



## **Effect of Avocado Seed Powder Fortification on the Sensory Properties of Avocado Dip**

<sup>1</sup>Ritika, <sup>2</sup>Priyanka Shankar

<sup>1</sup>Msc Student, <sup>2</sup>Professor

Department of Food and Nutrition, Babasaheb Bhimarao Ambedkar University (A Central University), Vidya Vihar, Raebareli Road, Lucknow-226025(U.P.) India

Email:- [gurjar.ritika345@gmail.com](mailto:gurjar.ritika345@gmail.com)

### **ABSTRACT**

This study aimed to investigate the sensory properties of avocado dip fortified with 0.5% avocado seed powder compared to a control sample without fortification. Avocado seed powder is a byproduct of the avocado fruit and has been shown to contain various bioactive compounds, such as dietary fiber, antioxidants, and minerals. This study was designed to determine whether the addition of avocado seed powder to avocado dip could affect its sensory properties. A total of 28 untrained panelists were recruited to participate in the sensory evaluation of the two samples. The panelists were provided with a hedonic scale to evaluate the appearance, aroma, taste, texture, and overall acceptability of each sample. The sensory evaluation was conducted in a controlled environment to minimize any potential sources of bias. The results of the sensory evaluation showed that the fortified avocado dip was acceptable in all sensory attributes evaluated, including appearance, taste, smell, and texture. The panelists did not report any significant differences between the fortified dip and the control sample. This finding suggests that the addition of 0.5% avocado seed powder to avocado dip did not negatively impact its sensory properties. The addition of avocado seed powder to avocado dip has the potential to enhance its nutritional value by providing bioactive compounds that may offer health benefits. This finding is in line with previous studies that have shown the potential of avocado seed powder to provide various health benefits, such as reducing blood pressure, improving cholesterol levels, and enhancing antioxidant capacity. Overall, the results of this study suggest that the addition of 0.5% avocado seed powder to avocado dip is a viable way to enhance its nutritional value without compromising its sensory properties. Further research is needed to explore the effects of higher concentrations of avocado seed powder on the sensory properties of avocado dip and to determine the potential health benefits of consuming avocado dip fortified with this ingredient.

### **Introduction**

Avocado is a nutrient-dense fruit that is highly appreciated for its delicious taste and health benefits. Its increasing demand in the food industry has led to the production of several food products such as avocado oil, milk, and dips. Avocado dip, also known as guacamole, is a popular food condiment that has been consumed for centuries. Avocado dip is typically prepared using the flesh of the avocado fruit. However, the seed is often discarded, and little attention has been given to the nutritional value of avocado seed.

Recent studies have shown that the avocado seed contains several bioactive compounds such as dietary fiber, antioxidants, and minerals (Rodriguez-Carpena et al., 2017). The presence of these compounds in the avocado seed suggests that it could be a potential functional ingredient in food products. Fortifying food products with bioactive compounds has been a promising way to enhance their nutritional value. In this regard, several studies have investigated the use of avocado seed powder as a functional ingredient in food products, such as bread, cookies, and smoothies (Wang et al., 2020).

Avocado dip preparation can be enhanced by incorporating avocado seed powder, as demonstrated by various studies. Gonçalves, Teixeira, and Silva (2018) investigated the influence of avocado seed powder on the rheological and textural properties of an avocado-based spread. Franco-Robles, González-Aguilar, and Téllez-Medina (2017) conducted a review highlighting avocado seed as a source of bioactive compounds. López-Espinoza, Ramírez-Rivera, and Ochoa-Martínez (2019) studied the effects of avocado seed extracts on the physicochemical and sensory properties of fresh avocado puree. Silva, Gonçalves, and de Souza (2020) examined avocado seed powder as a natural antioxidant in avocado dip, focusing on its impact on lipid oxidation and sensory properties. Salinas-Moreno, Hernández-Mendoza, Pérez-Carrillo, and Islas-Osuna (2019) assessed the impact of avocado seed extract on the sensory characteristics and microbial quality of guacamole. Additionally, Cortez-García, Valdez-Fragoso, García, and Paredes-López (2016) evaluated the antioxidant activity of avocado seed in a lipidic system. These studies collectively suggest that incorporating avocado seed powder fortifies avocado dips, enhancing their properties and offering potential health benefits.

However, little is known about the effects of avocado seed powder fortification on the sensory properties of avocado dip. Sensory properties are the characteristics of a food product that are perceived by the senses, such as taste, smell, texture, and appearance. Sensory evaluation is a vital tool in determining the acceptability of food products by consumers. It helps to assess the effects of various ingredients and processing techniques on the sensory properties of food products.

