iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** IV **Month of publication:** April 2025

DOI: https://doi.org/10.22214/ijraset.2025.69951

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

Preparation of Sattu Bites

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Abstract: ***Food product development has become more innovative as a result of the growing demand for nutrient-dense, ready-to-eat snacks. The goal of this project is to combine the health advantages of traditional Sattu flour with the decadent allure of chocolate by creating Sattu nibbles coated in white chocolate. Sattu, a roasted gram flour, is a staple in traditional Indian meals because of its high protein, fiber, and mineral content.***
Sattu is one of the well-known Traditional dishes. It is also used as a nutritional supplement to maintain health and prevent various diseases, as well as a medication to treat a variety of illnesses. The current study's objective was to gather and examine the data on Sattu that can be found in several traditional Ayurvedic literature. It is a Wholesome product consisting of goodness of healthy ingredients that enhance the Nutritional value of the product. Along with the good amount of Carbohydrate and Protein, it also contains various essential vitamins. The formulated product was analysed for its sensory and microbial properties. The nutritional properties were determined based on proximate analysis such as moisture content(5.41%), total ash content(3.32%), crude protein content(9g/100g), total fat content(20g/100g), and crude fiber content(0.03g/100g). Microbial load was found to be within the limit. Organoleptic analysis based on the attributes of color, flavor, texture, taste, and aroma showed that the product was liked very much (rating score 9) by the panelists. A suitable packaging for the product was selected taking into consideration the properties of the product's shelf-life. Thus, the developed product was the best and healthy option for childrens as well as adults.
Keywords: Preparation of Sattu flour, Sattu Bites, white chocolate, baking.

I. INTRODUCTION

Since it began selling its snack goods five months ago, Lil'Bites has sold thirty-six packets of cookies. Lil'Bites has just launched a line of kid-friendly snack cookies called Choco Almond Cookies, which are low in sugar and free of artificial coloring and preservatives. However, over time, Lil'Bites' sales have decreased, suggesting that more creativity is required in terms of taste combinations, packaging, and distinctiveness. The viability of novel taste variations that can pique customer interest and restore the Lil'Bites brand's marketability must be assessed in order to overcome this obstacle. Using this strategy will allow Lil'Bites to stay relevant in the cutthroat snack business. Since the Puranic and Mahabharata periods, pulses have been a staple of the Indian diet, appearing in dishes like dal-chawal and dal roti as well as in common snacks like Sattu, besan keladdo, and besan sev. Across the nation, all of these are frequently consumed in a wide range of cuisines. Since the Rigveda's time (8000 BC), Sattu has been regarded as a "instant" food, manufactured by making flour from roasted chickpeas and barley or wheat. Ordinary people who live in harsh environments frequently utilize it. A traditional Indian remedy for overcoming heat, sattu can be consumed in a number of ways, including simple beverages, paranthas, laddoos, and littichokhas. The historical practice of using sand as a heating media to simmer food grains is still used today to roast a variety of food grains. This method involves heating sand in an open pan over a heating medium (wood, coal, gas stove, etc.); food grains are then added once the pan reaches the necessary temperature, which can range from 150°C to 350°C during the roasting process. To increase overall acceptability, roasting improves flavor, color, texture, and other aspects of food while converting macro- and micronutrients into more palatable forms. Short-term exposure to high temperatures speeds up water loss, reduces water activity, crisps food grains, changes their antioxidant and functional properties, extends their shelf life, and increases their market appeal.

II. MATERIALS AND METHODS

A. Ingredients

1) Wheat

Wheat is the major staple food crop and a major source of energy for the Indian population.In terms of its age and significance as a human diet, wheat is the most important crop in the world. The regions of Central and Near East Asia are thought to be the origins of wheat. A likely primary center of origin for bread wheat is also thought to be the North Western frontier regions of India. With wheat grains discovered at the Mohenjo-daro excavations, wheat has been grown in India for several millennia.

