HAEMATOLOGY
**Introduction:**

The blood performs a lot of important functions, by means of the hemoglobin contained in the erythrocytes, it carries oxygen to the tissues and collects the carbon dioxide. It also conveys nutritive substances (eg. Amino acids, sugars, mineral salts) and gathers the excreted material which will be eliminated through the renal filter. It performs the defense of the organism by mean of the phagocitic activity of the leukocytes, the bacterial power of the serum and the immune response of which the lymphocytes are the protagonists.

Technological advances have quickly propelled haematology forward certain diseases primarily affect the blood and or organs that form or destroy blood. The particular branch of medicine that deals with these is termed haematology. Haematology is such an engrossing subject that it is not surprising that haematologist.

The south-east asian region is recognized as the natural habitat of the red jungle fowl (*Gallus gallus*), the ancestor of the domestic fowl. Although the haematology of the domestic chicken and other avian species has been studied and documented (Lucas and Jamroz, 1961).Very less work has been reported on haematological parameters, of *G. domesticus* in India, specially related with cestode infection therefore, this study focused on the haematological alteration of apparently normal and naturally infected hosts with cestode parasites.

The *G. domesticus* is provides with high nutritional and food value, due to its greats food value many people of India consumed *G. domesticus* as main source of food and if the host becomes infected by cestode parasite ultimately it affects human health and hence the study is carried out.
The haematological manifestations of the infected host are suggestive of macrocytic anemia much comparable to Bothriocephalous anemia in man due to *Diphyllobothrium latum* (Cestoda) as a result of vitamin B\textsubscript{12} deficiency or related factors. The eosinophilia plus lymphocytes may be believed to be associated with defensive and immunological responses of the host.

Parasitism may induce lower growth (Evans, 1974; and Silva Souza 2004) and haematological alteration (Sopinska, 1985; Yokoyama et al., 1996; Ruane et al., 2000). According to Tacher (1981) many parasites can live in a gastrointestinal tract of host, sometimes causing damage, sometimes not. Therefore, the changes associated with haematological parameters, due to various parasites establish a data base and allow precise diagnosis guiding the implementation in fish farming and fish industries (Roberts, 1981).

Several workers have been working on haematology of birds infected with helminth parasites. Viz. (Totterman 1944 Reddy et al., 1984, Chubb and Rowell, 1959, Reid and Carmon, 1958).

The research work carried out on the blood parameter and its alteration due to the cestode parasite *Raillietina* Fuhrmann, 1920, *Cotugnia* (Diamare, 1893) and *Amoebotania* (Cohn1900) from the *G. domesticus* (Linnaeus) which are highly recommended for convalescing people because of its nutritional value.

Despite of many limitations this study represents an important step forward in understanding of the impact of cestode infection on haematological parameters of *G. domesticus*, which are important as a food source for peoples.
**Material and Methods:**

**Sampling sites**

From the month June 2009 to May 2011, 120 numbers of host *Gallus gallus domesticus* (Linnaeus) were collected with body weight (250 ± 0.32) kg, from Aurangabad Dist, (M.S) India.

**Blood analysis:**

Blood samples can be obtained from the wing (brachial) vein where it runs over the muscles surrounding the humerus. Depending on the bird’s size, a 21-23 gauge needle can be used with a syringe or a vacutainer. Place the bird on a table on its side and gently extend the upper wing from the body. Antiseptic should be applied to clean the skin. Feathers located in the vicinity of the brachial vein can be removed with scissors to more clearly show the line of the vein from the abdomen to the wing. Insert the needle through the outer layers of the skin into the vessel, collect blood and after removing needle, apply pressure over the site for 30 seconds to seal the vein and minimize leakage of blood into surrounding tissue. (Phil Glatz et al., 2009)

For haematological investigations blood samples were collected from all hosts in glass tubes containing EDTA and were properly labelled. For estimation of haematological investigation.

