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Optimization and Functionality of Millet Flours in Development of Noodles and Fryum

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Abstract: ***Millets are one of the firstborn foods recognized to being and probable primary cereal grain to be used for inland determinations. Millets are vital food crop at worldwide level with an imperative monetary influence on evolving republics. Millets are deliberate as high liveliness yielding nourishing foods which facilitate in addressing starvation. Millet based foods are meticulous as probable prebiotic and probiotics with catalog of health benefits. Grains of these millet species are broadly used up as a basis of old-style medications and important food to preserve health. Millets are now spent in various forms such as flattened, beaten, popped, roasted, powdered, ground, fried and also as extruded products. The rough grains are now the nutri-cereals as everyone see millets as solution for changing the lifestyle. The high ingesting of polished rice and refinedflour is the chief ingredient in the most of the foods in the built-up population which led to rise in obesity, diabetes, heart disease and hypertension. In the present study Finger millet, Foxtail millet, Pearl millet and Little millet were utilized in different food product development. The millet flours namely Foxtail millet, Finger millet, Pearl millet, Little millet were prepared and processed into extruded noodles and fryum that are mainly consumed by all age groups and hence the products were made up of traditional ingredients applying modern techniques.***

Keywords: Millets, Processing, Ready to Cook Foods, Noodles, Fryum

I. INTRODUCTION

Millets are a collection of highly variable small-seeded grasses, extensively full-grown around the world as cereal crops or grains for food and human food. Millets are miraculous in their nutrition content. Millets are superior to rice in their protein content and are equal to wheat without gluten.

A diet including millets may improve glycemic control and trim down insulin, cholesterol and fasting glucose in Type-2 diabetes patients. The fibre content is 3 to 5 times extra than the extensively promoted rice and wheat. This increased fibre content is one of the rationale millets to have very low glycemic index compared to rice and wheat and thus beneficial in weight reduction, insulin resistance and diabetes mellitus. The high fibre content of millets acts as pre-biotics or gut fertilizers and thus helps to maintain healthy gut microbiome.

Extrusion cooking of millets emerge to be extremely promising in the preparation of value added traditional and novel food products with good keeping quality. It is an emerging food processing technology in India. A variety of ready-to-eat traditional snacks, breakfast cereals and supplementary foods could be ready by extrusion cooking technology. Extruded products are crispy and crunchy in texture comparable to the deep oil fried products but, contain only 2-3 % fat. Extrusion technology can be productively used for the preparation of several value added products.

A papadum or appalam is an Indian deep fried dough of black gram bean flour, either fried orcooked with dry heat (flipped over an open flame) until crunchy. Additional flours made from lentils, chickpeas, rice, tapioca, millet or potato are also utilized. Natural Millet Papad is a mixture of all healthy and organic ingredients without any preservatives. All natural herbs andspices are added to the papad to make it more delicious, rejection of Monosodium Glutamate (MSG) ortaste enhancers in the product. It is incredibly accommodating for people who have a digestion problem, blood sugar and coronary disease. It also clears your system and helps in detoxification. With the change in the lifestyle, there is a rise in the number of gluten-intolerantpeople, this papad is the best suitable snack for them.

In India diverse kinds of traditional foods ready from small millet grains, form staple diet for many rural and urban households. Since people are becoming health conscious by having high fibre, low fat content in their diet. Noodles from millets can provide such nutritional value. The present study aimed at optimization and functionality of millet flours in development of noodles and fryum and its characterization.

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II. MATERIALS AND METHODS

A. Procurement of Materials

The millets were procured from a local organic farm. Among more cultivated species of millets the Finger millet, Foxtail millet, Pearl millet, Little millet were procured from the local markets.

