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Studies on the Utilization of Orange Peel Powder in the Development of Food Product

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Abstract: ***Citrus fruit is an integral part of a healthy breakfast and thus promotes the beginning of a healthy every day. Orange is known for many health benefits and is one of the most popular all over the world. Citrus fruits (citrus) have a variety of vitamins, minerals, and antioxidants such as flavonoids, anthocyanins, phenolic acids and carotenoids as well as the presence of many nutrients such as fiber to have a positive effect on health immunity - such as the stomach and digestive system. All these act as anti-infection, anti-cancer and anti-anti-bacterial properties. The main objectives of the study are to assess the organoleptic characteristics of the finished product, determine the nutritional values of the finished product, preserve the finished food product, and the cost of the finished product at the core of the raw material. During the research, powders utilization from orange peel with 100 grams of refined flour were included in the 0 percent, 5 percent, 10 percent and 15 percent levels. Biscuits were prepared by utilizing powder made from the orange peel. The product scores sensory evaluation with the help of a nine-digit Hedonic scale score card, was among the five teachers selected from the Faculty of Home Science Department. In which it was found that T_1 in the colour and texture of biscuits incorporation from orange peel powder. The highest score given to T. (7 8) was given to T. (7 8) due to the bitterness of powder made from orange peel based on taste and flavour. (6.7). T.2 (5.7) A score higher than T.3 (4.8). The increase in the amount of energy, protein, fat, carbohydrate calcium and iron in those food products was observed when the powder produced from orange peel in the food product increased and the amount of fat in the powder made from the orange peel was not increased. Thus, these biscuits were also preserved for 45 days. In the end the cost of the product based on raw materials. The average cost per 100-gram biscuit is $T._0$ control Rs 15.31, $T._1$ Rs 14.54, $T._2$ Rs 13,77, $T._3$ Rs 13.01***

Keywords: orange fruit, powder made from fruit peel, biscuit, hedonic scale scorecard, nutrients, preservation, Cost

1. Introduction

Citrus fruit is one of the most popular fruits in the country. These fruits are the most consumed fruits in the world. These crop crops produced around the world from an important group. It is a major producer of citrus fruits in India. They are produced all over in India but the major producers are in the states of Maharashtra, Tamil Nadu, Andhra Pradesh, Punjab, and Haryana. The oranges of Nagpur are famous worldwide due to their size and aroma. Citrus fruits include oranges, lemons, mausambi, grapes, and sweet oranges. All these are mostly used for purposes like squash, juice, sorbet, jam, pickles etc. Owns its popularity for variety of fruit flavour. **(Rajiv Kumar, 2015)**

Food is found as raw fruit in industry. Such as puree, sorbet, pickle, and jam - jelly etc. The essential oils derived from these fruits are used in cosmetics use, and waste materials (peels) separated from fruits in organic from are also used in pharmaceutical industry.Citrus fruits (citrus) have a variety of vitamins, minerals, and antioxidants such as flavonoids, anthocyanins, phenolic acids and carotenoids as well as the presence of many nutrients such as fiber to have a positive effect on health immunity - such as the stomach and digestive system. **(Shafi'i Rafiq, 2018)** These all act as anti-infection, anti-cancer and anti-antibacterial properties.**(Rafaella Guimaraes, 2010)** orange fruit one of nature's finest gifts. This citrus fruit is the most popular wide spread.

Oranges are the fruit of the citrus-sinensis family native to China, also called sweet oranges. Vitamin C is an excellent source of oranges. Vitamin 'C' is also important for the proper function of many healthy immune systems. Oranges can be not only as a snack, but also as a major prescription ingredient in various dishes. Orange juice is an integral part of a healthy breakfast and thus promotes a healthy start every single day. Orange is known for many health benefits and is one of the most popular all over the world. **(Times of India, 2019)** Vitamin C 'is the primary water-soluble antioxidant in the body, which destroys free radicals and prevents damage to cells. Oranges are considered as the best source of many vitamins such as thiamine and folic acid. These thiamine and folic acid increase the growth, development of the muscles, bones, red blood cells of the human body, keep the skin healthy, and form the hormonal glands.