India has five wheat mega zones where three types of wheat— Triticum aestivum, Triticum durum, and Triticum dicoccum—are grown under high fertility, irrigated timely planted conditions, irrigated late sown conditions, and timely sown restricted irrigation conditions. As a cool-season crop, wheat grows best when the average day temperature is between 20-23˚C. Temperatures between 16-20˚C are ideal for optimal tillering. A higher temperature during the tillering stage inhibits the production of tillers and also causes the maturing seed to shrivel during the ripening stage**.**

2) Roasted Chickpeas

In India, roasted chickpea grains and their flour hold a significant place as daily consumable snacks, "Sattu" preparation, and related drinks. Consumption of chickpea grains is also favored due to their richness in carbohydrates, protein, essential amino acids, dietary fiber, nutritionally important unsaturated fatty acids, etc. Nowadays, it is very common to produce daily snacks from roasted food grains, which are either consumed directly or as fortified extruded foods and drinks.

Roasting: A common method for producing commercial agricultural products with improved flavor and extended shelf life is roasting. A variety of food grains, including coffee, groundnuts, wheat, barley, oats, chickpeas, and hazelnuts, are roasted and utilized for different purposes. In communities and enterprises, the relatively archaic tradition of using sand as a heating medium for roasting food grains is still used. This method involves heating sand in an open pan over a heat source (wood, coal, oil burner, or gas stove), and then adding food grains to the pan once the temperature reaches the desired level. During the roasting process, the temperature typically ranges between 150 to 350 degrees Celsius; however, the structure of the food grain and roasting time also influence the choice of roasting temperature. Stirring food grains frequently ensures even roasting. The high temperature during roasting turns the moisture in the grain into superheated vapor, which increases the pressure inside the grain and causes it to puff.

3) White Chocolate

The confectionery sector has seen significant changes in recent decades, particularly in cocoa products like chocolate, and there is a growing demand for creative foods made with natural ingredients. Determining the primary attributes of functional chocolate products made with natural ingredients—such as color, moisture content, texture, flow behavior, melting point, rheology, and sensory analysis—is therefore crucial. However, there have only been a few studies done on white chocolate that contains natural components like paprika extract. White chocolate research mostly focuses on the following topics: rheological properties, color loss kinetics, flavonoid content, acute coronary circulation effects, browning, increased flow features, and the interaction between white chocolate casein and phenolic compounds during storage. Therefore, this study will close the knowledge gap on natural ingredients in functional white chocolate in the confectionery business and literature.White chocolate was used in this work because its polyphenol content and antioxidant activity are significantly lower than milk and dark chocolate.

B. SPICES:

1) Cardamom

Traditionally referred to as the "queen of spices," cardamom is made from the seeds of the Elettaria cardamomum plant, which is grown for commercial purposes on plantations in Southeast Asia, Central America, Sri Lanka, and southern India. It improves savory and sweet foods in various parts of the world. Known by other names, such as green or small cardamom, authentic or true cardamom comes from seeds of the plant Elettaria cardamomum (family Zingiberaceae).

Benefits: Cardamom may possibly help prevent cancer because it has been shown to control immunological and inflammatory responses. Oral pathogenic microorganisms such as Candida albicans and Streptococcus mutans can be effectively combatted by cardamom extracts. Numerous pharmacological investigations (both in vitro and in vivo) as well as the identification and quantification of numerous classes of phytochemicals have been conducted in recent years because of the intense interest in the numerous health-promoting qualities of cardamom. Bioactive non-nutrients known as phytochemicals are thought to be responsible for cardamom's ability to stave against chronic illnesses. Numerous researchers are now more interested in phytochemicals because of their possible health benefits, such as chemoprevention of cancer and cardiovascular disorders, as well as their antioxidant activity and cholesterollowering qualities.

