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Prevalence and Histopathological Studies on Intestinal Cestode Parasite of Avian Host *Gallus Domesticus* (L) From Nashik Region, Maharashtra State, India

Sunil D. Patil[1], Komal Jagzap[2]
[1, 2]*Research Centre and P. G. Department of Zoology, Mahatma Gandhi Vidyamandir's Loknete Vyankatrao Hiray Arts, Science and Commerce College, Panchavati, Nashik, MS, 422003*

Abstract: ***The lowest infection is recorded in rainy season and highest in summer season, may be due to life cycle stages and intermediate host availability increases in winter and became adult in definitive host in summer. No nematode and trematode parasite were considered and identified during the study period. Cysts were found deep in submucosa, although touches to serosa. The non-penetrative type of worms is Cotugnia sp. and Thaparea sp.; while the penetrative type of worm is Raillietina sp. and Paruterina sp. Free gravid segments mostly found in the posterior region of intestine while mature segments are freely suspended from scoleces in the lumen of intestine, only scoleces are attached, either superficially (non-penetrative type) or deep in submucosa (Penetrative type).***
Keywords: Cestode, histopathology, prevalence, hold-fast organs, Penetrative scolex

I. ACKNOWLEDGEMENTS

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II. INTRODUCTION

One of the constrain to farmer's economy is parasitic infections, reducing growth and reproduction of domestic livestock. Mainly the uncontrolled free feeder animals suffer from cestode infection. The GI tract cestode infection is reported by many workers [1]-[4]. Histopathological studies on intestine of *Gallus domesticus* infected with cestode parasites carried out by many workers [1],[5]-[7]; shows that the cestode parasites present in the intestine of the gut region shows the hold-fast organs of attachment in the form of suckers, rostellum, spines, hooks, tentacles etc which destroy the intestinal villi, if numerous may blocks the intestine and interferes with passing of food, resulting in malnutrition of the bird [4]. But till it is necessary to carry out histopathological in relation with their prevalence other parts of country in find out their infections and to follow appropriate control measures. Hence, this work is undertaken to find out the prevalence of gastrointestinal cestode infections and their impact on structure of GI tract in desi fowl Gallus domesticus in Nashik district of Maharashtra for 2 years.

III. MATERIAL AND METHODS

Viscera of *Gallus domesticus* collected from slaughterhouses of Nasik region, 10 birds were examined per month. Sum of 240 intestines thoroughly examined and observed to see the degree of infection by cestode parasites only, for the 2 years 2019-20 and 2020-21. The worms which were free in lumen were spread and fixed in 4% formal aldehyde. Stain with Harris haematoxylin and dehydrated, mounted, and identified. The worms which were attached to intestine were kept intact and small pieces of infected and non-infected intestines were fixed in Bouin's fluid fixatives, wash with water. They were dehydrated through graded alcohol, cleared in xylene, and embedded in paraffin wax (M.P. 58-60^{0}C). The transverse and longitudinal sections were cut at 7µ and stained with Harris haematoxylin and eosin as counter stain. Slides were selected and observed under microscope for further studies and conclusions. Month wise record of number of cestode parasites and birds examined are kept for further conclusions.

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IV. OBSERVATIONS

In the year 2019-20, the prevalence of the cestode parasites in *Gallus domesticus* was 18.89% in rainy season (i.e. June to September). In winter season (i.e. October to January) the incidence of cestode infection was 42.02% and in summer season (i.e. February to May) was 64.67%. The total cestode parasites collected in rainy, winter and summer season were 567, 1260 and 2024 respectively.

In the year 2020-2021, the incidence of infection was 21.5% in rainy season, 42.56% in winter and 63.26% in summer season. The total cestode parasites collected in rainy, winter and summer season were 645, 1277 and 1897 respectively. It has been found that the highest incidence of infection was 53.62%. of the cestode *Cotugnia sp.* in the summer season of the year 2019-2020 and lowest was 11.07%., in the rainy season of the year 2020-2021 while *Raillietina sp.* found more 58.08% in the year 2019-20.

