Effect of Anthocleista Nobilis Root Extract on the Haematological Indices of Poultry Chicken Challenged with Newcastle Disease Virus (NDV)

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ABSTRACT

This study reports the effect of Anthocleista nobilis root extract on the haematological indices of poultry chicken challenged with Newcastle disease virus (NDV). Eighteen (18)-weeks-old chickens were used for this study. They were divided into 3 groups, A (chickens infected + treatment), B (chickens infected without treatment) and C (control). Groups A and B were challenged with Newcastle disease virus (NDV). Group A and C were given ethanolic root extract of A. nobilis orally at intervals of 6 h at 0.5mg per 100g of body weight for 28 days. All the chickens were given tetracycline antibiotic to eliminate bacterial infections. The average body weight and the temperature were monitored. The cytological examination of the chickens in group B showed that there was ulceration in the intestinal lining. All values for blood parameters were within the normal range for chickens before they were challenged with NDV. From our findings most of hematological indices of poultry chickens tend towards normal after treatment with the root extract of A. nobilis. This showed the ability of this plant extract to impact immunity in chickens suffering from Newcastle disease (ND). The packed cell volume (PCV), hemoglobin (Hb) and full blood count (TWBCC) were significantly different (P<0.05) between the Group A and Group B. The hematological indices of poultry chickens in group A were significantly (P<0.05) influenced by the treatments except for mean corpuscular haemoglobin concentration estimation (MCHC). It showed negligible differences (P>0.05) among the three groups, A (33.3% and 33.8% respectively), B (32.4%) and C (32.1%). They fell within the normal range of 30.0%-36.0%. This showed that the NDV did not affect that aspect. The study indicated a drop in the hematological indices of the infected and untreated chickens (Group B) while those of group A and C fell within normal range. The study showed that ethanolic root extract of Anthocleista nobilis was able to correct the haematological and physiological alteration associated with Newcastle disease among infected poultry chickens. The ability of group A poultry chickens to tend towards normal after treatment are physiological evidences of the antiviral effect of the root extract of A. nobilis on hematological indices of the poultry chickens studies. The study also showed that Anthocleista nobilis root extract was able to prevent further NDV infection of the poultry chickens. Thus, further studies on phyto-chemical and toxicological properties of Anthocleista nobilis as well as its antiviral property are advocated.

Key Words

A. nobilis, Antiviral effect, New Castle disease, NDV, hematological indices, chickens, ulceration, Nigeria.

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1 Introduction

Rural poultry are the dominant form of poultry kept in the developing world. They are a natural resource whose potential is not fully exploited for the welfare of rural populations (Awan et al., 1994). Some research has been carried out during the past few years and it now appears that rural poultry are receiving increasing support for research and development from many government and international funding agencies throughout the world (Awan et al., 1994). Diseases seriously affect family poultry and constitute one of its major threats (Ndahi et al., 2011). The most devastating disease of rural poultry is Newcastle disease (NCD). Newcastle disease is a major constraint to poultry production in Africa, in both commercial and village rearing systems (Nwanta et al., 2008). Moreki et al. (2010) ascribed losses in family poultry to diseases, parasites, predation, a combination of diseases, parasites and predation. In order of prevalence, the common diseases of poultry are coccidiosis, infectious coryza, fowl pox, infectious bursal disease (IBD) and Newcastle disease (Moreki et al., 2011; Moreki, 2012). NCD is the most widespread infectious disease in Africa (Moreki, 2012). Similarly, Moreki (2010) identified NCD to be a major constraint in family poultry, causing up to 100% mortality in unprotected flocks.

Newcastle Disease is a viral disease if birds caused by a filterable virus Newcastle Disease Virus (NDV) which belongs to the family Paramyxoviridae (Okwor and Eze, 2010). ND is considered among the most important disease of poultry and outbreaks with mortality up to 100% are common (Saidu and Abdu, 2008). Paramyxovirus 1 (PMV-1) or Newcastle Disease (ND) is a highly contagious zoonotic viral disease affecting poultry of all ages (McMullin, 2004).