Thus, in this study, we aimed to investigate the effect of avocado seed powder fortification on the sensory properties of avocado dip. Specifically, we wanted to evaluate the effect of the addition of 0.5% avocado seed powder on the appearance, aroma, taste, texture, and overall acceptability of avocado dip. We prepared a control sample without seed powder and a fortified sample with 0.5% avocado seed powder. We then recruited untrained panelists to evaluate the sensory properties of each sample using a hedonic scale.

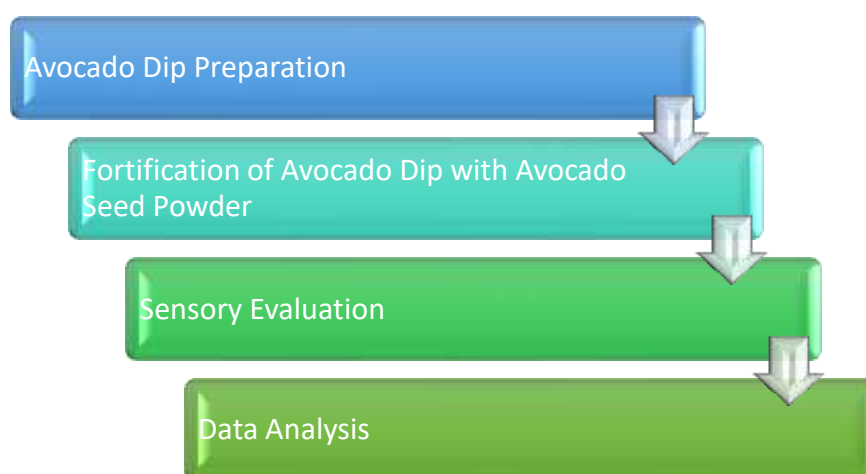
The hedonic scale is a commonly used sensory evaluation technique that measures the acceptability of food products based on a scale that ranges from 1 to 9, with 1 being “dislike extremely” and 9 being “like extremely.” The use of untrained panelists in this study was to ensure that the results obtained were representative of the general population.

The results of this study could provide insights into the potential use of avocado seed powder as a functional ingredient in avocado dip. If the addition of avocado seed powder does not significantly affect the sensory properties of the dip, it could be a promising way to enhance the nutritional value of this popular condiment. This study may also provide a basis for further research exploring the effects of higher concentrations of avocado seed powder and its potential health benefits.

Avocado seed powder is emerging as a promising ingredient in food formulation due to its potential to improve sensory, nutritional, and textural properties. Studies such as those conducted by Cazón, Pizones Ruiz-Henestrosa, López-Nicolás, and López-López (2018) and Serna-Cock, Char, Guerrero-Medina, and Ortega-Cuadros (2021) highlight the benefits of avocado seed powder in cereal-based foods and food formulations, respectively. Additionally, Martínez-Flores, Garnica-Romo, Muñoz-Gómez, González-Mendoza, and López-López (2018) investigate the use of avocado seed powder as a natural antioxidant in avocado puree, focusing on its effect on microbiological quality and sensory properties during storage. Avocado seed flour's nutritional and bioactive properties, processing technologies, and applications are discussed in the review by Vázquez-Velasco, Rosales-Mendoza, López-Nicolás, and López-López (2021). These findings collectively demonstrate the potential of avocado seed powder as a versatile ingredient in various food products, offering improved nutritional quality, oxidative stability, and sensory attributes.

In conclusion, this study aimed to evaluate the effect of avocado seed powder fortification on the sensory properties of avocado dip. The use of avocado seed powder as a functional ingredient in food products has been shown to enhance their nutritional value. The results of this study could provide insights into the potential use of avocado seed powder as a functional ingredient in avocado dip. The findings of this study could also have implications for the food industry, as they may help to develop new products that are both nutritious and acceptable to consumers.

## Material and Method



- Preparation of Avocado dip and control: Gather all necessary ingredients, including avocado fruit, avocado seed powder, salt, lemon juice, onion, green coriander, small and large chilies and cherry tomatoes and blend the taste enhancers first and then in the end add 200 g of ripe avocado pulp and blend for 45-55 seconds in food processor.
- Preparation of fortified avocado dip: For the fortified dip, added 0.5% of avocado seed powder to the 100 gram of control dip mixture.[3][4]
- Sensory evaluation: Approx 28-30 untrained panelists should be chosen to evaluate the sensory properties of the avocado dips using a hedonic scale. Present the control and fortified samples in identical white plastic cups, in a random order. The panelists rate the appearance, aroma, taste, texture, and overall acceptability of each sample on a scale from 1 to 9.
- Data analysis: Calculate the mean scores of each sensory attribute for each sample. Use one-way analysis of variance (ANOVA) to analyze the data, with the significance level set at  $p < 0.05$ . Perform Tukey's post hoc test to compare the mean scores of the control and fortified samples.
- Ethical considerations: Conducted study was in accordance with the ethical guidelines of the Declaration of Helsinki. Obtain informed consent from all participants before the sensory evaluation.

