

Case Report: Uses of *Nigella sativa* in A Cat with Feline Panleukopenia Virus Infection

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Abstract. Feline panleukopenia virus (FPV) is a pathogenic Parvoviridae virus that causes high mortality and morbidity, characterized by leukopenia (<2,000 cells/ μ L). *Nigella sativa* (black cumin), is a herb with bioactive compound *Thymoquinone* which recognized for its immunomodulatory and antiviral characteristics. The ability to enhance immune function and leukocyte counts in animal models has been reported; however, its application in cats with FPV and leukopenia remains unreported. We report a case of a 1-year-old, 2.8 kg, unvaccinated domestic male cat presenting anorexia, vomiting, fever, hypersalivation, and history of exposure to FPV-positive cats. The cat tested positive for FPV by rapid antigen assay and showed severe leukopenia (450 cells/ μ L). Supported therapy was given, combined with oral administration of Black cumin extract with dosages modified from other research on *Mus Musculus*. Following the treatment, progressing improvement in total leukocyte count and recovery of the differential leukocyte profile were observed. This case suggests that clack cumin extract may have potential as an adjunctive immunomodulatory therapy in cats with FPV, although further controlled studies are required to confirm its efficacy and safety

1 Introduction

Feline panleukopenia is infectious disease caused by viral agent from Parvoviridae family that highly contagious mostly in young Felidae or unvaccinated cats [1]. FPV tropism in high mitotic activity cells such as bone marrow, lymphoid tissues, and intestinal crypt cells which leads to leukopenia, vomiting, anorexia, diarrhea, depression, dehydration, and high fever. Infection acquired during pregnancy can lead to abortion, cerebral hypoplasia, and nerve abnormalities in the fetus [2]. Parvovirus has high morbidity and mortality rates, with the severity influenced by many factors such as age, immune status, and co-infection with bacterial or parasitic agents [3]. The virus can be transmitted to cats through direct contact with FPV-positive cats and through equipment with high environmental resistance that can remain infectious for months [1][2].

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The diagnosis of FPV was determined based on medical history, clinical signs, detection of viral antigen, and hemogram changes in the animal. The most common clinical presentation of FPV is fever up to 41°C, lethargy, anorexia, vomiting, diarrhea, severe dehydration, also hypersalivation due to nausea. Thickened intestinal loops and enlargement mesenteric lymph nodes can be found on abdominal palpation [4]. Antigen and antibody detection of FPV can be performed using rapid assays, ELISA, PCR, HI testing, and indirect immunofluorescence. Hematology examination in FPV-affected cats show severe leukopenia below 2000 cells/ μL with differential leukocytes finding neutropenia [5]. There is currently no causative treatment for FPV, treatment mainly focuses on restoring physiological conditions, providing supportive and antibiotics therapy, and symptomatic treatment [6].

Nigella sativa or black cumin seed known for rich biocompounds such as fixed oil, proteins, alkaloids, saponin, and essential oil including thymoquinone (TQ), nigellamine, nigellidine, quercetin, and O-cymene [7]. The active ingredient TQ is responsible for the major pharmacological effects of *Nigella sativa*, such as anticonvulsant activity, antioxidant properties, anti-inflammatory, anti-cancer, antibacterial, immunomodulatory, and anti-tumor effects, et cetera [8]. TQ acts as an immune booster and immunostimulant, strengthening and stabilizing the immune system by enhancing the T-helper-to-T-suppressor cell ratio. Black cumin can also stimulate bone marrow and immune cells to protect normal cells from viral damage, kill tumor cells, and increase antibody production by B cells [9].