Primary and secondary blood indices were determined as per methods described by Houston (1990). The Total red blood cell count (TRBCC) was performed manually on an Improved Neubauer hemocytometer using Hayem’s fluid as diluents (Benjamen, 1985), total leukocyte count was estimated by the standard dilution technique using diluting fluid (4% glacial acetic acid and two drops of genital) (Talib and Khurana, 1995),
In determining Haemoglobin concentration is estimated by Sahli method (Sahli, 1962). The haemoglobin concentration was converted to acid haematin by the action of 0.1 N Hcl using 0.02 ml pipette. 20 ml of 0.1N HCL and 0.02 ml of blood sample were used to fill the graduated tube. The mixture was allowed to stand for 5 min before introducing few drops of distilled water till colour match the standard.

The determination of pack cell volume was done using method described by Wintrobe (1934). The 1 ml volume haematocrit tube sealed at one end were filled with host (*Gallus gallus domesticus*) blood and set in centrifuge for 30 min at 4000 rpm.

**Statistical analysis:** The level of significant differences between the mean values of the infected and control stages were determined using students t-test at p<0.05 (Steel and Torrie 1982)

The haematological Indices: Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin Concentration (MCHC), and Mean Corpuscular Haemoglobin (MCH) were calculated using the formula of Baker and Silverton (1982) given below:

\[
MCV = \frac{PCV \times 1000}{RBC \text{ count}}
\]

\[
MCH = \frac{Hb \text{ Value}}{RBC \text{ count}} \text{ Express in Picogrammes}
\]
• $MCHc = \frac{Hb}{PCV \times 1000}$

Differential leukocyte count was done by preparing blood smear and staining with “Leishman stain blue” by Mender method.
PLATE - 10

Blood Collection
**Introduction:**

The blood performs a lot of important functions, by means of the hemoglobin contained in the erythrocytes, it carries oxygen to the tissues and collects the carbon dioxide. It also conveys nutritive substances (e.g., amino acids, sugars, mineral salts) and gathers the excreted material which will be eliminated through the renal filter. It performs the defense of the organism by mean of the phagocytic activity of the leukocytes, the bacterial power of the serum and the immune response of which the lymphocytes are the protagonists.

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\]
Differential leukocyte count was done by preparing blood smear and staining with “Leishman stain blue” by Mender method.
### Results:

**Table 1:** Mean haematological parameters of (*Gallus gallus domesticus*) infected with *Cotugnia wankhedii n.sp*

<table>
<thead>
<tr>
<th>Haematological parameters</th>
<th>Normal host</th>
<th>Infected host</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total erythrocyte count – RBC (x 10/mm³)</td>
<td>3.4±0.7</td>
<td>2.5±0.2</td>
</tr>
<tr>
<td>Total leukocyte count – WBC (x 10⁴/ mm)</td>
<td>26.4±1.7</td>
<td>30.2±3.4</td>
</tr>
<tr>
<td>Haemoglobin content – Hb (g %)</td>
<td>8.6±0.4</td>
<td>7.5±0.3</td>
</tr>
<tr>
<td>Packed cell volume – Ht (%)</td>
<td>29.9±1.4</td>
<td>26.4±1.2</td>
</tr>
<tr>
<td>Mean Corpuscular Volume – M.C.V (µ³)</td>
<td>87.9±14.5</td>
<td>176±8.9</td>
</tr>
<tr>
<td>Mean corpuscular Haemoglobin M.C.H(µg)</td>
<td>25.3±4.2</td>
<td>5.0±2.5</td>
</tr>
<tr>
<td>Mean Corpuscular Haemoglobin Concentration – M.C.H.C (%)</td>
<td>28.8±0.2</td>
<td>28.4±0.1</td>
</tr>
<tr>
<td>Lymphocyte %</td>
<td>16.5±1.3</td>
<td>19.9±2.4</td>
</tr>
<tr>
<td>Neutrophil %</td>
<td>25.51 ± 0.58</td>
<td>17.80 ± 0.07</td>
</tr>
<tr>
<td>Basophil %</td>
<td>1.83±0.40</td>
<td>2.66±0.66</td>
</tr>
<tr>
<td>Monocyte %</td>
<td>0.6±0.1</td>
<td>0.5±0.1</td>
</tr>
<tr>
<td>Eosinophil %</td>
<td>0.4±0.1</td>
<td>0.2±0.04</td>
</tr>
</tbody>
</table>
The above result obtained in *Gallus gallus domesticus*; it is clear that blood parameters either increase or decrease in the *Gallu gallus domesticus* infected with cestode parasites as compare to the normal host.

