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Consequences of Genotyping among the Indigenous Poultry breed Kadaknath and Exogenous White Leghorn based on Performance Traits

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Abstract: ***Poultry productivity has its own place not in India even worldwide by making important contribution to the agricultural economy. Among the various animal species contributing to the National economy, the contribution of poultry is the most significant and considerable as compare to others.***
However, bulk of the poultry productivity of the country is contributed by the high-yielding exotic chicken stocks bred and propagated by International companies.
Relative estimates of productive traits are also known as reliable measures for the study of heredity between the selective poultry breeds among the constitutive generations under the influences of environmental interaction for the establishment of traits of economic importance.
The current study was carried out to evaluate the genetic differences between two selected poultry breeds: Kadaknath (KN) and White Leghorn (WLH) being distinctly-diverse in geographic origin and contrasting breeding histories as well. During the current study, exotic breed WLH was observed significantly better for performance traits such as growth, egg weight and numbers, in contrast to native breed KN.
Current study confirm that genotypes having great significance on the performance traits, which warrant molecular confirmation further and it is also confers that traits of economic importance may enhance via multiple crosses between the selective breeds especially for the native breeds as compare to exotic poultry breeds.
Keywords: Poultry breeds, performance, genesis, productive traits etc.

I. INTRODUCTION

Poultry is well known for its nutritional eggs and meat and both traits are contributing significant role in the National economy and overcoming of malnutrition in poor villagers and tribal as well on minimal cost.

Poultry production system offers an opportunity to extend the qualitative and quantitative genetics by conservation planning and strategies for the poultry producers and consumers.

Numerous native and exotic Poultry breeds engrossing for higher researches and various other perspectives from last decades due to shorter generation time interval, ease of handling, wider availability, lower investment cost and valuable products for the nutritional purpose (Thakur et al., 2006; Singh et al., 2007; Haunshi et al., 2012; Qadri et al., 2013; Valavan et al., 2016a). Poultry considered as an ideal sector of higher researches and poultry products.

The evaluation of phenotypic traits of chicken leads to various production parameters supporting the national and global economies (Arora, 2010).

In respect of animal model, chicken widely preferred due to its smaller size of chromosomes than mouse and human genome i.e. 1.2 x 10^9 bps and short generation time of 21 days and high nutritive values in terms of essential amino acids, polyunsaturated fats as a low cholesterol food.

However, over the last decades, purity of native chickens has become questionable due to large-scale introduction of exotic breeds under various rural development programmes undertaken by the government.

The relevancy which makes the breed being more efficient in terms of the poultry products and also help to enhance the socio-impact status of poor villagers. (Chatterjeeet al., 2007; Sreenivas et al., 2012 Qadri et al., 2013; Tomar et al., 2014; Valavan et al., 2016a).

A. Germplasm for the Current Study

The current study was carried out on the Indian native breed of chicken *i.e.* Kadaknath and White Leghorn exotic egger type breed WLH, commercial poultry breed basically originated from the Italy. Both breeds rearing in various parts of country with the multiple prospects. Kadaknath (KN) is locally known as "Kalamassi" meaning the fowl having black flesh, black skin and appendages. However "Kalamassi" is not as popular as the present name "Kadaknath" also spelled as “Kharakanath". Since a long time, Kadaknath breed of poultry was reared by tribals/adivasies (Bhils, Bhillalas and others) and therefore, through many generations. Kadaknath birds are also resistant to extreme climatic conditions like summer and winter’s stress and can thrive very well under adverse environments like poor housing, poor management and poor feeding. There are three main varieties of Kadaknath breed, which are found in Jhabua District (Singh et al., 1998; Mishra et al., 2008; Arora, 2010; Tomar et al., 2014; Valavan et al., 2016a).

Other hand, exotic breed, White leghorn chickens (WLH) is an exogenous breed imported from Italy widely known for its egg production with its white plumage color, white-reddish textured meat and white shelled egg being the best examples of selection program to a specific trait such as egg number (Ahmad et al., 2009; Arora, et al,, 2010; Lemlem, et al., 2010; Qadri et al., 2013).