B. Preparation of Millet flours

Flour is used as a key ingredient for a variety of recipes. The millet grains with physical damage were discarded, cleaned, preliminary processing was done like washed with clean water to remove the impurities and prepared for the flour preparation. Millet grains (Pearl Millet, Finger Millet and Foxtail Millet etc.) are processed by dry milling. The dry milling process starts with the cleaning of grains. The cleaned grain is milled by the hammer mills to detach the endosperm, germ and bran from each other to get fine flour. The excellence of the product is more important for consuming. The prepared products were tested for its Moisture analysis, Texture analysis, Sensory analysis, Shelf life and its keeping quality.

C. Physical Characteristics Of Flour

1) *Volume of the Flour:* Twenty five grams of flour was taken in a measuring cylinder and was tapped it several times tightly and final volume of the flour was measured and recorded.
2) *Density of the Flour:* Density of flour was determined using the formula

$$\text{Flour density} = \frac{\text{Flour weight (g)}}{\text{Flour Volume}}$$

D. Functional Properties Of Millet Flour And Other Ingredients

1) *Water Absorption of Flour:* Twenty grams of flour was taken added required amount of water, made into a dough and kneaded measured as absorption capacity and recorded.
2) *Swelling Power and Percent Solubility:* Swelling power and percent solubility was determined when 500 mg (W1) of flour taken in a centrifuge tube and weighed the centrifuged tube with flour (W2) and 20 ml of distilled water was added. Then it was allowed for 30 minutes in a boiling water bath. The contents were cooled and centrifuged for 10 minutes. The aliquot was transferred to a test tube and was wiped well and again **the** centrifuge tube was weighed with swelled material (W3). Swelling power was calculated by using the formula**.**

$$\text{Swelling power /g} = \frac{(W3-W2) \times 1}{W1}$$

E. Cooking Quality Of Noodles

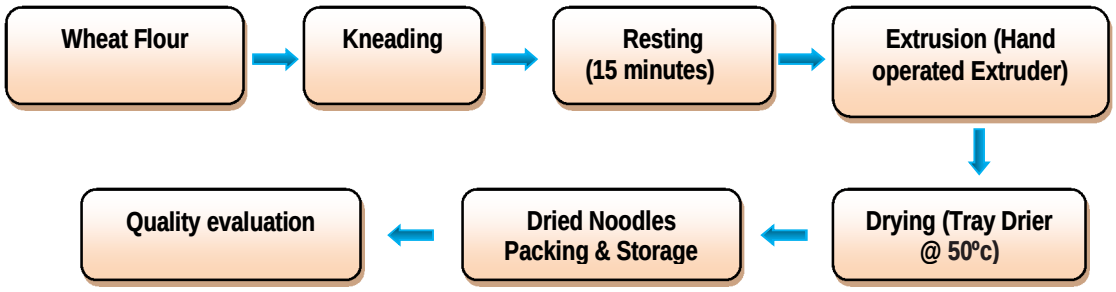
1) *Cooking Time:* A known amount of product were dropped in boiling water and cooking time was noted by pressing the cooked grain between the glass slides and the time taken for disappearance of opaque core of noodles strands was taken as cooking time.
2) *Cooked Weight and Volume:* About 10 g of noodles was taken and cooked in about 200 ml of water. Weight of cooked noodles was measured by using electronic balance and volume of cooked noodles was measured using measuring cylinder.
3) *Development of Noodles Flour:* The prepared millet flour has been at different proportion with tapoioca flour, addition of salt, water.The noodles are obtainable fresh or dried and are used in such dishes as chow mein. They are often mentioned to as chow mein noodles. Wheat is the standard ingredient used with incorporated with the millet flour. The noodles are through without any artificial additives, flavours, stabilizers, emulsifiers. It can be consumed by all the age groups and it is prepared without eggs and meat.

F. Preparation of Noodles

Noodle was prepared by mixing the millet flour at different combinations and ratios with tapoioca flour, salt, refined oil. The flour was moisten in an electrical mixer to desired crumbly consistency.Noodles are a type of food made from unleavened dough which is rolled flat and cut, stretchedor extruded, into long strips or strings. The dough is made with the boiled water and the noodle flour, mixed the ingredients in a dough mixer for 15-20 minutes.

