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IMPACT OF DIAMMONIUM PHOSPHATE (DAP) ON SOME OF THE HAEMATOLOGIAL PARAMETERS OF CLIMBING PERCH, *ANABAS TESTUDINEUS* (BLOCH)

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ABSTRACT

Diammonium Phosphate (DAP) is widely used as a fertilizer to enhance crop production to cope with the food requirement of human population explosion. The effect of DAP fertilizer on some haematological parameters (Total RBC count, total leucocyte count, haemoglobin and PCV) of Anabas testudineus were studied.

The DAP toxicity resulted reduction in the values of RBC count, haemoglobin and PCV and rise in the value of leucocyte count at sublethal concentration of DAP (8.5 mg/L) treated for 14 days and 28 days. The present study reveals that, the blood constituents are prove to the toxicity of DAP fertilizer which, affect their body physiology and haematology.

KEYWORDS: *Diammonium phosphate, Anabas testudineus blood constituents.*

INTRODUCTION

Diammonium Phosphate (DAP) NP 18:46 is most concentrated phosphate based fertilizer. It is ideal for any agriculture crop that contribute full phosphorus nutrition both for Rabi and Karif crops.

The chemical fertilizers beyond questions, have promoted the efficiency of agriculturists to enhance crop yields to cope with the increasing food demands due to population explosion world wide. However, the chemical fertilizers are truly blamed for water pollution that, makes the aquatic animals including fishes vulnerable to various ailments. The impact of fertilizer as a pollutant of fisheries was reviewed by Weldichuk (1974) reveals that the agrichemical pollutants in the aquatic environment cause ecological disruption.

Bobmanuel et al., (2006) observed that, agrochemical fertilizers have devastating effects on aquatic biota. Haque et.al.(2010) finds that excessive application of inorganic fertilizers may have adverse effects on the structure and function of community of an aquatic habitat. Many workers have observed detrimental effect of chemical fertilizers on the aquatic animals (Lioyd R, 1992; Ekweozor et.al., 2001; Sangeetha el.al, 2011). Fish are largely used for the assessment of aquatic environment quality and are accepted as bio-indicators of environmental pollution. The fishes are very susceptible to physical and chemical changes which may be reflected in their blood components. During the present study the effects of sublethal

exposure to DAP fertilizer on some haematological parameters of *Anabas testudineus* have been investigated.

MATERIALS AND METHODS

Procurement and maintenance of animals.

Healthy *Anabas tesudineus* of 22±2.2 gm wt and 11±1.6 cm size were procured from the focal fish market at Gileshan (Madhubani town, Bihar, India). The fishes were acclimalized to the laboratory conditions for two weeks under well aerated condition and fed twice daily with commercial diet.

Preliminary test

The physic-chemical features of waters were determined as per APHA (1998). (Table -1)

Table – 1
Water Quality Parameters during Urea fertilizer
Mean ±SD (2 replictes per treatment at 14 days and 28 days)

Parateters	On 0 days	On 14 days	On 28 days
Temperature	26.48 ±0.38^{0}C	37.34 ±0.26^{0}C	27.48 ±0.16^{0}C
Dissolved Oxygen (mg/L)	7.15 ±0.33	6.07 ±0.06	5.37 ±0.40
Total Hardness (ppm)	16.48 ±0.37	17.34 ±0.66	18.66 ±0.15
pH	6.26 ±0.17	6.25 ±0.04	6.43 ±0.11
Alkalinity	27.36 ±0.78	31.12 ±0.75	32.74 ±0.38

Selection of test concentration

8.5mg/L concentration of DAP was preferred to treat the fish for 14 and 28 days.

Experimental design

Blood was drawn from the DAP treated fish by cardiac puncture using a hypodermic syringe rinsed with anticoagulant (Heparin). Blood was transferred into heparin rinsed small vials.

