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Preparation of Herbal Hair Dye

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Abstract: Objective: To formulate and evaluate herbal hair dye by using herbal ingredients such as Henna, Guava leaves extract, Amla and Hibiscus.
Materials and Method: Herbal based hair dye was formulated by using different plans such as psidium guajava leaf, henna, hibiscus and amla. All collected ingredients in the powder form are mixed uniformly to prepare a homogeneous mixture of powder form of dye.
Result; The formulation shows the formulation shows good appearance, pH, texture and solubility.
Conclusion; As compared to synthetic cures natural cures are generally more effective and safe as they are more secure with negligible secondary effects when shown with the synthetic based items. Henna is the more popular natural hair dye plant. The use of henna increases color intensity. This natural hair dye has the benefit of causing no skin damage, erythema development, or edema. It is made entirely of water soluble plant elements. We made the beneficial qualities of the natural hair dye in our study.
Keywords; Henna, Natural hair colorants, Dye Yielding Plants, Hair Care Plant,

I. INTRODUCTION

herbal remedies that provide nutrition for healthy skin and hair as well as phytochemicals taken from a variety of botanical sources. A key component of human beauty is hair. Humans utilised herbs for cleansing, beautifying and hair growth science in the ancient age (1).Although Grating of hair is a natural phenomenon associated with aging there has been a significant occurrence of premature graying specially in women, attributed probably to stress and varied reasons like genetic influence, environmental factors, use of alcoholic preparation etc graying of hair result of an absence of pigment. It occurred to the scientist that hydrogen peroxide and databases might play a critical role in the process. Every hair cell makes a little hydrogen peroxide, but over time the amount builds up.(2).Many people periodically feel the need to alter or improve the colour of their hair, but they are reluctant to use the harsh and occasionally potentially hazardous hair dyeing chemicals present in the majority of commercial colour and dye rinses. With brutal hair colour, you can alter your natural hair colour, add fresh highlights to your locks, or naturally darken dark grey strands, just like men and women have done for thousands of years. Numerous plants, including henna, indigo, camomile, shoe flower, madder, and aloe, have been used to make hair dyes since ancient times. These dyes are used to give grey hair a natural black colour. (3). Loss of natural hair color is due to varied reasons like genetic influence, effect of environmental factors, Though permanent synthetic hair dyes are available in varied color range, they have the disadvantage of producing hypersensitivity reactions. Also studies have shown permanent hair color has produced cancer. A need was felt to formulate a product which is safe for use and does not have any problem of hypersensitivity reaction.(4) Natural plants are capable of producing natural colors that can change hair colour safely.(5) The hair dye include dyes modifier, antioxidant, alkalizers, soap, ammonia, wetting agent, fragrance and variety of other chemo aid used in small amount that imparts special qualities to hair such as softening the texture or give a desired action to the dye. Antioxidants protect the dye from oxidizing with air. Most commonly used is sodium sulfite. Alkalizers are added to alter the pH of the dye formula, because the dye works best in a highly alkaline milieu. In addition to these fundamental elements, several more compounds are employed to give a manufactured formula unique properties. A popular alkalizer is ammonium hydroxide (6).

II. HAIR DYES

According to the colour durability after application on the hair strand, hair dying systems can be categorised into four main groups: temporary, semi-permanent, semi-permanent, and permanent. The two main categories are oxidative and non-oxidative. Because the dye molecules only interact with the hair cuticles, temporary and semi-permanent non-oxidative hair dyes are based on coloured moleThey are known as semi-permanent products and can withstand up to six washes when there is only a slight penetration of the molecules into the hair cortex. The semipermanent and permanent oxidative hair dyes are based on oxidative hair dye precursors, whose colour features are formed by the interaction with an oxidising agent, and thus present a longer lasting colour. (7)

