

Newcastle Disease Outbreak in Backyard Poultry: Herbal Remediation Using *Phyllanthus Polygonoides* and *Carica Papaya* Leaves

K.Jayalakshmi*, M. Veeraselvam, M.Venkatesan and K.Karthika

Department of Veterinary Medicine, Veterinary College and Research Institute,
Orathanadu-614 625, Thanjavur, Tamil Nadu
Tamil Nadu Veterinary and Animal Sciences University, Chennai-600051

Abstract

Newcastle disease (ND) is a devastating disease of backyard poultry and causes great economic losses to the economy of the individual as well as the nation. The study was undertaken to assess the effectiveness of herbal leaves extracts of *Phyllanthus polygonoides* and *Carica papaya* for control of Newcastle outbreak in backyard poultry. A total of 60 representative desi fowl (chicken 50, turkey 7 and duck 3) from 40 flocks were presented to Veterinary Clinical Complex, VC&RI, Orathanadu for treatment. The sample like oropharyngeal fluid/ cloacal swab collected from 40 representative birds from 40 flocks (Chicken-30, turkey-7 and Duck-3) and performed haemagglutination test. Out of 40 birds screened, 18 birds (Chicken-13, turkey- 4 and Duck- 1) were positive for haemagglutination test and showed the presence of Newcastle disease virus and confirmed by PCR. The infected birds were treated with aqueous extract of *Carica papaya* and *Phyllanthus polygonoides* leaves @ 0.5ml/ kg b.wt orally once a day for 3 days. Most of the birds recovered in single dose, the moderately infected birds recovered after 3 days of treatment. The herbal extract was also used prophylactically other than the infected birds in their respective flocks to prevent the infection. None of the adult birds in their flocks become infected and protected from infection. The aqueous extract of *Phyllanthus polygonoides* and *Carica papaya* leaves were highly effective for control of ND in backyard poultry, it could be used prophylactically every 30 days to prevent Newcastle disease outbreak in backyard poultry to minimize economic losses to the farmers.

Keywords: Newcastle disease, HA, *Phyllanthusspp*, Papaya

Poultry industry is one of the most developed sectors in the world. The explosive growth of backyard chickens as an industry results from increasing consumer demands for organic meat and eggs. The economic returns from backyard poultry provide additional income to rural poor with low investment (Puro and Sen, 2022). The major problem in backyard poultry is increased incidence of diseases due to unregulated bio-security and limited veterinary care on native birds (Ayala *et al.*, 2020). Among infectious diseases, Newcastle disease (ND) poses a great economic threat to poultry industry since, it was discovered (Alexander, 2000). The occurrence of ND in backyard poultry has devastating effect on particular area or village due to huge morbidity and mortality rate in naive poorly vaccinated or unvaccinated birds (Puro and Sen, 2022). ND is an acute and highly fatal viral disease of domestic and wild birds caused by Avian Paramyxovirus-1, the strains of NDV produce a range of low pathogenicity to high pathogenicity (Ogaliet *al.*, 2018). Infection with the virulent ND viruses in the field causes sudden death without clinical signs, however, some of the affected birds

shows greenish diarrhea, gasping, respiratory distress, torticollis and paralysis of leg and wings (Arthanari Eswaran *et al.*, 2018; Getabalewet *al.*, 2019). Currently, Ethno veterinary practices are gaining attention to treat the diseases in livestock and poultry. The present article describes the management of Newcastle disease outbreak in backyard poultry by using aqueous extract of *Phyllanthus polygonoides* and *Caricapapaya* leaves.

The representative desi fowl from various villages of Thanjavur District with a history of sudden death, huddling stance and anorexia, a total of 60 birds from 40 flocks (Chicken-50 birds from 30 flocks, Turkey-7 flocks from 7 birds and Duck-3 flocks from 3 birds) were presented for treatment from August 2021 to July 2022. The individual flock size was 4-300 numbers and reported mortality rate was in the range of 30-70%. Randomly, clinical samples like oropharyngeal/cloacal swabs were collected from clinically affected birds in 0.5 ml of phosphate buffered saline (PBS) for HA test and stored in deep freezer at -20°C. Some of the birds were died on arrival to Veterinary Clinical Complex, Veterinary College and Research Institute, Orathanadu and postmortem examination was also performed.

*Corresponding author : jayalkshm22@gmail.com

The sheep blood was collected in proportion of 1.1 ml of sterile Alsever's solution (sodium chloride 0.42g, Sodium citrate 0.8g, dextrose 2.05g and citric acid 0.055g dissolved in 100 ml distilled water) for each ml of blood. The sheep RBC was washed thrice with sterile normal saline by gentle centrifugation at 1500 rpm for 10 minutes and prepared 1% Sheep RBCs (Packed RBC 1ml and 99ml sterile normal saline) and stored at 4°C.