The use of black cumin extract in the medical field has been widely investigated, yielding positive outcomes with minimal adverse effects. A study conducted [10] demonstrated the immunomodulatory potential of *N. sativa* extract, evidenced by a significant increase in total leukocyte count in male mice (*Mus musculus*), providing the rationale for the present case report. To date, the use of black cumin extract has not been reported in cats with leukopenia secondary to FPV infection. This case report aims to demonstrate the effectiveness of black cumin extract as an immunomodulatory agent and as a potential alternative therapy for FPV infection in cats. It is expected that this report may serve as a reference for future studies and contribute to the development of alternative therapeutic strategies for Feline Panleukopenia Virus infection

2 Case Description

The patient with registered number K.8115 was a 1-year-old, 2.8 kgs domestic tomcat with no vaccination history. Living in an indoor environment with a population of 44 cats. According to the anamnesis, the cat exhibited decreased appetite and water intake for the past two days, accompanied with vomiting of ingesta and yellowish fluid, fever, hypersalivation and previous exposure to FPV-positive cats within the same population.

2.1 Physical Examination

Physical examination revealed cat was in lethargic condition, with respiratory rate 76x/minute, pulse rate at 176 bpm, and body temperature was 41,1°C. Skin turgor was delayed, hair coat appeared dirty, dull, and easily shed; flea infestation was also observed. Examination of respiratory system showed moist nasal planum with mucopurulent discharge and frequent sneezing, the conjunctiva appeared pale, the gingiva appeared pale pink with capillary refill time exceeding 2 seconds, cardiac auscultation was normal. Gastrointestinal examination showed hypersalivation, halitosis, increased intestinal peristaltic sounds, soiled anus, watery feces with clotted blood around perianal. Ears bilaterally dirty with a wet, dark-brown ceruminous wax type.



Fig 1. Clinical condition of the FPV-infected cat on October 29, 2024. (A) diarrhea with watery consistency and presence of blood clots from around perianal; (B) initial condition of the cat at the inpatient facility showing lethargic state.

2.2 Laboratory and Diagnostic Examination

2.2.1 Ectoparasite identification

Fecal examinations showed negative result on nematode and other endoparasites. Microscopic findings of ectoparasite in ear wax showed infestation of *Otodectes* sp. and the ectoparasites were identified as *Ctenocephalides* sp.

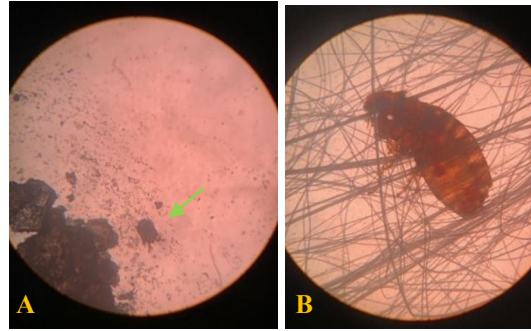


Fig 2. Microscopic findings of ectoparasites in the case cat. (A) Examination of ear debris showed a positive result for *Otodectes* sp. infestation (indicated by the green arrow); (B) Ectoparasites collected from the cat's hair were identified as *Ctenocephalides* sp.

2.2.2 Hematology examination

Hematology examination of the cat presented leukopenia, increase of total plasma protein (TPP) vindicated dehydration, likely resulting from reduced food and water intake accompanied by diarrhea and vomiting. Whereas the elevated of fibrinogen level suggested the presence of inflammation [11]. The inflammatory condition in the case cat was further evidenced by hemorrhagic diarrhea and otic inflammation, characterized by excessive ear debris caused by *Otodectes* sp. The result in initial hematological examination presented in Table 1.

Table 1. hematological examination

Parameters	Unit	Reference*	10/29	10/30	11/1	11/4
PCV	%	24,0 – 45,0	35	27	35,48	33,87
Hemoglobin	g/dL	8,0 – 15,0	12,2	9,0	11,0	10,2
RBC	10 ⁶ sel/μL	5,00 – 10,00	6,22	4,22	7,06	6,89
MCV	fL	42 – 52	56,27	63,98	50	49
MCH	Pg	13 – 17	19,61	21,33	15,5	14,9
MCHC	g/dL	30 – 33	34,86	33,33	30,9	30,2
TPP	g/dL	5,9 – 8,5	9,7	7,1	-**	-**
Fibrinogen	Mg/dL	50 – 300	700	600	-**	-**
WBC	10 ³ sel/μL	5.500 – 19.500	450	7.600	19.810	17.660
Neutrophil	μL	2.500 – 12.500	0	7.038	16.620	13.530
Lymphocyte	μL	1.500 – 7.000	0	306	1.750	1.950
Monocyte	μL	0 – 8500	0	236	1.150	1.470
Eosinophil	μL	0 – 1.500	0	72	280	710