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A. Mechanism of Hair Dying

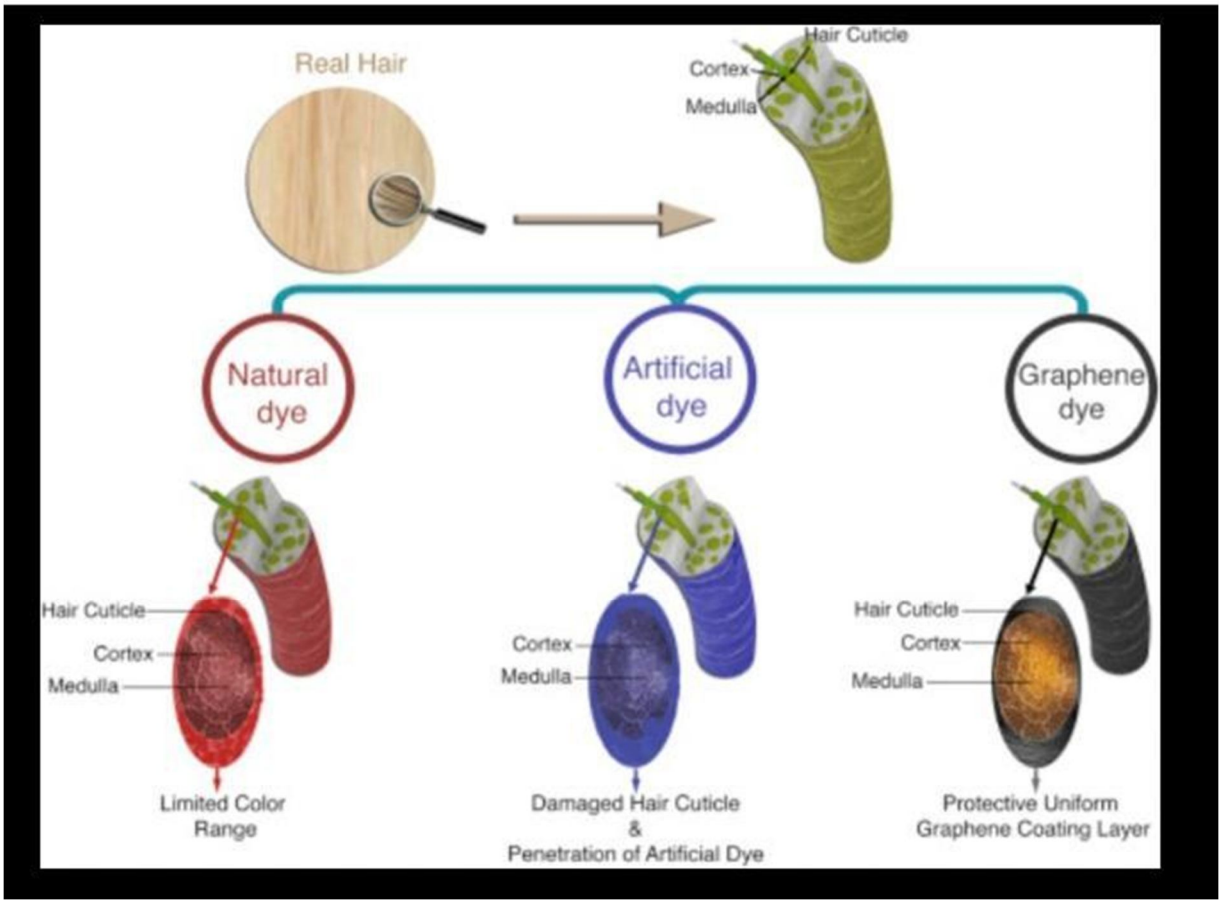

Fig: Mechanism of hair dye

B. Drawing, Hair Sample

Two layers of protein make up human hair, which is a fibre. Melanin is found in the cortex, the inner layer. Your hair has different colours of blonde, black, auburn, or brown thanks to the pigment melanin. Cuticle is a further layer that covers the cortex. Your hair's cuticle protects the cortex and gives it shine. As the cuticle is inert, it cannot absorb any substances through biological or chemical means.