Although the first outbreaks recognized as Newcastle disease occurred in Indonesia in 1926, it has been suggested that a large outbreak in Scotland in 1896 was due to Newcastle Disease Virus (NDV) (Sadiq et al., 2011). The first documented outbreak of Newcastle disease in Nigeria occurred between December, 1952 and February 1953 in and around Ibadan (Okwor and Eze, 2010). The disease has since this time remained a notable problem in the country (Oladele et al., 2002) and has become endemic in Nigeria in both, local and commercial poultry with annual epidemics recorded in highly susceptible flocks with pockets of outbreaks occurring in between the annual epidemic periods (Saidu and Abdu, 2008; Okwor and Eze, 2010).

Outbreaks of Newcastle disease in Nigeria were reported to be more likely in farms that kept exotic birds together with local chickens and other poultry species like ducks and turkeys (Abdu et al., 2005a). The outbreaks of Newcastle disease were more common in layers than in broilers (Abdu et al., 2005a). Newcastle Disease (ND) is the most important disease and it causes very high mortality (Sonaiya, 2009). The disease was also reported to be more common during the dry harmattan (November–March) (Abdu et al., 2005b; Sonaiya, 2009; Sadiq et al., 2011). ND in Nigeria has age and species differences (Abdu et al., 2005b). In rural Nigeria, it is common to find a combination of different poultry species and breeds being kept in the same compound, including chickens, turkeys, Muscovy ducks and pigeons. At present, it is customary to find ostriches, peacocks, geese and mallard ducks in the same compound in cities and in some poultry farms (Adene and Oguntade, 2006; Friend, 2006; Sadiq et al., 2011).

New Castle Disease (NCD) is the most important disease that affects these chickens resulting in very high morbidity, mortality and case fatality rates. Based on this study which indicates that this disease usually starts at the onset of the cold dry season that is around November, NCD vaccine (Lasota) could be administered just before the onset of this period and during the period in order to curtail this disease. Also, fowl pox vaccination could be carried out to prevent further occurrence of the disease. Anthelmintics could be given before the onset of raining season and during raining season to guard against syngamus trachea infection which is said to occur from the month of June to October.

All strains of Newcastle disease virus (NDV) occur in rural poultry, but velogenic strains are reported to be more common. Serological surveys in conjunction with isolation studies have shown that velogenic NDV strains are endemic in rural poultry populations even in isolated villages and possibly in isolated flocks (Awan et al., 1994). Although NDV is endemic in village poultry, the clinical disease usually follows an epidemic pattern. ND outbreaks often occur once or twice a year at regular intervals affirming the endemicity of the virus, however, ‘mini’ outbreaks in individual flocks and sporadic cases in individual birds may occur. Epidemics usually occur at times of climatic stress, leading to seasonal occurrence (Awan et al., 1994). The spread of NDV within and between village poultry populations is relatively slow due to a low contact rate (Awan et al., 1994). The major mode of transmission appears to be by the faecal-oral route. The respiratory route may also play a role in flocks where close bird-to-bird associations exist. Other poultry species, wild and feral birds, wild animals, communal water reservoirs and domestic animals may play a role in transmission; however, their role has not been properly investigated (Awan et al., 1994).
cosmetics, and food supplements and even as traditional source of medicines because of their antitumor, antiarthritic and antithrombotic functions (Sajjad et al, 2011). The consumption and demand for medicinal plants have been adopted in many countries because of low cost, easy availability, affordability for a common farmer, good antimicrobial natured, reduced diseases associated risks, lowering blood cholesterol level and diversified functions in improving performance, growth rate, feed conversion rate and weight gain in birds (Sajjad et al, 2011).

The use of ethnoveterinary medicine in the management of animal healthcare is as old as the domestication of various livestock species (Ndahi et al., 2011). Compared to Western modern medicine, EVM is widely utilized by the family poultry rearers across the country (Ndahi et al., 2011). Anthocholeista nobilis which is commonly called the candelabrum or cabbage tree in English language, Duwa Kuchi in Nupe language, Kwari in Hausa language and Apa Ora in Yoruba language belongs to the family Loganiaceae. The plant is used with boiled root of Combretum smeathmannii (combretaceae) pepper and ash taken as a drink for chest pain, the liquid resulting from boiling dry falling leaves is drunk is Sierra Leone to treat Jaundice, the leaf sap is reputed to be haemostatic. The bark is used in Nigeria for its antipyretic, tonic purgative properties. In Congo, its pulped back is applied as antiseptic and Cistercian on sores, swollen bubes and abrascences and to treat yaws (Lewington, 1990). The root is the most active pharmacologically and is the most used as a purgative and dietary, a poison antidote, an emmenagogue, abortifacient to treat leprosy, edemas and elephantiasis of the scrotum. A root decoction is taken in Serra Leone for constipation and gonorrhea. In Congo the root decoction is given to women as a purgative to cleanse the abdomen and to ensure that the urinogenital parts return to its proper place (Burkill, 1995).