Several strains/lines of WLH have been evaluated for their performance and characterized phenotypically under various agro-climatic conditions.

Among the Internationally reputed chicken breeds, White Leghorn (WLH) is the most popular one, owing to its high production potential as white eggs. Bulk of the commercial egg laying chickens in India, are constituted by the WLH and their crosses. The significance of this breed worldwide, due to the reasons, for which the chicken genome map developed by the genome-mapping consortium is based on WLH specific sequences, as evolved from that of Red Jungle fowls (Wallis et al., 2004). However, the strains/lines of WLH cannot be easily distinguished phenotypically from one another, although there might be differences in the production characteristics on molecular basis (Mahadeo Kumar et al., 2006; Gaur et al., 2017).

These diverse poultry breeds have selected for the current study to evaluate the effect of genotypes among the both breeds of chickens under the same rearing and manage mental condition at the Poultry farms. For the current study, 50 birds of each breed were selected and reared for the performance traits of economic importance. For my dissertation work, Dr MPS College, Agra sponsored the financial assistance for rearing my respective birds in Sikandra Poultry Farm, Agra in favor of my research work and collection of performance data to Department of Biotechnology Dr MPS Group of Institutions for the statistical analysis to reach out on fruitful outcome.

B. Performance traits for Current Study

The assessment of the genotypic effect was carried out on the basis of phenotypic traits like, body weight, egg weight, ASM, EP-40, etc for the selected native breed Kadaknath and exotic breed White Leghorn (WLH) as follows-

1) *Body Weight:* The body weight were recorded under the appropriate managemental and health care conditions for the breed of Kadaknath (KN) and White Leghorn (WLH) including both sexes, upto 16th week of age using electronic balance under observation to minimize the error in data recording (Chattergee et al., 2007, Ahmad et. al., 2007; Qadri et al., 2013; Valavan et al., 2016a). The body weight was recorded on bi-weekly basis on 4th, 6th, 8th, 10th, 12th, 14th and 16th weeks of age for the selected the KN and WLH chicks to 50 birds of each sex followed by the mean by SPSS- 20 software.
2) *Egg Weight:* Egg weight was also carried out on the same local Poultry Farm on request to the farm was evaluated for individual hen at 28th, 32th and 36th week of age. The weight of an egg taken under the independent observations and measured in grams by using an electronic weighing balance (Bangar, et al., 2005: Parmar et al., 2006, Ahmad et al., 2009).
3) *Age of Sexual Maturity (ASM):* The age of sexual maturity was recorded for the selected females of both breed on request to the same farm was recorded as first egg lay by an individual female. All the observations were recorded in data recording (Singh et al., 2003; Qadri et al., 2013 Valavan et al., 2016a).
4) *Egg Production (EP-40):* Daily egg production (EP) was recorded, up to the age of 40th week of age for the breed of KN and WLH, respectively. The collective number of good eggs laid by an individual hen during experimental period was calculated as the total egg number of an individual (Yasmeen et al., 2008; Valavan et al., 2016a).

C. Statistical Analysis for the Performance Traits

The Analysis of performance traits were carried out by the SPSS analytical System 20 version for the evaluation of mean, significance level to reach out on traits of economic performance.

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D. Experimental Results of Phenotypic Traits