**Table 1 shows** significant variation in blood parameters of normal and infected *Gallus gallus domesticus* (Linnaeus). It was observed that

I. Statically significant decrease in RBCs count as healthy 3.4±0.7 and 2.5±0.2 infected one.

II. A significant decrease in haemoglobin percentage as 8.6 ±0.4 normal and 7.5 ± 0.3 infected one.

III. Haematocrit was statically significant decline in infected host such as 29.9 ± 1.4 in normal and 26.4 ± 1.2 in infected host.

IV. The MCHC observed significant decreases in infected condition such as 28.8 ± 0.2 in normal and 28.4 ± 0.1 infected hosts. were significantly decreased (P<0.05) than those observed in the normal host,

V. The WBCs counts recorded significantly higher in infected host than normal as 26.4± 1.7 normal and 30.2 ±3.4 infected host.

VI. Significant decreases in MCV as 87.9 ± 14.5 in normal ,and 176± 8.9 infected one.

VII. The infected *Gallus domesticus* shows significant increases MCH 25.3 ± .4.2 normal and 5.0±2.5 infected one values of the healthy host were lower (P<0.05) than those observed in the infected host.

VIII. The percentage of differential leukocyte cell count showed an increase (P<0.05), particularly in
lymphocyte [normal (16.5±1.3), infected (19.9±2.4)];
basophile [normal (1.83± 0.40), infected (2.66± 0.66)];
monocytes [normal (0.6±0.1), infected (0.5±0.1)]

**IX.** Significant decrease in neutrophil [normal (25.51 ± 0.58), infected (17.80 ± 0.07) and eosinophil [normal (0.4±0.1), infected (0.2±0.04)] (P<0.05) in infected *Gallus gallus domesticus*, in relation to that observed in normal *Gallus domesticus*. 
Table 2: Mean haematological parameters of (*Gallus gallus domesticus*) infected with *Raillietina (R) tetragona* Molin1858.

<table>
<thead>
<tr>
<th>Haematological parameters</th>
<th>Normal host</th>
<th>Infected host</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total erythrocyte count –RBC (x10³/mm³)</td>
<td>2.9±0.22</td>
<td>2.25±0.28</td>
</tr>
<tr>
<td>Total leukocyte count- WBC (X 10⁴/mm)</td>
<td>27.5±2.7</td>
<td>37.5±2.7</td>
</tr>
<tr>
<td>Haemoglobin content – Hb (g %)</td>
<td>13.5±0.7</td>
<td>9±0.9</td>
</tr>
<tr>
<td>Packed cell volume – Ht (%)</td>
<td>40±2.4</td>
<td>31±3.2</td>
</tr>
<tr>
<td>Erythrocyte Constant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Corpuscular Volume – M.C.V (µ³ )</td>
<td>133.48±2.28</td>
<td>162.7±7.7</td>
</tr>
<tr>
<td>Mean Corpuscular Haemoglobin M.C.H(µg)</td>
<td>44.93±1.16</td>
<td>47.2±2.6</td>
</tr>
<tr>
<td>Mean Corpuscular Haemoglobin Concentration M.C.H.C (%)</td>
<td>33.75±1.4</td>
<td>29.0±1.2</td>
</tr>
<tr>
<td>Differential leucocyte Count (DLC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphocyte %</td>
<td>17.5±1.3</td>
<td>20.9 ± 2.4</td>
</tr>
<tr>
<td>Neutrophil %</td>
<td>25.51 ± 0.58</td>
<td>18.80 ± 0.07</td>
</tr>
<tr>
<td>Basophil %</td>
<td>1.83± 0.40</td>
<td>2.77±0.49</td>
</tr>
<tr>
<td>Monocyte %</td>
<td>8.75±0.35</td>
<td>5.55±0.16</td>
</tr>
<tr>
<td>Eosinophil %</td>
<td>3.32±0.17</td>
<td>2.32±0.17</td>
</tr>
</tbody>
</table>
The above result obtained in *Gallus gallus domesticus*; it is clear that blood parameters either increase or decrease in the birds infected with cestode parasites as compare to the normal host.