The noodle dough was made with the noodle flour mix with the ratio of various combinations at different levels. The dough is rested for 30 minutes, then rolled and extruded using extruder with a suitable die cut into desired size of extrudates. The extruded noodles were steamed ina steamer for 10 minutes at 102°C to 105°C and spread over a tray for drying in a try drier at 130°C for 4 to 5 hours. After complete drying the noodle is packed for storage. Aluminized laminated film is widely used in the packaging of instant noodles becauseof its high level of light barrier properties. Now the most used aluminized film structure is: BOPP / VMCPP. The packed noodles has been tested for its shelf life and keeping quality for 2-3 months the noodles has been stabled without any Microbial spoilage.

Process flow for the Preparation of Noodles



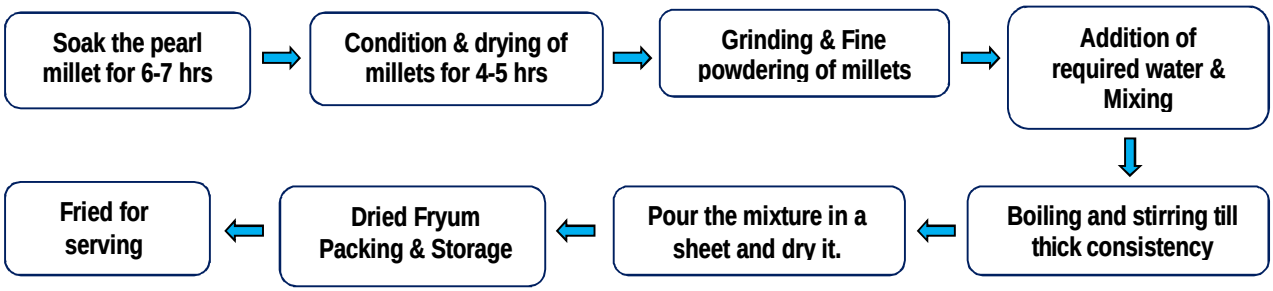
G. Development of Fryum Mix

The prepared millet flour has been mixed with the salt and spices like chilli, cumin seeds. Thecombination of the raw materials has been done with different trial variation at different ratios. The different fryum mix has been prepared for drying.

H. Preparation of Fryum

The millet grains of different species has chosen as the main ingredient and made into flour mix of the fryum. The fryum flour should be mixed with the required amount of water and slightly cooked at low flame. Boil until it reaches into a thin porridge consistency. The mix becomes more thick consistency at room temperature when cooled. To enhance the flavour and taste of the fryum add the cumin seeds with required amount of salt. In a clean plastic sheet or greased sheet to be spread on the surface under the sunlightfor drying and pour the fryum into a uniform shape. The dried fryum should be crisp without any moisture content. It takes around 2-3 days for drying. Once the fryum is dried completely the fryum is taken and separated from the sheet. It is stored as dried product in airtight container for usage. The fryum is deep fried in oil when heated to 60°C and packed /stored in the airtight container for consumption. Make sure that two sides of the fryum is dried. Store them in zip lock covers until further use. The dried fryums are deep fried and served alongside with main dish. The fryum is packed with a Polyester (PET) material based centre sealed pouches which is very transparent, break resistant, lower heat resistance and it is very low cost for packing the fryum. The packed fryum has been checked for shelf life were fryum is stabled for 3-4 months without any microbial spoilage.

Process Flow for the Preparation of Millet Fryum



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I. Sensory Analysis

Sensory analysis represents the unique tool for determination of organoleptic properties of food using human senses, because it is highly correlated with the consumers attitude. The sensory evaluation of different noodles and fryum using different millet flour was undertaken by semi trained panel member. The sensory attributions like appearance, color, taste, flavor, texture and overall acceptability were evaluated by using 5 hedonic score system. The organoleptic characteristics of cooked noodles and fryum were assessed by descriptive sensory profile. The 5 point hedonic scale ranging from 1 indicating poor to 5 indicating like excellent with a neutral category of 3 indicating good.