Furthermore, scientists and researchers are trying to combat against fatal diseases in poultry through the use of medicinal plants, containing the most active ingredients to promote growth, weight gain, and immunostimulant (Sajjad et al, 2011). Aloe spp. and N. tabacum were also used against internal parasites while wood ashes, especially those from Peltophorum africanum and Combretum imberbe were used against external parasites (Ndahi et al., 2011). Because of its unpleasant and strong smell, Thamnosma rhodesica leaves were placed in chicken shelters in order to repel external parasites (Ndahi et al., 2011).

In Nigeria, Musa et al. (2008) noted that these remedies that are used by rural farmers may or may not have direct effect on NCD virus but could affect protozoan and helminths parasites of rural poultry by reducing the parasites burden, and boosting the immunity of birds against infection. Deeba (2009) in Pakistan reported the use of Nicotiana tabacum in treatment of NCD. Mwale et al. (2005) reported that A.vera and Aloe spicata were the predominantly used plant species for chicken health management in Zimbabwe. In agreement with Moreki et al. (2010), Mwale et al. (2005) mentioned that A.vera acts like a broadspectrum antibiotic remedy. Moreeng (2008) reported that feeding chickens a concoction of Moringa (Moringa oleifera) tree leaves is an effective deworming practice. The study of Ogbe and Affiku (2011) in Nigeria showed that M. oleifera leaves contained appreciable amounts of carbohydrate, protein and minerals, which are nutritional requirements for poultry. The authors also mentioned that M. oleifera could be useful as feed supplement and as medicine in poultry to improve health and growth performance (Moreki, 2012).

Masimba et al. (2011) pointed out that ethnoveterinary knowledge was mostly in the custody of older men and women who passed it orally to younger generations by word of mouth. According to Sri Balaji and Vikrama Chakravarthi (2010), ethnoveterinary practices concern to animal health care is as old as the domestication of various livestock species. They comprise beliefs, knowledge, practices and skills pertaining to health care and management of livestock (Ndahi et al., 2011).

In Kenya, Lagu and Kayanja(2010) reported that traditional healers play limited roles in treating local chickens as many farmers collect, concoct and administer the local herbs themselves. Many of the plants used to prepare indigenous medicine contain valuable active ingredients (Ndahi et al., 2011). Previous study by Moreki et al. (2010) showed that 86.7% of family poultry rearers used EVM, whereas the remainder used modern medicines (vaccines and drugs). The most common forms of EVM preparations are powders, poultice, ointment, decoction, infusion, cold ware extract, tinature and fumigation (Toyang et al., 2007; Sri Balaji and Vikrama Chakravarthi, 2010; Ndahi et al., 2011).

In contrast to vaccines, therapeutic remedies are village traditions. Rural poultry producers use many local natural products to treat or prevent diseases in their livestock. Their chickens also receive treatment. Workers with village chickens have become interested in ethnoveterinary medicine and lists of traditional remedies are becoming available. This study was carried out to ascertain in greater details the relationship between the active ingredient in the ethanol root extracts of Anthocholeista nobilis and the haematological evidence that can be obtained during the treatment of poultry chickens against Newcastle disease virus. The haematological indices were examined before, during and after the administration of the A. nobilis root extracts.