C. By Chemical Dye

The majority of chemical dyes contain bleaching ingredients like ammonia and/or peroxide, which weaken the hair shaft's outer covering and form capillaries. The chemical colour of PPD, OPD, and MPD then fills these capillaries, penetrates the inner layer, and becomes permanently embedded there. The hair shaft is treated the same way with the subsequent application. As a result, the hair becomes weaker, rougher, and permanently damaged

D. By Natural Dye

By covering the hair shaft, natural dyes colour hair. It sticks as a semi-permanent colour and gives hair thickness. The second treatment accomplishes the same thing and makes your hair stronger and more radiant (8).

E. General Formulation of Hair Dye

In general, hair dyes include dyes, modifiers, antioxidents, alkalizers, soaps, ammonia, wetting agents, fragrance, and a variety of other chemicals used in small amounts that impart special qualities to hair (such as softening the texture) or give a desired action to the dye (such as making it more or less permanent).

F. General Methods of Preparation of Hair Dye :

1) All mentioned ingredients are collected in the powdered form. All ingredients are weighed . Then all ingredients are mixed uniformly to prepare a homogeneous mixture of a powder form of dye. The homogeneous mixture is weighed and packed in a plastic bag(9).

2) The aforementioned dried extracts in gramme form of henna, indigo, amla, bhringraj, and myrobalan were also taken. To create a homogenous, viscous paste, all of the aforementioned plant extracts are combined with enough ethanol (25ml) (10).

3)

(a) Preparation of herbal extract- 100gm of each of all herbal powder was taken separately and boiled with 100 ml of distilled water for 1h. and the extract was filtered and evaporated.

(b) Formulation of herbal hair dye - All the dried herbal extract were taken as per the quantities mentioned in the table and it was continuously mixed with water to prepare uniform paste (1).

4)

(a) Extraction and formulation of dye - Each raw material has been applied to the hair sample brought from a picture to check the fastness and dying effect on it for 30 minutes. Fresh leaves of aloe Vera were collected, washed roughly and the outer surface has been peeled off and inner mass was collected with the help of scoops.

(b) Finally 50 gm of lawsonia inermis, 20gm of hibiscus rosa sinensis, (leaves and flowers), 20 gm of Murray's koenigii, 20gm of eclipta alba, 20g of punica granatum, 30g of emblica offcinale, 5gm of azadirachta indica, 5gm of ocimum sanctum, 5gm of trigonella foenum, 20gm of juglone husk powder were blended with 5gm of aloe vera gel along with 2gm of iron filling and soaking the mixture for 1h in water along with tea decoction obtained a dye (2).

III. EVALUATION OF HERBAL HAIR DYE

The formulated herbal hair dye was evaluated for various parameters like organoleptic, Rheological and photochemical evaluation.

A. Organoleptic Evaluation

Organoleptic characteristics for various sensory characters like color, test, odor, texture and appearance have to be identified carefully.

B. Rheological Evaluation

1) Particle size - Particle size is a parameter, affecting various factors such as dispersion, stiffness etc. .

2) Bulk density - Bulk density is the ratio between a given powder's weight and it's bulk volume. Bulk density is calculated using the form below given formula.

$$\text{Bulk density} = \frac{\text{mass of powder}}{\text{Volume of powder}}$$

3) Tapped density- Tapped density is the increased density of the bulk. It is observed after tapping a container containing a powder sample. After seeing a first dose of flour or weight, measuring cylinder or vessel tapping for 1 minute and volume or weight reading is taken until additional volume or weight change is observed. It was measured per cubic centimetre (g/cm3) .

$$\text{Tapped density} = \frac{\text{weight of powder}}{\text{Tapped volume of powder}}$$

4) Angle of repose- It is defined as the maximum angle that can occur between piles of powder to a horizontal flow. Good flow property is essential in formulation of any powder.