Color of noodles becomes darker (from light brown to brown) while increasing level of millet flour blend. Roughness of cooked noodles indicating amount of grainy particles and bumps on noodle surface was slightly increased with increase in level of millet flour blend. Firmness of cooked noodles from composite flour had a slightly less firm texture while increasing the level of millet flour blend, but significantly higher than branded noodles. Noodles from was found to exhibit a mildly starchy mouth coating, unlike noodles from other composite flour and branded noodle.

Developed Noodles

Developed Frvum

J. Quality Analysis

Quality should be the first thing of a food product. Ensuring noodles and fryum product qualityduring manufacturing will influence the quality of the end product. The noodles and fryum standard parameters that will help in maintaining high quality of the product .

K. Estimation of Moisture

Moisture was determined by taking 10 g of sample in moisture estimation cups and dried in an oven at 60˚C till the weight of moisture cups with its content was constant. Each time before weighing, the moisture estimation cup was cooled in desiccator. Moisture content of the sample was expressed in g/100g of sample. Measured the initial and final weight of the sample and reduction in weight represents the moisture loss which is calculated.

L. Chemical and physical composition of the noodle and fryum

Check the noodle extensibility, fryum firmness and bending strength with the aid of the texture analyser firmness, stickiness elasticity and bending strength define the overall texture of cooked and uncooked noodles. The breaking strength of uncooked and cooked noodles andfryum can be analyse by the correct cooking time.

III. RESULTS AND DISCUSSION

A. Optimal Cooking Time

The cooking quality of noodles was evaluated by the optimal cooking time, cooking loss, and texture of cooked noodles. Optimal cooking times for the differet noodles were reported to be between 6 to 8 minutes. The optimal cooking time increasing gradually with increasing levels of guar gum

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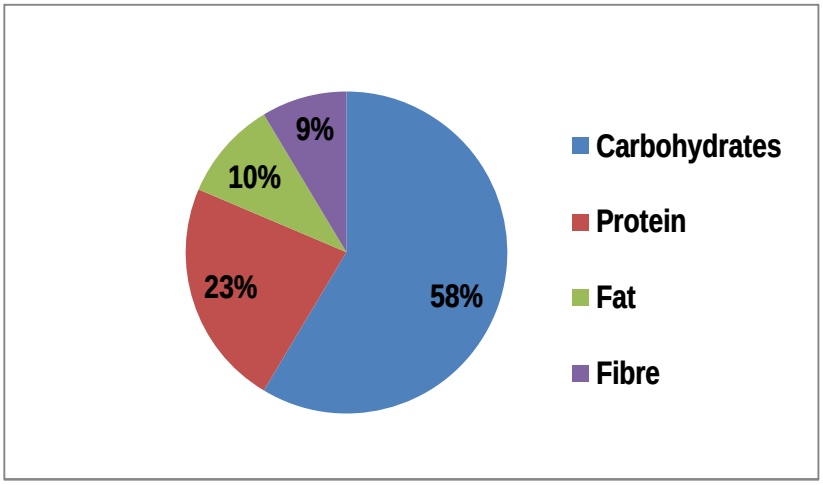
B. Optimal Cooking Time of Noodles

Cooking quality of noodles could be assessed by measuring the cooking yield. The cooking yield of the noodles ranged between 200- 300 %. The Prepared noodles having variation in yields compared to commercial products.

C. Nutritive Composition of Millet Noodles



D. Chemical Properties of Millet Fryum

The developed millets fryum had the total carbohydrates 75 to 80%, proteins 8 to 13%, fat 0.7 to 1%, moisture content of 9 to 10.5 % and ash content of 0.5 to 1.5% and the fibre at ease of the whole grain is very high, low in fat content and has around 12% of protein.