2) Netmeg

The majority of taxonomists are familiar with nutmeg (Myristica fragrans), an evergreen tree that is a member of the Myristicaceae family of flowering plants that are native to Asia, Africa, the Pacific islands, and America. Because of its well-known member, Myristica fragrans, the plant that produces mace and nutmeg, it is also referred to as the nutmeg family.

There are roughly 150 species in the genus Myristica, which are distributed throughout Asia and the western Pacific. Insufficient blooms of both sexes on a single tree cause nutmeg to crosspollinate.

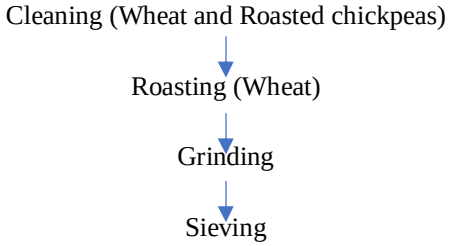
Benefits: Numerous unique benefits of nutmeg have been documented, including stimulant, antifungal, anti-inflammatory, anti-diarrheal, antidiabetic, and carminative effects. In Asia, nutmeg and mace are often used as traditional remedies for rheumatism, diarrhea, and stomachaches. Volatile oils found in nutmeg include myristicin, an alkyl benzene derivative. The properties of myristicin acid include its modest monoamine oxidase inhibitory action and the structural resemblance of some myristicin to serotonin agonists. Myristicin can be broken down to produce substances that resemble amphetamine and have psychedelic effects akin to those of lysergic acid diethylamide.

C. Preparation Of Sattu Flour

The process of making Sattu flour involves grinding roasted grains and spices into a fine powder. Follow these steps to prepare Sattu flour using the specified ingredients:

First of all sort the wheat and roasted chickpeas to remove any dirt, stones, or impurities. Wipe the cardamom pods and nutmeg if needed to ensure cleanliness.To achieve a more complex flavor, dry roast the wheat over medium heat until it becomes light golden and emits a nutty scent. Let it cool fully.In a blender or grain mill, combine the roasted wheat, roasted chickpeas, cardamom pods, and nutmeg. Make a fine powder out of the mixture.Sieve the flour through a fine mesh screen. This aids in husk or bigger chunk removal.

FLOWCHART OF SATTU FLOUR



D. Preparation Of Sattu Bites

Step 1: Roasting the Sattu Flour

Add the Sattu flour to a pan that has been heated to a low to medium temperature. Let it dry roast for two to three minutes, or until a nutty scent emerges. Always stir to prevent scorching. Take off the heat and let it cool a little.

Step 2: Mixing

Add the butter and powdered sugar to a mixing bowl and stir until combined. Add roasted Sattu flour to the butter-sugar mixture at a time. Mix thoroughly.

Step 3: Dough making

One tablespoon of milk at a time should be added gradually until the mixture becomes a soft dough that holds its shape.

Step 4: Shaping (Molding)

Take a small amount of the Sattu dough and press it firmly into the silicon mold to fill the shape completely.

Step 5: Baking

Put the mold in the preheated oven for 25-30 minutes, or until they are slightly golden at the edges. Take them out of the oven, remove the Sattu bites from the mold and let them cool fully.

Step 6: Coating with White Chocolate

Use a double boiler to melt the white chocolate. Stir until smooth. Dip each attu bite into the melted white chocolate using a fork, ensuring it is fully coated.

Step 7: Setting

Allow the coated bites to set at refrigerate for 15-20 minutes until the chocolate hardens.