RBC Count

Total RBC count done with the help of improved standard Neubauer

WBC Count

Total WBC count was done by using improved WBC differential count. Counting of Neutorphils, lymphocytes, eosinophils, basophils, monocytes in blood smears were determined as described by Anderson (2003).

Standard Neubauer Hemocytometer (Dacia and Lewis, 1968).

Haemoglobin determination

Haemoglobin was determined by Sahlis's method outlined by Wintorbe et. Al. (1981)

PCV estimation

Haemabocrit or the packed cell volume was determined by the method of Wintrobe et al (1981).

RESULT AND DISCUSSION

Reduction in the values of RBC total count, PC value and haemoglobin value was observed but the value of WBC total count was observed increased under both the exposure period for 14 days and 28 days when *Anabas testudineus* was treated with 8.5 mg/L concentration of DAP fertilizer in comparison to control values (Table - 2). Effects of DAP fertilizer exhibited increase in the values of Neutrophils, Lymphocytes and

monocytes but decrease in the value of Eosinophils and Basophils under both the exposure duration of DAP (Table-3).

The present findings shows agreement with the findings of Ajima et. Al., (2015) who reported reduction in the value of RBC count, heamoglobin and PCV and increase in the value of WBC count in comparisons to control, while working on the response of catfish *Clarias gariepinus* following chronic exposure to NPK (15:15:15) fertilizer. Iqbal et. Al., (1992) also reported similar trend in the value of RBC count, heamoglobin, haematocrit and WBC count while working on the effect of 50 ppm and 100 ppm urea on the haematological parameters of *Clarias batrachus.* Trivedi et al., (1990) reported decrease in RBC count, haemoglobin, haemotocrit and increase in WBC count while working on the hematotoric effects of DAP and urea on the fish *Clarias batrachus* also in unison with the present findings.

The present findings is also in agreement with the findings of Naqvi (2017) who reported similar trend in the values of RBC count, heamoglobin PCV and WBC while working on the haemotocrit assessment of commonly used fertilizer urea on the haematological parameters of the fish *Clarias batrachus.* The present work is also in conformity with the findings of Ghaffar et. Al (2016) who reported similar trend of alterations in the haematological parameters of the fish *Labeo rohila* exposed to Arsenic and urea combination. Nath et.al., (2017) while working on the effects of mustard oil cake on Haematological parameters of the freshwater fish *Channa punctatus* observed similar trend as in the present study. During the present investigation WBC differential count exhibited increase in the percentage of Neutrophil, Lymphocyte and Monocyte values and decrease in the values of Eosinophils and Basophils under the same concentration of DAP for both the exposure periods. (Table-3). The present study is in agreement with the findings of Khoshbabar Rostani et al., (2005) who noted an increase in Neutrophils, Eosinophils and monocytes in *Acipenser stellatus* exposed to thiamethoxon and they suggested that the increase in there differentiate might be due to stressors as these differentials play an important role in defense mechanism. Increase in Lymphocytes and Neutrophils was also reported by Nath et al (2017) in *Channa punctatus* exposed to mustard oil cakes, is also in conformity with the present findings.

Table – 2
Haematological Parameters of *Anabas testudineus* Control and Under DAP exposure at 8.5 mg/L for 14 days and 28 days

Exposure Period	Total No. of RBC (x 10^6/cmm)	Total No. of WBC (x 10^3/cmm)	Haemoglobin (g/100 ml)	Haematocrit (%)
00 days (Control)	2.83 $\pm$0.4	11.50$\pm$0.28	14.36$\pm$0.04	42.85$\pm$0.16
14 days exposure	1.38$\pm$0.36	16.14$\pm$0.54	5.7$\pm$0.09	28.4$\pm$0.24
28 days exposure	1.27$\pm$0.74	16.35$\pm$0.19	4.8$\pm$0.46	24.8$\pm$0.46