2 Material And Methods
2.1 Source of Newcastle disease virus (NDV)

The Newcastle disease virus used in this study was obtained from National Veterinary Research Institute (NVRI) Vom, Jos. The Newcastle disease virus was in a freeze dried form, prepared and stored in amperes. It was kept in the

after challenging these poultry chickens with the viral pathogens. Group A was treated while group B was left without treatment. Only groups A and C were given the plant extract at a dose of 0.5mg orally per 100g body weight the treatment was done at interval of 6 hours. In order to eliminate bacterial and other infections, all the chickens were given an oxytetracycline treatment was administered at 4 weeks of age via the birds’ water supply at a dose of 25 mg/lb for 5 days. The blood samples of the chickens were also collected to determine hematological indices which include using standard methods as described by other workers (Spencer and Price, 1997; Ajagbonna et al., 1999; Uko et al., 2000; Cheesbrough, 2006; Mohammed et al., 2008, 2011; AL-Eissa and Alkahtani, 2011). The hematological indices include the pack cell volume (PCV), %; hemoglobin (Hb), g/l; full blood count (TWBCC) cells/mm$^3$; and mean corpuscular haemoglobin concentration (MCHC), %.

2.5 Data Analysis
Data were analyzed using the general linear model procedure, ANOVA and independent t-test to compare the level of significant difference between the treated groups and the controls. Indicator of statistical significance is $P \leq 0.05$.

3 Results Analysis
The study was conducted to investigate the effect of Anthocleista nobilis root extract on the haematological indices of poultry chickens challenged with Newcastle disease virus (NDV). The results of the haematological indices of the test chickens challenged with New Castle Disease are shown in Tables 1, 2 and 3. The haematological indices obtained before challenging the chickens with NDV indicated that all the chickens were healthy and no physiological abnormalities were traced in them. The packed cell volume; PCV (%), haemoglobin; Hb (g/l), mean corpuscular haemoglobin concentration (MCHC) (g/l) and total white blood count concentration; TWBCC (g/l) of all the groups tends towards normal. It ranged from 0.35% – 0.43%, 120.0g/l – 140.0g/l, 302.3g/l – 357.1g/l and 4.0 $\times$ 10$^3$ – 4.6 $\times$ 10$^3$ mm$^3$ respectively (Table 1). In the same vein, the mean PCV (%), Hb (g/l), MCHC (%) and TWBCC (g/l) ranged from 37.0– 42.0%, 127.5–130.0g/l, 32.6–34.5% and 4.15 x 10$^3$ – 4.4 x 10$^3$ mm$^3$ respectively (Table 1) and these values are normal.

Means PCV level is also presented in Table 1. Group C receiving no NDV and ethanolic extract showed higher PCV (42.0%) level. This was closely followed by Group B (39.0%) receiving only NDV and no ethanolic extract of A. nobilis. While Group A (37.0%) receiving both NDV and ethanolic extract of A. nobilis showed higher Hb level (13.00 g/l) as compared to Group A receiving both NDV and ethanolic extract of A. nobilis having Hb level of 127.5 g/l. There was no significant difference between the Hb level of the treatments and the control (130.0g/l vs. 135.0g/l, $P>0.05$). Means corpuscular haemoglobin concentration estimation (MCHC) level is also presented in Table 1. Group A receiving both NDV and ethanolic extract of A. nobilis showed higher (P<0.05) MCHC level (34.5%). This was followed by Group C receiving no NDV and ethanolic extract with MCHC level of 33.7% and Group B receiving only NDV and no ethanolic extract of A. nobilis showed lower (P<0.05) MCHC level (32.6%) as compared to other groups. There was no significant difference between the MCHC level of the treatments and the control (33.7g/ l vs. 32.6g/l, P>0.05). Means total white blood count concentration (TWBCC) level is also presented in Table 1. Group B receiving only NDV and no ethanolic extract of A. nobilis showed lower (4.4 x 10$^3$ Cells/mm$^3$). This was followed by Group A receiving both NDV and ethanolic extract of A. nobilis and Group C receiving no NDV and
Table 1. Haematological indices obtained before challenging the poultry chickens with NDV.