Description: MCV: Mean Corpuscular Volume; MCH: Mean Corpuscular Hemoglobin; MCHC: Mean Corpuscular Hemoglobin Concentration; TPP: Total Plasma Protein; *(Weiss and Wardrop, 2010); -**: parameter not checked

2.2.3 Rapid Test Examination

The rapid antigen test was performed using the MongGo Rapid FPV Ag Test Kit®, which is based on an immunochromatographic assay and utilizes feline body secretion specimens. This product has a reported sensitivity of 97% and specificity of 98.5% (MonggoVet, 2024).

The result of the initial FPV rapid-test, conducted on October 29th, 2024, was positive for FPV, as shown in Figure 3. Corresponding to day 7 of treatment, the FPV rapid-test result converted negative on November 4th 2024.

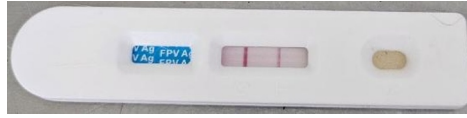


Fig 3. Result of the FPV antigen rapid test in the case cat on October 29, 2024, demonstrating a positive outcome as indicated by the presence of red lines at the control (C) and test (T) positions.



Fig 4 Result of the FPV antigen rapid test in the case cat on November 4, 2024, demonstrating a negative outcome as indicated by the presence of red lines only at the control indicator (C)

2.3 Diagnosis and Prognosis

Based on the results of anamnesis, physical examination, hematological findings, FPV rapid antigen testing, and evaluation of clinical signs, the patient was diagnosed with feline panleukopenia virus infection followed by Rhinitis with a dubious-to-fair prognosis.

3 Discussion

3.1 Supportive and symptomatic therapy

3.1.1 Fluids therapy

The fluid therapy aimed to restore hydration status and correct physiological imbalance. The infusion used was Ringer Lactate 0.9% supplemented with 2 ml of Vitamin B complex per 500 ml infusion administered intravenously. According to Hermawan et al (2023), fluid and electrolyte replacement is core strategy in FPV management as dehydration represent a major cause of mortality. Administration of vitamin B-complex is also recommended to replace nutrients loss through reduced feed intake, preventing thiamine deficiency [12].

3.1.2 Antibiotic Therapy

The presence of bloody diarrhea and sign of rhinitis, the cats received enrofloxacin (Interflox-100®, Interchemie holland) by intramuscular injection 0,05 mg/kg once daily for five days. Antibiotic were administered to prevent secondary bacterial infection, sepsis, and microbial imbalance resulting from leukopenia and mucosal barrier disruption due to FPV infection [12]. FPV replicates within rapidly dividing crypt epithelial cells of the intestinal mucosa, causing villus atrophy and necrosis that can progress to severe hemorrhagic enteritis [13]. The hemorrhagic diarrhea in FPV-infected cats is primarily due to damage of the intestinal barrier, enabling translocation of gut bacteria into the bloodstream.

3.1.3 Gastrointestinal Support

To control diarrhea condition, attapulgite-pectin (Enterostop®, Kalbe) was given as ¼ tablet as needed until stool consistency normalized. Attapulgite acts as an absorbent that binds excess water and toxins, normalizes fecal consistency, and forms a protective barrier on the intestinal mucosa [14].

3.2 Immunomodulatory Therapy

In the leucopenic condition, indicating immune system suppression, supportive immunomodulatory therapy was considered essential. Leukopenia reflects a reduction in white blood cells, which compromises host defense and increase susceptibility to secondary infections [15]

Administration of black cumin extract as an immunomodulator has been reported both *in vitro* and *in vivo* to enhance immune cell activity across various animal models. Methanolic extract of black cumin has been shown to increase total leukocyte counts in BALB/c mice, elevate serum globulin and phagocytic activity in fish, and enhance bone marrow mitotic activity in dexamethasone-treated rabbits [16]. Tymoquinone, as the main bioactive constituent of Black Cumin, exerts immunostimulatory effects by promoting T-cell and NK-cell response [17].

