Archives of Current Research International

Volume 24, Issue 12, Page 10-20, 2024; Article no.ACRI.126961
ISSN: 2454-7077

Consumer Preferences for Dehydrated Vegetables

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/acri/2024/v24i12993

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/126961

Original Research Article

Received: 18/09/2024
Accepted: 22/11/2024
Published: 02/12/2024

ABSTRACT

Why do buyers purchase certain products but not others? How do they determine how much to purchase? Under what circumstances does a sensible customer spend his money and what is his goal? These are some of the important questions to which we seek answers. The overall vegetable production for 2023-24 is expected to be around 205.80 million tonnes, screening a balanced trend. Substantial growths are expected in crops like tomato, cabbage, cauliflower, tapioca, bottle gourd, pumpkin and cucumber. Globally, it has been estimated that 42% of all of fruit and vegetable calories produced are ultimately wasted. Our sample consisted of a total of 100 participants who have been consuming the dehydrated vegetables. The study was conducted in the year 2023-24. Our focus in the physical sampling exercise was on important locations around Jabalpur, MP. Due

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Cite as: *Verma, Anupama, Rishabh Patidar, and P. Shrivastava. 2024. "Consumer Preferences for Dehydrated Vegetables". Archives of Current Research International 24 (12):10-20. https://doi.org/10.9734/acri/2024/v24i12993.*

to the location VAM Agro, selection of Jabalpur, Madhya Pradesh as study area for examining scope of dehydrated vegetables with specific reference to VAM Agro Processing Private Limited was therefore quite strategic and justified. We relied on convenient sampling in picking the study participants. It was found that more male members are there in the dehydrated vegetable consumer group in comparison with females. Of the major proportion of consumers interested in dehydrated vegetables, 78% fall within the age bracket of 21-25 years. 40 per cent of the respondents use them in instant foods such as potato chips and ready-to-eat foods, citing convenience and speed. A cool, dry place was best preferred by most consumers for storing their dehydrated vegetables, as it allows quality maintenance and prevents spoilage from moisture.

Keywords: Dehydrated vegetables; consumer preferences; moisture; onion production.

1. INTRODUCTION

A consumer is an individual or a household composed of one or more individuals. The consumer is the basic economic unit that determines which commodities are purchased and in what quantities. Millions of such decisions are made each day on the more than $13 trillion worth of goods and services produced by the American economy each year. (Necula & Bădan,2020). What guides these individual consumer decisions? Why do buyers purchase certain products but not others? How do they determine how much to purchase? Under what circumstances does a sensible customer spend his money and what is his goal? These are some of the important questions to which we seek answers. {Salvatore. (n.d.).}

The Ministry of Agriculture and Farmers Welfare reveals that important horticultural crops like fruits, spices, flowers, and medicinal plants are increasing significantly. The ministry has also released the third advance estimates of the acreage and production of several horticulture crops for the 2023–2024 season. These estimates provide important insights into national trends in fruit, vegetable, and plantation crop production. They were developed using data from the States, Union Territories, and other government sources. An estimated 205.80 million tonnes of vegetables would be produced overall in 2023–2024, indicating a balanced trend. Significant increases are expected in crops like tomato, cabbage, cauliflower, tapioca, bottle gourd, pumpkin and cucumber. On the other hand, major staples like potato, onion, brinjal, elephant foot yam, and capsicum are anticipated to witness declines. Onion production is expected to reach 242.44 lakh tonne in 2023-24, marking a substantial output, although challenges remain in certain regions. Potato Three production is projected at 570.49 lakh tonne, with a noticeable decline attributed to reduced output from key states like Bihar and West Bengal (Business World, 2023).

Tomato production is estimated to increase by 4.38 per cent, reaching 213.20 lakh tonne, compared to 204.25 lakh tonne last year. This increase in tomato output is expected to stabilise prices, benefiting consumers and producers alike.

India stands second globally in the production of potatoes, cauliflower, brinjal, cabbage, and other vegetables, and is the world's top producer of onions, ginger, and okra, according to FAO (2022). The enormous production base offers India incredible export prospects. India exported fresh fruits and vegetables valued at Rs 15039.27 crore in 2023–2024, India exported fresh fruits and vegetables worth Rs. 15039.27 crores/ 1814.58 USD Millions which comprised Fresh Fruits worth Rs. 8178.22crores/ 986.32USD Millions and vegetables worth Rs. 6,861.05crores/ 828.26USD Millions. Major destinations for the Indian Processed Fruits and Vegetables are U.S.A, UAE, Bangladesh, U.K, Saudi Arab, China and Netherland.