<table>
<thead>
<tr>
<th>Group</th>
<th>PCV (%)</th>
<th>Mean PCV (%)</th>
<th>Hb (g/l)</th>
<th>Mean Hb (g/l)</th>
<th>MCHC (%)</th>
<th>Mean MCHC (%)</th>
<th>TWBCC (Cellsmm$^{-3}$)</th>
<th>Mean TWBCC (Cellsmm$^{-3}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A$_1$</td>
<td>31.0</td>
<td>100.0</td>
<td>125.0</td>
<td>32.6</td>
<td>32.3</td>
<td>7.2 x 10$^3$</td>
<td>7.6 x 10$^3$</td>
<td></td>
</tr>
<tr>
<td>A$_2$</td>
<td>32.0</td>
<td>110.0</td>
<td>105.0</td>
<td>34.4</td>
<td>33.3$^a$</td>
<td>8.0 x 10$^3$</td>
<td>9.4 x 10$^3$</td>
<td></td>
</tr>
<tr>
<td>B$^1$</td>
<td>16.0</td>
<td>54.0</td>
<td>50.5$^a$</td>
<td>31.3</td>
<td>32.4</td>
<td>8.8 x 10$^3$</td>
<td>9.4 x 10$^3$</td>
<td></td>
</tr>
<tr>
<td>B$_2$</td>
<td>14.0</td>
<td>47.0</td>
<td>50.5$^a$</td>
<td>33.6</td>
<td>32.4$^a$</td>
<td>1.0 x 10$^4$</td>
<td>9.4 x 10$^3$</td>
<td></td>
</tr>
<tr>
<td>C$_1$</td>
<td>43.0</td>
<td>130.0</td>
<td>31.7</td>
<td>32.2</td>
<td>4.2 x 10$^4$</td>
<td>4.1 x 10$^3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C$_2$</td>
<td>41.0</td>
<td>140.0</td>
<td>32.6</td>
<td>32.2$^b$</td>
<td>4.0 x 10$^4$</td>
<td>4.1 x 10$^3$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Keys: PCV – Packed Cell Volume (%); Hb – Hemoglobin g/l; MCHC – mean corpuscular haemoglobin concentration (%); TWBCC – Full blood count (cellsmm$^{-3}$); A = Chickens that were challenged and treated; B = Chickens that were challenged and without treatment; C = Chickens that were not challenged and were given treatment (control); $^a$ = Significant (P<0.05); $^b$ = Not Significant (P>0.05)

Table 2. Hematological indices results obtained 7 days after the administration of Newcastle disease virus and A. nobilis root extract.

<table>
<thead>
<tr>
<th>Group</th>
<th>PCV (%)</th>
<th>Mean PCV (%)</th>
<th>Hb (g/l)</th>
<th>Mean Hb (g/l)</th>
<th>MCHC (%)</th>
<th>Mean MCHC (%)</th>
<th>TWBCC (Cellsmm$^{-3}$)</th>
<th>Mean TWBCC (Cellsmm$^{-3}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A$_1$</td>
<td>35.0</td>
<td>125.0</td>
<td>127.5$^b$</td>
<td>33.3</td>
<td>34.5$^b$</td>
<td>4.3 x 10$^3$</td>
<td>4.2 x 10$^{3b}$</td>
<td></td>
</tr>
<tr>
<td>A$_2$</td>
<td>39.0</td>
<td>130.0</td>
<td>120.0</td>
<td>32.4</td>
<td></td>
<td>4.6 x 10$^3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B$^1$</td>
<td>40.0</td>
<td>140.0</td>
<td>130.0$^b$</td>
<td>35.0</td>
<td>33.7</td>
<td>4.2 x 10$^3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B$_2$</td>
<td>43.0</td>
<td>130.0</td>
<td>30.2</td>
<td></td>
<td></td>
<td>4.4 x 10$^3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C$_1$</td>
<td>40.0</td>
<td>140.0</td>
<td>135.0$^b$</td>
<td>35.0</td>
<td>32.6$^b$</td>
<td>4.0 x 10$^3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C$_2$</td>
<td>40.0</td>
<td>140.0</td>
<td>135.0$^b$</td>
<td>35.0</td>
<td>32.6$^b$</td>
<td>4.2 x 10$^3$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Keys: PCV – Packed Cell Volume (%); Hb – Hemoglobin g/l; MCHC – mean corpuscular haemoglobin concentration g/l; TWBCC – Full blood count (cellsmm$^{-3}$); A = Chickens that were challenged and treated; B = Chickens that were challenged and without treatment; C = Chickens that were not challenged and were given treatment (control); $^b$ = Significant (P<0.05); $^a$ = Not Significant (P>0.05)

Ethanolic extract with mean TWBCC level of $4.2\times10^3$ Cellsmm$^{-3}$ as compared to Group B. However, this differences were not statistically different ($4.4 \times 10^3$ Cellsmm$^{-3}$ vs. $4.2\times10^3$ Cellsmm$^{-3}$, P>0.05) in the haematological indices obtained before challenging the poultry chicken with NDV.

