INTRODUCTION

Farmers as well as scientists are looking out for newer varieties of domesticated birds, which have sufficient potential to grow fast and supplement the availability of meat on economic basis. Under this circumstance turkey industry has been gaining momentum in India especially because turkey’s meat while providing all essential substances as other meat, has comparatively low percentage of fat and high percentage of proteins (Nixey and Grey, 1985). While turkeys are emerging as an important source of animal protein, the available records on haematology and biochemical profile of turkeys are very scanty. Hence this study was undertaken to arrive some baseline values of serum total protein, albumin and globulin, glucose, serum cholesterol and alkaline phosphatase at different age groups of turkeys.

MATERIALS AND METHODS

Poultry Research Station, Nandanam, Chennai - 35 adopted turkey programme in 1997 and maintains three varieties namely Beltsville small White, Native and their Cross named White..
Cross. Blood samples were collected at bi-weekly intervals from 180 turkeys of both male and female turkeys maintained at PRS - Nandanam and subjected to haematology and serum protein albumin and globulin glucose, cholesterol and alkaline phosphatase estimations as per standard methods. The results obtained were categorized into nine age groups as given below, tabulated sex wise and statistically analysed. Group. I: 0-3 weeks old poults, Group II: 3-6 weeks old poults, Group. III: 6-12 weeks old birds, Group. IV: 12-18 weeks old birds, Group. V: 18-26 weeks old birds, Group. VI: 26-34 weeks old poults, Group. VII: 34-44 weeks old poults, Group. VIII: 44-50 weeks old birds and Group IX Above 50 weeks old birds.

RESULTS AND DISCUSSION

From the mean PCV values recorded it was seen that the PCV ascended with age from 0-3 weeks and reached the peak value of 54.39 ± 0.62 per cent at 18-26 weeks and then decreased gradually to a lower value at above 50 weeks age group and the over all mean value was 46.75 (1.36 per cent. The highest values were observed in both sexes at 18-26 weeks.

Hodges (1977),Suchy et al. (1995)and Strakova et al. (1996)had reported that PCV increased with age in turkeys. Lisano and Quay (1977) observed that PCV values increased with age in the first nine months and gradually declined over the next 4 months in turkeys which was in agreement with our finding.

From the sex wise values recorded in the study it was observed that both in male and female turkeys the PCV increased with age from 3-6 weeks to 18-26 weeks and declined gradually thereafter.

From the group wise mean Hb values recorded in this study it was observed that Hb concentration increased with age in turkeys from 0-3 weeks to 18-26 weeks age group and reached the highest value of 10.47 ± 0.06 g/dl at 26-34 weeks of age and then gradually declined. Balasch et al. (1973) reported mean TEC of 2.63 ±0.50 millions/cu mm in Galliformes which was lower than the value observed in this study. Ferguson et al. (1964) reported that TEC increased from three days to four months of age in male turkeys. Cason and Teeter (1994)reported that TEC increased by 47 % between 10 and 30 weeks of age in turkeys. From the values recorded in this study it was inferred that TEC increased with age in turkeys from 0-3 to 18-26 weeks. The values of TLC observed in this study indicated that TLC increased with age significantly between age groups of 0-3 weeks and 12-18 weeks of age in turkeys. The highest value of 14,785.00 ± 55.40 /cu mm was observed in 12-18 weeks age group which then decreased gradually. The TLC value observed in 12-18 weeks of age was significantly higher than the values observed in other groups. Where as Cason and Teeter (1994)reported that TLC values did not show any variation between the age of 10 and 30 weeks in turkeys Ferguson et al.(1964)observed mean TLC of 21,600.00 /cu mm between 3 days to 13 months in turkeys. The values reported by the above authors were very much higher than the values observed in this study.
Haematological and blood biochemistry in male and female turkeys of different age groups

In general it was reported by various authors that no specific reason could be attributed to variations in TLC values between different age groups and sex, as various factors like age, sex, metabolism, nutritional status, environment, and vaccination were known to influence TLC values.

From the sex wise mean values recorded in the study it was observed that in both male and female turkeys the PCV increased with age from 3-6 weeks to 18-26 weeks and declined gradually thereafter. In all the age groups PCV values in female turkeys were lesser than that of the males. Ferguson et al. (1964) observed that PCV values increased with age in male turkeys from 3 days to 13 months. Hunsaker (1969) reported that PCV values were higher in male turkeys than in females. Hodges (1977) reported significant difference between PCV values of male and female turkeys. Lisano and Quay (1977) had reported higher mean PCV values in males than in female turkeys. Nirmalan and Robinson (1972) had reported that PCV value decreased with administration of stilbestrol which appeared to inhibit erythropoiesis.

