iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** IX **Month of publication:** September 2020

DOI: https://doi.org/10.22214/ijraset.2020.31594

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue IX Sep 2020- Available at www.ijraset.com

Quantitative Analysis of Plankton in the Paddy Field of Thoubal District, Manipur

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Abstract: ***The Physico-chemical and biological analysis of water was carried out on the four paddy field of Thoubal District. Temperature, transparency, pH, dissolved oxygen, carbondioxide, chloride, total alkalinity acidity, calcium hardness NO_2 and NO_3 etc. are the favour on the plankton in the paddy field. Phytoplankton increase during rainy season while decrease in zooplankton during winter. A total 492 number of phytoplankton & 471 zooplankton were recorded from the paddy field during study period September to November 2019.***
Keywords: Physico-chemical parameter, plankton, Thoubal, Manipur

I. INTRODUCTION

Water quality in the Manipur valley is not satisfactory. Water bodies are contaminated and paddy fields are exposed to domestic and Municipal effluent. Since water pollution in essentially a biological phenomenon, the degree of pollution can be estimated either from physical and chemical properties and from biological characteristics of water. The present paper includes biological estimate of plankton and their taxonomic composition along with chemical assessment of the paddy field. Most of the rural population are cultivator in the paddy field. The plankton begins the agricultural food chain. Microscopic phytoplankton use the sun's energy to combine carbondioxide and water to form sugar and oxygen process is called photosynthesis. Thus the present work is established.

II. MATERIAL & METHODS

The observation for the study on plankton at the paddy fields were taken in three observation in one cycle. The first observation was taken after twenty days of plantation. The second observation was taken when the paddy plant matured i.e. at the time of flowering and third observation was taken when the harvesting in ready for the paddy.

Water were collected during the observation from the approachable paddy field sampling sites starting from September to November 2019. Temperature, dissolved oxygen, free carbondioxide, alkalinity, acidity, chloride, hardness nitrate and nitrites were analysed after APHA (1995). Phytoplankton were collected from the surface water and Zooplankton were collected at the depth of 15-20cm from the surface water by filtering water sample using plankton net (mesh size no. 20) and preserved in 100ml of plastic bottle with 4% formalin and three drops of Lugon solution was also added and kept in dark place for 24 hours by decantation and estimated the volume of the rest water. The collected planktons were analysed after Sidgwick Rafler Counting Cell (SR-Cell) and identification was under the phase contrast light Olympus microscope Japan and analysed after Edmonson (1992).

III. RESULT AND DISCUSSION

The water quality data presented in (Table-2) revealed that water temperature ranged from 27^0C to 30^0C, higher temperature in generally recorded during summer. Temperature is key factor for the seasonal periodicity of plankton as observed in the present study. Paddy field having water temperature more than 23^0C is suitable for phytoplankton reported by Bhosale, Sabale and Mulic (1994) supported the temperature of present study.

Transparency was low during summer and rainy seasons the turbidity was high in summer season due to high planktonic and increase in concentration due to high evaporation rate, while in rainy season it was because in suspended particles brough in through surface run off the present study recorded 1cm during September at Thokchom Loukon. While 7.6cm recorded during the month of November at Yairipok (Sibly Loukon). Result is suitable for plankton as they live on the surface water. Analogous was supported by Mishra *etal* (1998).

pH value ranges from 6.5 to 7.5 revealed the medium productive in nature for plankton community. The lowest pH value was recorded during monsoon and post monsoon season in the month of September and November, 2019 which implies the influence of run-off water entering into the water bodies. The pH was slightly alkaline during summer and pre-monsoon which may be due to

dumping of garbage and inflow of sewage water. The present data is in within the range of IS (Indian Standard value) (6.5 to 8.5) (BIS, 1992). The increased rate of organic matter decomposition high influx of free carbondioxide, higher water temperature during September creates slight acidic. The present study recorded low range of carbondioxide between 1-4.8mg/L at Yairipok and Wangjing as minima and maxima respectively, pH of water is an important factor that affect the plankton. The maximum value recorded monsoon was due to enlarge surface decomposed of organic matters from domestic and municipality effluents and enter to the paddy fields. Lower values of free carbondioxide increase the value of dissolved oxygen, increase in dissolved oxygen is related to the decrease in temperature or decrease is D.O in possibly because higher temperature in solubility of oxygen decreases with increase in temperature.