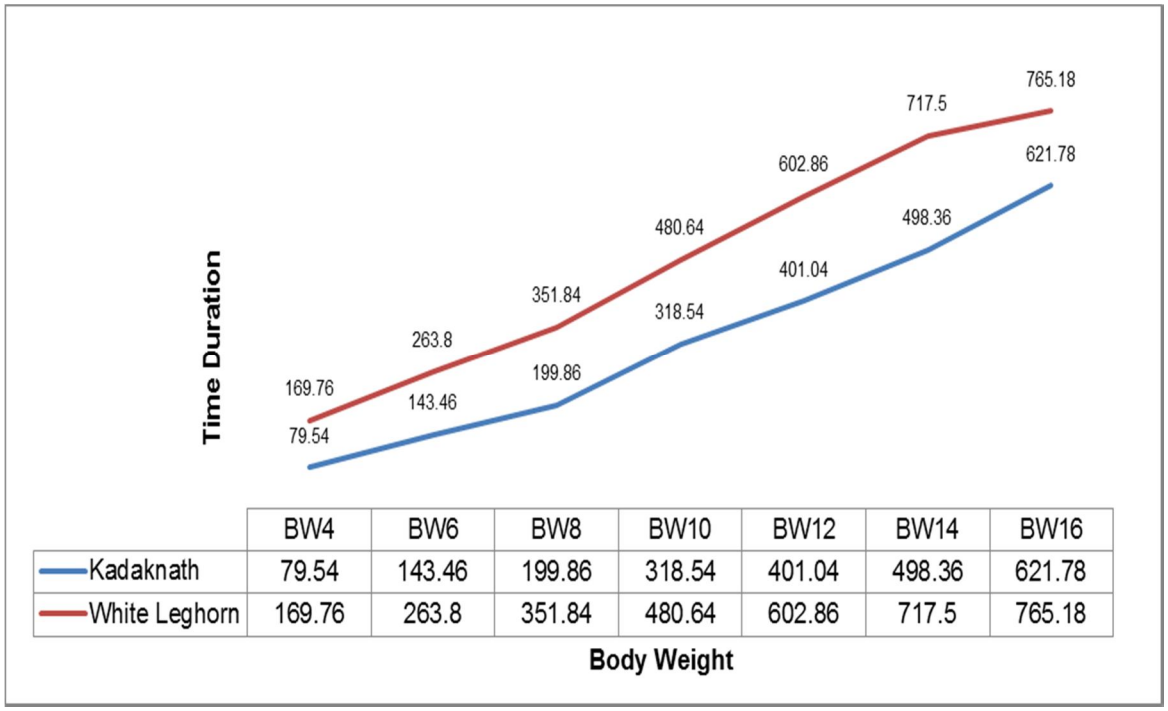
The collective production data of both breeds was subjected to statistical analysis and following observations were recorded as follows-

1) *Body Weight:* The average of body weight for Kadaknath chicks were recorded like, 79.54 ± 1.59, 143.46± 2.65, 199.86 ± 4.15, 318.54± 6.86, 401..04 ±8.19, 498.36±11.33 and 621.78 ±10.32 as against of White leghorn chicks as; 169.76 ± 3.50, 263.80 ±6.66, 351.84 ± 8.44, 480.64± 11.72, 602.86 ± 14.10, 717.50±14.04 and 765.18 ±21.35, respectively on the same interval on bi-weekly basis in the current study. A comparative graph was also ploughed among the both breeds chicks body weight (BW) which reflects that increases with number of weeks from 4th to 16th week and remained lower in case of Kadaknath as compare to WLH. The WLH was observed significantly higher for the growth rate in contrast to native breed KN having slower growth rate being which are akin to earlier citations like as; Singh, 2003; Giri, 2004; Bangar et al., 2005; Parmar et al., 2006; Thakur et al., 2006; Nasiri et al., 2007; Mohan et al., 2008a; Anonymous, 2009; Qadri et al., 2013; Valavan et al., 2016a. The current observations have been placed in the Table No. 1 and Figure 1 clearly reflects the confirmation of the existence of genetic differences of these two breeds with the successive generations being reared in almost similar environmental, nutritional conditions.

Table No. 1: Comparative Body weight of selected breeds KN and WLH

Body Weight	Kadaknath			White Leghorn		
	Sample	Mean	Standard Error (S.E)	Sample	Mean	Standard Error (S.E)
Week (BW-4)	50	79.54	1.59	50	169.76	3.50
Week (BW-6)	50	143.46	2.65	50	263.80	6.66
Week (BW-8)	50	199.86	4.15	50	351.84	8.44
Week (BW-10)	50	318.54	6.86	50	480.64	11.72
Week (BW-12)	50	401.04	8.19	50	602.86	14.10
Week (BW-14)	50	498.36	11.33	50	717.50	14.04
Week (BW-16)	50	621.78	10.32	50	765.18	21.35

Figure 1: Graph of comparative Body Weight (in weeks) of both breeds.