It was inferred that PCV values were significantly lower in female turkeys than in males and the same was attributed to the presence of oestrogen in female turkeys. Hence it was concluded that PCV values were influenced by both age and sex in turkeys.

From the male and female mean Hb values recorded in this study it was observed that the values in female turkeys were lower than that of males in all the age groups. In both sexes the highest values were observed in the age group of 26-34 weeks.

Lisano and Quay (1977) had reported higher Hb values in males than females. Nirmalan and Robinson (1972) demonstrated that administration of stilbestrol decreased Hb concentration by inhibiting erythropoiesis.

It was inferred that Hb values increased with age in both male and female turkeys. However the values in female turkeys were always lower than that of the males and the effect of oestrogen in female turkeys was considered as the cause of the variation.

From the mean TEC values recorded in the study it was observed that the values increased with age in both male and female turkeys. However it was observed that female values were lower than that of the male turkeys in all the age groups.

Where as Hodges (1977) reported that there was significant difference in TEC between male and female turkeys. Cason and Teeter (1994) reported that there was low TEC at maturity due to oestrogen effect in female turkeys.

Bell and Sturkie (1965) reported that erythrocyte number increased as laying period came to an end and decreased during the period immediately prior to the onset of laying and suggested that variations in endogenous oestrogen level might be the cause for such fluctuations in domestic fowls.

From the observations made in this study it was concluded that TEC values were greatly influenced by sex in turkeys and endogenous oestrogen level in female turkeys was considered as the cause.

In general it was reported by various authors that no specific reason could be attributed to variations in TLC values between different age groups and sex, as various factors like age, sex, metabolism, nutritional status, environment, and vaccination were known to influence TLC values. However from the values recorded in this study it was observed that TLC values significantly increased from 0-3 weeks to 12-18 weeks and then declined gradually and that the female TLC values were lower than that of males in all the age groups.
Total serum protein mean values observed in this study increased from 2.71 ± 0.02 g/dl in 0-3 weeks group to 4.68 ± 0.03 g/dl in 26-34 weeks group and then declined to a lower value of 2.32 ± 0.04 g/dl in above 50 weeks group. The over all mean value of 3.10 ± 0.04 g/dl irrespective of age groups was in agreement with the value of 3.50 g/dl reported by Clarkson (1966) and 3.44 g/dl by Turk (1968) in turkeys. Bierer (1969) observed that the total protein in turkeys ranged between 3.00-3.60 g/dl which was in agreement with the over all mean value observed. It was inferred that the total serum proteins increased with age till 26-34 weeks during the period of active growth and then gradually declined.

From the male and female values recorded it was seen that the protein level fluctuated insignificantly between sex and age in all the groups but significantly high values were observed in the age group of 26-34 weeks in both male and females. The values were 4.31 ± 0.03 and 5.05 ± 0.03 g/dl in male and female turkeys respectively. It was observed that the female values were higher than that of the males in this group. Lisano and Quay (1977) reported higher mean total protein value in females than in males. The protein values were 4.31 ± 0.03 and 5.05 ± 0.03 g/dl in male and female turkeys respectively. The variations in the over all mean values of albumin and globulin recorded in this study were similar to the variations observed in the other species. The increase in protein values recorded in the current study were reflected both in albumin and globulin values separately. However the difference in the values between males and females were more pronounced in globulin fraction than in albumin. Perhaps age and sex had more influence on globulin than on albumin. Kundu et al. (1993) suggested that age, sex and age - sex interaction had significant effect on serum protein level as also reported by Darshan et al. (1987) that age had a greater influence on serum protein level in females than in males.

The highest albumin values were observed in the 26-34 weeks group male and female turkeys and globulin values were very low. The over all mean values of albumin and globulin recorded in this study were 2.07 ± 0.02 and 1.03 ± 0.04 g/dl. The over all mean values of albumin in this study were 2.19 ± 0.01 and 2.04 ± 0.03 g/dl and the globulin values were 1.14 ± 0.01 and 0.97 ± 0.03 g/dl in male and female turkeys respectively. The variations in the over all mean values of albumin and globulin recorded in this study were similar to the variations observed in the other species. The increase in protein values recorded in the current study were reflected both in albumin and globulin values separately. However the difference in the values between males and females were more pronounced in globulin fraction than in albumin. Perhaps age and sex had more influence on globulin than on albumin. Kundu et al. (1993) suggested that age, sex and age - sex interaction had significant effect on serum protein level as also reported by Darshan et al. (1987) that age had a greater influence on serum protein level in females than in males.