It is estimated that 42% of the calories from all fruits and vegetables produced globally are ultimately wasted. (Lipinski et al., 2013). Vegetables are particularly susceptible to postharvest loss because of these factors as well as a lack of information sharing among supply chain partners that may result in transit delays in hot and muggy places. (Balaji and Arshinder, 2016). The food processing industry in India is also an important component in generating employment, increasing the income of farmers, providing timely products to the consumers, and meeting the food requirements of the country. (Verma & Shrivastava 2021).

The objective of this study is to find out the customers experience regarding their day to day

shopping experience, their preference and buying. The questionnaire provides the customer an opportunity to express their views and concerns which they face on a regular basis while buying Dehydrated Vegetables. (Ramachandran et al., 2020)

Dehydrated vegetables FAQ (n.d.). stated vegetables that have had their water content eliminated using a cutting-edge air-drying technique are known as dehydrated vegetables. By removing moisture, drying prolongs the shelf life of vegetables by preventing the growth of bacteria. The veggie is dried by circulating hot, dry air through it. Vegetables that have been dried lose weight and become easier to preserve. Additionally, it slows down the activity of enzymes without deactivating them. Dried vegetables are utilized as fresh vegetables by soaking them in water whenever the buyer is ready to use them. (Jayaraman & Gupta, 2020). Agri-food businesses can variously be large or small, formal or informal, public or private, national or international. Well-functioning agricultural markets and agribusinesses that are inclusive and efficient — and that optimize the sustainable production and distribution of food — are essential for a food-secure future for all. (Maestre & Henson ,2017). Dehydrated veggies have the following advantages:

- They retain many of the nutrients found in vegetables;
- They don't deteriorate, so you may keep tomatoes, red and green capsicum, chillies, and other vegetables for up to 18 months.
- They are easy to transport or store because they are compact and light.
- Dried foods are tasty, healthy, and quick to prepare; they are low in fat and safe to consume; they are simple to chop and add to your dishes.
- Only the vegetable's edible portion is dried, thus there is no waste.
- Cost Effective. (Dehydrated Vegetables. (n.d.).

2. MATERIALS AND METHODS

Due to the location VAM Agro selection of Jabalpur, Madhya Pradesh as study area for examining scope of dehydrated vegetables with specific reference to VAM Agro Processing Private Limited was therefore quite strategic and justified. We relied on convenient sampling in picking the study participants. Convenient sampling is a method to select sample through accessible participants, wherein one group of people are approachable or easily reached for data collection. Our focus in the physical sampling exercise was on important locations around Jabalpur, MP. We also visited local markets where there is usually higher purchasing of dehydrated vegetables for the hands-on experience of consumer preference and buying behaviour. (FIFESCHAW. 2006). This general approach ensured that we capture views and insights of a wide group of diverse stakeholders involved in the dehydrated vegetable market. Our sample consisted of a total of 100 participants who have been consuming the dehydrated vegetables. The study was conducted in the year 2023-24.(((Lekhna et al 2023).

Analytical Tools:

1. CAGR Percentage
2. Likert Scaling Techniques
3. Graphs and Charts Analysis

1. CAGR Percentage (Compound Annual Growth Rate): The compound growth rate will be calculating by using the exponential function of the following specification:

$$\text{CAGR} = \left(\frac{Ending\ Value}{beginning\ value}\right)^{1/N} - 1$$

Where, **N** = time in years

2. Likert Scaling Techniques: To understand participant opinions, preferences, or perceptions related to dehydrated vegetables, we used Likert scales. Participants rated statements on a scale (e.g., from “very important” to “not important”).

3. RESULTS AND DISCUSSION

The collected data was analysed and has been systematically presented below –

Analysis 1:

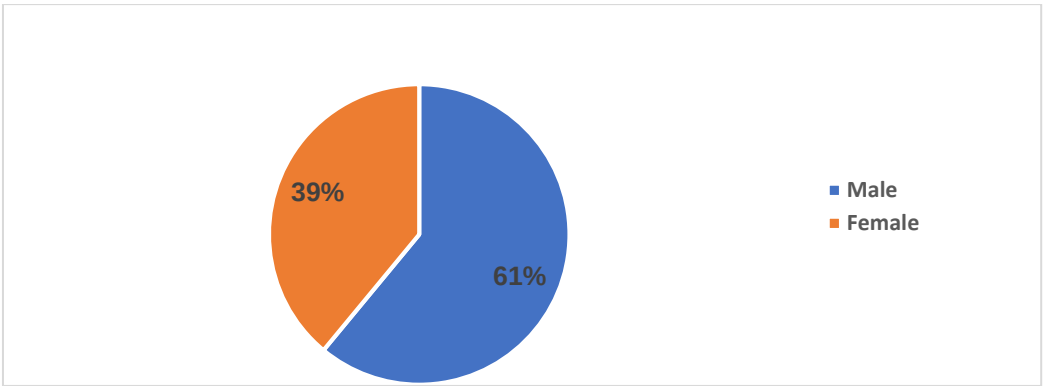

Fig. 1. Gender

Interpretation: According to the pie chart, 61 percent of consumers who are interested in dehydrated vegetables are males, while 39 percent are females. That means more male members are there in the dehydrated vegetable consumer group in comparison with females.

Analysis 2:

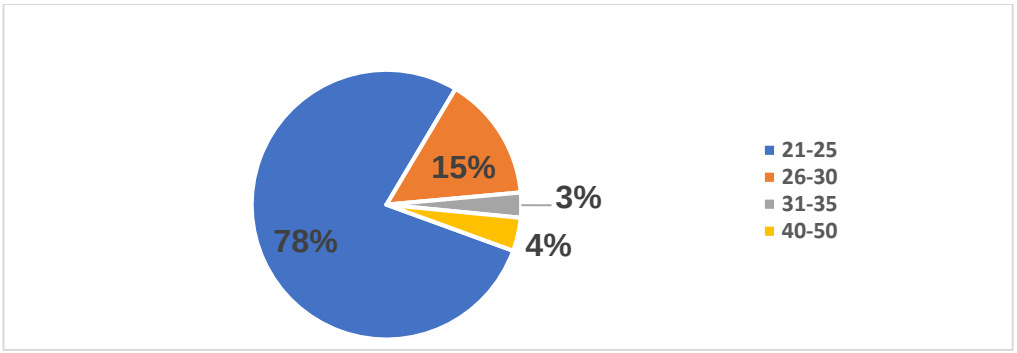

Fig. 2. Age

Interpretation: Of the major proportion of consumers interested in dehydrated vegetables, 78% fall within the age bracket of 21-25 years. The smallest percentage of consumers, only 3%, consists of those aged 40-50 years. Health benefits and ease of use are key propositions for this group. Since the age category 21-25 dominates, by far, targeting marketing strategies toward this demographic would most probably show maximum effect and engagement.

Analysis 3:

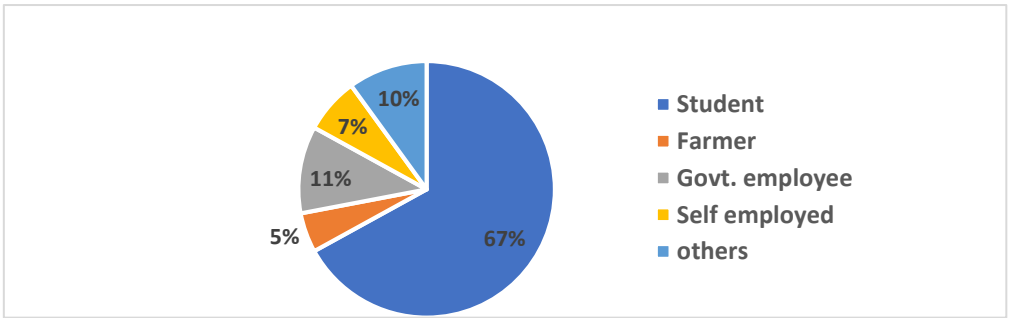

Fig 3. Occupation

Interpretation: The major group of consumers among dehydrated vegetables constitutes 67%, made up of students. They are pursued by government employees who take 11%, and the self-employed group that values the convenience adds 7%. This variation also indicates that the occupations and lifestyles noted among consumers are different.

Analysis 4:

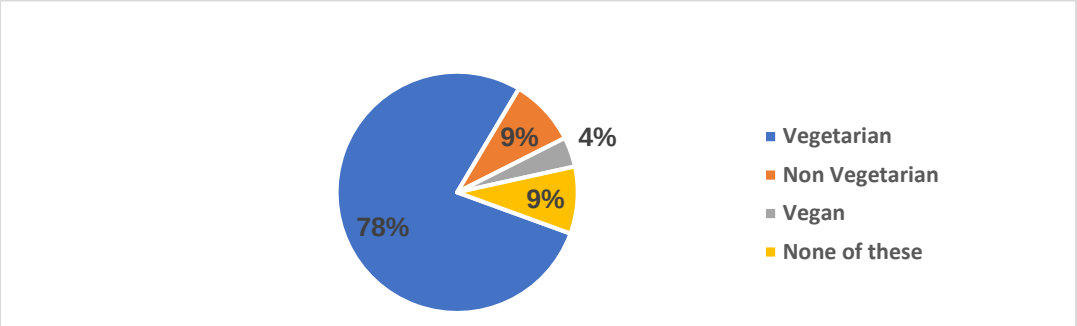

Fig. 4. Diet usually Follows

Interpretation: Of these, 78% of consumers of dehydrated vegetables are those interested in a vegetarian diet. It means that they mainly consume vegetables and thus consider dehydrated ones convenient for them. Non-vegetarians form 9% of the consumers who consider the convenience of the above-mentioned products despite different dietary habits or preferences. These segments indicate the diverse nature of diet-related preferences of the buyers of dehydrated vegetables.

Analysis 5:

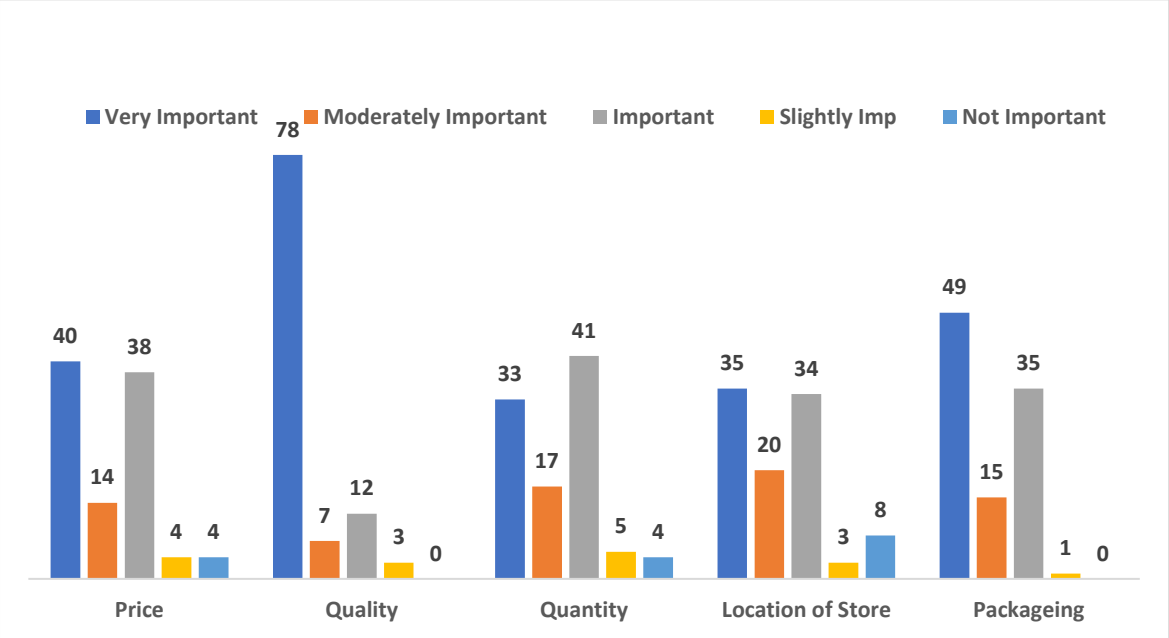

Fig 5. Consumer Overview

Interpretation: Different aspects become more salient to customers while making the purchases of dried vegetables. Price is a significant aspect, according to forty percent of the respondents, illuminating a real price sensitivity phenomenon. Quality is considered very significant by seventy-eight percent of them, and quantity is considered important by forty-one percent of them. The location of the store also comes from the results as being very important to thirty-five percent of them.

Packaging, which forty-nine percent of them consider very important, influences the perception of product quality and the appeal.

Analysis 6:

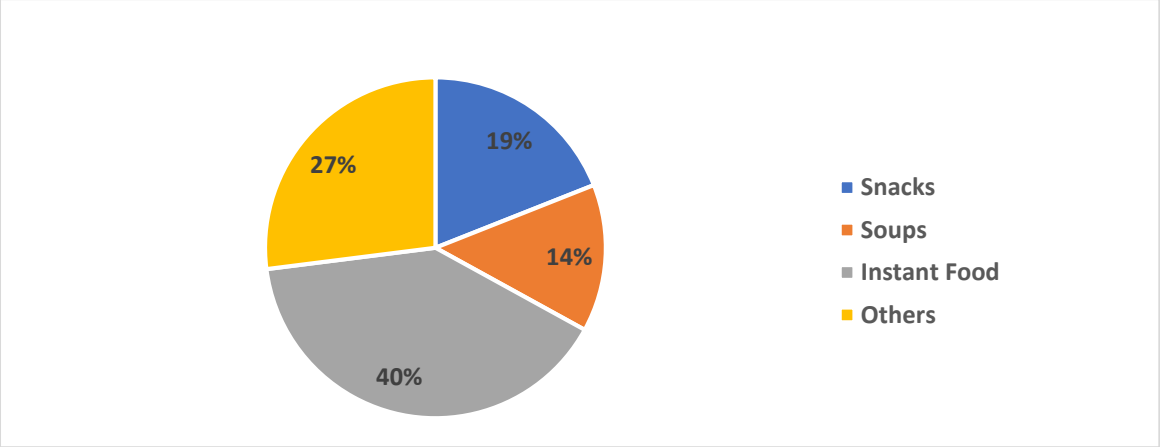

Fig. 6. Application

Interpretation: A closer look will reveal that dried vegetables meet a number of demanding consumer needs where their inclusion comes in handy. First, 40% of the respondents use them in instant foods such as potato chips and ready-to-eat foods, citing convenience and speed. Another 19% like them because they are quick, healthy snacks that are also easy to carry-about. The third-biggest application area, at 14%, is soups, where dehydrated veggies bring flavor and nutritional value aboard, and conveniently should make life easier for meal makers.

Analysis 7:

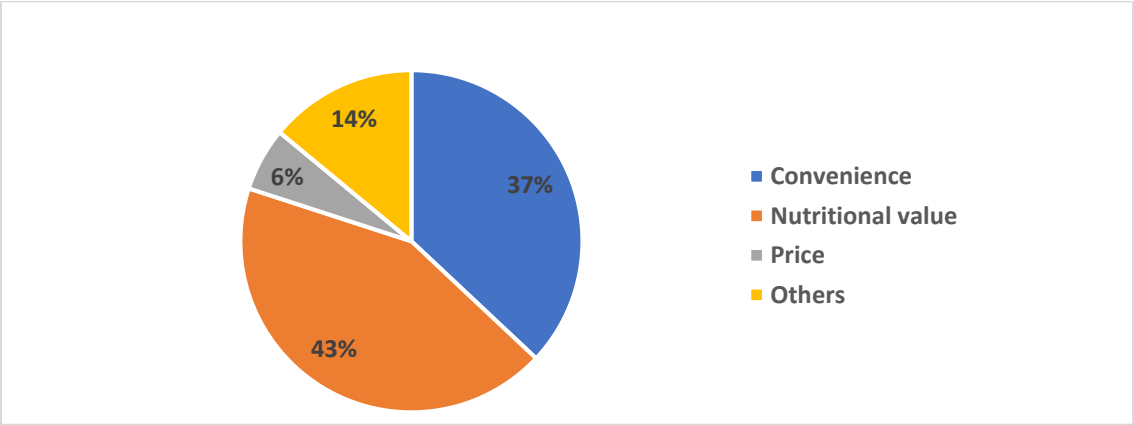

Fig. 7. Primary Reason for Use

Interpretation: Consumers apply great importance to two things when it comes to choosing dried vegetables. The largest segment, 43%, is driven by the nutritional value in which consumers look for sound and healthful products that still hold their vitamin and mineral values. This suggests a wider trend of consumers caring about general well-being in their food choices. The second most important factor is convenience, at 37%, which cites the fact that dehydrated vegetables are easy to store and prepare; it fits well with busy lifestyles, underlining that they are practical food.

Analysis 8:

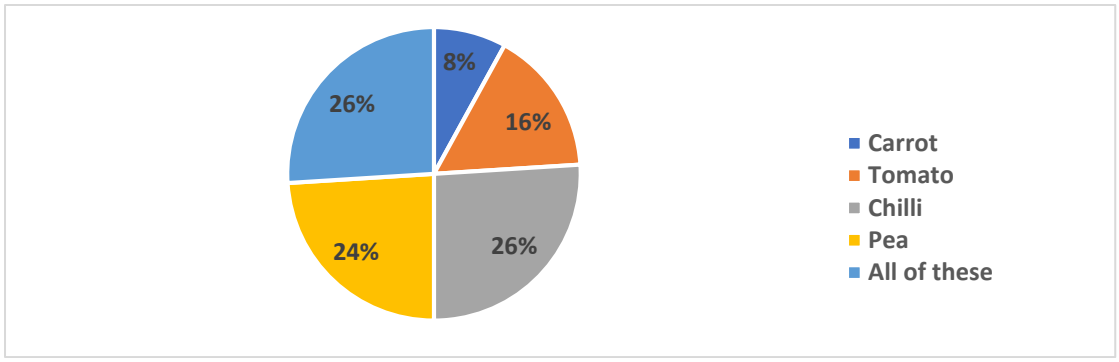

Fig. 8. Dehydrated Vegetables Consumed most Frequently

Interpretation: Customer preference in dehydrated vegetables stands at 26% for chili, which provides spicing and flavor to the food; 24% preference for peas, and beans which have a mild natural taste and can be accommodated in several recipes. Tomatoes at 16%, with its rich umami flavour, enlighten sauces and stews; 8% favour carrots, which are sweet and filed with nutritional benefits matched with several dishes. A striking 26% of consumers love this mix of all these vegetables, underlining that they love diversity in their food preferences. (Abreu et al.,2023)

Analysis 9:

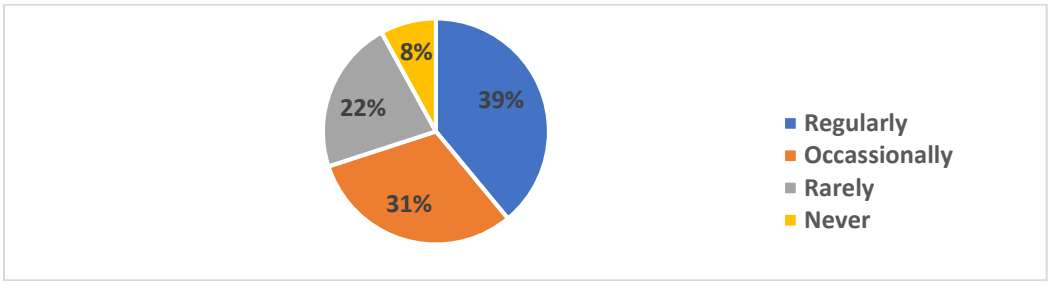

Fig. 9. In Cooking

Interpretation: Indeed, 39% of the respondents claimed they had already adopted the use of dehydrated vegetables into their cooking practices, making it a process fully completed by many. The use of such products occasionally was reported by 31% of the respondents, which may refer to singular dishes or times when fresh alternatives are scarce. A small percentage, 22%, said that they would rarely use these dried products, obviously preferring fresh produce or having less exposure to the dehydrated alternative.

Analysis 10:

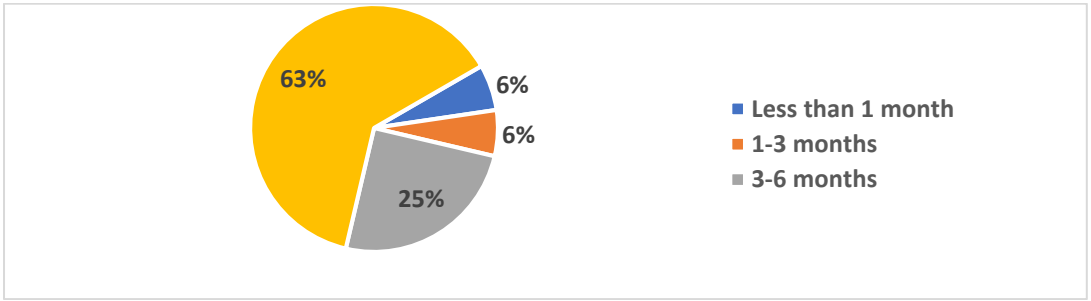

Fig. 10. Freshness

Interpretation: The majority of consumers, 63%, consider the shelf life of dehydrated vegetables as being over six months, proving to have high trust in these products' long-term freshness, accompanied by a high level of quality. Just 25% of consumers consider the freshness to stay as for about three to six months, meaning that they may use such products more occasionally or for a particular occasion. An even smaller percent, 6% of participants, believes the freshness lasts for only 1–3 months, likely using them much faster when needed in certain recipes or for seasonal uses.