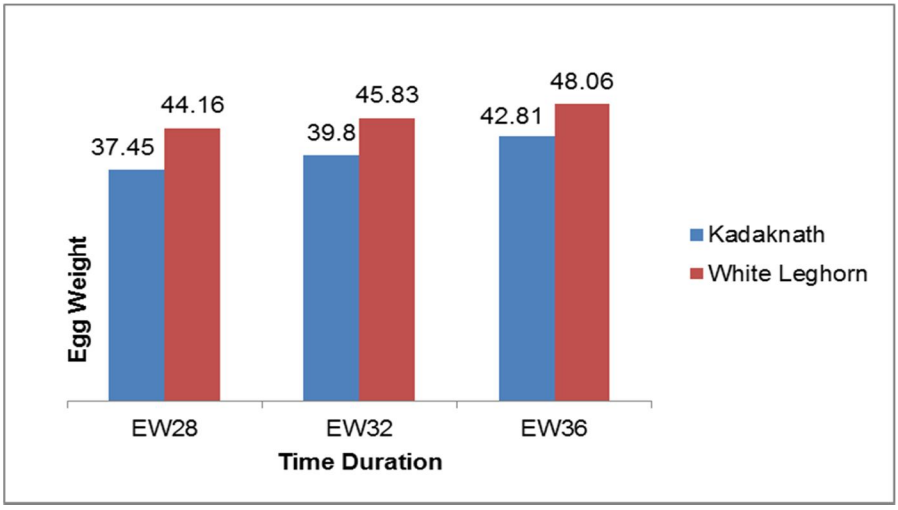


2) *Egg Weight:* The egg weight is an important trait of economic importance of Poultry breeds for the consumers, obviously for the nutritional purpose further on the minimal cost. Egg weight were evaluated for individual hen of both breeds at different ages of 28th, 32nd and 36th weeks of age depicted in Table No. 2. The average egg weight of KN females were observed as 37.45±2.78, 39.80 ± 2.05 and 42.81± 3.57 as compare to 44.05± 4.71, 45.82± 3.96 and 48.06± 3.37, respectively in case of egger breed WLH across the 28th, 32nd and 36th week of age in the current study which clearly depicted more as with consumption of feed by WLH is higher. Egger breed WLH was remained superior which could be reasoned out due to intense selection and genesis for the more number of eggs in contrast to native breed KN. As depicted in the Figure 2, our observations are well supported by earlier citations (Parmar et al., 2006; Chatterjee et al., 2008; Yasmeen et al., 2008; Ahmad et al., 2009; Mohan et al., 2008a; Lemlem et al., 2010; Qadri et al., 2013).

Table No. 2: Comparative Egg weight of selected breeds KN and WLH

Egg Weight	KN			WLH		
	Sample	Mean	Standard Error (S.E)	Sample	Mean	Standard Error (S.E)
Week (EW-28)	50	37.45	2.78	50	44.05	4.71
Week (EW-32)	50	39.80	2.05	50	45.82	3.96
Week (EW-36)	50	42.81	3.57	50	48.06	3.37

Figure 2: Graphic depiction of Egg weights among the selected breeds



3) *Age of Sexual Maturity:* Each individual consist their specific age of sexual maturity to reproduce the first egg for the establishment of their progenies further, placed in the Table No. 3. ASM means the age of sexual maturity on which the female chicken is going to laid of his first egg through ovulation. Nothing doubt about it than if an individual is going to laid first egg early than she will reproduce more number of eggs during their respective ovulation period. Hence, the age of sexual maturity (ASM) was recorded lower for the KN females as; 202 ± 5.1. days generally not known for eggs potential while the well-known egger type commercial breed WLH was remained significantly superior as 145± 1.2, as depicted in the Figure 3. Our results are well supported by other reports (Rajkumar et al., 2008;Yasmeen et al., 2008; Ahmad et al., 2009; Chattergee et al., 2010; Lemlem et al., 2010; Qadri et al., 2013; Tomar et al., 2014; Gaur et al., 2017).