The haemagglutination test was performed in oropharyngeal fluid and cloacal swab by using 1% Sheep RBCs as per the procedure described by Bilal *et al.* (2014). The vaccine virus (Lasota virus) was used as positive control. The HA test carried out in V-bottom microtitre plate, 25 μ L of normal saline was added in each well in the first row upto 10th well. Positive control and RBC control was maintained in 11th and 12th well. Then 25 μ L of oropharyngeal fluid/ cloacal fluid was added in the first well and made serial two fold dilution

upto 10th well, and discarded 25 μ L from 10th well, subsequently 25 μ L of 1% sheep RBCs was added in each well and mixed well, let it in room temperature for 30 minutes. The reciprocal of highest dilution showing 100% agglutination was considered as titre of HA.

The fresh *Phyllanthus polygonoides* plant (Fig. 1) and *Carica papaya* leaves (Fig. 2) were collected and washed with water to remove dirt. The whole plant of *Phyllanthus polygonoides* and *Carica papaya* leaves were chopped with knife. The equal quantity (1:1) of both leaves was homogenized with blender with an addition of small quantity of water. The juice (aqueous extract) was obtained by squeezing the content in muslin cloth and stored at 4°C. The clinically affected and normal birds were treated with aqueous extract of *Phyllanthus polygonoides* and *Carica papaya* @ 0.5ml/Kg b.wt orally once a day for 3 days. The severely infected birds were treated twice in a day for 3 days.



Fig 1. *Phyllanthuspolygonoides*



Fig 2. *Carica Papaya* leaf

The physical examination of clinically affected birds showed dullness, cyanosis of comb, whitish or greenish diarrhea, crop stasis, mucus discharge from mouth, gasping, torticollis and lateral recumbency (Fig. 3-6). The post mortem examination of dead birds revealed haemorrhagic lesions in the trachea, proventriculus and caecal tonsil (Fig. 7-8). Out of 40 birds (flocks) screened, 18 birds (45%) from 18 flocks (Chicken-13, turkey- 4 and Duck- 1) were positive for haemagglutination test and showed the presence of ND virus and confirmed by PCR. This finding was similar to that of Okpanachiet *al.* (2020), who reported that 46% of chicken was positive by HA test. The HA titre in positive cases were 1:2 to 1:16 (Fig 9-10). Both infected and apparently healthy birds in affected flocks were treated with an aqueous extract of *Phyllanthus polygonoides* and *Carica papaya* leaves for 3 days. The birds showed

gradual improvement after treatment. The whitish/ greenish diarrhea and mucus discharge from beak was gradually stopped and resumed feed and water intake within 3 days. Most of the birds recovered in single dose, the mildly infected birds recovered in single dose, whereas moderately infected birds were recovered in 2nd and 3rd dose. Herbal treatment was very effective in mild to moderately infected birds (90%), which was less effective in chicks and severely infected adult birds (10%) especially those are presented in comatose condition. The plant juice was used prophylactically to protect the unaffected birds in that flock and prevented the ND for 30 days. The efficacy of individual plant juices tested was found to be ineffective. The combined plant juice was highly effective against ND in backyard poultry. Faejiet *al.* (2019) reported that the administration of n-hexane extract of *Phyllanthus amarus* @ 250 mg/ L 14 days before challenge protected from ND.



Fig 3. Whitish and Greenish diarrhea



Fig 4. Cyanosis of comb and wattle



Fig 5. Mucus discharge from mouth



Fig 6. Paralysis of wing and leg



Fig 7. Haemorrhage in proventriculus



Fig 8. Tracheal haemorrhage

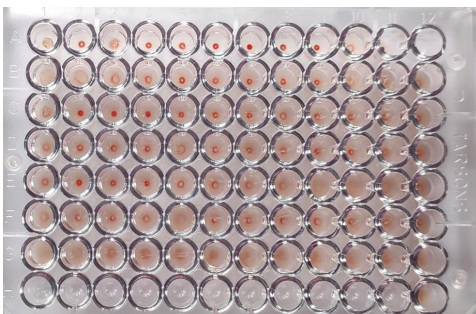


Fig 9. Haemorrhage in proventriculus

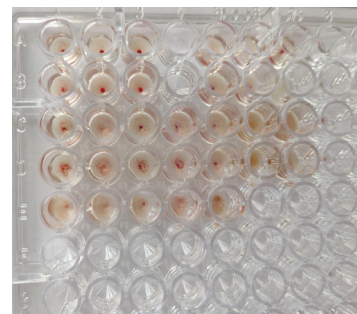


**Fig 10. HA positive samples:
HA titre 1:2 to 1:16**

The plant genus *Phyllanthus* consists of more than 1000 species, of which many are used as traditional medicines (Sarin *et al.*, 2014), and rich in phytochemicals such as tannins, terpenes, alkaloids, glycosidic compounds, saponins, and flavones (Nisar *et al.*, 2018) and possess wide spectrum of pharmacological activities like antiviral, antibacterial and anti-inflammatory (Patel *et al.*, 2011). The *P. niruri* has enormous pharmacological activities such as antimicrobial, antiviral activities against Hepatitis B, hepato-protective and immunomodulatory activity (Lee *et al.*, 2016). Papaya leaf extract has strong medicinal properties such as antibacterial, antiviral, antitumor, hypoglycemic and anti-inflammatory activity. Additionally, the leaf juice of papaya increases the platelet counts in people suffering from dengue fever (Singh *et al.*, 2020). Pandey *et al.* (2016) studied and reported the papaya extract and papaya associated phytochemicals have anti-inflammatory and immunomodulatory properties.