A. Collection of Cestodes and Infected Intestine

Fig 1: Heavily infected intestine and collected cestode parasites of *Gallus domesticus*

Table 1: Showing Month Wise % Incidence Of Infection Of The Cestode *Parasites*

Month & Year of collection	% Incidence of infection	Month & Year of collection	% Incidence of infection
June 2019	16.08	June 2020	19.68
July 2019	18.6	July 2020	19.73
August 2019	14.55	August 2020	23.8
September 2019	26.34	September 2020	22.8
October 2019	29.44	October 2020	34.06
November 2019	33.24	November 2020	49.89
December 2019	45.93	December 2020	37.19
January 2020	59.48	January 2021	49.22
February 2020	53.06	February 2021	58.57
March 2020	68.02	March 2021	59.58
April 2020	66.21	April 2021	67.04
May 2020	71.40	May 2021	67.88

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Table 2: Showing Seasonal % Incidence Of Infection Of The Cestode Parasites

Season of the Year 2019-2020	% Incidence of infection	Season of the Year 2020-2021	% Incidence of infection
Rainy	18.89	Rainy	21.50
Winter	42.02	Winter	42.56
Summer	64.67	Summer	63.26

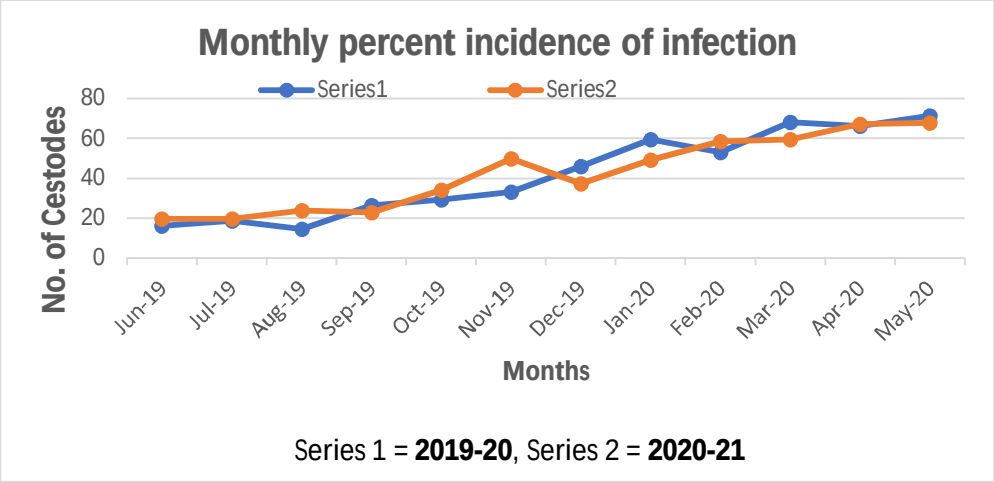

Fig 1: Month Wise Incidence Of Infection For 2 Years

For the histopathology, the intestine heavily infected showing swellings and lesions from external surface where some of the intestinal villi were found ruptured. But it is difficult to conclude that there is any relation between such lesions and isolated parasites [19]. Attachment of scolex by hold fast organs including rostellar hooks and muscular suckers. In the lumen of intestine few free gravid segments were found. Scolex is small which is deeply penetrated in submucosa. It is penetrative type of scolex and non-penetrative were superficially attached to villi. Rostellum is small with two rows of hooks and suckers are very large and armed with spines. Few mature segments were invaded by villi. Most mature and gravid proglottids were recorded in the intestinal lumen.

V. RESULTS AND DISCUSSION

In both years 2019-20 and 2020-21 the prevalence of the cestode parasites in *Gallus domesticus* was 20.19% in rainy season (i.e. June to September). In winter the incidence of cestode infection was 42.29% and in summer season was 63.96%. But according to Reference [1], high prevalence in rainy season (43.41 %) followed by summer (38.91 %) and winter (17.68 %) seasons for all parasites but not corelate with cestode infection only.