E. Sensory Analysis of Millet Noodles and Fryum

The noodles and fryum were served to semi trained panelists for organoleptic evaluation on a 5 point hedonic scale, with score 5 as excellent and score 1 as poor. Sensory evaluation was carried by 25 semi trained panel members. The sensory properties such as appearance, colour, consistency, flavor, taste and overall acceptability of finished product were evaluated on the basis of 5 points hedonic score card system.

Table - 1: Sensory Analysis of Millet Noodles

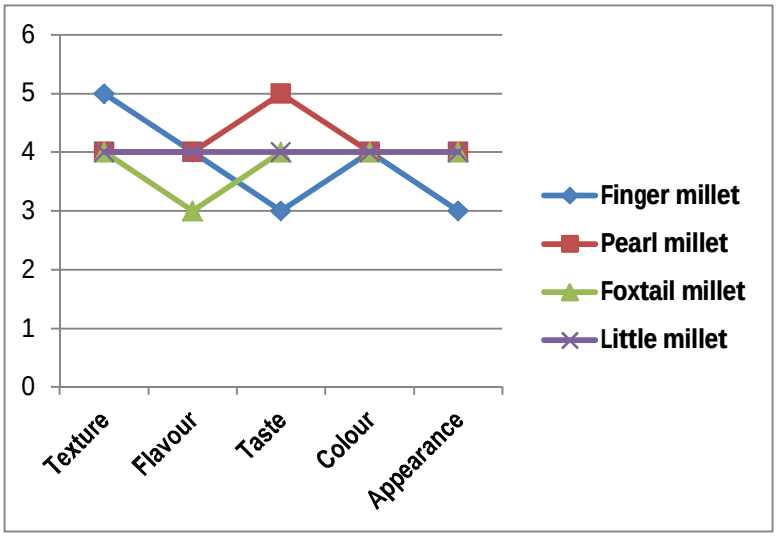
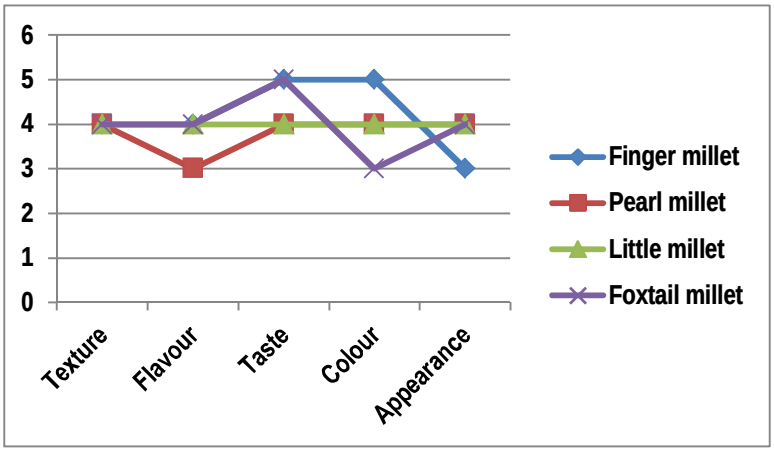


Table - 2: Sensory Analysis of Millet Fryum



F. Cooking Characteristics of the Noodles

Table - 3: Cooking characteristics of the Noodles

Type	Initial Weight	Cooked Weight
Finger Millet Noodles	120gm	200gm
Pearl Millet Noodles	120gm	190gm
Little Millet Noodles	120gm	200gm
Foxtail Millet Noodles	120gm	240gm

IV. CONCLUSION

Supplementation of cereal based food products by means of millets has become progressively more popular due to the nutritional and economic advantages. With appropriate processing technique a greatest of 30% of the cereal supported flour can be replaced with millet flour expediently. The noodles and fryum developed using the millet flours helps in new product formulations with ambient nutrients and health benefits. The study plead with millet flour blend in food products on physical, functional, dietary, cooking and organoleptic characteristics of noodles and fryum prepared with good keeping quality and extebnded shelf life. Fiber, protein and minerals ratio will increase significantly than the commercial products. Therefore, this nutrient rich noodle and fryum will be a high-qualitysource of Ready to cook foods for different age groups and added nutriets.