Since ancient times, 70 percent of the total production of oranges is used for the manufacture of derivative products, but 30 percent of processed fruits are converted into citrus peels waste, so these wastes contain many nutrients. Fruit peels act as a protective coating, which protects the underlying edible parts of fruits from environmental factors as well as micro-organisms and enzymes. Depending on their thickness and taste, they are sometimes accepted as fruits, often people throw away their peels while using fruits, while the nutritional properties of these fruits are also found in its peels. They help protect our body from many diseases and increase disease resistance. Apart from this, various types of dishes, cosmetics and medicines are also prepared by using these nutritious peels properly. **(Youssef, 2007)**

According to the World Health Organization (2003) report, "Dietary nutrition and prevention of chronic disease." Provides protection from heart disease due to folate present

in citrus fruits, which is essential to lower levels of heart. Potassium helps lower blood pressure, prevents stroke and kidney disease, and vitamins, carotenoids, and flavoids are found in citrus fruits, all of them as protective cardiovascular effects.

2. Natural benefits and curative properties of orange fruit

- **Fever-** Orange is an excellent food in all types of fever. Orange fruit keeps the body temperature under control. When the digestive power of the body is severely impaired, only in fever, the patient suffers from blood poisoning called toxaemia, often destroying water thirst and desire for food. Orange fruit is very helpful in removing these deficiencies. Orange juice is the most ideal liquid food in typhoid like fever and measles. It gives energy, increases urine output and boosts the body's resistance against infection, thereby keeping the body healthy quickly.
- **Indigestion -** Orange is an effective food for indigestion of food items. It relaxes the digestive organs and most readily supplies nutrition in assimilation form. It also stimulates the flow of digestive juices which improves digestion and increases appetite. This creates a suitable condition for the growth of friendly bacteria in the intestines.
- **Constipation-** Orange fruit is beneficial in treating constipation. Taking one or two oranges at bedtime is a great way to stimulate intestinal activity in the morning. The normal stimulant effect of orange juice stimulates peristaltic activity and helps prevent the accumulation of food additives in the colon, leading to fortification and auto-intoxication.
- **Bone and tooth diseases-** This fruit is valuable in bone and tooth diseases due to it being an excellent source of calcium and vitamin 'C'. Disorders in tooth structure usually result from deficiency of vitamin 'C' and calcium. Sufficient intake of oranges can control these diseases.
- **For new born baby-** Orange juice is considered to be an excellent food for infants, giving 15 to 120 ml of orange juice daily to children who are unable to breastfeed needed. It helps in prevention of scurvy and rickets and in the growth and development of the body.
- **Heart disease-** Orange juice with honey is very beneficial in heart diseases. The use of orange juice with honey is a very safe liquid food solution in chronic conditions such as coronary, ischemia and myocardial infarction. Using a pinch of salt and a tablespoon of honey mixed with juice of the vinegar prevents an effective infection for asthma, cold, oncitis, and other conditions of cough.

3. Need for study

During the preparation and consumption of orange fruits, large quantities of fruit peels, pulp and seeds are obtained, which are discarded as waste. Half of the weight of an entire fruit (50 percent) is fruit peels. If these citrus fruits products are not processed overnight it can cause serious environmental pollution, although citrus fruits (citrus) contain a variety of vitamins, mineral salts, and antioxidants such as flavonoids, anthocyanins, phenolic compounds and carotenoids. It is the presence of many nutrients like fiber. These nutrients act as important properties such as controlling blood sugar, providing protection against heart disease, preventing type-2 diabetes, and lowering cholesterol.

Thus, dietary fiber is an indispensable part of our diet, indigestible fibrous fruits of the fruit can be developed by using a powder food product derived from orange peel along with flavour rich food product. Also, through these efforts, powder obtained from orange peel can be increased in nutritional values in food products.

4. Study methodology

The details of the materials, experiments, processes and techniques adopted during the present investigation carried out at the Home Science Department's Culinary Laboratory, PatnaWomen's College, (Autonomous), Patna University, Patna, Bihar are detailed under the following headings.

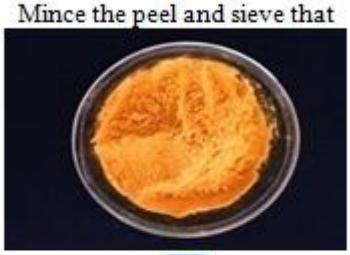
a) **Purchase of raw materials**
Oranges and other ingredients were purchased from the local market in Patna.

b) **The presentation of the experiment**
The presentation of the experiment was conducted in the cookery laboratory, PG, Department of Home Science, Patna Women's College, (Autonomous), Patna University, Patna, Bihar.

c) Preparation of orange peel powder

Dry
(Dried in a tray- dryer at 60^0-70^0C, for 24-48 hours)