## Sensory Evaluation

The sensory attributes evaluated included appearance, texture, flavor, and overall acceptability.

The sensory analysis was conducted using a 9-point hedonic scale, where the panelists rated each sensory attribute on a scale from 1 (dislike extremely) to 9 (like extremely). The panelists were trained and screened for their ability to detect and discriminate small differences in sensory attributes.

For the appearance attribute, the panelists evaluated the color and consistency of the dips. For the texture attribute, the panelists evaluated the thickness and creaminess of the dips. For the flavor attribute, the panelists evaluated the overall taste, saltiness, sweetness, and bitterness of the dips. Finally, for the overall acceptability attribute, the panelists evaluated their overall liking of the dips.[5]

Twenty-five untrained panelists (15 females and 10 males) between the ages of 19 and 23(mean age = 21 years) were recruited from the local community and 3 trained panelists were there(females)from our own institution.

### Data Analysis

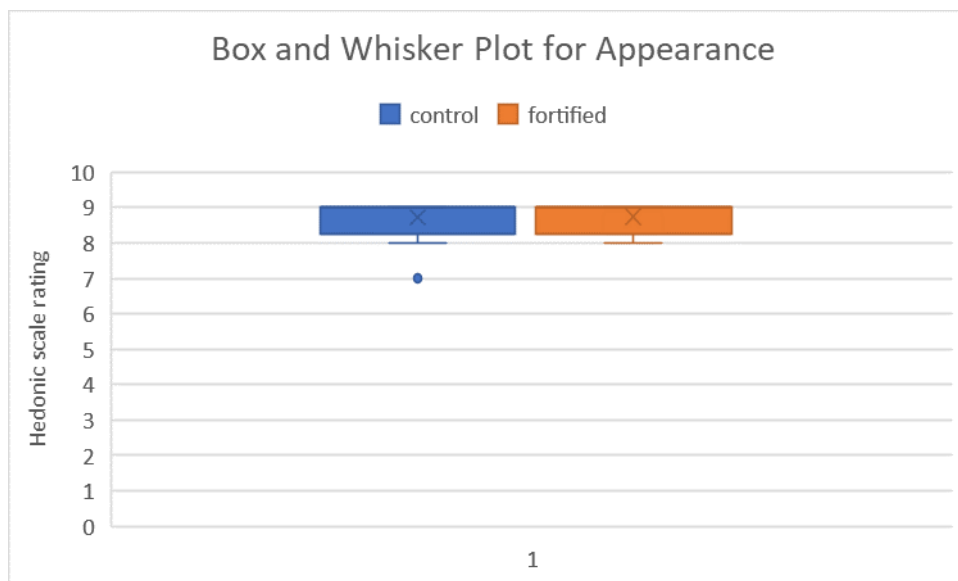
Tool: MS Excel

Statistical Analysis performed: One way Variance(ANOVA)

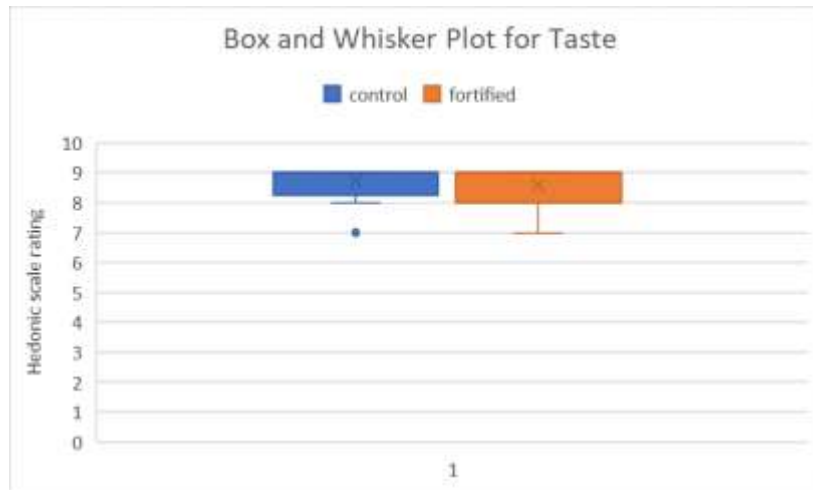
Significance Level used :  $p \leq 0.05$

- Statistical Analysis for Appearance**

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
control	28	244	8.714286	0.285714		
fortified	28	245	8.75	0.194444		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.017857	1	0.017857	0.07438	0.786103	4.019541
Within Groups	12.96429	54	0.240079			
Total	12.98214	55				