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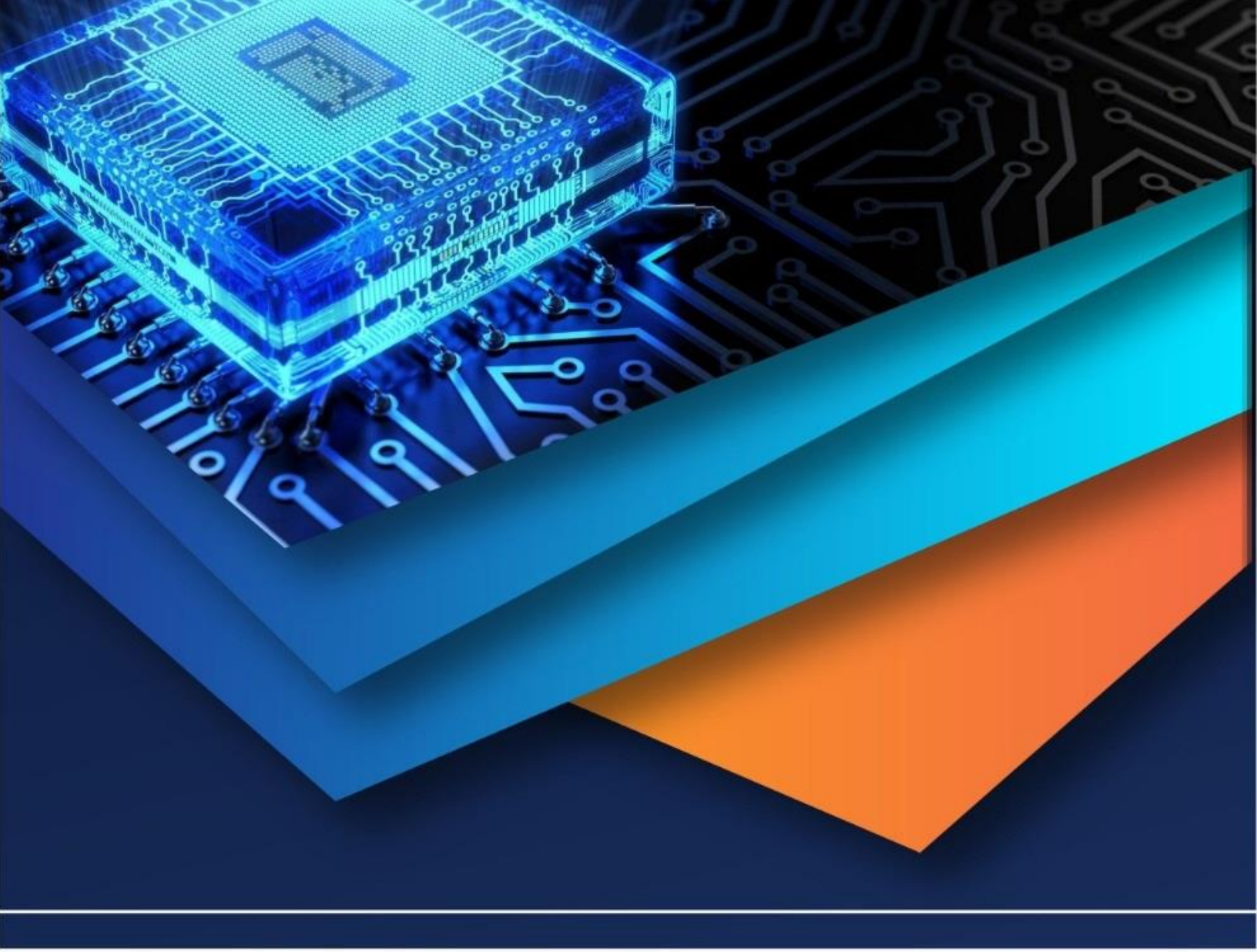

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