**Table 2**: shows significant variation in blood parameters of normal and infected *Gallus gallus domesticus* (Linnaeus). It was observed that

I. Statically significant decrease in RBCs count as normal 2.9±0.22 and 2.25±0.28 infected one.

II. A significant decrease in haemoglobin percentage as 13.5 ± 0.7 normal and 9 ± 0.9 infected one.

III. Haematocrit was statically significant decline in infected host such as 40 ± 2.4 in normal and 31 ± 3.2 in infected host.

IV. The MCHC observed significant decreases in infected condition such as 33.75 ± 1.4 in normal and 29.0 ± 1.2 infected hosts. were significantly decreased (P<0.05) than those observed in the normal host,

V. The WBCs counts recorded significantly higher in infected host than normal as 27.5± 2.7 normal and 37.5 ±2.7 infected host.

VI. Significant decreases in MCV as 133.48± 2.28 in normal and 162± 7.7 infected one.

VII. The infected *Gallus domesticus* shows significant increases MCH 44.93 ± 1.16 normal and 47.2 ± 2.6 infected one values of the normal host were lower (P<0.05) than those observed in the infected host.

VIII. The percentage of differential leukocyte cell count showed an increase (P<0.05), particularly in
lymphocyte [normal (17.5 ± 1.3), infected (20.9± 2.4)]; basophil [normal (1.83±0.40), infected (2.77±0.49)]; monocyte [normal (8.75±0.35), infected (5.55±0.16)]

IX. Significant decrease in neutrophil [normal (25.51 ± 0.58), infected (18.80±0.07) and eosinophil [normal (3.32±0.17), infected (2.32±0.17)] (P<0.05) in infected Gallus gallus domesticus, in relation to that observed in normal in Gallus gallus domesticus.
Table 3: Mean haematological parameters of *Gallus gallus domesticus* infected with *Amoebotenia prabhuravii* n.sp

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<th>Haematological parameters</th>
<th>Normal host</th>
<th>Infected host</th>
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<tbody>
<tr>
<td>Total erythrocyte count – RBC (x 10⁸/ mm³)</td>
<td>3.68±0.15</td>
<td>3.014±0.15</td>
</tr>
<tr>
<td>Total leukocyte count – WBC (x 10⁴/ mm³)</td>
<td>29.05±0.9</td>
<td>31.05±0.68</td>
</tr>
<tr>
<td>Haemoglobin content – Hb (g %)</td>
<td>11.3±0.6</td>
<td>9.31±0.61</td>
</tr>
<tr>
<td>Packed cell volume – Ht (%)</td>
<td>33.0±1.3</td>
<td>29.0±0.8</td>
</tr>
<tr>
<td>Erythrocyte Constant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Corpuscular Volume – M.C.V (μ³)</td>
<td>89.67±7.0</td>
<td>96.21±0.5</td>
</tr>
<tr>
<td>Mean corpuscular Haemoglobin M.C.H(μg)</td>
<td>30.7±0.2</td>
<td>30.6±0.2</td>
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<td>Mean Corpuscular Haemoglobin Concentration – M.C.H.C (%)</td>
<td>34.24±0.5</td>
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<tr>
<td>Basophil %</td>
<td>1.83±0.40</td>
<td>2.433±0.42</td>
</tr>
<tr>
<td>Monocyte %</td>
<td>6.566±0.477</td>
<td>5.167±0.54</td>
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<td>Eosinophil %</td>
<td>9.167±0.601</td>
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The above result obtained in *Gallus gallus domesticus*; it is clear that blood parameters either increase or decrease in the birds infected with cestode parasites as compare to the normal host.

**Table 3** shows mean haematological values in infected and normal *Gallus gallus domesticus* (Linnaeus).

I. Statically significant decrease in RBCs count as normal 3.68±0.15 and 3.014±0.15 infected one.

II. A significant decrease in haemoglobin percentage as 11.3 ±0.6 normal and 9.31 ± 0.61 infected one.

III. Haematocrit was statically significant decline in infected host such as 33.0 ± 1.3 in normal and 29.0 ± 0.8 in infected host.