The higher value of DO may be due to the influence of run off water from monsoon rain. Lower value DO was recorded during pre-monsoon season at all the paddy fields during study period. Atmospheric aeration and photosynthetic production of oxygen of phytoplankton may be low during pre-monsoon and higher during post monsoon.

The monthly variations were recorded in the dissolved oxygen content of surface water ranged from 4.0 to 8.0 mg/L. Which is satisfactory the survival and growth of aquatic organisms. Maximum value of dissolved oxygen content 8.0mg/L was recorded in November and minimum value of 4.0mg/L in September, 2019. This might be due to fluctuation in temperature which alter turbidity and reduce photosynthetic activities as well as establishing the principle of Low temperature and increase in solubility of gases (Rao *etal,* 1993). The total alkalinity during the study period recorded at the range of 28 to 32 mg/L. The data was supported by (Singh, 1993). The minimum value was recorded in the month of November and maximum was recorded during the month monsoon season, during study period. This increase of alkalinity might be due to the fact that the accidental mixing the amount of sewage and wastes materials in low water quality and high evaporation rates and change in alkalinity might be due to the increased decomposition. Similar result was also reported by Hedge and Bharathi (1989).

Total acidity ranged from 4-22.5mg/L. The result was supported by (Singh, 2018). Acidity is also related temperature and D.O. chloride ranged from 3 to 10.6mg/L. The higher chloride content may be due to the higher amount of sewage effluent and municipal wastes discharged in the paddy field. The result is supported by the Ongley (1996).

Hardness of water was due to the concentration of salts, particularly due to the concentration of multivalent metallic ions of calcium and magnesium. Any increase in hardness causes scale deposition and scum formation. The present study recorded 45mg/L as maximum in the month of November 2019. The present value recorded are within the permissible limits of ICMR (WHO). The highest concentration of nitrate is an indicator of organic pollution and eutrophication. The present work recorded ranged from 0.01 to 0.04mg/L of nitrate and 0.02 to 0.04mg/L nitrites. The increase in value of nitrate & nitrite in water is due to manmade domestic activities and fertilizers in paddy fields. This result in supported by Zutchi and Khan (1998).

Aquatic life depends on physico-chemical parameters of water. The phytoplankton and zooplankton in the paddy fields of Thoubal District were found distributed but influenced by combinations of several physical, chemical factors. Most of the phytoplankton are floating on the water surface influencing the colour, test and odour. While zooplankton are wandering animal living in darken and cold area of the water body. Among phytoplankton community recorded *Cyanophyceae* > *Bacillariophyceae* > *Chlorophycea* > *Myxophycea* (Table-6) while among zooplankton *Rotifers* > *Cladocera* > *Copededa* > *Ostracopoda* (Table – 1)

The Planktonic organisms in the aqua systems are essential link in food chain. The present study explores in plankton community in the paddy field of Thoubal district. The Phytoplankton plays a phenomenon of organic materials while zooplankton is one important of secondary producer in the aquatic ecosystem. Zooplankton is good indicators of the changing of water quality to change in environmental quality. A total 512 species of phytoplanktons were collected. Members of *Cyanophyceae* was recorded maximum during the post monsoon in the field of Thoubal District. Similar observation was reported by Pachgade et al (1994). *Anabaena sp.* was extensively observed during the study in Thoubal district. The numerical density of *Myxophycea* and *Chlorophyceae* were recorded as minimum during the monsoon/rainy days. Dominance of Diatoms over *Chlorophycea* in stagnant water, Vaishali et al (2007), supported the present observation in the paddy field. Plankton community dynamic is regarded as a biomonitoring tool of water quality. The phytoplankton in paddy field showed fluctuation and degree of pollution. In summer, when high concentration of organic pollution was suspected. Some tolerant sps. of *Chlorococcus Oscillatoria, Anabaena sp.* etc. were abundance in the present study (Table-1).

The fluctuation in the phytoplankton may be caused by grazing of consumers like carp fishes. However, the organic land as reflected by phytoplankton was more evident from the domestic and municipal waste from the residential areas. Phenomenon is supported by Mishra & Saxena (1993). A total 471 zooplanktons were collected (Table – 1) Among the Zooplanktons, rotifers apparently the most sensitive indicator of water quality. The preliminary study shows *Rotifers* > *Cladocera* > *Copepoda* > *Ostracopoda.*

Table – 1: Lists of phytoplankton and zooplankton recorded during September to November 2019