Analysis 11:

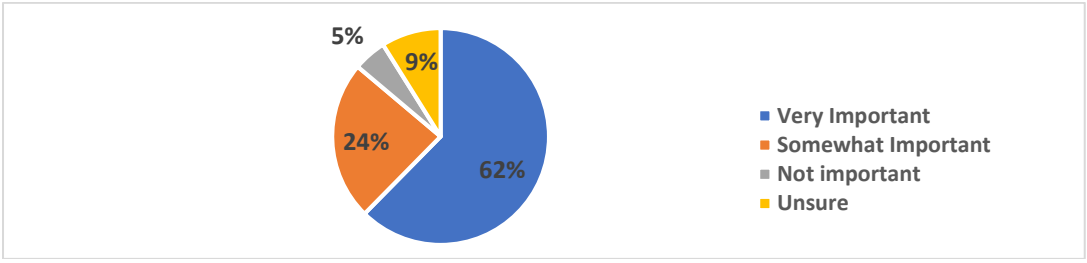

Fig. 11. Nutritional Content

Interpretation: The largest segment of consumers, 62%, considers dehydrated vegetable nutritional content very important, indicating that most consumers are health-conscious and prioritize nutrition in the products they buy. Another 24% find the nutritional content somewhat important. This means that they find nutrition very important, but there may also be other factors that they consider alongside this. A smaller group, 9%, does not find the nutritional aspect important at all, likely to look at facets like the taste, convenience, or cost.

Analysis 12:

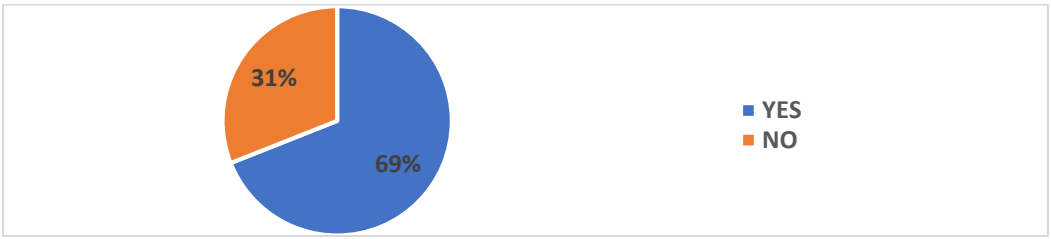

Fig. 12. Health Benefits

Interpretation: The larger group, constituting 69% of the tested respondents, feels that through such foods their state of health is often healthier, indicating that dehydrated veggies are healthy for them to take. On the other hand, 31% of the respondents do not feel there are significant health benefits and imply that they believe dehydrated vegetables are not likely to have significant health benefits.

Analysis 13:

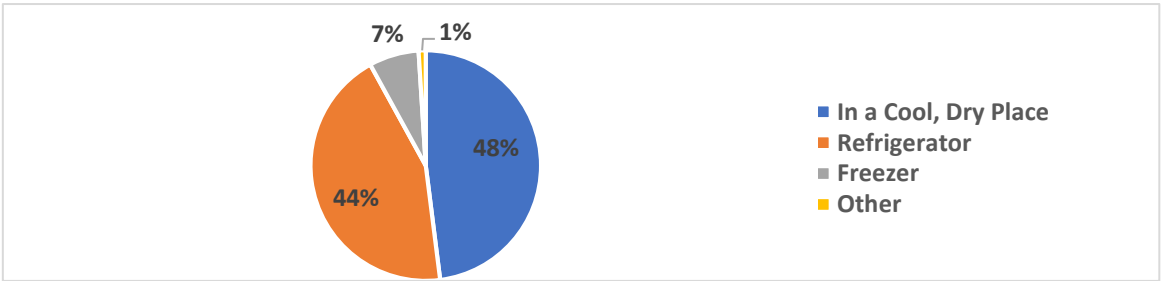

Fig. 13. Storage

Interpretation: A cool, dry place was best preferred by most consumers for storing their dehydrated vegetables, as it allows quality maintenance and prevents spoilage from moisture. A high percentage, 44%, prefers to store the product in the refrigerator, which inevitably offers better control. Dehydrated vegetables are frozen by only 7%, which is common, since freezer space might be a limitation, or because texture changes may occur.

Analysis 14:

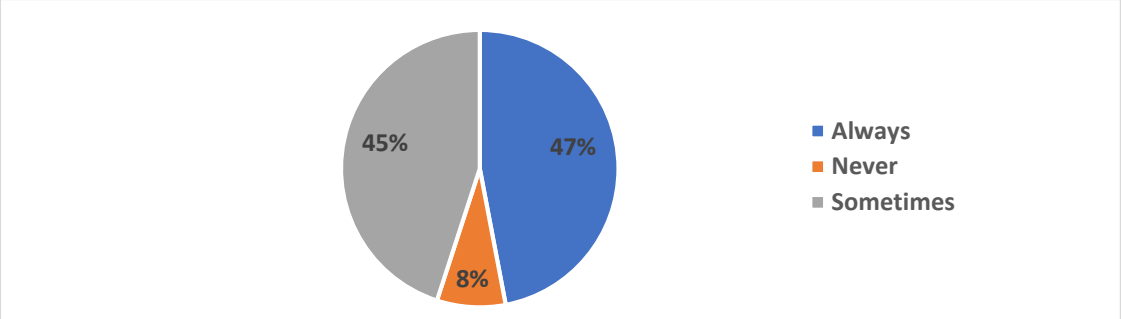

Fig. 14. Recommendation

Interpretation: A similar pattern was observed in the responses to the question of when to use dehydrated vegetables. The largest share of the respondents, 47%, always recommend dehydrated vegetables. They believe that they should be a part of people's diets all the time. The similar proportion, 45%, sometimes recommend dehydrated vegetables.