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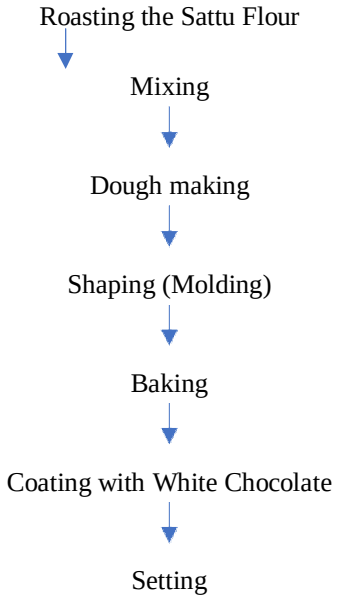
FLOWCHART OF SATTU BITES



III. RESULT AND DISCUSSION

A. Determination of Ash Content

PROCEDURE:

5 g of powdered sample was taken in a previously dried silica crucible. 5-10 ml ethanol was added to burn the sample after charring the crucible and it was placed in a muffle furnace for ignition at 550 °C for 4 hours. The crucible was taken outside and cooled in a desiccator. The sample was ignited again after every half an hour until a constant weight was obtained accepted by the difference of 0.001 [AOAC 942.05].

$$\textbf{Ash \%} = \frac{\text{Weight of the crucible with sample after ignition - Weight of empty crucible}}{\text{Weight of sample}} \times 100$$

B. Determination of Protein Content

PROCEDURE:

The crude protein content of the sample was determined using the Kjeldahl method (AOAC 2001.11) in three steps: digestion, distillation, and titration. First, a 1-gram sample was digested with 2 grams of a catalyst mixture and 20 ml of sulfuric acid (H_2SO_4) at 100°C for 2-3 hours until it turned light green. The digested sample was then distilled, with the ammonia (NH_3) collected in 30 ml of 4% boric acid after adding 60 ml of distilled water and 50 ml of 40% sodium hydroxide (NaOH). Finally, the ammonia-boric acid solution was titrated with 0.1 N hydrochloric acid (HCl) using methyl red and bromocresol green indicators until it changed from blue to red/pink. The burette reading was used to calculate the protein nitrogen content, thereby determining the crude protein content of the sample.

$$\text{Crude Protein \%} = \frac{(A-B) \times N \times 14.01 \times 6.25}{W}$$

C. Determination Of Carbo Hydrate Content

PROCEDURE:

The total carbohydrate content was calculated by the difference method. All the calculated proximate values were subtracted from 100; the resulting value is the carbohydrate content of the given test sample.

Total Carbohydrate = 100 – [Moisture content + Ash content + Crude Fat + Crude Fiber + Crude Protein]

D. Determination Of Moisture Content

PROCEDURE:

5gm of the powdered sample was taken in a Petri plate and the weight was measured, the Petri plates with samples were placed in a hot-air oven for drying at a temperature of 105 ℃, after 3 hours the sample was taken out and cooled in a desiccator, weight was taken and again placed in the hot-air oven to redry the sample and reweighed after half an hour until the constant weight was obtained for last three readings. [AOAC 2000].

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

Where,

W=Weightofsample

W1weightofsample+weightofPetridish

W2-Weightofdriedsample+weightofPetridish

E. Determination Of Fat Content

PROCEDURE:

A 5-gram sample was weighed and placed in a thimble for Soxhlet extraction using 250 ml of petroleum ether at 60°C, with a drop rate of 150 drops per minute. The extraction ran for 6-12 hours until the petroleum ether appeared clear. The solvent was then recovered via downward distillation. The round bottom flask with the extracted fat was dried at 105°C in a hot air oven, cooled in a desiccator, and weighed repeatedly until weight differences were less than 0.001 grams. The ash of the sample was treated with dilute HCL, filtered, washed, dried, and ignited at 550°C before weighing[AOAC (1995)].

$$\text{Crude Fat \%} = \frac{\text{Weight of Fat} \times 100}{\text{Weight of sample}}$$

F. Determination Of Fiber Content

PROCEDURE:

The official AOAC (1990) method was employed to determine the crude fiber content of a fat-free sample obtained from a prior fat extraction test. The sample was first boiled in 200 ml of 1.25% H_2SO_4 for 30 minutes, then filtered and washed with hot distilled water to remove acid traces. It was subsequently boiled in 200 ml of 1.25% NaOH for another 30 minutes, cooled, filtered, and washed with lukewarm distilled water to eliminate NaOH. The residue was then washed with 10% HCl, absolute ethanol, and petroleum ether. The final residue was collected in a pre-weighed crucible, dried at 105°C for 3 hours, cooled in a desiccator, and weighed. The crucible was then ignited in a muffle furnace at 550°C until ashed. After cooling in a desiccator, the crucible was weighed again to calculate the fiber content.