Class	Species
Chlorophyceae	*Closterium elegans, volvox sp. Ulothrix sp. Zygnema sp. Spirogyra singularis, Spirogyra macrospora, Chlorella vulgaris Chlorococcus sp.*
Bacillariophyceae	*Diatoma elongatum, Navicula seminulum, Pinnularia gibba Diatoma vulgare, Achanthes granulate, Pinularia sp.*
Cyanophyceae	*Anabaena affinis, Nostoc sp. Oscillatoria, liunosa, Melosira sp. Oscillateria princeps.*
Myxophyceae	*Anacystis sp. Gomphospaeria sp. Anabaena sps.*
Rotifers	*Branchionus calyciflorus, B. quadridentatus, Keratella tropica,*
Copepoda	*Cyclops sp. Cypris sp. Naupluis sp. Mesocyclops sp.*
Cladocera	*Daphnia sp. Moina sp. Bosmina sp.*
Ostracoda	*Crustaceans, Prawn, decapoda, nauplus, mysis*

Table-2: Average Physico-chemical parameters of water in (mg/L) at different paddy field of Thoubal District, 2019

Parameter	September				October				November			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
Temperature O^0C	26±1.2	22±1.5	21±1.3	20±1.2	24±1.2	25±1.3	23±1.2	22±1.6	24±1.6	23±1.2	25±1.2	22±1.3
Transparency (cm)	3±1.2	3.5±2.2	4±1.2	5±1.3	5±1.3	5±1.4	4±1.3	3±1.5	2.1±1.3	3±1.3	4±1.6	3.1±1.5
pH	6.8±0.2	6.0±0.7	6.1±0.6	6.5±1.6	6.5±1.6	6±1.4	6.3±1.5	6.3±1.6	7±0.1	8.0±1.1	8.5±1.2	9.0±1.3
DO	5.6±1.3	6.0±1.0	6.0±1.5	6.2±1.1	7.1±1.4	7.3±1.5	7.2±1.4	7.6±2.5	8.1±0.7	8.6±1.3	9.0±1.3	30±1.4
Total Alkalinity	28.0±3.1	29±2.0	28.6±1.4	29.3±1.0	28±1.5	28±1.7	29.2±1.2	30±1.0	31±1.3	32±1.2	29±1.5	18±1.2
Acidity	10±1.3	11.1±2.8	12±2.6	12±2.6	15±2.5	14±2.1	16±1.2	18±1.3	19±1.1	19.0±1.6	20±1.1	5.8±1.6
CO_2	2.0±1.3	4±1.8	3.7±1.6	3.7±1.6	4±1.2	4.6±1.3	3.6±1.8	4±1.2	4.5±1.0	5±1.2	5.6±1.2	8.5±1.4
Chloride	6.6±1.3	6.0±1.2	5±1.6	5±1.6	3.7±1.0	4.2±1.2	5.0±1.2	5.2±1.0	5.0±1.0	6±1.0	7.2±1.2	70±1.6
Hardness	43.0±0.9	44±1.2	45±1.3	45±1.3	54±1.0	55±1.0	5.0±1.2	53±2.0	55±2.0	57±1.2	60±1.3	70±1.6
Nitrate	0.06±0.02	0.07±0.03	0.09±0.04	0.09±0.04	0.07±0.04	0.06±0.01	0.05±0.02	0.04±0.02	0.06±0.02	0.05±0.02	0.06±0.03	0.07±0.01
Nitrite	0.01±0.01	0.05±0.02	0.08±0.02	0.08±0.02	0.09±0.01	0.08±0.02	0.07±0.02	0.07±0.03	0.09±0.01	0.08±0.02	0.09±0.03	0.08±0.03

Table-3: Total number and percentage (%) population of phytoplankton of Thoubal District, 2019

Phytoplankton	September				October				November				Total	(%)
Class/Station	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4		
Cyanophycea	15	10	5	18	2	21	2	12	15	20	25	5	150	15%
Bascillariophycea	8	8	6	10	10	12	15	10	10	15	16	10	130	13%
Chlorophyceae	13	10	12	7	8	15	10	10	10	8	15	4	122	13%
Myxophyceae	12	7	3	13	10	5	6	3	7	10	10	4	90	9%
	48	35	26	48	30	53	33	35	42	53	66	23	492	100