The market for dehydrated vegetables is expected to see significant growth by 2030, driven by evolving consumer demands, technological advancements, and changing global food trends. Dehydrated vegetables are widely used in soups, snacks, sauces, and seasoning mixes. As the demand for these types of processed foods grows, so too will the use of dehydrated vegetables in industrial food manufacturing. (Robinson & Humphrey,2015). As consumer lifestyles become increasingly fast-paced, the demand for convenient and easy-to-prepare food options is rising. Dehydrated vegetables, which offer long shelf lives and require minimal preparation, are well-positioned to meet this demand. Technologies such as freeze-drying and vacuum dehydration are improving the quality of dehydrated vegetables, better preserving nutrients, flavor, and texture. These innovations could increase consumer appeal by making dehydrated vegetables more comparable to fresh produce in terms of taste and nutritional content. (Barham,2015).Overall, by 2033, the dehydrated vegetables market is expected to benefit from a combination of consumer demand for convenient, nutritious, and sustainable food options, as well as technological advancements in dehydration methods.

4. CONCLUSION

From the above findings it may be concluded that more than half of the respondents surveyed were male, around three-fourths of the respondents were within the age group of 21-25 years and 67 per cent of them were students. Just more than three -fourths of them were vegetarians, while 40 percent of those surveyed stated that price of the product was an important criteria in making a purchase decision.

63 percent of those surveyed stated that the shelf life of these vegetables was around six months. Just around 70 per cent of the respondents believed that it is healthy to consume dehydrated vegetables. Nearly 90 per cent of the respondents were of the view that the dehydrated vegetables should be stored in a cool dry place and 40 per cent of them said that refrigerator is an ideal place for storage. Out of the total respondents surveyed nearly half of them recommend that dehydrated vegetables should be always used as a part of our food/ menu whereas only 8 per cent of them said that dehydrated vegetables should never be used at all.

5. LIMITATION

Dehydrated vegetables are a convenient and shelf-stable option, they may not always be the

best choice in terms of nutrition, texture, and flavor, and there are practical considerations around cost and rehydration that consumers should keep in mind.(Principles of macroeconomics. n.d.). Not all vegetables are suitable for dehydration. Some, like leafy greens or high-water content vegetables like cucumbers or lettuce, don't dehydrate well or may lose too much of their original quality upon rehydration. The dehydration process can lead to the loss of certain vitamins and minerals, particularly vitamin C and some B vitamins, while the nutrient loss is generally minimal, it can be significant for some varieties of vegetables. (Robinson & Humphrey,2015)

The texture of dehydrated vegetables is often compromised. When rehydrated, they may not return to their original state and can be softer or more fibrous. The taste might also be less vibrant than that of fresh vegetables. Some vegetables rehydrate poorly or unevenly, leading to inconsistent results when cooking. This can be particularly problematic for dishes that require specific textures, like salads or stir-fries.

The food industry is introducing more and more food that are easy and quick to prepare ,since the consumption of goods requires time which is also limited time often represents another constraint face by consumer, this explains the increasing popularity of ready to eat foods and the use of many other time saving goods and services but the cost of saving time can be expensive sometimes. (Salvatore. n.d.). Dehydrated vegetables can be more expensive than fresh or frozen alternatives, especially if they are organic or processed using specialized techniques. While they have a long shelf life, proper storage is necessary to prevent spoilage or loss of quality over time.

Dehydration often intensifies flavors, which might not always be desirable. For example, a vegetable's natural sweetness or bitterness can become more pronounced, affecting the overall dish. The use of preservatives or additives in some commercial dehydrated vegetable products may concern consumers who prefer natural foods. Additionally, those with dietary sensitivities may need to avoid certain brands that add salt or other chemicals during processing. The cost and storage requirements can also be higher compared to fresh or frozen options. Overall, while dehydrated vegetables can be a valuable resource in certain contexts, such as emergency preparedness or long-term storage, they may not always be the best alternative for everyday consumption due to these various challenges.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/126961