A. Histopathology of GALLUS Intestine Infected with CESTODE Parasites

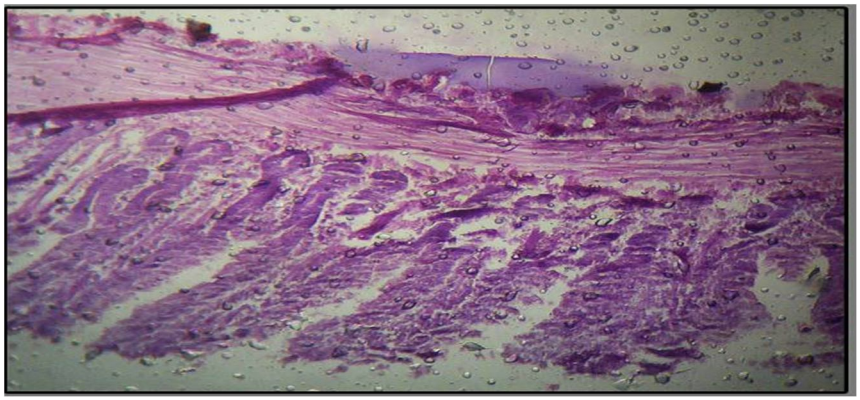

Fig 2: Non-infected *Gallus* intestine

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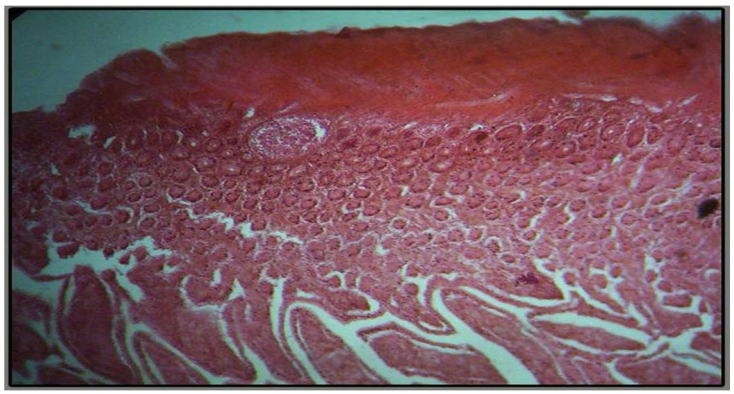