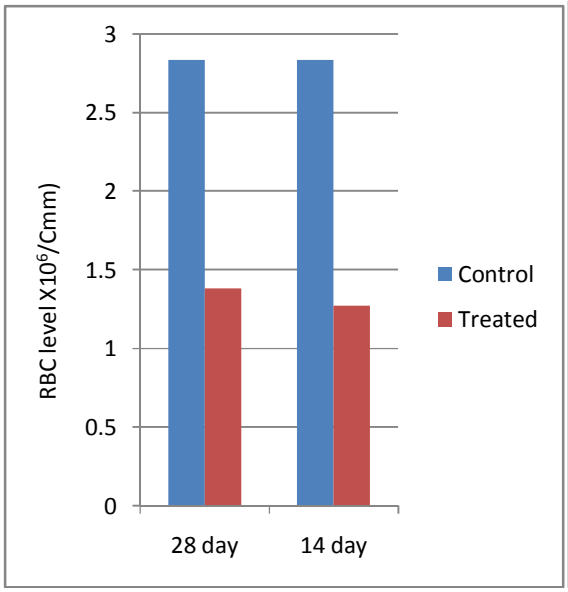

PLATE 1 PROFILES OF RBC NORMAL AND DAP TREATED OF Anabas testudineus

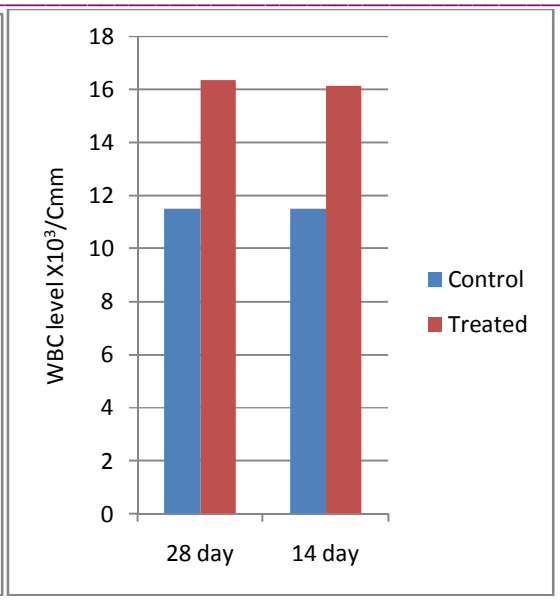

PLATE 2 PROFILES OF WBC IN NORMAL AND DAP TREATED OF Anabas testudineus

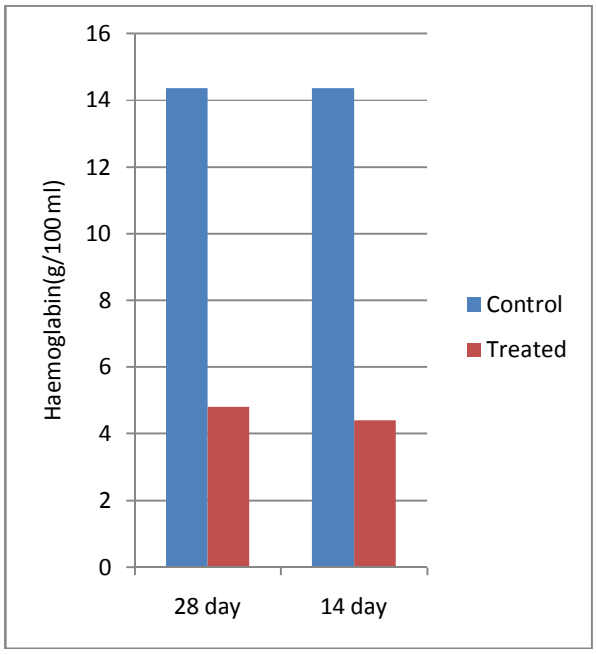

PLATE 3 PROFILES OF HAEMOLAOBIN IN NORMAL AND DAP TREATED OF Anabas testudineus

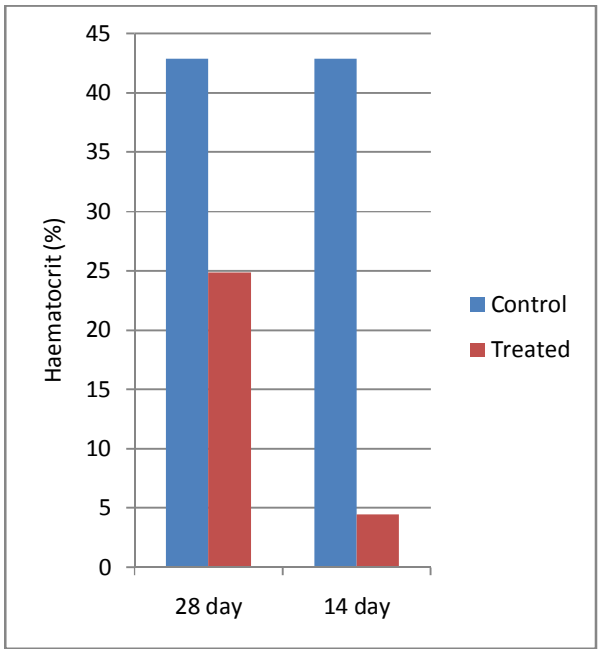

PLATE 3 PROFILES OF HAEMATOCRIT IN NORMAL AND DAP TREATED OF Anabas testudineus

Table – 3

WBC differential count of *Anabas testudineus* under Control and Under 8.5 mg/L concentration of DAP for 14 days and 28 days