The hematological indices obtained following the challenging with NDV and no administration of the Anthocephista nobilis root extract (after 7 days of treatment) showed decrease in the PCV (%) and Hb (g/l) levels in the blood of chickens in group B. While those of groups A and C maintained the normal ranges. The mean TWBCC cell mm$^{-3}$ values of groups A and B increased ranging from $4.2\times10^3$ - $7.6\times10^3$ Cellsmm$^{-3}$ and $4.4\times10^3$ – $9.4\times10^3$ Cellsmm$^{-3}$ respectively. The MCHC (%) of all the groups showed negligible differences (Table 2).

Means PCV level after challenging with NDV and after 7 days of administration or no administration of ethanolic root extract of A. nobilis is presented in Table 2. The mean PCV level of Group C receiving no NDV and Anthocephista nobilis root extract remained the same after 7 days (42.0%). A slightly decrease in mean PCV level of the chickens in Group A from 37.0% (Table 1) to 32.0% (Table 2) was observed. However, there was drastic decrease (P<0.05) in mean PCV level from 39.0% (Table 1) to 15.0% (Table 2) among chickens in group B which received only NDV and no treatment with ethanolic extract of A. nobilis. There was significant differences in mean PCV level between treatments and control (32.0% vs. 15.0%; 32.0% vs. 42.0%; 42.0% vs. 15.0%, P<0.05).

Means Hemoglobin estimation (Hb) level is also presented in Table 2. Group C receiving both NDV and treatment with the extract showed no increase or decrease (P>0.05) in Hb level (135.0g/l) as shown in Tables 1, 2, and 3. Group A receiving both NDV and ethanolic extract of A. nobilis showed a decrease in Hb level from 127.5g/l (Table 1) to 105.0g/l (Table 2). However, these differences were statistically different (105.0g/l vs. 50.5g/l; 135.0g/l vs. 105.0g/l; 50.0g/l vs. 135g/l, P<0.05). When compared to Group B chickens which received only NDV and no treatment with the Anthocephista nobilis root extract, there was a drastic decrease (P<0.05) in Hb level from 130g/l (Table 1) to 50.5g/l (Table 2). Means corpuscular haemoglobin concentration estimation (MCHC) level of all the groups showed negligible differences (P<0.05).

Mean total white blood count concentration (TWBCC) level is also presented in Table 2. Group B receiving only NDV and no treatment with the extract showed higher (P>0.05) TWBCC level (9.4 x 10$^3$ Cellsmm$^{-3}$). This was followed by Group A receiving both NDV and treatment with the extract (7.6 x 10$^3$ Cellsmm$^{-3}$). The mean TWBCC level of Group C chickens receiving no NDV and no treatment showed negligible difference from day 1 (4.1 x 10$^3$ Cellsmm$^{-3}$). However, these differences in mean total white blood count concentration (TWBCC) level were statistically different (7.6x10$^3$ Cellsmm$^{-3}$ vs. 9.4x10$^3$ Cellsmm$^{-3}$; 7.6x10$^3$ vs. 105.0x10$^3$ Cellsmm$^{-3}$).
Table 3. Haematological indices obtained 28 days following the administration of Newcastle disease virus and A. nobilis root extract.