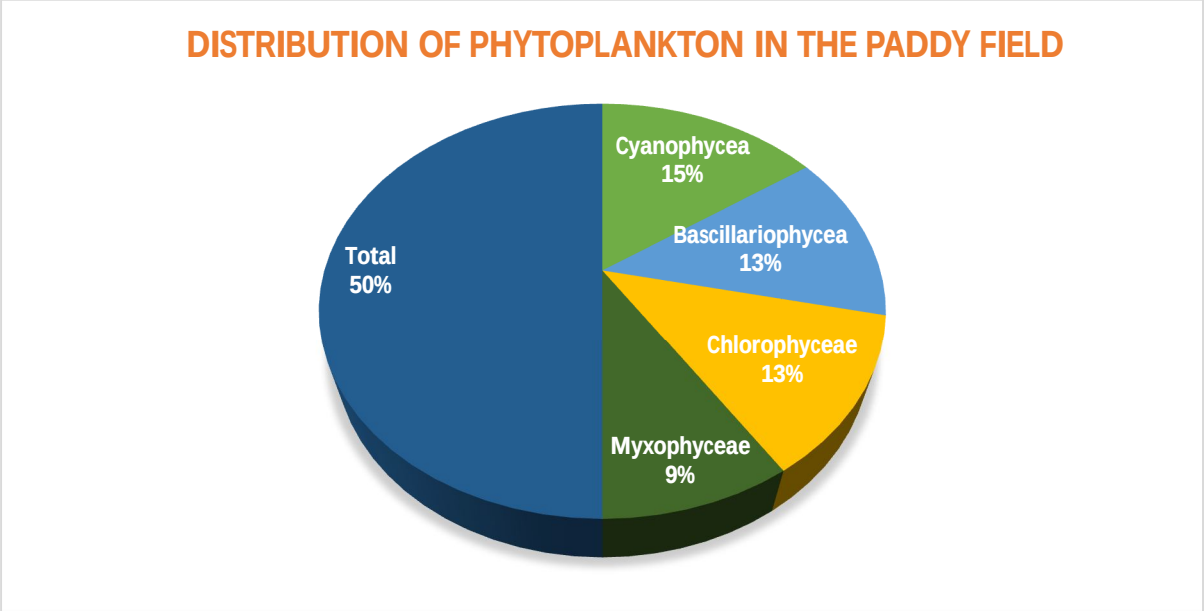

Fig. 1

Table – 4
Total number and percent (%) population of zooplankton of Thoubal District

Zooplankton	September				October				November				Total	(%)
Class	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4		
Rotifer	20	15	6	10	20	10	10	6	15	16	8	10	146	30.99%
Copepoda	12	10	8	5	-	8	15	8	12	10	13	8	109	23.14%
Cladocera	22	20	18	10	-	6	10	9	8	10	8	9	130	27.60%
Ostracoda	11	8	10	6	8	10	-	5	10	-	8	10	86	18.25%
Total	65	53	42	31	28	34	35	28	45	36	37	37	471	100

S_1 – Yairipok, S_2 – Ukhongsang, S_3- Thokchom, S_4- Wangjing

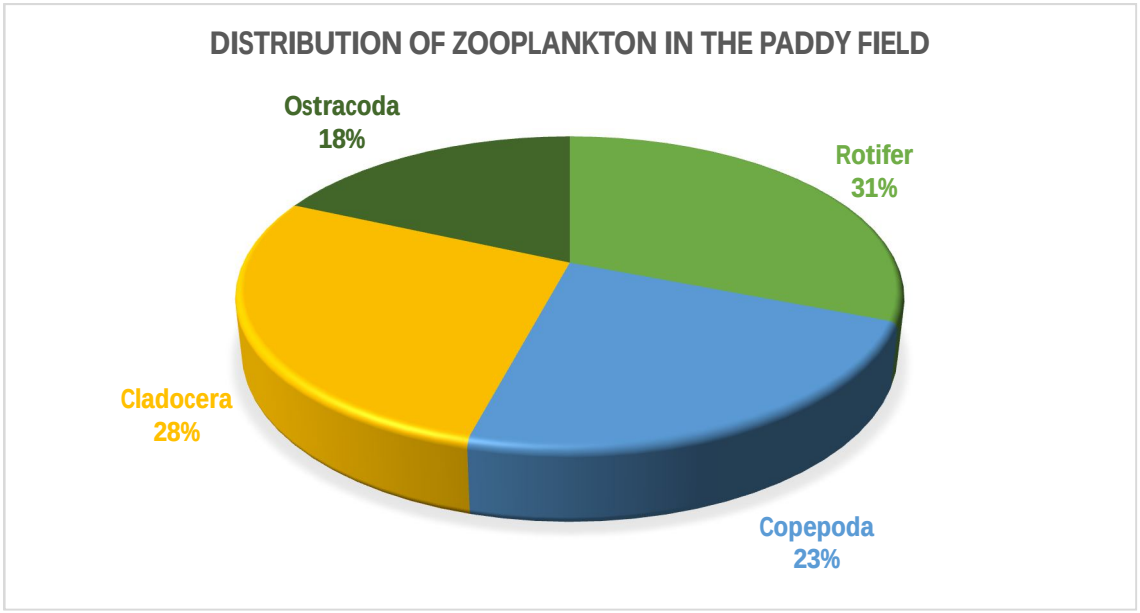

Fig. 2.