5) Carr's index - Tapped density - Bulk density / tapped density* 100

6) Housner 's ratio - tapped density / bulk density (9).

C. Physicochemical Evaluation

1) pH - ph of the formulated herbal hair dye is determined by using pH meter(1).

2) Washability- when dye is applied on the skin it is during washing it is necessary to wash easily by water.

3) Solubility- Solubility is defined as the ability of a substance to dissolve in a solvent.

4) Patch test- for many cosmetic products, whether commercial or home made, this is recommended you do a patch test on your skin before using it. This is to make sure you do not have an allergy reaction to the product and if you do it will only be confirmed to a small area of skin and so on is easily handled.

5) Moisture content determination - Moisture content is necessary to determine for each sample.

6) Stability study - Stability testing of the prepared formulation is necessary to perform by storing it at different temperatures for the different time of period. The prepared dye formulation is evaluated for physical parameters like color, odor, pH, texture and smoothness etc(9)

IV. DRUG PROFILE

1) *Psidium Guajava:* Psidium Gujava (common name guava) is a well known tropical tree and widely used for fruit. Family (myrtaceae). vitamins A, C, iron, phosphorus and calcium are all present on guava fruit. more vitamin C present in guava than oranges. The various phytoconstituents present in guava fruit such as saponin, oleanolic acid, xylopyranoside, arabinopyranoside, guajavarin quercetin and flavonoids. Essential oils in the leaves contain alpha pinned, limonene, beta pinned, isopropyl alcohol, menthol, terpinyl acetate, caryophyllene long cyclen and beta bisabolene. Oleanolic acid found in guinea flow leaves. Guava contains a high proportion of nutrients that are antibacterial and antioxidants that help to control free radical activity. Antioxidants help to increase blood circulation and help hair grow as well as treating infection. Antioxidant property used in case of hair loss or disease. (11).

Fig: Guava leaves powder

2) *Henna:* Lawsonia inermis, family (lythraceae) (12). Lawsonia inermis, lythraceae family. Lawson, a resonance collared compound that is contained in dried leaves in a concentration of 1–1.5% w/w, is the main colouring component of henna. Lawson is suggested to be used as a non-oxidizing agent in the cosmetic product at a maximum concentration of 1.5. Flavonoids and gallic acid, among other henna ingredients, act as an organic mordant in the colouring process. The henna paste's appropriate consistency for hair attachment is provided by carbohydrates (4). Moreover, henna exhibits antifungal properties against Malassezia species (causative organism of dandruff). By regulating the pH of the scalp and preventing hair greying, henna delays premature hair loss (4).

Fig: Henna powder

3) *Amla:* Biological source- phyllanthus emblica. Family- phyllanthaceae.(13). Amla berries improve calcium absorption, resulting in stronger bones, teeth, hair, nails, and skin. It strengthens the hair follicles, preserves hair colour, and delays premature greying. Together with tannins, amla contains the highest concentration of Vitamin C of any plant. The active component of the hair care treatments is whole fruit. Furthermore abundant in tannins, minerals like calcium phosphorus, iron, and amino corrosive, this amla powder. Amla has antimicrobial and cell-reinforcing qualities that can help advance the growth of strong and glossy hair(9).

Fig: Amla Powder

4) *Hibiscus:* Botanical name - Hibiscus rosa sinensis, family- Malvaceae(15) It is excellent for increasing hair growth activity. Hibiscus is naturally enriched with Calcium, Phosphorus, Iron, Vitamin B1, Vitamin C¸ Riboflavin and Niacin, which help to promote thicker hair growth and decrease premature graying of hair. This flower is employed to control dandruff. Hibiscus produces flavonoids like anthocyanins and other phenolic compounds which have antioxidant qualities. It can be used to rejuvenate the hair by conditioning it.

