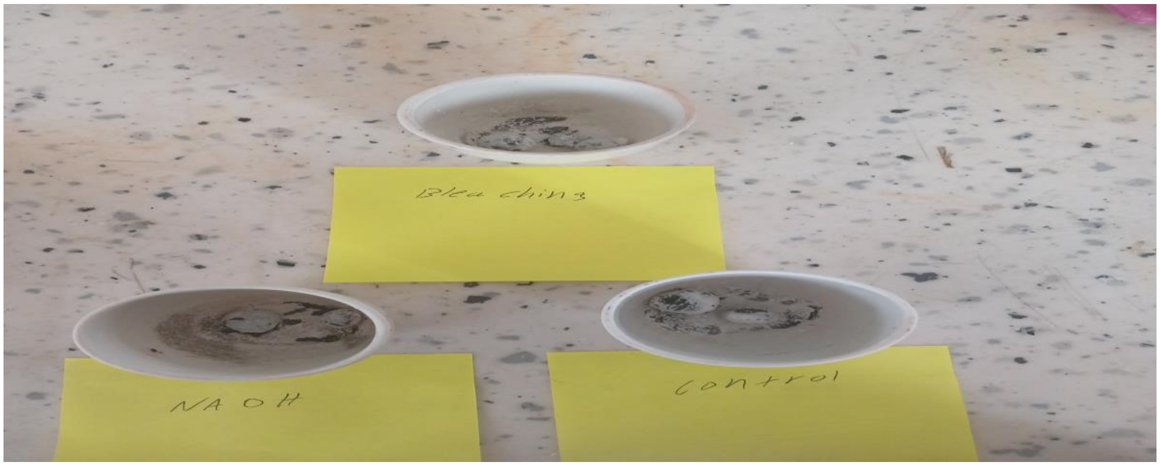
$$\%\text{Ash} = \frac{[A(g) - C(g)]}{S - C} \times 100$$

Where:

A= weight of ash + crucible (g)

S= weight of sample + crucible (g)

C= weight of crucible (g)



3-Determination soluble solid

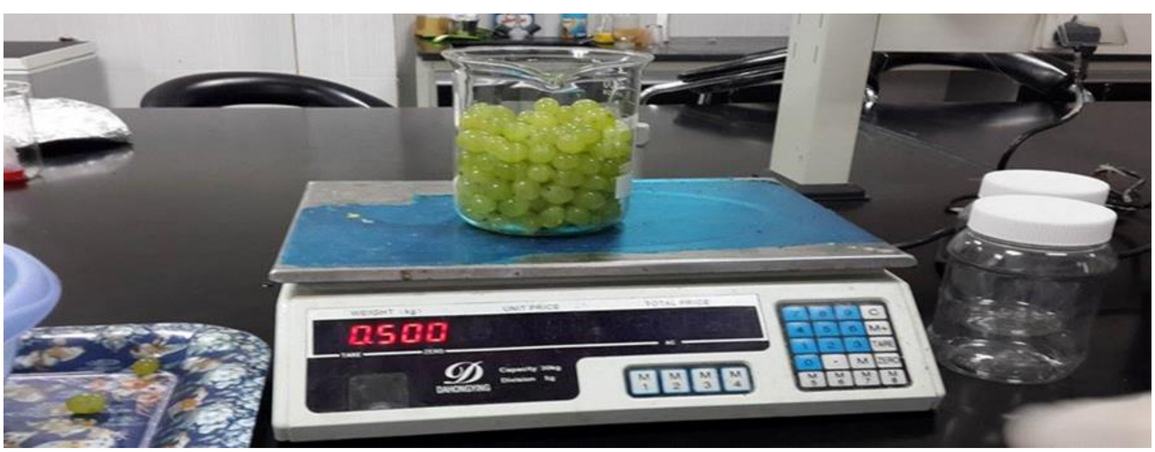
2. Put a small quantity of the test solution (2- 3 drops are sufficient) on thefixedprismof the refractometer and immediately adjust the movable prim. Suitably illuminate the field of view. Bring the line dividing the light and darkparts of the surface inthe field of view to the crossing of The threads and readthe value of refractive index. (ISO 13815: 1993)

4-**Measurement of pH:**

1. pH of samples was measured according to(pH)through electronic digital pH meter . Buffer solution of pH 4 and 7 were used to calibrate the pH meter at 25^{0}C (AOAC, No. 981).