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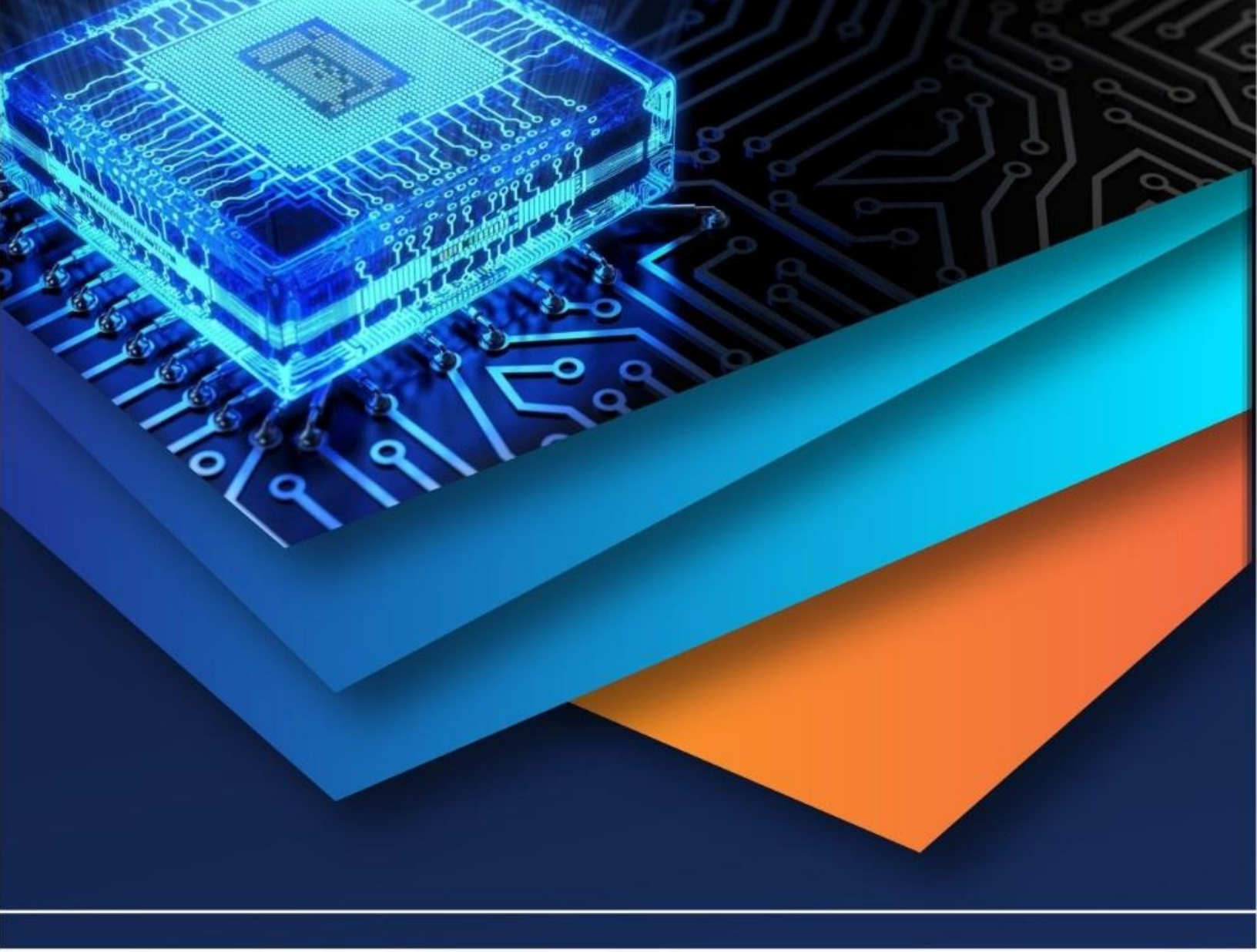

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