Fig: Hibiscus powder

5) *Fenugreek Powder:* Foenum graecum Trigonella (leguminosae). One agent for conditioning is fenugreek. A sufficient number of flavonoids, which have antioxidant activity by scavenging free radicals and preventing hair fall, are present in fenugreek, which may aid in hair development. Moreover, seed extract is used to clean hair. (4).

Fig: Fenugreek powder

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V. MATERIAL AND METHOD

A. Collection of Plant Material

Powder of Psidium guajava (guava leaves extract) was prepared. Lawsonia Inermis (henna leaves), Emblica officinale(amla fruit), Hibiscus flower, and fenugreek powder were taken from the local

B. Extraction Procedure of Guava Leaves

The guava leaves were dried under shade and dried for 14 days at room temperature and the grounded leaf powder by using a grinder for extraction of active constituents. The powder plant material (15g) was packed into soxhlet apparatus and extracted up to four hours with ethyl acetate (250ml) at 60-80°C. The extract was filtered and the solvent was evaporated under reduced pressure by using a rotary vaccine evaporator at 65°C.

C. Phytochemical Screening of Guava Leaves Extract

1) *Test for Saponins:* 1ml of leaf extract was combined with 5 ml of water which is at 60°C, then shaken for 2 minutes as saponine are known to process frothing activity. The volume of froth produced in this experiment was observed.
2) *Test for Tannins:* The plant leaf crude extract was treated with alcoholic 0.1% ferric chloride reagent. A bluish black colour will appear.
3) *Test for Flavonoids:* The plant leaf crude extract was treated with a drop of 20% NaOH. Yellow colour will appear which becomes colourless on adding dil HCl.
4) *Test for Alkaloid:* The plant extract was evaporated to dryness in a boiling water bath. The residue was dissolved in 2NHCl. The mixture was filtered and the filter was treated with an equal amount of waggers reagent. The reaction shows brown precipitate indicating the presence of alkaloid.
5) *Test for Carbohydrates:* Extract was dissolved in 5ml distilled water and filtered. The filtrate were used for detection of carbohydrates. Few drops of Benedict's reagent to the ear solution and boiled in a water bath. Formation of reddish brown precipitate indicates formation of sugar.
6) *Test for Terpenoid:* The plant leaf extract was treated with 2 ml chloroform and 3 ml sulfuric acid. Formation of reddish brown precipitate will indicate that terpenoids are present.
7) *Test for Phenolic Compound:* 1ml test solution was treated with 10% ethanolic ferric chloride. Phenolic compounds were considered if the colour changed to dark green or bluish black.

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D. Formulation Table

Sr No.	Ingredients	Quantity	Use
1	Guava leaves extract	3g	Maintain natural hair colour
2	Henna	25g	Coloring agent, Antifungal
3	Amla	12g	Antioxidant, maintain natural hair colour
4	Hibiscus	5g	Colouring agent, promote hair growth
5	Fenugreek	5g	Conditioning and nourishing hair

Table1: Composition of herbal hair dye formulation

E. Preparation OF Herbal Hair Dye

All mentioned ingredients are collected in the powdered form. All ingredients are weighed . Then all ingredients are mixed uniformly to prepare a homogeneous mixture of a powder form of dye. The homogeneous mixture is weighed and packed in a plastc.

F. Evaluation OF Herbal Hair Dye

The formulated herbal hair dye was evaluated by using various parameters like organoleptic, Rheological and photochemical evaluation.

1) Organoleptic Evaluation

a) Color of formulation
b) Odor of formulation
c) Appearance
d) Texture

2) Rheological Evaluation

a) Particle Size: Particle size is a parameter which affects various properties like spreadability, giddiness etc. Particle size was determined by using the sieving method.

b) Bulk Density: 5g of dye powder weigh carefully and transfer in 100ml of measuring cylinder. Carefully level the powder blend without compacting and read the unsettled value. The following formula was used to determine the bulk density.