Mince the peel and sieve that



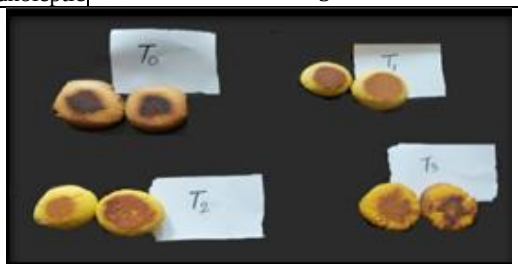
Packaging
To Air tight container

d) Product development

Powder made from orange peel was used for the development of various products. The product is named Biscuit, which is made using orange peel powder. Products were prepared using standard recipes.

Treatment and iteration of product

Treatment	The level of inclusion of orange peel powder in the product varies.
	Biscuit (percentage)
T_0	0
T_1	5
T_2	10
T_3	15
Replication	
Organoleptic	3



e) Organoleptic analysis of the finished product

Sensory evaluation of a biscuit made from orange peel powder Was among the five members selected from the Faculty of Home Science Department. The product was scored with the help of a nine-digit hedonic scale scorecard designed for this purpose.

f) Description of Nutrient Calculation of Growth Food Products

In the Food Product Biscuit, the description of calculation of the following nutrients of the product was made using the table.

- Energy
- Protein
- Fats
- Carbohydrates
- Iron
- Calcium

g) Statistical Analysis

Data obtained from sensory evaluation were statistically analyzed using significant differences between analysis of variance techniques and prescribed treatments.

5. Result and Discussion

The data of the present study is recorded "The value-added food product prepared from powder utilize from orange peel on different aspects according to methodology is tabulated and statistically analyzed. Results obtained from analysis is presented and the following discussion is discussed in this chapter

1) Assessing the organoleptic characteristics of the finished product.
2) Determining the nutritional values of the finished product.
3) Preparedness of the finished product.
4) Prepared at the root of the raw material Product Costing.

5.1.1 Organoleptic Characteristics of Food Products Developed by Powder Made from Orange Peel.

Biscuits with Powder Made from Orange Peel.

Table 4.1.1: Average Sender Score of Various Parameters in Control Treatment of Biscuits

Sensory treatment	Score on a 9digit hedonic scale			
	Colour	Texture	Taste	Content acceptance
T-0 (control)	6.6±0.78	6.6±0.28	7.8±0.21	7.4±0.34
T_{-1}	7.9±0.23	6.9±0.23	6.7±0.10	6.9±0.14
T_{-2}	7.3±4.26	6.2±0.18	5.7±0.38	6.0±0.19
T_{-3}	5.3±1.25	5.2±0.76	4.8±0.58	4.8±0.66
F-%	3.00(NS)	3.78(NS)	3.85(NS)	12.09(S)
C.D.%	1.19	0.68	0.63	0.611

± SE S= Significant NS= Non-Significant

Table 4.1.1 shows the average score of a powder made from orange peel with respect to colour. T1(7.9) found the highest score, followed by T0 (6.6), T2 (7.3) and T3(5.3). It was obtained by scoring that the treatment T1 Was very much liked while T0, T2, And T3 were disliked by the panel of judges. The texture of the biscuit clearly indicates that the treatment T1 the highest score was found in the design of (6.9). After which T0 (6.6), T2 (6.2), and T3 (52) scores.

Based on the taste of the biscuit, it was observed by the effect of powdery bitterness produced from orange peel that the treatment was T3 (4.8), T1(6.7), t 2 (5.7). A higher score was found as a result of T.0 (7.8).

The average score of the biscuit in relation to overall acceptability indicates that the treatment is T0 (74), T1 (6.9), T2 (6.0) and T3 (4.8) did not improve the overall acceptability of the biscuit except for the powder made from orange peel.

5.1.1 (a) analysis of variance data for the colour of biscuit.