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The protein, albumin and globulin values of above 50 weeks group were clearly lesser than their corresponding over all mean values. This indicated that while the protein levels were rising during the active life, it started declining once the turkeys attained old age as the birds were past productive life.

From the above discussions it was inferred that age and sex had definite influence on protein values which was more pronounced in females between the sexes and in globulin among the various fractions of protein in turkeys.

The significant recording in the plasma glucose level in the present study were 114.87 ± 1.14 mg/dl in 0-3 weeks, 178.55 ± 2.30 mg/dl in 12-18 weeks and 134.32 ± 2.06 mg/dl in above fifty weeks group. It was observed that the glucose level increased with age from 0-3 weeks then decreased gradually with age after 12-18 weeks.
The recording of sex wise glucose values also showed similar trend in both the sexes. The values of plasma glucose recorded by Kundu et al. (1993) in day old and month old guinea fowls were similar to the findings of the present study in the corresponding age groups.

The decrease in mean plasma glucose level after 12-18 weeks in turkeys nearing maturity might have been due to increased activity of sex hormones in the system as the birds were in active growth phase. This observation was in agreement with Rogemont (1930) who reported that the glucose level in chicken decreased at maturity suggesting depressing effect of androgen and Pitt et al (1980) reported low plasma glucose level of 116 ± 24 mg/dl in Pekin duck during laying. The plasma glucose level in male and female turkeys increased till maturity and then decreased gradually through out the birds life. The significant recording in the serum cholesterol level in the present study were 101.27 ± 0.92 mg/dl in 0-3 weeks, 199.10 ± 2.11 mg/dl in 26-34 weeks and 113.12 ± 1.86 mg/dl in above 50 weeks group. It was observed that the cholesterol level increased with age from 0-3 weeks then decreased gradually with age after 26-34 weeks.

Konicki et al. (1999) reported a mean cholesterol level of 121.50 ± 11.25 mg/dl in nine weeks old turkeys which was very close to the values observed in this study. The wide range observed in the values was in agreement with Coles (1986) who had reported very wide ranging cholesterol value of 100 - 200 mg/dl in most birds. Lisano and Quay (1977) reported 123.20 ± 26.70 and 159.80 ± 38.10 mg/dl of total serum cholesterol in male and female turkeys.

Though the cholesterol values in both the sexes were ascending with age from the day of hatch to 12-18 weeks, it fluctuated from group to group before reaching the lowest value in above 50 weeks group.

From the over all mean cholesterol values of 166.42 ± 1.75 and 155.21 ± 1.25 mg/dl observed in male and female turkeys, it was seen that females had lower cholesterol level. But most importantly the values of both male and female cholesterol values varied significantly in many groups. Gilbert (1971) had stated that cholesterol was the precursor of steroid hormones and was used in yolk formation. He concluded that the lower levels of cholesterol in layers were due to increased steroid hormone and yolk formation.

From the values observed in this study it was inferred that cholesterol value increased with age till the start of laying and the lower level of cholesterol recorded in laying turkeys could have been the result of increased utilisation in egg formation. The mean serum ALP values observed in the study generally increased from 141.87 ± 1.08 at 0-3 weeks to 154.63 ± 1.36 IU/L at 12-18 weeks group of turkeys after which the values decreased. The over all mean value was 99.27 ± 1.02 IU/L. But many inter age group fluctuations were observed with in this period.

Similarly Auchinaachie and Emstie (1934) observed that the ALP activity decreased with advancing age from 7-13 months in fowls and Rao et al. (1969) had reported higher ALP activity in young chicken than in adults. Narayan Nair (1974) reported that the enzyme activity was highest at 6 weeks of age as observed in turkeys in this study.

From the male and female values observed in this study it was seen that the female values were lower than that of their male counter parts in all the age groups. The over all mean values were 96.95 ± 1.10 and 90.95 ± 0.93 IU/L in male and female turkeys. Tamaki and Tanabe (1970) reported that the male birds had higher ALP activity than females at all ages. Tamaki et al. (1975) reported that ALP activity was greater at 32 days than at 56 days of age and greater in male chicks than in females at both ages.
From the values observed in this study, it was concluded that the ALP activity was greater in poults than in adult turkeys and the level was higher in males than in females in all the age groups studied. Kuan et al. (1966) estimated the alkaline phosphatase activity in 10 randomly selected cockerels at 3-17 days of age in bone, intestine, serum and liver and found that the ALP activity increased rapidly after hatching and reached the peak at one week of age and leveled. The increase in serum ALP was attributed to rapid growth and bone activity (Coles, 1986). Turkeys of this study revealed very high ALP activity during the active phase of life and then the level declined. Therefore it was inferred that ALP activity was associated with bone and somatic growth.