<table>
<thead>
<tr>
<th>Group</th>
<th>PCV (%)</th>
<th>Mean PCV (%)</th>
<th>Hb (g/l)</th>
<th>Mean Hb (g/l)</th>
<th>MCHC (%)</th>
<th>Mean MCHC (%)</th>
<th>TWBCC (Cellsmm⁻³)</th>
<th>Mean TWBCC (Cellsmm⁻³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₁</td>
<td>37.0</td>
<td>37.0⁻⁴</td>
<td>126.0</td>
<td>128.0⁻⁴</td>
<td>33.0</td>
<td>33.8⁻¹</td>
<td>5.4 x 10⁻³</td>
<td>5.3 x 10⁻³</td>
</tr>
<tr>
<td>A₂</td>
<td>38.0</td>
<td>37.0⁻⁴</td>
<td>130.0</td>
<td>126.0</td>
<td>34.6</td>
<td>33.8⁻¹</td>
<td>5.2 x 10⁻³</td>
<td></td>
</tr>
<tr>
<td>B¹</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0⁻¹</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>B²</td>
<td>0.0</td>
<td>0.0⁻⁴</td>
<td>0.0</td>
<td>0.0⁻¹</td>
<td>0.0⁻¹</td>
<td>0.0⁻¹</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>C¹</td>
<td>41.0</td>
<td>42.0⁻²</td>
<td>130.0</td>
<td>135.0</td>
<td>31.2</td>
<td>32.1⁻¹</td>
<td>4.2 x 10⁻²</td>
<td>4.1 x 10⁻²</td>
</tr>
<tr>
<td>C²</td>
<td>41.0</td>
<td>42.0⁻²</td>
<td>140.0</td>
<td>135.0</td>
<td>35.0</td>
<td>32.1⁻¹</td>
<td>4.0 x 10⁻²</td>
<td></td>
</tr>
</tbody>
</table>

Keys: PCV – Packed Cell Volume %; Hb - Haemoglobin g/l; MCHC – mean corpuscular haemoglobin concentration %; TWBCC – Full blood count (cellsmm⁻³); A = Chickens that were challenged and treated; B = Chickens that were challenged and without treatment; C = Chickens that were not challenged and were given treatment (control); 0.0 = No survivor; * = Significant (P<0.05)

Discussion

Newcastle disease is a viral and often fatal disease that has been reported to affect a wide range of avian hosts, irrespective of age and sex. It is reported to be a major constraint to the development, survival and productivity of village poultry (Nwanta et al., 2008a). ND is regarded as the most economically important disease that devastates village poultry in Nigeria as it causes death of millions of birds (particularly young birds) and economic losses through the slaughter of sick birds (Nwanta et al., 2006a,b). Mortality rate as high as 80% has been recorded in chickens (Nwankiti et al., 2010). This study was carried out to evaluate the antiviral effect of A. nobilis root extracts on the haematological indices of poultry chickens infected with Newcastle disease virus (NDV) following its the administration. Haematological blood components are influenced by the quantity and quality of feed (Akinmutimi, 2004). Haematological components of blood are sensitive to elements of toxicity in feed, especially with feed constituents that affect the formation of blood (Oyawoye and Ogunkunle, 1998; Mohammed et al., 2011). The phytochemical diversity of tropical forest plants has been the focus of much interest and research. The secondary phytochemicals in the vegetation protect...
the plants against herbivores. The chemicals are often biologically active and may have antibiotic properties. For these reasons, many chemicals used in drug manufacture are or were originally derived from tropical forest plants, and it is likely that more will be discovered since much of the flora has not yet been researched. The people who inhabit these forests make extensive use of the phytochemicals in their traditional medicine, a factor which is gaining importance in forest management and rural development (Thomas et al., 1989).

Interest in the use of NDV as an anticancer agent has arisen from the ability of NDV to selectively kill human tumor cells with limited toxicity to normal cells (McMullin, 2004). No treatment for NDV exists, but the use of prophylactic vaccines and sanitary measures reduces the likelihood of outbreaks (McMullin, 2004). The cytological examination of the test chickens in group B showed that there was ulceration of the intestinal lining of the chickens. However, ulceration of the intestinal lining was not observed in those of groups A and C, and no visible damage was inflicted on the kidneys and livers of the chickens in all the groups. The occurrence of ulceration has been reported by Jordan et al. (1990) is an indicator of Newcastle disease that ulceration was not observed in the treated group A suggested that the root extract of Anthocleista nobilis is able to either prevent the multiplication of the virus or ameliorate the toxic effect leading to ulceration. Newcastle disease (ND) is reported as the most important viral disease of poultry in the world including developing countries. It has a devastating effect on commercial as well as village poultry industries (Nwanta et al., 2006). The resource derivable from the chickens cannot be fully utilized unless the disease is controlled particularly in the village poultry flocks that are believed to keep the virus in circulation and act as reservoirs and carriers to themselves and the more susceptible exotic breeds in commercial farms (Nwanta et al., 2006).