IV. The MCHC observed significant decreases in infected condition such as 34.24 ± 0.5 in normal and 32.10 ± 0.2 infected hosts. were significantly decreased (P<0.05) than those observed in the normal host,

V. The WBCs counts recorded significantly higher in infected host than normal as 29.05± 0.9 healthy and 31.05 ±0.68 infected host.

VI. Significant decreases in MCV as 89.67 ± 7.0 in normal, and 96.21± 0.5 infected one.

VII. The infected *Gallus domesticus* shows significant increases MCH 30.7 ± 0.2 normal and 30.6±0.2 infected one values of the normal host were lower (P<0.05) than those observed in the infected host.

VIII. The percentage of differential leukocyte cell count showed an increase (P<0.05), particularly in lymphocyte [normal (16.5±1.3) infected (19.9±2.4)];
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The data on the Haematological values of *Gallus gallus domesticus* both infected and normal with cestode parasite *Cotugnia wankhedii* (Diamare, 1893), *Raillietina tetragona* (Fuhrmann, 1920), and *Amoebotania prabhuburavii* (cohn1900)
Graph No.1 Showing RBC count in Infected and Normal Host Gallus gallus domesticus with cestode parasite

- Cotugnia wankhedi n.sp
- Raillietina tetragona
- Amoebotania praburavi n.sp

Graph No.2 Showing TLC of infected and normal Gallus gallus domesticus with cestode parasite

- Cotugnia wankhedi n.sp
- Raillietina tetragona
- Amoebotania praburavi n.sp
Graph No. 3 Showing Haemoglobin content of infected and normal *Gallus gallus domesticus* with cestode parasite

- Cotugnia wankhedii n.sp
- Raillietina tetragona
- Amoebotanina prabhuravii n.sp

Graph No. 4 Showing Packed cell volume of infected and normal *Gallus gallus domesticus* with cestode parasite

- Cotugnia wankhedii n.sp
- Raillietina tetragona
- Amoebotanina prabhuravii n.sp
Graph No. 5 showing MCV (%) in normal and Infected host *Gallus gallus domesticus* with cestode parasite

![Graph showing MCV](image)

- **Cotugnia wankhedii n.sp**
- **Raillietina tetragona**
- **Amoebotania prabhuravii n.sp**

Graph No. 6 Showing Mean corpuscular Haemoglobin % of Normal and Infected *Gallus gallus domesticus* with cestode parasite

![Graph showing MCH](image)

- **Cotugnia wankhedii n.sp**
- **Raillietina tetragona**
- **Amoebotania prabhuravii n.sp**
Graph No. 7 Showing MCHC (%) in Normal and Infected host *Gallus gallus domesticus* with cestode parasite

![Graph showing MCHC (%) for normal and infected hosts with different cestode parasites.](image-url)
Graph No. 8 Showing Differential Leucocyte count in Infected and Normal Host Gastrus gallus domesticus with cestode parasite
**Discussion:**

Blood is the only tissue that flows throughout your body. This red liquid carries oxygen and nutrients to all parts of the body and waste products back to your lungs, kidneys and liver for disposal. It is also an essential part of your immune system, crucial to fluid and temperature balance, a hydraulic fluid for certain functions and a highway for hormonal messages.

In the present investigation, the haematological parameters studied of the *G. domesticus* correlates with cestode parasitism. The haematological parameters were studied Viz. RBCs, Hb, WBCs, PCV, MCV, MCH, MCHC, monocytes, Eosinophil, neutrophil, basophile and lymphocyte from *G. domesticus* infected with cestode parasites, our results show highly significant correlations between blood parameters and parasitic worm burden in *G. domesticus*. The statistically significant changes were found between heavy infection of cestodes and haematological values in normal and infected host. The study highlights in bird which comparable to those earlier work has been done by many researchers which summarized below.