Source of variance	D.F.	S.S.	Mean of S.S.	F.cal	F. Tab (5%)	Result
Reason of treatment (T)	3	11.21	3.73	3.00	4.75	N.S.
Cause of application(R)	2	14.80	7.4	5.96		
Reason of error	6	7.46	1.24			
Total	11	33.47				

C.D.=1.19 S= Significant F= 4-75<0.05

ANOVA Table 4.1.1 (a) shows that F. (3.00) calculated value at 1 percent probability level F. (4.75) was lower than the table value, so it was calculated that there was a significant difference between the colour treatments.It therefore indicates that the addition of different percentages of powder produced from orange peel affects the colour of the finished product. ANOVA

5.1.1(B) comparison between treatments, C.D. colours of the three treatments of biscuits against

Average price		T_{-3}	T_{-2}	T_{-1}	T_{-0}
		5.3	7.3	7.9	6.6
T_{-0}	6.6	1.3	0.7	1.3	0
T_{-1}	7.9	2.6	0.6	0	
T_{-2}	7.3	2	0		
T_{-3}	5.3	0			

C.D.=1.19

Table 4.1.1. (B) It was clarified that F. (3.00) calculated value at 1 percent probability level F. (4.75) was lower than its table value, so it can be concluded that there was a significant difference between the treatments in the colours of the biscuit, so the difference between the two treatments against the CD value suggests that (T0, T3), (T0.T2), (T0.T1).There was a significant difference between the (T1, T2) and (T2, T3) differences.

5.1.1 (C) analysis of variance data for texture of biscuits

Source of variance	D.F.	S.S.	Mean of S.S.	F.cal.	F. Tab (5%)	Result
Reason of treatment (T)	3	4.67	1.55	3.78	4.75	N.S.
Cause of application(R)	2	4.34	2.17	5.29		
Reason of error	6	2.51	0.41			
Total	11	11.53				

C.D.=0.68 S= Significant F= 4-75<0.05

ANOVA Table 4.1.1 (c) shows that F. (3.78) calculated value F at 1 percent probability level. (4.75) was lower than the table value, so it was calculated that there was a significant difference between the texture treatments. It therefore indicates that the addition of different percentages of powder produced from orange peel affects the texture of the finished product.

5.1.1 (D) Comparison between treatments, C.D., texture of three treatments of biscuits against

Average		T_{-3}	T_{-2}	T_{-1}	T_{-0}
		5.2	6.2	6.9	6.6
T_{-0}	6.6	1.4	0.4	0.3	0
T_{-1}	6.9	1.7	0.7	0	
T_{-2}	6.2	1	0		
T_{-3}	5.2	0			

C.D.=0.68

ANOVA Table 4.1.1. (D) It was clarified that F. (3.78) calculated value F at 1 percent probability level. (4.75) was lower than its table value so it can be concluded that there was a significant difference between the treatments in the texture of the biscuit, hence the C.D. The difference between the two treatments against the value states that (T0, T3), (T0, T2). (T0, T1). There was a significant difference between the (T1, T2) and (T1, T3) differences.

5.1.1 (e) analysis of variance data for taste of biscuits.

Source of variance	D.F.	S.S.	Mean of S.S.	F.cal.	F. Tab (5%)	Result
Reason of treatment (T)	3	15.63	5.21	3.85	4.75	N.S.
Cause of application(R)	2	2.84	1.42	4.05		
Reason of error	6	2.11	0.35			
Total	11	20.59				

C.D.=0.63 S= Significant F= 4-75<0.05

ANOVA shows from Table 4.1.1 (e) that F. (3.85) calculated value at 1 percent probability level F. (4.75) was lower than the table value, so it was calculated that there was a significant difference between the taste treatments. It therefore indicates that the addition of different percentages

of powder produced from orange peel affects the taste of the finished product.

5.1.1 (F) Comparison between treatments, C.D. taste of three treatments of biscuits against.

Average price		T_3	T_2	T_1	T_0
		4.8	5.7	6.7	7.8
T_0	7.8	3	2.1	1.1	0
T_1	6.7	1.9	1	0	
T_2	5.7	0.9	0		
T_3	4.8	0			

C.D.=0.63

ANOVA Table 4.1.1 (f) It was clarified that F. (3.85) calculated value at 1 percent probability level F. (4.75) was lower than its table value, so it can be concluded that there was a significant difference between the treatments in the taste of the biscuits, hence the C.D. The difference between the two treatments against the value states that (T0, T3) (T0, T2) (T0, T1). There was a significant difference between the (T1, T2) and (T1, T3) differences.

5.1.1 (g) analysis of variance data for overall acceptability of biscuits

Source of variance	D.F.	S.S.	Mean of S.S.	F.cal.	F. Tab (5%)	Result
Reason of treatment (T)	3	11.74	3.91	12.09	4.75	S.
Cause of application(R)	2	3.5	1.75	5.30		
Reason of error	6	1.99	0.33			
Total	11	17.24				

C.D.=0.61 S= Significant F= 4-75<0.05

ANOVA from Table 4.1.1 (g) shows that F. (12.09) calculated value at 5 percent probability level F. (4.75) was higher than the table value, so it was calculated that there was a significant difference between treatments for overall acceptability. It therefore indicates that the addition of different percentages of powder produced from orange peel affects the overall acceptability of the finished product.