Bulk density = Mass / Bulk volume

c) Tapped Density: Weigh accurately 5g of dye powder and transfer in 100ml of measuring cylinder and measuring cylinder or vessel tapped for 1 min and carefully measure the tapped volume. Tapped density was determined by using the following formula .

Tapped density = Mass/ Tapped volume

d) Angle of Repose: Angle of repose was determined using a funnel for the determination of powder flow. The given formula was set to determine the angle of repose.

Tan alpha= H/R

Where,

Alpha= Angle of repose, H= height of pile of the powder, R= radius of pile of the powder

e) Hausner's Ratio: The following formula was used to determine the hausner's ratio.

Hausner ratio = Tapped density/ bulk density

f) Carr's index: Tapped density- Bulk density/ Tapped density * 100

3) Physicochemical Evaluation

a) PH – pH affects the pharmaceutical consideration as well as it affects hair. 1g of powdered sample in distilled water. The resulting solution was calculated using a pH meter.
b) Washability - Formulation was applied on the skin and then washed with water were checked manually.
c) Solubility - Solubility is defined as the ability of solute to dissolve in a given solvent. One gram of powder is weighed accurately and transferred into a barker containing 100 ml of water. This was shaken well and warm to increase the solubility. Then cooled and filtered and residue was weighed and noted.
d) Moisture content - The method commonly used for determination of moisture content is loss on drying or LOD. Crude drug was heated at constant temperature and calculated the total loss of weight.
e) Patch test - A small quantity of paste was applied on the ear back. After 20 minutes this paste was removed and the area was washed carefully. There was no irritation and allergic reactions were seen.
f) Stability study- Stability of the prepared formulation was determined by keeping the formulation at different temperature conditions for the period of time for one month The packed formulation were stored at different temperature conditions viz. At room temperature and 35°C and were evaluated for physical parameters. The prepared dye formulation was evaluated for the physical parameters like pH , colour, odour, texture and smoothness.

VI. RESULT AND DISCUSSION

A. *Phytochemical Screening of Guava Leaves Extract*

Sr. No.	Phytoconstituent	Guava leaf extract
1	Saponine	+
2	Tannin	+
3	Flavonoids	+
4	Alkaloid	+
5	Carbohydrate	+
6	Terpenoid	+
7	Phenolic compound	+

Table2: Phytochemical screening of guava leaves extract

B. *Organoleptic Evaluation*

Sr. No.	Parameters	Observations
1	Colour	Green
2	Odour	Characteristics
3	Texture	Fine
4	Appearance	Powder

Table3: Organoleptic evaluation

C. *Rheological Evaluation*

Sr. No.	Parameters	Result
1	Particle size	20-23nm
2	Bulk density	0.33
3	Tapped density	0.5
4	Angle of repose	27.58
5	Carr's index	34
6	Hausner's ratio	1.5

Table4: Rheological evaluation

D. Physicochemical Evaluation

Sr. No.	Parameters	Result
1	pH	6.7
2	Washability	Easy Washable
3	Solubility	Soluble in water
4	LOD	1.7%

Table5: Physicochemical evaluation

E. Patch Test

Sr. No.	Parameters	Result
1	Sweling	Negative
2	Redness	Negative
3	Irritation	Negative

Table6: Patch test for herbal hair dye

F. Stability Testing

Sr. No.	Parameters	Room temperature	35°C
1	Colour	No change	No change
2	Odour	No change	No change
3	pH	6.5	6.7
4	Smoothness	Smooth	Smooth
5	Texture	Fine	Fine

Table7: Stability testing for herbal hair dye

VII. CONCLUSION

When compared to synthetically based treatments, natural therapies are typically safer, more effective, and have fewer side effects. The most well-known natural hair colouring plant is henna. Henna application intensifies colour. This natural hair dye has the advantage of not harming the skin or developing erythema or edema. It's constructed entirely of plant materials that are soluble in water. In our research, we considered the advantages of using natural hair dye.