Haematological studies are important in diagnosing the structural and functional status of the body. Haematology is the study of blood and its different components. The birds are inevitable subjected to various kinds of stresses that may lead to down regulation of immunity. Hence, to start the development of infection and diseases may occur. Tapeworm infection is a major health problem in *G. domesticus* because it affects the normal blood parameters and produces anemia, lymphocytosis etc. (Bhure et al., 2011).
This study was done to contribute to the current knowledge on avian haematology, or, more specifically, to describe some changes in haematological parameter during the highly infected Red jungle Fowl (Gallus gallus domesticus) with cestode parasites. The elementary paper on this topic, pointing out significant decrease (P<0.05) in RBC count, haemoglobin concentration, packed cell volume (Table I, II, III). Increase in WBC count, MCV while decrease in RBC count from normal and infected Gallus gallus domesticus,

The result of this study indicate that cestode parasite affect the blood parameter of Gallus domesticus a significant reduction in the level of host especially considering the fact that PCV, RBC count, Haemoglobin concentration show significant changes when compare with the Normal. The implications in the reduction of the parameter lead to anaemia, which may be functionally defined as a decreased oxygen-carrying capacity of the blood. a very interesting feature that accounts for infected birds show restlessness and different types to helminths produce different types of changes in haematological parameters in birds (Natt and Herrick 1952) which is quite comparable to those in mammals including man. The similar results i.e. Increase in WBC count, MCV while decrease in RBC count from normal and infected host also reported (Ramkrishanan, 1950) from albino rats infected with plasmodium parasites. as well as he suggests the physiological significance of leukocyte like their phagocytic action, release toxin globins from lymphocytes.

The role of globins in tissue repair and blood clotting, result in their increase during parasitic infection. The similar finding also recorded of blood parameters from Capra hircus infected with nematode infection (Wankhede, Shaikh, 2007).
Increase in WBC count, MCV while decrease in RBC count from normal and infected *Columba livia* (Bhure, and Nanware 2010). The parasite infects domestic chickens, penguins, ducks, canaries, falcons, pigeons and several marine avifauna (Brossy, 1992; Biu et al., 2005; William, 2005; Schultz and Whittington, 2005). In the infected birds, the clinical disease is associated with fever, depression, anorexia, loss of body weight, dyspnea, hepatomegaly, splenomegaly, ocular haemorrhage, haemolytic anaemia, haemoglobinuria, leukocytosis, lymphocytosis, hypoalbuminaemia, nephritis, fatty liver, oedema of the lungs, hydropericardium and occlusion of capillaries of the brain (Aiello, 1998; William, 2005). Mortality in bird due to the disease may be up to 90 % (Jordan and Pattison, 1998).

In most of the pathologic (infection) conditions in higher animal are accompanied by an increase in the number of leucocyte (leucocytosis) in the peripheral blood and this type of reactive leucocytosis disappear as the subject recovers from the pathologic conditions (Kassirsk and Alexcev, 1972). Leucocytosis in the avian patient, like other species, may be due to a physiologic event, an infectious disease process, a neoplastic disease or an inflammatory condition. In the present study leucocytosis was noted in *Gallus gallus domesticus* infected with cestode parasites (Table I, II, III), the leucocyte had a significant increase (P<0.05) in infected *Gallus domesticus* as compare to the normal. This result was similar to Ismail (2002), Suleyman Kozat (2006), Shaikh (2012).

When the worm number is high there is increased blood loss caused by hemorrhage and consumption by worms, leading to an overall low Hb% . Thus can affect the productivity of the birds through mortalities, by decreasing growth rate, reducing
the quality of the meat and making the hosts more susceptible to pathogenic parasites and bacteria.

Even though MCV is higher in heavy infection, than in the uninfected *Gallus gallus domesticus*. The observed increase is not statistically significant MCH. MCHC shows some changes significantly decrease in heavy infection are not statically significant

A higher MCV indicates a macrocytic anemia while a lower value is indicative of microcytic variety. A decreased MCH denotes hypocromic anemia. MCHC gives the quantity of Hb. In each cell and also indicates the ratio of weight of Hb to the volume of cell. In most anaemia this ratio is kept constant by the alteration of the cell volume and Hb. While the cell volume is normal. There is compensatory mechanism in nature in providing the body with adequate amount of erythrocyte aeration surface. Even in the same species, a lower RBCs count is made up by an increase in the red cell diameter and hence there are increases in the MCV as well as increases in the MCH. (Ganti A. Sastry).