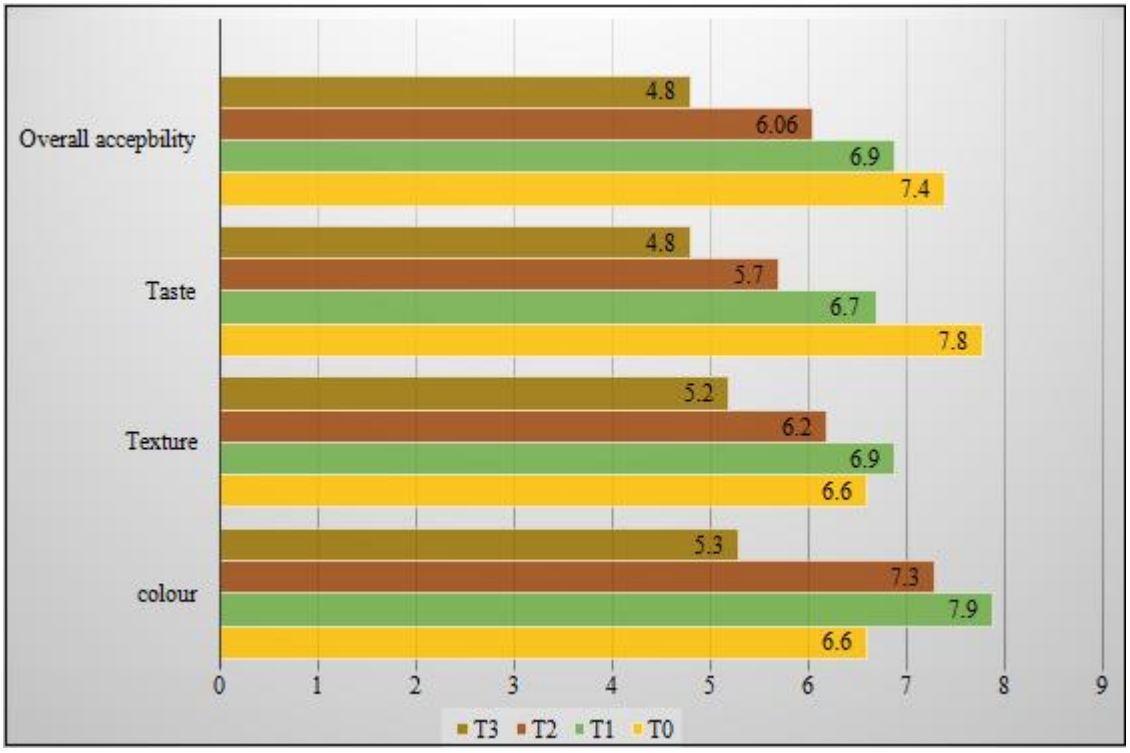


Table 4.2.1: Control and treatment of powder made from orange peel percentage of nutrients (100 g).

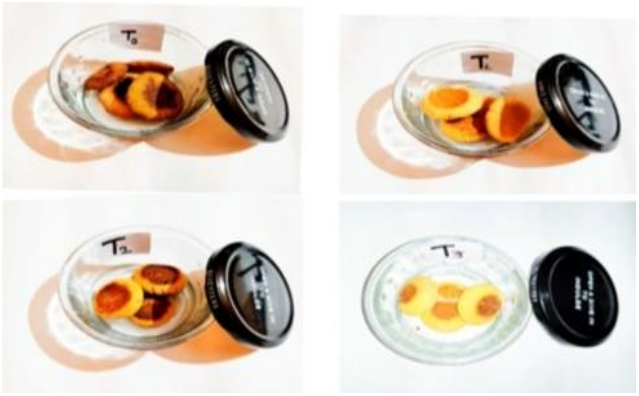
Product and treatments	Nutrient content in the finished food product.					
	energy	protein	fat	carbohydrate	iron	calcium
BISCUITS						
T_0	364.95	6.79	15.74	79.35	1.68	24
T_1	356.3	6.86	15.74	80.8	1.72	32.05
T_2	374.69	6.94	15.74	81.85	1.76	40.1
T_3	379.5	7.01	15.74	83.1	1.8	56.2