The aqueous extracts of *Phyllanthus polygonoides* plant and *Carica papaya* leaves was cheap and effective therapy for management of ND disease in backyard poultry. It could be used prophylactically to control ND in desi fowl to reduce economic losses to the farmers. Further research is needed to evaluate the molecular mechanism of blocking of virus attachment on host cell membrane to prevent the viral infection.

Acknowledgements

The authors are thankful to the Dean, Veterinary College and Research Institute, Orathanadu and the Tamil Nadu Veterinary and Animal Sciences University, Chennai-51, Tamil Nadu.

References

- Alexander, D.J. and Senne, D.A. 2008. Newcastle disease. In: Diseases of Poultry. (12th Edn.) Saif, Y.M., Barnes, H.J., Glisson, J.R., Fadly, A.M., McDougald, L.R. and Swayne, D.E. (Eds.), Iowa State University Press, Ames, IA, pp.75-100.
- Arthanari Eswaran, M., Mekala, P., Vadivoo, V.S. and Sukumar, K. 2018. Incidence of Newcastle disease in desi chicken and its control through ethno veterinary medicines. *J. Pharmacogn. Phytochem.* **7**(6): 1418-1419.
- Ayala, A.J., Yabsley, M.J. and Hernandez, S.M. (2020). A review of pathogen transmission at the backyard chicken–wild bird interface. *Front. Vet. Sci.* **7**: 539925.
- Bilal, E.S.A., Elnasri, I.M., Alhassan, A.M., Khalifa, K.A., Elhag, J.I. and Ahmed, S.O. 2014. Biological pathotyping of Newcastle disease viruses in Sudan 2008-2013. *J. Vet. Med.* doi.org/10.1155/2014/209357.
- Faeji, C.O., Oladunmoye, M.K., Adebayo, I. and Adebolu, T.T. 2019. Antiviral effect of *Phyllanthus amarus* leaf extract against Newcastle disease in broilers. *Asian J. Plant Sci.* **2**(4):1-9.
- Getabalew, M., Alemneh, T., Akebereg, D., Getahun, D. and Zewdie, D. 2019. Epidemiology, diagnosis and prevention of Newcastle disease in poultry. *Am. J. Biomed. Sci. Res.* **3**(1):50-59.
- Lee, N.Y.S., Khoo, W.K.S., Adnan, M.A., Mahalingam, T.P., Fernande, A.R. and Jeevaratnam, K. 2016. The pharmacological potential of *Phyllanthus niruri*. *J. Pharm. Pharmacol.* **68**(8): 953-969.
- Nisar M.F., He, J., Ahmed A., Yang, Y., Li, M. and Wan, C. 2018. Chemical components and biological activities of the genus *Phyllanthus*: A review of the recent literature. *Molecules.* **23**: doi:10.3390/molecules23102567.
- Ogali, I.N., Wamuyu, L.W., Lichoti, J.K., Mungube, E.O., Agwanda, B. and Ommeh, S.C. (2018). Molecular characterization of Newcastle disease virus from backyard poultry farms and live bird markets in Kenya. *Int. J. Microbiol.* doi.org/10.1155/2018/2368597.
- Okpanachi, J.U., Umoh, J.U., Kia, G.S.N. and Dzikwi, A.A. 2020. Detection of Newcastle virus (NDV) in laughing doves and the risk of spread to backyard poultry. *Folia Vet.* **6** **3**(1): 1-12.
- Pandey, S., Cabot, P.J., Shaw P.N. and Hewavitharana, A.K. 2016. Anti-inflammatory and immunomodulatory properties of *Carica papaya*. *J. Immunotoxicol.* **13**(4): 590-602.
- Patel, J. R., Tripathi, P., Sharma, V., Chauhan, N.S. and Dixit, V.K. (2011). *Phyllanthus amarus*: ethnomedicinal uses, phytochemistry and pharmacology: A review. *J. Ethnopharmacol.* **138**(2):286-313.
- Puro, K. and Sen, A. 2022. Newcastle disease in backyard poultry rearing in the northeastern states of India: Challenges and control strategies. *Front. Vet. Sci.* **9**: 1-7.
- Sarin, B., Verma, N., Martín, J.P. and Mohanty, A. 2014. An overview of important ethnomedicinal herbs of *Phyllanthus* species: Present status and future. *Sci. World J.* doi.org/10.1155/2014/839172.
- Singh, S.P., Kumar, S., Mathan S.V., Tomar, M.S., Singh, R.K., Verma, P.K., Kumar, A., Kumar, S., Singh, R.P. and Acharya, A. 2020. Therapeutic application of *Carica papaya* leaf extract in the management of human diseases, *DARU. J. Pharm. Sci.* **28**:735-744.