Table No. 3: Age of Sexual Maturity of KN and WLH breeds

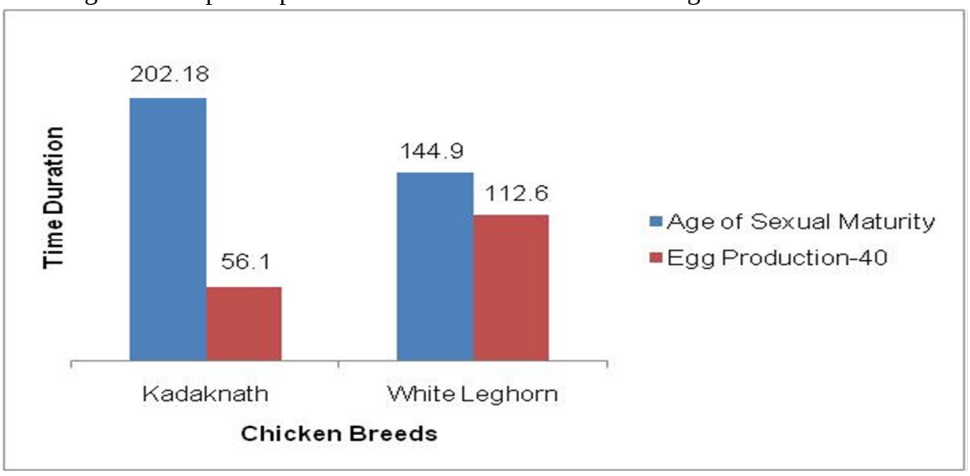
Age of Sexual Maturity	KN			WLH		
	Sample	Mean	Standard Error (S.E)	Sample	Mean	Standard Error (S.E)
ASM	50	202	1.2	50	145	5.1

4) *Egg Production (EP-40):* Egg laying is an important attribute of Poultry breeds either for commercial or native breeds which is remained an important nutritional source for the human food on minimal cost. Almost poultry breeds are reared for the maximum number of eggs in rural and urban areas on commercial scales. The total numbers of eggs produced upto 40th week of age (EP-40) was recorded as a mean of 56.10 ± 1.24 for KN, in contrast to 112.66 ± 0.84 respectively for the egger type commercial breed WLH during the current study. The results depicted in Table No. 4 and Figure 3 clearly showed that the native breed was recorded for lower number of eggs being poor number of egg production in contrast of exotic breeds commercial breeds are well known for their egg potentials due to genesis effect on their maturity on 40th week. Our findings remains in accordance of Pirany et al., 2007;Yasmeen et al., 2008; Ahmad et al., 2009; Chattergee et al., 2010; Mohan et al., 2008a; Lemlem et al., 2010; Pratap et al., 2013; Qadri et al., 2013; Tomar et al., 2014; Valavan et al., 2016a).

Table No. 4: Egg Production on 40th week of age (EP-40) among the selected breeds

Egg Production (EP)	KN			WLH		
	Sample	Mean	Standard Error (S.E)	Sample	Mean	Standard Error (S.E)
EP -40	12	56.10	1.24	50	112.66	0.84

Figure 3: Graphic representation of ASM and EP-40 among the selected breeds



II. CONCLUSION

Current study showed that selected breed WLH was recorded significantly higher for the performance in contrast to KN due to the successive conservation strategies *via* intense selection programs across the generations. Such genotypic effects on performance traits need more indepth molecular analysis for drawing clear cut evidences of phenotypes among the selected breeds based on molecular parameters respect to survival, which needs further investigations. The results of current study showed that these both breeds having a great potential to a table birds being having their genotypic effect on different performance traits. White Leghorn (WLH) was observed higher for the egg numbers, Body Weight, Egg production, Age on Sexual maturity while not known generally for its better immune-competence. The native breed KN is unique in the nutritional qualities of meat, eggs and allelic composition with extended immunity even on adverse environmental conditions. Due to significant genetic profiling the need of the strategies for its breeding and conservation which will play an important role in research studies this will challenge the hunger index with its products and help in declination of malnutrition in the upcoming years with chicken as nourishment. It may be concluded that genotype has profound effect on performance traits of a breed and various crosses may produce for better performance traits as a unique Poultry breed for enhanced traits of economic importance further.