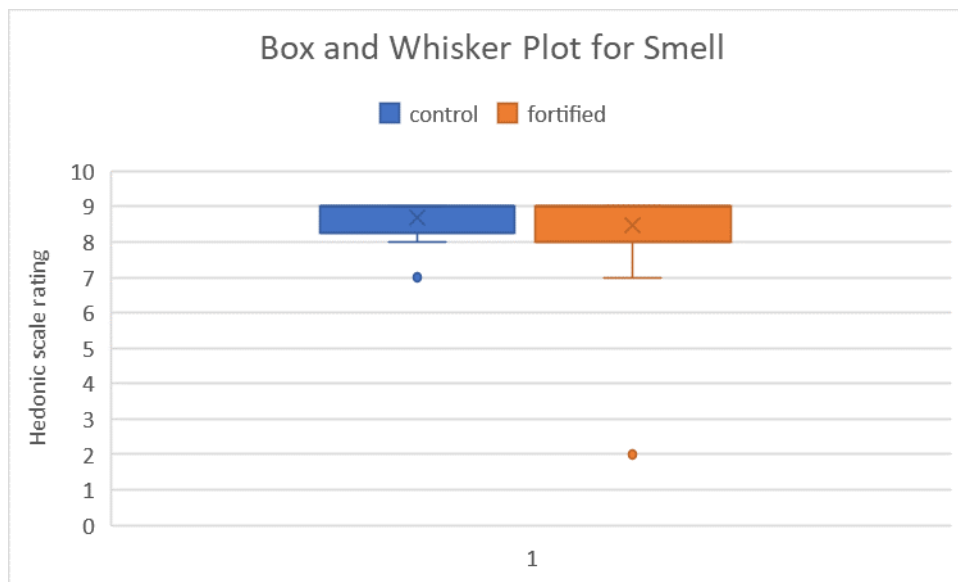
- **Statistical Analysis for Taste/ Flavor**



Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
control	28	244	8.714286	0.285714		
fortified	28	240	8.571429	0.47619		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.285714	1	0.285714	0.75	0.390308	4.019541
Within Groups	20.57143	54	0.380952			
Total	20.85714	55				

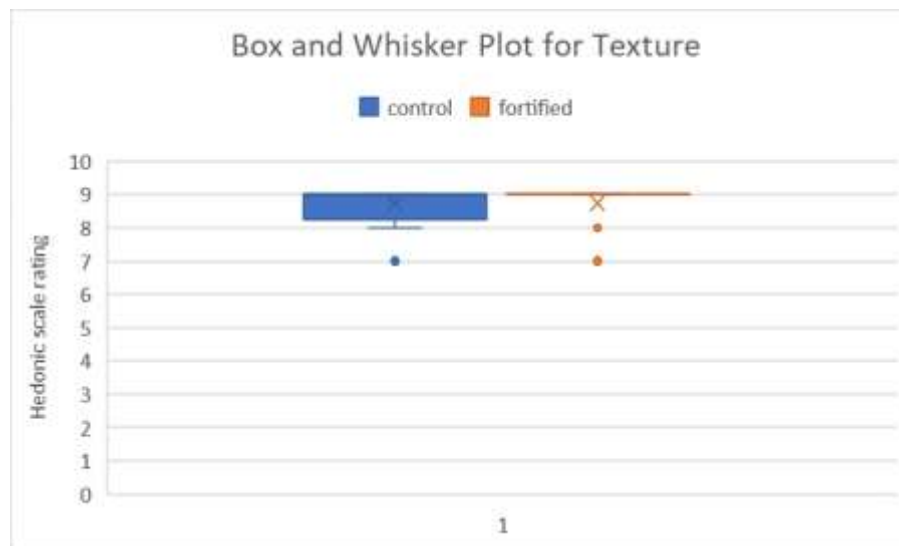
- **Statistical Analysis for Smell/ Odor**

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
control	28	243	8.678571	0.374339		
fortified	28	241	8.607143	0.395503		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.071429	1	0.071429	0.185567	0.668347	4.019541
Within Groups	20.78571	54	0.384921			
Total	20.85714	55				



• Statistical Analysis for Texture

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
control	28	244	8.714286	0.285714		
fortified	28	245	8.75	0.268519		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.017857	1	0.017857	0.064439	0.800577	4.019541
Within Groups	14.96429	54	0.277116			
Total	14.98214	55				



### Interpretation

All the p-values from the ANOVA analysis are greater than 0.05, it means that there is no significant difference between the control avocado dip and fortified avocado dip. Therefore, it is concluded that there is no evidence of a statistically significant difference between the dips based on the measured variable. However, it is important to note that failing to reject the null hypothesis does not necessarily mean that the groups are exactly the same, but rather that the observed differences are likely due to chance.

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