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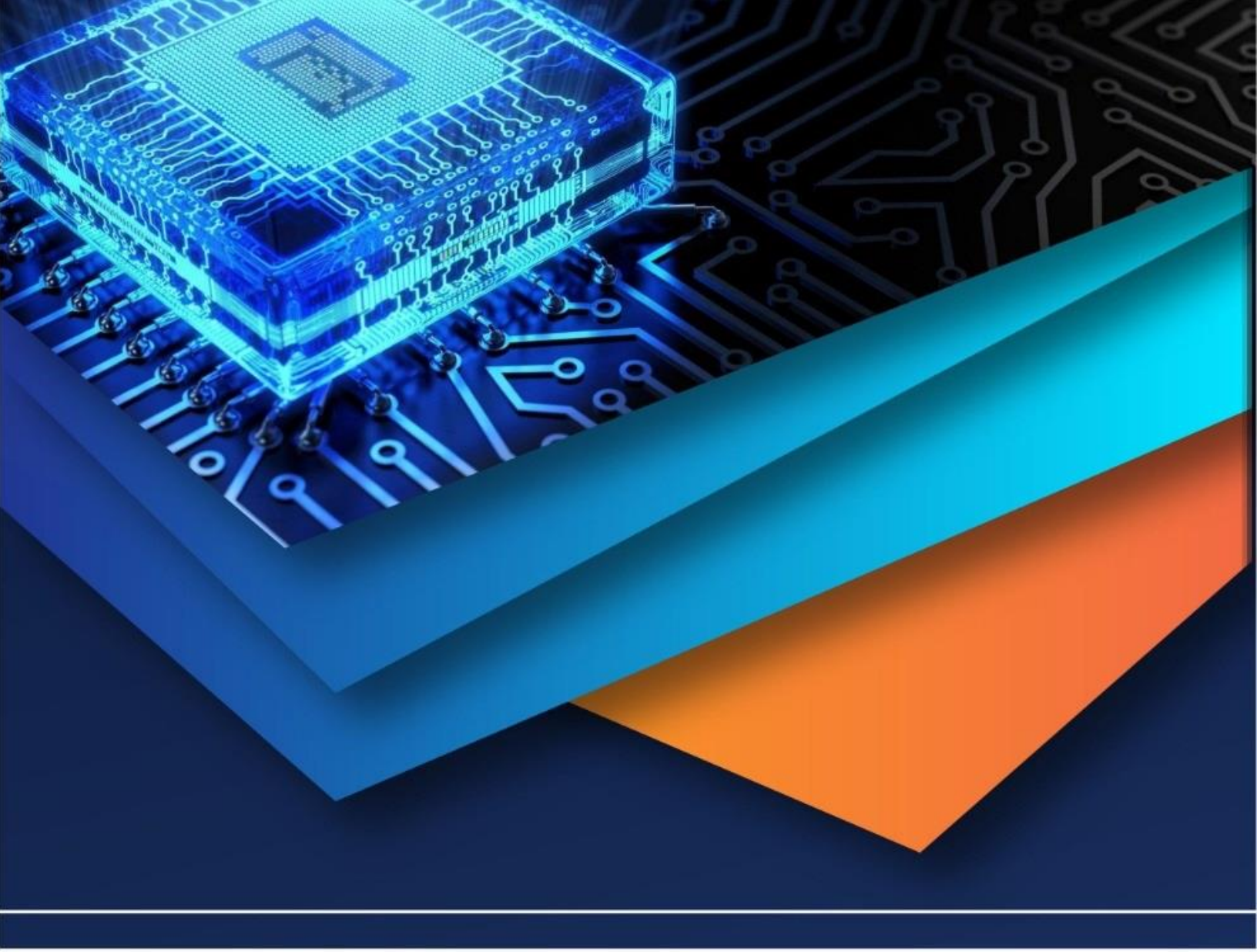

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