$$\text{Crude Fiber \%} = \frac{\text{Loss of Ignition} \times 100}{\text{Weight of sample}}$$

G. Physiological Analysis

Physical measurements:- In this test, various physical parameters like weight, length, and the candy's thickness were calculated.

Shape:

The shape of the bites was identified by a sensory test by the visual method. Various shapes can be made by using molds or cutters.

Average Weight:

10 bites were selected randomly from the prepared batch and their weight was measured. The average weight was calculated by using the formula;

$$\text{Avg Wt.} = \frac{\text{Total Wt. of 10 Bites}}{\text{No. of Bites}}$$

Length:

10 bites were selected randomly and the horizontal length of candy from the top was calculated by using a digital vernier caliper scale

Thickness:

By using a digital vernier caliber scale, the average thickness (vertical height) of selected 10 bites was calculated

H. Microbial Analysis

We have performed a microbial analysis of our product. Sattu bites have undergone thorough microbial testing, and the results are negative for harmful microorganisms. This confirms that our product is safe for consumption, adhering to stringent quality and safety standards. 24 Consumers can enjoy our Sattu bites with confidence, knowing it is free from microbial contamination and crafted with the highest levels of hygiene and care.

IV. OBSERVATION

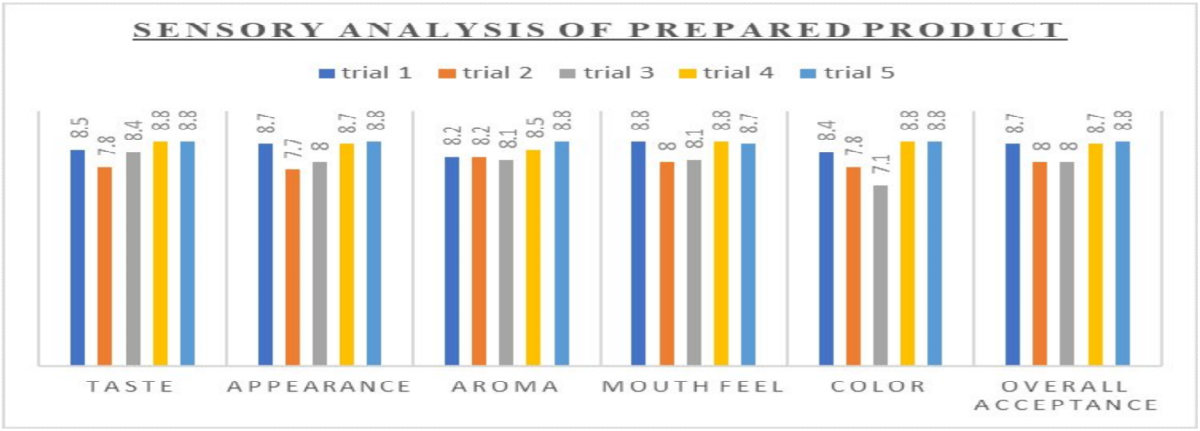
DIFFERENTFORMULATIONSOF SATTU BITES

Sr. no	Raw material	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
1.	Sattu	10.00g	10.4g	10.7g	10.13g	10.34g
2.	Sugar	5.00g	-	2.07g	5.13g	5.19g
3.	Milk	2tbs	-	-	2tbs	2tbs
4.	Butter	5.00g	5.56g	5.07g	5.56g	5.06g
5.	Milk Powder	-	5.05g	5.14g	-	-