Regarding differential count of WBC the result presented in table 1: Show that there is progressive reduction in percentage of lymphocyte with increasing severity of infection. Con current with progressive increase in the percentage of neutrophil, basophile and monocytes, eosinophil decreases in heavy infection.(Baker and Douglas, 1966).

The sum total of the haematological changes shows that the infected host become anaemic, as it evident from the erythrocyte constants and indices, the anemia is of the macrocytic hyperchromic type, characterized by increase MCV and MCH (Wintrobe, 1961).
A few authors who ventured to study the haematological changes in helminth infection of fishes have shown that cestode infection cause reduction in RBC count and haemoglobin content and increase WBC count, Lymphocytes, Heterophils and eosinophils increased significantly in all the infected host *Gallus gallus domesticus* (Deka and Borah 2008, Tanwar et al., (2001), Matta and Ahluwalia (1982), Kumar et al., (2003), Kumar, et al., 2002, Wahid 2008, Sadkovskaja, 1953; Shpolyanskaya; 1953, Kosheva; 1956, Baues; 1958, Bylund; 1972).

In the present study, infected host showed reduced haematocrit, MCV and MCHC value. This suggests the occurrence of a microcytic hypochromic anemia. Similar result was described in infected with ectoparasites (Al-Saffar 2008).

K. Sunita et al., (2005) Eosinophils are more in number in the infections of tapeworms and hookworms like that they reported after experimental infection of *plasmodium pinottii* in chicks the changes occurred in hematological values in infected chicks than normal one the eosinophils values was in normal chicks as (2%) and in infected chicks was (3%) were noted.

Thomas and et al., (2002) described increases in number of eosinophils that worldwide parasites are the principal group of infectious agents’ responsible for eosinophilia. Eosinophilia is most often associated with helminthic parasites, which includes nematodes, cestodes and trematodes.

Our present study and findings are correlated with above reports, hence our finding are considerable.
Plate 10: Blood Collection

Plate 11: Red and White Cells

Plate 12: Differential leukocytes

Plate 13: Haematological Apparatus

A. Neubauer chamber
B. Haemocytometer in cross section
C. Haemometer Sahli Plano.
PLATE - 11

RBC and WBC Cells

A

B

C
Conclusion:

The use of haematological values in disease diagnosis and nutritional status of bird has been knowledge of various parameters is beneficial to the farmers, scholars and further development of the poultry industry in the country.

It can be concluded that from this study infection rate of *Raillietina (R) tetragona* Molin1858 is higher as compare to other parasite because it is more prevalent in chicken. Internal parasites cause significant clinical, pathological changes in host *Gallus gallus domesticus*. Therefore, it is necessary to take adequate parasite control measures to ensure the health of birds, forgoing results also suggest that there are a progressive change in haematological parameters some parameters are associated with rise in these parameters and some are the decrease due to heavy infection of cestode parasites. The increases and decreases in parameters depend upon the intensity of parasite infection. from the above results, it may be mentioned that during infection of tapeworm, RBC, Hb, PCV, MCHC , N%, E% parameters decreases and WBCs, L%, M%, B%, MCV, MCH parameters increases, so theses parameters are very important for diagnosis of diseases at the earliest possible.

The entire study indicate that the intensity of cestode infections is responsible for altering the haematology of (host) *Gallus domesticus* and their relationship of infection with the haematological alterations.

It is further speculated that mechanical damage caused by cestode parasites to the host intestine could cause vitamin B12 and folic acid deficiency which are other wise responsible for erythropoiesis. Increase number of total leucocytes count and differential leucocytes count value may be associated with the
defense mechanism and immunological responses against disease cause by cestode parasites.

When the worm number is high there is increased blood loss caused by hemorrhage and consumption by worms, leading to an overall low Hb%. Thus can affect the productivity of the birds through mortalities, by decreasing growth rate, reducing the quality of the meat and making the hosts more susceptible to pathogenic parasites and bacteria.