Sample preparation for making raisins

The grapes were washed with water to remove the dust particles and contaminants.



1- Control used (not treated)

2- Two drying enhancers used:

a- Dipping solution make form NaOH (5% concentration by weight) for (3) min.

b- Blanching was carried out for (3) min. Then transferring samples into a bowl of ice water

In all three treatments the steams were remove, and dried with towel and spread in a single layer onto the trays.

Result and Dissection

Table (3.1) Physico-Chemical analysis of local seedless grapes

Grape treatment	Moisture (%)	Soluble solid (Brix)	Ash (%)	pH
Control	**78%**	**22**	**0.25**	**5.5**
Blanching	**69%**	**31**	**0.31**	**5.2**
NaoH	**73%**	**27.5**	**0.29**	**5.4**

Physio chemical analysis of local seedless grapes as shown in table (3.1). Blanched seedless grapes, NaOH dipping treatment and untreated seedless grapes were carried out with average observations .The % moisture content found in both the pretreatment of grapes was 69% for blanched seedless and 73% for NaOH grape treatment also 78% for untreated seedless grapes , the % Ash content found in both the pretreatment of grapes was 0.31% for blanched and 0.29% for NaOH seedless grape treatment also 25% for untreated seedless grapes, Total soluble solids content found in both the different pretreatment of grapes was 31% for blanched seedless and 27.5% for NaOH seedless grape treatment also 22% for untreated seedless grapes. The pH content found in both the different pretreatment of grapes was 5.2 for blanched seedless and 5.2 for NaOH grapes treatment also 5.5 for untreated seedless grapes. But for grape raisin preparation the most suitable pretreatment seedless grapes were blanched treatment because of its color and shape so it was finalized. Obtained results are at par to the results obtained by (Patidar, et.al., 2021).

Table (3.2) Drying rates for different treatments of seedless grapes

Control	Blanching	NaOH
33h	22h	28h

Drying rates for different treatments of seedless grapes as shown in table (3.2). concludes that blanching samples in hot water and treated with (0.5%) NaOH enhanced the drying rate, in comparison with untreated samples. This is in accordance to what was reported in the literature (Lokhande, S. M., & Sahoo, A. K. (2016)). The results indicate that if a 'hot' dipping is planned, the addition of NaOH to the water is not worth the cost and water blanching is sufficient. Differences in the drying rate of untreated samples did not imply a noteworthy difference in total drying time. showed shorter drying times (up to 1/3) than untreated samples.

Conclusion

Raisins have numerous advantages such as higher shelf life, commonly used as dry fruits, ease in convenience, sweet taste, value-added product, etc. The process required during the development of this product must be carefully defined in order to get higher market values and good-quality product at a lower processing cost. However, most of the review literature has summarized the important pretreatment and drying process in just one or two headings, though these are primarily important unit operations defining the cost and quality of the end product. The effect of pretreatment and drying process on the chemical and physical properties of grapes is discussed for providing useful information while selecting the technology. Thus, the review shows the potential engineering and research development done on the grape processing field. However, the area still requires further research in the processing of grape for raisins development.

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CONCLUSION

Raisins have several advantages such as higher shelf life, sweet taste, commonly used as dry fruits, ease in convenience, value-added product, etc. The process required during the development of this product must be carefully defined in order to get higher market values and good-quality product at a lower processing cost. However, most of the review literature has summarized the important pretreatment and drying process in just one or two headings, though these are primarily important unit operations defining the cost and quality of the end product. Thus, this review has focused on providing detailed knowledge about traditional, commercial, and advanced processes of the pretreatment and drying unit operations required during raisin development. Each traditional process has been well explained in a topic. The new development in pretreatment and drying process has been described in detail for the future research in further innovation of raisin processing. The effect of pretreatment and drying process on the chemical and physical properties of grapes is discussed for providing useful information while selecting the technology. Thus, the review shows the potential engineering and research development done on the grapeprocessing field. However, the area still requires further research in the processing of grape for raisins development.

The effect of abrasive pretreatment on drying rate and quality of raisins was studied and compared with chemical pretreatment in alkaline ethyl oleate solution. Grapes obtained by abrasion method and with ethyl oleate solution showed shorter drying times (up to 1/3) than untreated samples.