RESULT OF PROXIMATE AND PHYSIOLOGICAL ANALYSIS

PARAMETERS	RESULTS
Proximate Analysis	
Ash content	3.32%
Moisture content	5.41%
Crude Fat content	20g
Crude Protein content	9g
Crude Fiber content	0.03%
Total Carbohydrate	62.24g
Physiological analysis	
Shapes	Coffee beans and heart-shaped
Average weight	1.45
Length	13.28
Thickness	7.86

SENSORY GRAPH:



FINAL PRODUCT:

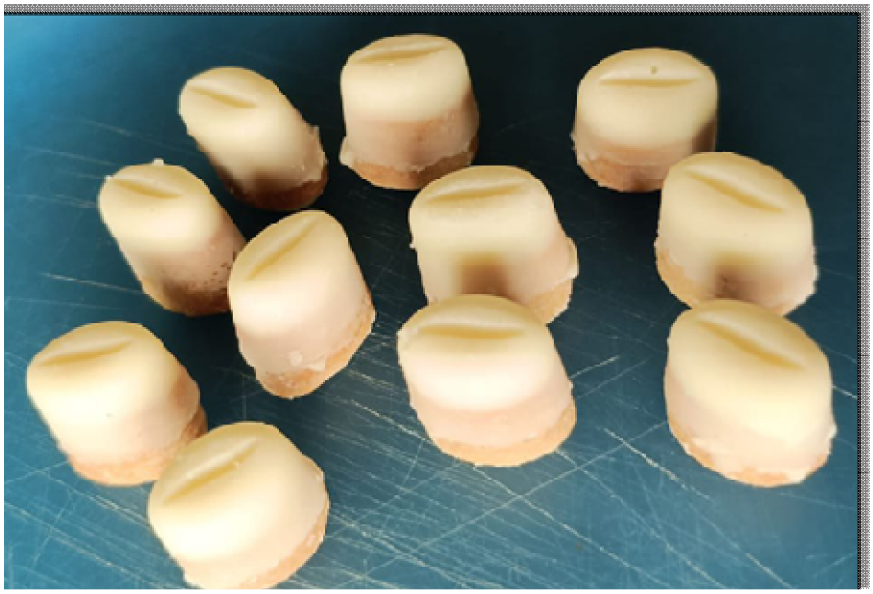


Fig. Sattu Bites

V. CONCLUSIONS

A creative method of combining traditional components into a contemporary, nutrient-dense snack is demonstrated by the creation of Sattu bites. Made from roasted grams, Sattu flour is incredibly nutrient-dense and adaptable, making it ideal for making tasty, high-energy nibbles. The bites are a great option for both kids and adults since they achieve a harmonious mix of taste and health benefits by combining Sattu with components like sugar, butter, and milk. The nutritional value of the ingredients is preserved by the simple method that calls for little cooking. Sattu bites are a healthy and environmentally friendly substitute for commercially available snacks because they don't contain artificial additives or preservatives. A unique modern twist on a classic recipe is Sattu bites coated in white chocolate. In addition to increasing the snack's visual appeal, the addition of white chocolate expands its market, making it a great option for gift-giving, celebrations, and even as a high-end, health-conscious dessert. The ideal ratio of enjoyment to nourishment is achieved by Sattu bits coated in white chocolate. This creative recipe uses the rich, creamy texture of white chocolate to enhance the appeal of Sattu while maintaining its health advantages. It illustrates how conventional elements can be rethought to suit modern tastes and inclinations. These bites combine tradition, innovation, and indulgence in every mouthful, making them not only a feast for the taste buds but also a step toward better snacking habits. Based on its taste, texture, and overall appeal, the fifth experimental sample—which had a 1:2 ratio of Sattu to white chocolate—was determined to be the most appropriate. Sattu's earthy, nutrient-rich flavor and white chocolate's creamy richness are well balanced in this ratio, making it both nourishing and decadent.The chosen sample is notable for its uniform mouthfeel, smooth texture, and strong binding, all of which improve the customer experience.The success of this recipe demonstrates how adaptable Sattu is as a foundational component and how well it can meld with modern flavors.