Fig.3: Cyst of deep in submucosa and serosa

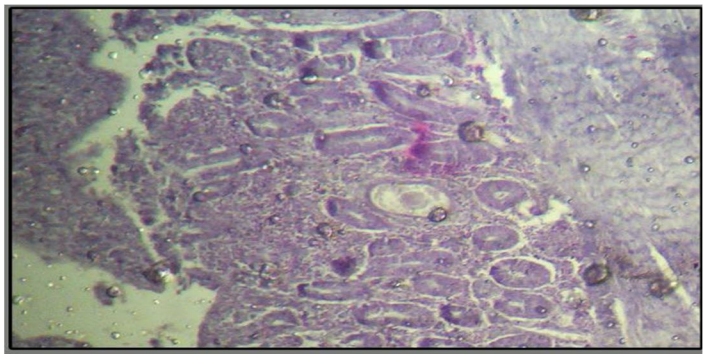

Fig. 4: Cyst deep in submucosa

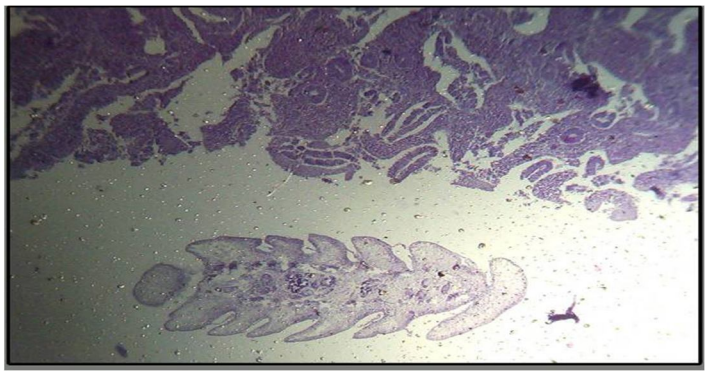

Fig. 5: Free mature proglottids of *Raillietina*

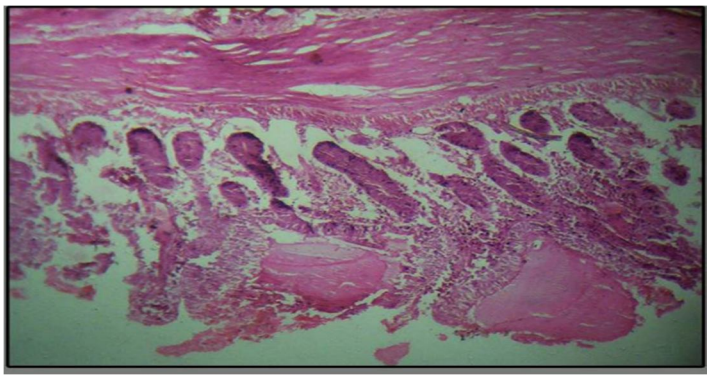

Fig. 6: Scoleces of *Raillietina* in submucosa

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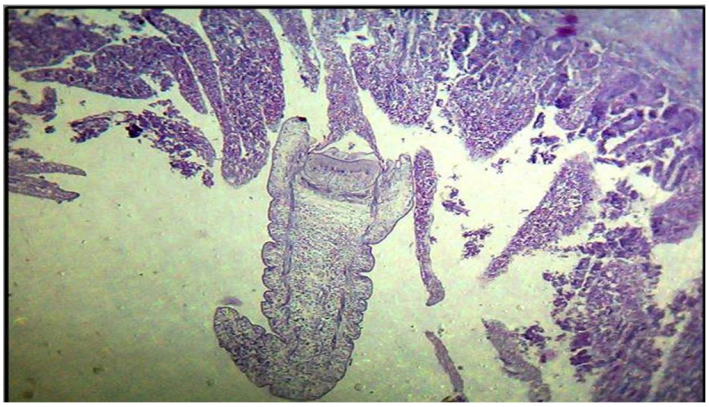

Fig. 7: Cotugnia scolex attaches to villus

The total cestode parasites collected in rainy, winter and summer season were 7702 from 240 gallus domesticus and 69% bird found infected.

It has been found that the highest incidence of infection was 53.62%. of the cestode *Cotugnia sp.* in the summer season of the year 2019-2020 and lowest was 11.07%., in the rainy season of the year 2020-2021 while *Raillietina sp.* found more 58.08% in the year 2019-20. Cestode possess complex life cycle for the transmission from one host to intermediate host, it needs to be consumed by it [3]. The parasite finds the nutritive material, favourable for growth and development of the worm by causing damage to the host [5]. The identified cestode species and their prevalence were *Cotugnia sp.* 53.62% and *Raillietina sp.* found more 58.08% are relate to the findings of reference [9]. When examining the intestine of gallus, it can be identified externally by lesions and swellings as it may be associated with host response, combined with the deep penetration of the scolex into the gut wall, but adversely it formed a very firm seat of parasite attachment [6].

The prevalence of *Raillietina* found highest to most of the workers including Saleh M. Jajerea,2017; *Raillietina* heavily destroyed, rupturing the villi, piercing through submucosa. So, the scolex of *Raillietina* sp. is penetrative type [17]. The intestine was heavily infected, so some of the intestinal villi were found ruptured. Attachment of scolex by rostellar hooks and suckers.