REFERENCES


Haematological and blood biochemicals in male and female turkeys of different age groups


Table 1

The mean values of haematology and serum biochemicals in turkeys of different age groups

<table>
<thead>
<tr>
<th>Age in weeks</th>
<th>Total Protein (g/dl)</th>
<th>Albumin (g/dl)</th>
<th>Globulin (g/dl)</th>
<th>Glucose</th>
<th>Cholesterol</th>
<th>ALP (per cent)</th>
<th>Hb (g/dl)</th>
<th>TEC (millions/cu mm)</th>
<th>TLC (per cu mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>2.71 ± 0.02</td>
<td>1.23 ± 0.02</td>
<td>1.48 ± 0.09</td>
<td>114.87</td>
<td>101.27</td>
<td>141.87</td>
<td>35.83 ± 0.56</td>
<td>5.96 ± 0.04</td>
<td>4991 ± 2.27</td>
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<tr>
<td>3-6</td>
<td>2.88 ± 0.04</td>
<td>1.24 ± 0.03</td>
<td>1.63 ± 0.06</td>
<td>132.60</td>
<td>130.23</td>
<td>125.55</td>
<td>46.12 ± 0.58</td>
<td>6.48 ± 0.04</td>
<td>8429 ± 43.89</td>
</tr>
<tr>
<td>6-12</td>
<td>3.08 ± 0.03</td>
<td>1.45 ± 0.02</td>
<td>1.63 ± 0.06</td>
<td>160.92</td>
<td>168.30</td>
<td>138.60</td>
<td>49.65 ± 0.55</td>
<td>7.19 ± 0.07</td>
<td>12951 ± 41.01</td>
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<tr>
<td>12-18</td>
<td>3.16 ± 0.03</td>
<td>1.48 ± 0.03</td>
<td>1.68 ± 0.03</td>
<td>178.55</td>
<td>183.55</td>
<td>154.63</td>
<td>51.58 ± 0.48</td>
<td>8.10 ± 0.04</td>
<td>14785 ± 55.40**</td>
</tr>
<tr>
<td>18-26</td>
<td>3.08 ± 0.03</td>
<td>2.83 ± 0.06</td>
<td>0.25 ± 0.03</td>
<td>170.25</td>
<td>199.10</td>
<td>93.60</td>
<td>54.39 ± 0.62**</td>
<td>9.93 ± 0.25</td>
<td>13913 ± 53.33</td>
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<tr>
<td>26-34</td>
<td>4.68 ± 0.03**</td>
<td>4.24 ± 0.03**</td>
<td>0.44 ± 0.01**</td>
<td>176.03</td>
<td>165.42</td>
<td>74.42</td>
<td>52.03 ± 0.56</td>
<td>10.47 ± 0.06**</td>
<td>12280 ± 48.17</td>
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<td>3.38 ± 0.03</td>
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<td>167.52</td>
<td>149.92</td>
<td>64.11</td>
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<td>9.15 ± 0.22</td>
<td>10505 ± 37.39</td>
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<td>44-50</td>
<td>2.65 ± 0.03</td>
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<td>131.20</td>
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<td>6110 ± 37.95</td>
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<td>OAM ± SE</td>
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<td>2.07 ± 0.02</td>
<td>1.03 ± 0.04</td>
<td>154.39</td>
<td>149.12</td>
<td>99.27</td>
<td>46.75 ± 1.36</td>
<td>8.10 ± 0.35</td>
<td>10373 ± 45.77</td>
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Table 2

The mean values of haematology and serum biochemcials in male and female turkeys of different age groups