Biscuit Table 4.21 shows that the powder produced from orange peel contains three oranges of 5 percent, 10 percent, and 15 percent. of T1, T2, T3 and nutritional values of the controlled and treated biscuits respectively in T3(379.5) From the result it was found that in T0, T1, and T2 the highest energy was found after. Powder made from orange peel i.e. T3 (7.01). T3 (15.13), and T3(83.1) /100 gmcontent also increased with an increase in the amount of Protein, fat and carbohydrate. T3(56.2) also found the highest calcium content. After this, T0, T1. And T2 in which the percentage of powder produced from orange peels was maximum. Powder made from orange peel i.e. T3 (1.8) followed by T0, T1 and T2 the amount of iron added increased. Therefore, it can be concluded that the amount of powder produced from orange peel in biscuits increased with percentage of nutrients along with the powder. Preservation of food products made from orange peel powder.

Table 4.3.1: Preservation of biscuits

Product	preserves
Biscuits	45 days

As a result of the preservation of food products made from Orange peel powder in Table 4.31, it was found that the biscuits made from orange peel powder were preserved for about 45 days. After 45 days, the look and taste of food products started to deteriorate.



The cost of the finished product at the core of the raw material.

Table 4.3.1: Costs in biscuit products

Biscuits	T-0	T-1	T-2	T-3
Costs	15.31	14.54	13.77	13.01

Cost of the product based on raw material, average cost per 100-gram biscuit. T0(Control) Rs. 15.31, T1 Rs. 14.54, T2 Rs 13.77, T3Rs 13.01, Hence the cost per kg was calculated by T0(Control) Rs. 145.00, T1 Rs.137.75, T2 130.0, and T3 Rs.123.25.

6. Summary

In this research, a biscuit incorporation from orange peel powder was given to T0 (0 percent), T1 (5 percent), T2 (10 percent), and T3 (15 percent)With the help of a nine-point Hedonic Scale scorecard drawn at levels, the product was evaluated on the basis of scores from among the five teachers selected from the faculty of PG. Department of Home Science. In which it was found that in the biscuit made from orange peel powder, the colour, texture and flavour ANOVA table showed that F. (3.00, 3.78, and 3.85) calculated value F at 1 percent probability level. (4.75) was lower than the table value, so it was calculated that there was a significant difference between colour, texture and taste treatments, or C.D. The difference between the two treatments against the values indicates that (T0, T3), (T0, T2), (T0, T1), (T1, T2) and (T2, T3). There is a significant difference between differences. However, from the ANOVA table of the overall acceptability of biscuits made from orange peel powder, it was found that F.(12.09) calculated value at 5 percent probability level F. (4.75) was higher than the table value, so it was calculated that there was a significant difference between the treatments for overall acceptability, and the biscuits incorporation from orange peel powder were considered completely meaningful. During the research, a biscuit made from orange peel powder is used in three levels of 5 percent, 10 percent, and 15 percent.

The nutritional values of controlled and treated biscuits were extracted respectively. It was found from the result that T3 (379.5) included T2, T1, and T0the highest energy was found after. Powder made from orange peel i.e. T3 (7.01) T3(15.13), and T3 (83.1) / 100 gmincrease in the amount of Protein, fat and carbohydrate content also increased with an. Calcium was also found to be highest in T3 (56.2), followed by T0, T1 And T2 in which the percentage of powder produced from orange peels was maximum. Powder made from orange peel i.e. T3 (1.8) followed by T2 , T1 and T0 . The addition of iron has also been increased by the preservation of food products.
Product preserve resulted in the biscuits being preserved for 45 days.

At the end of the research, the average cost was also calculated in a biscuit product made from orange peel powder. The cost of the product based on the raw material, the average cost per 100-gram biscuit was T0 control Rs. 15.31, T1 Rs. 14.54, T.2 Rs. 13.77, T.3 13 01, hence the cost per kg was calculated as T0 Control Rs.145.00, T1 137.75 rupees, T.2 130.0 rupees, and T3 123.25 rupees.

7. Conclusions

Appropriate studies lead to the conclusion that using a powder made from orange peel has enhanced taste and nutritional values and provides protection from many diseases. Biscuits made from orange peel powder based on organoleptic evaluation were preferred over the organoleptic samples T1, and T2, T3 due to the taste of the product based on the flavouring treatment T1, T2and T3 , in which T1, Score more than given. These food products were also preserved for more and more days. In the end, the cost of the product based on the raw material, the average cost per 100 grams of biscuits was produced at least in rupees.

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