In the lumen of intestine few free gravid segments were found. Scolex is small which is deeply penetrated in submucosa. It is penetrative type of scolex. Rostellum is small with two rows of hooks and suckers are very large and armed with spines. Few mature segments were invaded by villi. Scolex of *Cotugnia sp.* attached to the intestinal villi through large rostellum. The scolex of this worm is non-penetrative type, so the worm invades only the villi but not the crypts of Lieberkühn and this type of attachment is superficial [11]. Histopathological studies of intestine infected with cestode have been carried out by many authors in various orders of tapeworm. In Cyclophyllidea many genera like *Hymenolepis*, *Dipylidium*, *Echinococcus*, *Cotugnia*, and *Raillietina* are studied for histopathology, host-tissue reactions, host specificity, host-parasite relationship etc. In Cyclophyllidea the scoleces are of two types: Penetrative type and non-penetrative type. In the penetrative type the scolex penetrates down into the crypts of Lieberkühn at the base of the villi. The scolex may be armed with hooks. In non-penetrative type the sucker encloses a group of villi, but the scolex does not penetrate the mucosa.

The scolex of parasites which are very minute and so crosses the mucosal epithelium and reaches to submucosa layers and come to lie near serosa suggesting that, it is very destructive to the host [7]. Here the cestode parasite having hold fast organs to the scolex and firmly attaches to the intestinal layers cause damages to villi, epithelium of host tissue.[4][5][12]. As per reference [13] the histopathological changes affects the intestine with severe villi destruction with necrosis.

The damage to the host intestine is proportional to the depth of the penetration of scolex. It is negligible when parasites are attached to the epithelial mucosa only. Cyst stages of the cestode life cycle mostly found in the submucosa region of the intestine and embedded in the fibroblast cell and is attached to the intestinal villi [14]. The non-penetrative type of worms are *Cotugnia* and *Thaparea* sp. Which are found attached superficially to the villus and remain in the gut lumen; while the penetrative type of worms, found scolex in the mucosa between the villi as the *Raillietina* and *Paruterina sp.* [15]. Free gravid segments mostly found in the posterior region of intestine while mature segments are freely suspended from scoleces in the lumen of intestine, only scoleces are attached, either superficially as referred non-penetrative type or may be up to submucosa region of the intestine called as Penetrative type of cestode parasites.

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The cestode infection in the intestine associated with the formation of raised inflammatory swellings. This host response, combined with the deep penetration of the scolex into the gut wall, adversely, it creates a very firm seat of parasite attachment [6].

The gravid proglottids mostly found free in the posterior region of intestine while mature segments are freely suspended from scoleces in the lumen of intestine, only scoleces are attached, either superficially or deep in submucosa. The lesions observed on the intestinal wall of the infected birds may be due to the severe infestation or heavy worm burden [16].

Cyst is encircled with connective tissue sheath and located deep in the submucosa, just above the muscularis externa. Few gravid segments were also found in posterior part of intestine. Cysticercosis is a parasitic tissue infection caused by larval cysts of the cestode parasites. Cysts were found deep in submucosa, although touches to serosa.

VI. CONCLUSION

The lowest infection is recorded in rainy season, was 20.19% and highest in summer season 63.96%, may be due to life cycle stages and intermediate host availability increases in winter and became adult in definitive host in summer.

The presence of worms in the intestine of *Gallus,* destroy the intestinal villi, sometimes blocks the intestine, and interferes with passing of food through the lumen as well affects the digestion and absorption of simple food. Cyst mostly found deep in the submucosa near the serosa. The non-penetrative type of worms are *Cotugnia* and *Thaparea* while the penetrative type of worms are *Raillietina* [8]. and *Paruterina sp.* Free gravid segments mostly found in the posterior region of intestine while mature segments are freely suspended from scoleces in the lumen of intestine, only scoleces are attached, either superficially (non-penetrative type) or deep in submucosa (Penetrative type). Future studies should make it possible to accumulate enough biological information to find out control procedures to reduce these parasite infections. It would be a one of the important attempts to know the natural infections, to create sustainable domestic livestock and rearing of chickens as additional economy development of farmers.