The hematological indices of the examination carried out showed a drop in the mean packed cell volume of the chickens in group B (infected but not treated) from 39.0% at day 1 to 15.0% at day 7 and 0.0% at day 28. Those of group A (challenged with NDV and treated) though tended toward normal dropped from 39.0% before administration of the NDV and extract at day 1 to 31.0%, 7 days after treatment with the extract. This finding was similar with that of Sajjad et al. (2011), who reported significant decrease in PCV level of broilers chicks administered with medicinal plants infusion of aloevera gel, barbery, garlic and ginger. Also, from those of group A (infected and treated) though tended toward normal dropped from increased 31.0% at day 7 after treatment to 37.0% at day 28 after treatment with the extract. This finding agrees with Esonu et al. (2006), who reported significant increase in PCV level, in layers fed herbal plant neem. In differential count, an abnormally higher monocytes level is synonymous with bacterial infection (Akinmutimi, 2004). Dairo (2005) and Mohammed et al. (2005, 2011) reported that the inclusion levels of camel blood-rumen content mixture did not affect PCV, RBC, and MCHC values of growing rabbits.

From the hematological indices of the examination carried out, it showed a drop in the mean haemoglobin levels from 130.0g/l at day 1 before the administration of NDV to 0.50g/l at day 7 and 0.0g/l at day 28 after the administration of the NDV to the chickens in group B. In the same vein, it also showed a drop (P<0.05) in the mean Hb levels from 127.5g/l at day 1 before the administration of NDV and the A. nobilis extract to the chickens in group B. In the same vein, it also showed a drop (P<0.05) in the mean Hb levels from 127.5g/l at day 1 before the administration of NDV and the A. nobilis extract to the chickens in group A to 105.0g/l after 7 days of treatment. This finding agrees with Esonu et al. (2006), who reported significant increase in PCV level, in layers fed herbal plant neem. In differential count, an abnormally higher monocytes level is synonymous with bacterial infection (Akinmutimi, 2004). Dairo (2005) and Mohammed et al. (2005, 2011) reported that the inclusion levels of camel blood-rumen content mixture did not affect PCV, RBC, and MCHC values of growing rabbits.

This study showed that 7 and 28 days following administration of NDV and the ethanolic root extract of A. nobilis, mean corpuscular haemoglobin concentration estimation (MCHC) level showed negligible differences (P>0.05) among the three groups, A (33.3% and 33.8% respectively), B (32.4%) and C (32.1%). Since, they fall within the normal range of 30.0%-36.0%. It showed perhaps that the disease does not affect that aspect. Means total white blood count concentration (TWBCC) level as presented Table 3b and 3c showed that the presence of Newcastle disease in those of group A and B gave rise to increase in the full blood count (TWBCC) cellmm$^{-3}$. While those of group A and group C (controls) fell within normal ranges of 4.0x10$^3$-5.5x10$^3$cellmm$^{-3}$, those of group B had no survivor 28 days after the administration of the NDV and the extract. Finding of this study is in disagreement with the findings of Gautam et al. (2004), who noticed that no significant effect on lymphocyte and WBC counts was observed, while feeding Withania somnifera to animals. Our
Conclusively, the mean packed cell volume (PCV), mean haemoglobin (Hb), mean corpuscular haemoglobin concentration (MCHC) and full blood count (TWBCC), were significantly different (P<0.05) among the treated (group A) and the untreated group (group B). Group A were significantly (P<0.05) influenced by the treatments after 7 days and 28 days following the administration of the A. nobilis ethanolic root extract. However, since the chickens in groups A and B were injected intravenously with the same dose of New Castle Virus (NDV) and the confirmatory symptoms observed in group B which was initially mild in group A and later was not noticeable, coupled with the ability of group A poultry chickens to tend towards normal after treatment are physiological evidences of the antiviral effect of the root extract of Anthocleisia nobilis on hematological indices of the poultry chickens studies. It also showed that the extract was able to impact immunity in chickens suffering from Newcastle disease. There is therefore, the need for the ethanolic extract of Anthocleisia nobilis to be publicized so as to create awareness to farmers for the treatment of Newcastle disease.

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