3.2.1 Dosage Determination

The dosage of Black cumin extract used in this case was modified from other research [10] who administered 150, 300, 600 mg/kg BW on *Mus musculus*. Those dose were converted for feline[18], yielding an equivalent feline dosage range of 62,24 – 248,95 mg/kg BW. A literature reported that administration up to 6 g/kg BW caused no toxicity in mice, and even 21 g/kg BW did not produce mortality [19]. The product used in this case was Habbatussauda cap Kurma Ajwa®, each capsule containing 500 mg of oil extract. For the 2.8 kg cat, the calculated dose was approximately 179 mg/kg BW, equivalent to one capsule twice daily for five days.

3.2.2 . Safety considerations and limitation use

Black cumin contains main bioactive constituent such Thymoquinone (TQ), thymohydroquinone (THQ) and thymol, which belong to phenolic and quinone classes [20]. TQ undergoes reversible conversion to THQ through redox cycling producing high levels of ROS [21], [22]. Cross-species pharmacokinetic analyses indicate that cats exhibit the lowest clearance rates of phenolic compounds compared to other animal models because cats reduce UGT activity and limited antioxidant capacity increase the likelihood of toxicity [23], [24]. The primary mechanisms include impaired hepatic metabolism, accumulation of reactive intermediates, and systemic oxidative stress. Although TQ has demonstrated hepatoprotective and anti-inflammatory effects in several species, its safety profile in feline has not been fully evaluated, and potential adverse effect cannot be excluded [25]

3.3 Hematological Response

As shown in Table 1, initial hematology (October 29th 2024) revealed marked leukopenia (4.5×10^3 cells/ μ L). After 24 hours of black cumin extract administration (two capsules), leukocyte counts increased to the normal range (7.6×10^3 cells/ μ L). By 1 November 2024, leukocyte numbers exceeded the upper normal limit, indicating

restoration of immune responsiveness against infection. This finding aligns with [13], who stated that leucocytosis reflects a physiological immune response to microbial invasion. By 4 November, leukocyte counts had gradually returned to normal levels. Differential leukocyte analysis showed neutrophil dominance (neutrophilia) on 1 and 4 November 2024. According [13] most leucocytosis cases are characterized by elevated absolute neutrophil counts. Neutrophilia commonly arises from infectious or inflammatory processes [26]. In this case, neutrophilia was likely associated with inflammation due to viral, bacterial, and parasitic factors which specifically *Otodectes sp.* infestation and prior enteritis. The increase in lymphocyte and monocyte counts after treatment also supports previous findings that *N. sativa* extracts enhance specific immune responses by elevating lymphocyte and monocyte levels while reducing excessive segmented neutrophils [27].

Anemia was detected on 30 October 2024, likely resulting from hemorrhagic diarrhea observed between 29 – 30 October 2024. According to [13], bloody diarrhea results from viral invasion of intestinal epithelial cells, leading to erythrocyte loss. Elevated mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) values indicated macrocytic normochromic anemia, typically associated with vitamin B₁₂ or folate deficiency and chronic intestinal disease. An increased MCHC suggested hyperchromia, possibly due to hemolysis and the release of free hemoglobin into the plasma [28].

3.4 Follow-up Rapid Test

A second FPV antigen rapid test conducted on 4 November 2024, 7 days after the onset of clinical signs and 6 days after the first test, yielded a negative result. The incubation period of FPV ranges from 2 to 7 days [3]. The negative conversion indicates successful viral clearance, consistent with immune recovery and decreased viral antigen levels below the rapid test's detection threshold.

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There are no competing interests to declare.

This case report presents the first documented use of black cumin extract in a feline patient with FPV-positive with leucopenic condition. Nevertheless, additional research are required to determine its safety and potential adverse effects.

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