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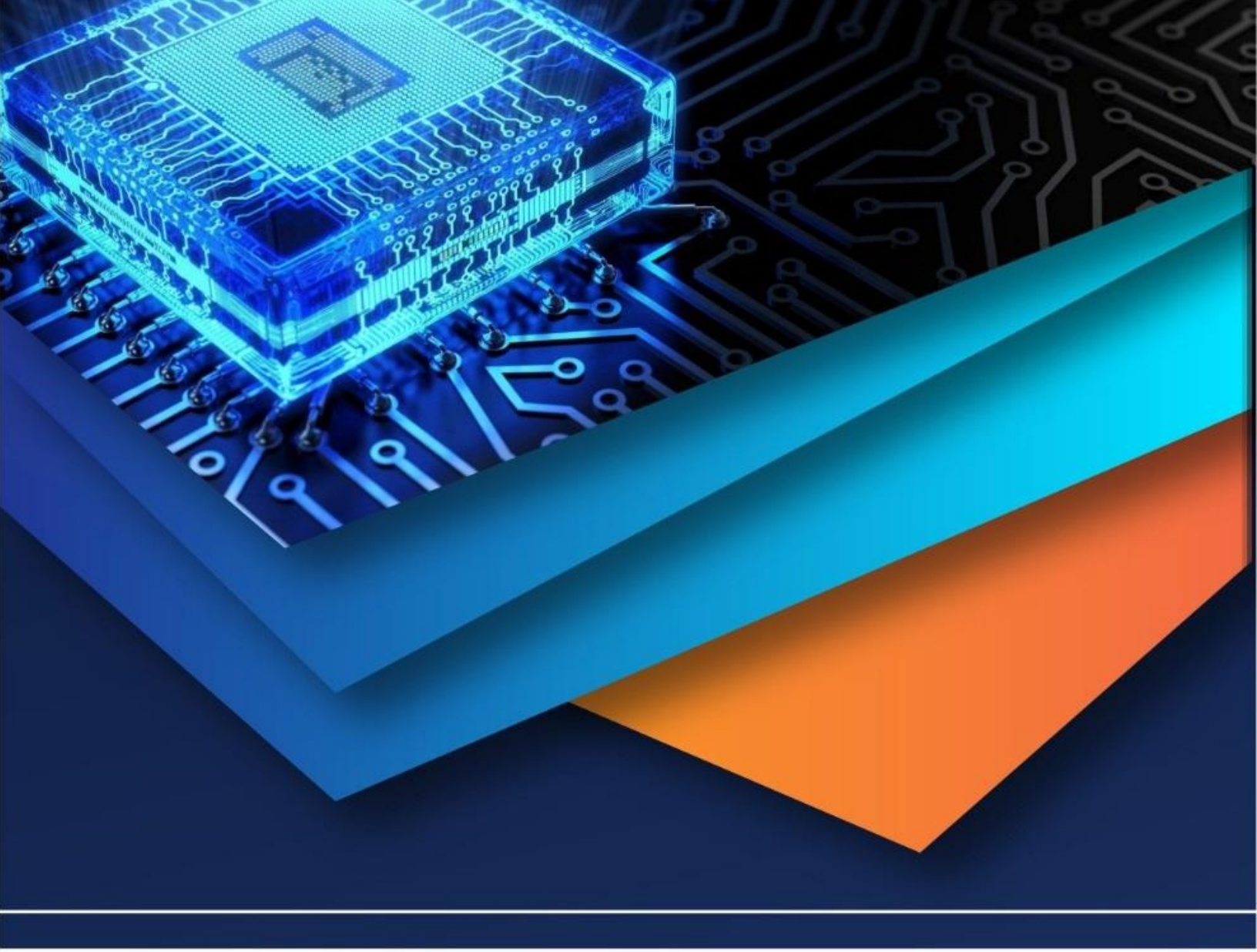

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