<table>
<thead>
<tr>
<th>Age in weeks</th>
<th>N</th>
<th>TOTAL PROTEIN (g/dl)</th>
<th>ALBUMIN (g/dl)</th>
<th>GLOBULIN (g/dl)</th>
<th>GLUCOSE (mg/dl)</th>
<th>CEMBLAST ASP (IU/L)</th>
<th>ALP (IU/L)</th>
<th>PCV (percent)</th>
<th>HB (g/dl)</th>
<th>TEC (millions /cu mm)</th>
<th>TLC (per cu mm)</th>
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</thead>
<tbody>
<tr>
<td>6-12</td>
<td>M</td>
<td>3.72 ± 0.02</td>
<td>1.58 ± 0.02</td>
<td>1.70 ± 0.02</td>
<td>180.40 ± 2.33</td>
<td>176.33 ± 1.04</td>
<td>141.23 ± 0.86</td>
<td>3.11 ± 0.08</td>
<td>3.52 ± 0.00</td>
<td>1.88 ± 0.00</td>
<td>± 47.95</td>
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<td>F</td>
<td>2.88 ± 0.03</td>
<td>1.32 ± 0.02</td>
<td>1.56 ± 0.02</td>
<td>183.43 ± 1.49</td>
<td>160.27 ± 1.39</td>
<td>135.97 ± 0.86</td>
<td>48.17 ± 0.43</td>
<td>6.81 ± 0.04</td>
<td>2.89 ± 0.04</td>
<td>1.20 ± 0.00</td>
<td>± 47.95</td>
</tr>
<tr>
<td>12-18</td>
<td>M</td>
<td>3.97 ± 0.02</td>
<td>1.59 ± 0.02</td>
<td>1.80 ± 0.02</td>
<td>146.07 ± 1.84</td>
<td>183.37 ± 1.49</td>
<td>84.03 ± 0.04</td>
<td>3.91 ± 0.09</td>
<td>1.59 ± 0.09</td>
<td>± 77.20**</td>
<td>± 77.20**</td>
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<td>F</td>
<td>2.92 ± 0.03</td>
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<td>1.56 ± 0.02</td>
<td>211.03 ± 2.46**</td>
<td>186.80 ± 1.57</td>
<td>147.87 ± 0.49</td>
<td>49.80 ± 0.49</td>
<td>7.64 ± 0.04</td>
<td>3.51 ± 0.04</td>
<td>± 138.86</td>
<td>± 52.15</td>
</tr>
<tr>
<td>18-26</td>
<td>M</td>
<td>3.88 ± 0.03</td>
<td>3.38 ± 0.03</td>
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<td>151.10 ± 2.05</td>
<td>188.90 ± 2.10**</td>
<td>99.40 ± 0.13</td>
<td>56.17 ± 0.45</td>
<td>10.36 ± 0.03</td>
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<td>26-34</td>
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<td>34-44</td>
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<td>46.50 ± 0.85</td>
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<td>44-50</td>
<td>M</td>
<td>2.83 ± 0.01</td>
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<td>159.80 ± 1.77</td>
<td>127.63 ± 0.70</td>
<td>53.98 ± 0.79</td>
<td>45.50 ± 0.40</td>
<td>9.40 ± 0.04</td>
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<td>± 100.33</td>
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<tr>
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<td>2.97 ± 0.05</td>
<td>1.54 ± 0.06</td>
<td>0.94 ± 0.06</td>
<td>149.14 ± 1.40</td>
<td>134.75 ± 1.40</td>
<td>51.30 ± 0.48</td>
<td>41.65 ± 0.47</td>
<td>8.59 ± 0.04</td>
<td>2.14 ± 0.05</td>
<td>± 87.00</td>
<td>± 38.06</td>
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<tr>
<td>ABOVE 50</td>
<td>M</td>
<td>2.57 ± 0.04</td>
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<td>134.80 ± 0.91</td>
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<td>46.93 ± 0.47</td>
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<tr>
<td>F</td>
<td>2.38 ± 0.03</td>
<td>1.35 ± 0.04</td>
<td>1.04 ± 0.04</td>
<td>133.80 ± 1.11</td>
<td>114.57 ± 0.77</td>
<td>49.17 ± 0.51</td>
<td>37.67 ± 0.43</td>
<td>6.23 ± 0.04</td>
<td>2.21 ± 0.04</td>
<td>± 55.40</td>
<td>± 38.06</td>
</tr>
<tr>
<td>OAM ± SE</td>
<td>M</td>
<td>3.31 ± 0.02</td>
<td>2.19 ± 0.01</td>
<td>1.14 ± 0.01</td>
<td>151.73 ± 1.75</td>
<td>164.75 ± 1.01</td>
<td>96.95 ± 0.10</td>
<td>46.78 ± 0.81</td>
<td>8.81 ± 0.05</td>
<td>3.39 ± 0.05</td>
<td>± 116.21</td>
</tr>
<tr>
<td>F</td>
<td>3.02 ± 0.05</td>
<td>2.04 ± 0.03</td>
<td>0.97 ± 0.03</td>
<td>166.93 ± 1.13</td>
<td>156.76 ± 1.25</td>
<td>90.95 ± 0.70</td>
<td>46.45 ± 0.82</td>
<td>7.92 ± 0.05</td>
<td>2.89 ± 0.04</td>
<td>± 104.70</td>
<td>± 48.70</td>
</tr>
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</table>