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Address for correspondence: Dr. Sunil D. Patil Mobile No. 9420361709
Email: sunilpatil991@gmail.com
Associate Professor, Department of Zoology
M. G. Vidyamandir's L. V. H. College,
Panchavati, Nashik. 422005

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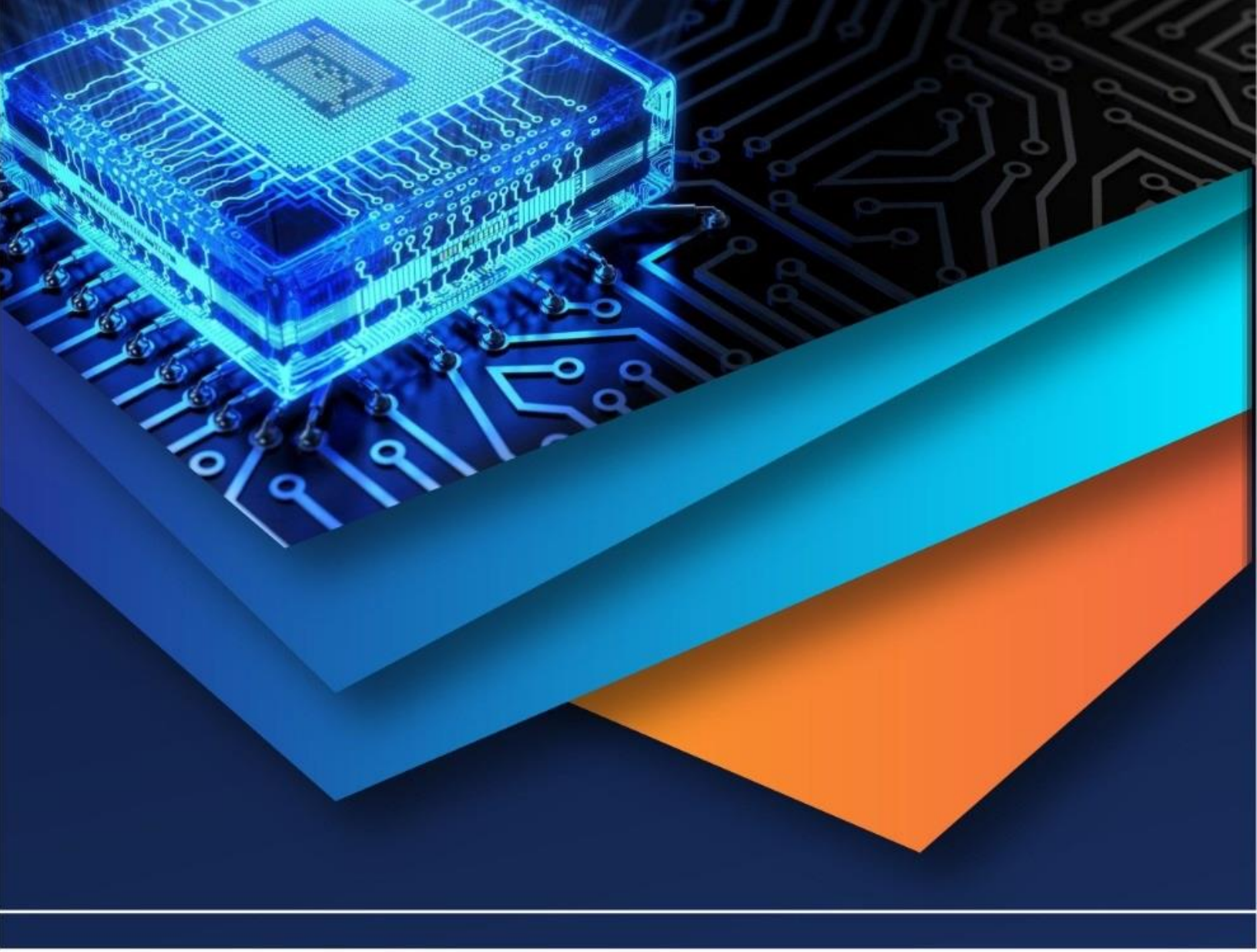

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