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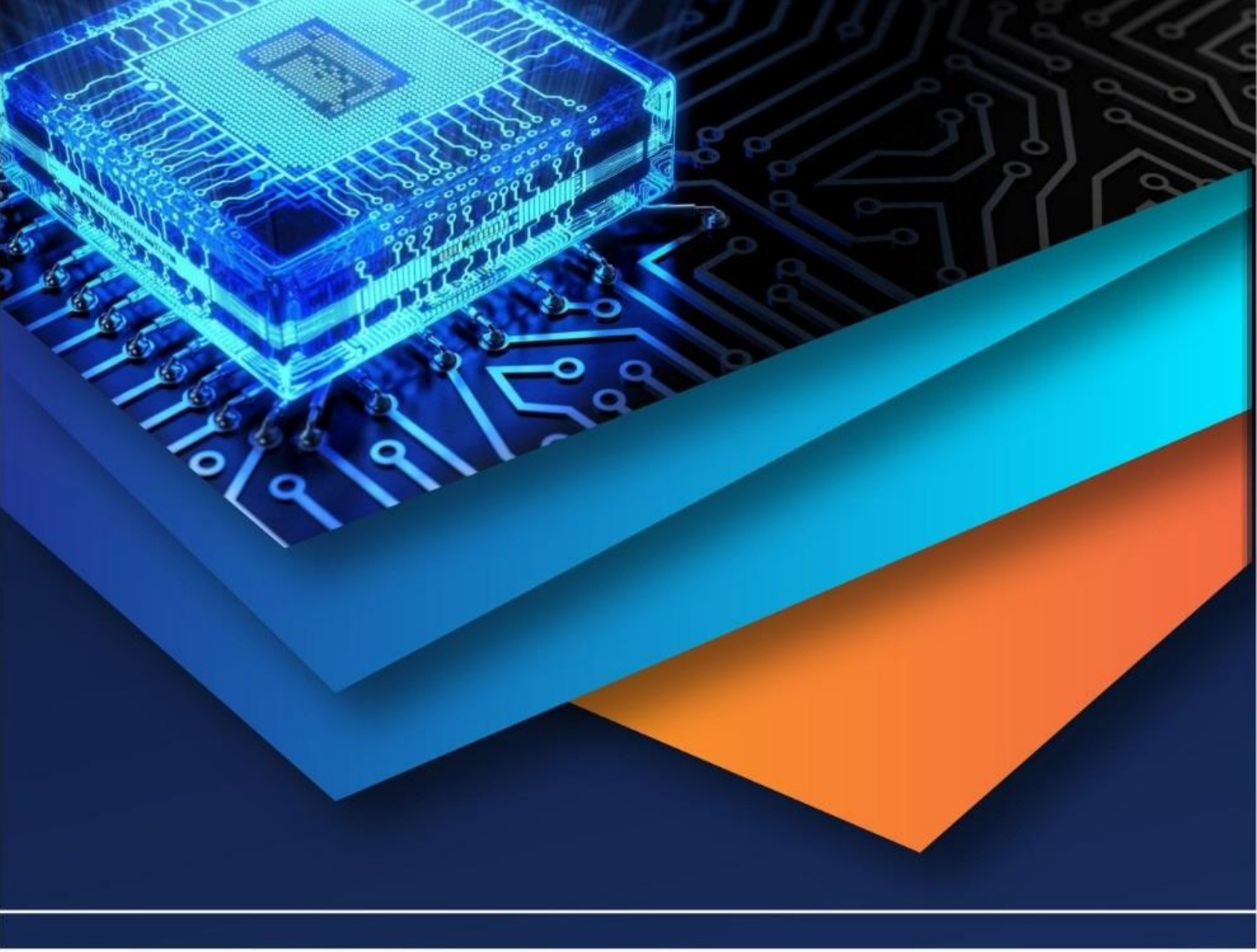

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