Exposure Period	Neutrophils (%)	Lymphocyte (%)	Monocytes (%)	Eosinophils (%)	Basophils (%)
00 days Control	32.23 ±0.16	38.05±0.28	0.1±0.0	0.05±0.10	23.08±0.09
14 days exposure	39.3±0.32	53.2±1.76	6.5±0.12	0.16±0.32	0.1±0.89
28 days exposure	47.3. ±0.14	55.8±0.39	6.9±0.80	1.7±0.18	0.1±0.61

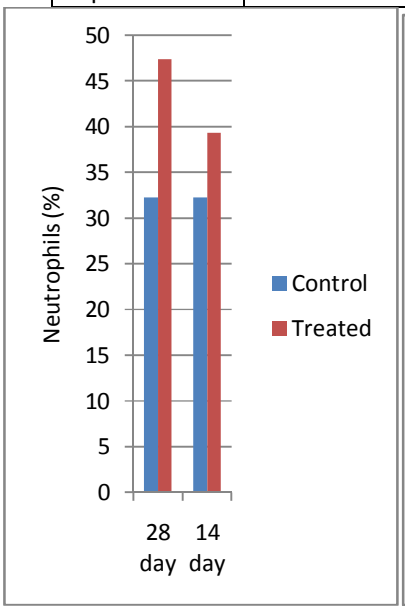

PLATE 5 PROFILES OF IN NEUTROPHILS IN NORMAL AND DAP TREATED OF Anabas testudineus

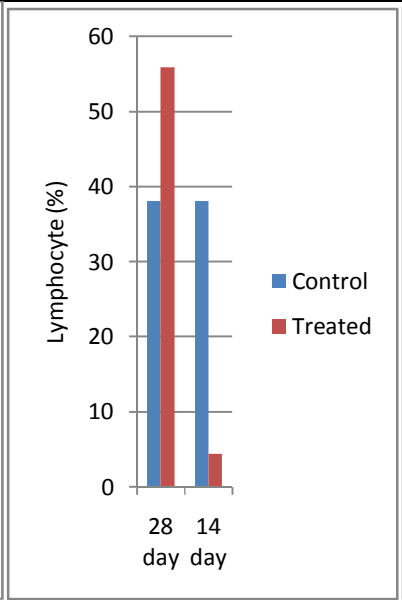

PLATE 6 PROFILES OF LYMPHOCYTE IN NORMAL AND DAP TREATED OF Anabas testudineus

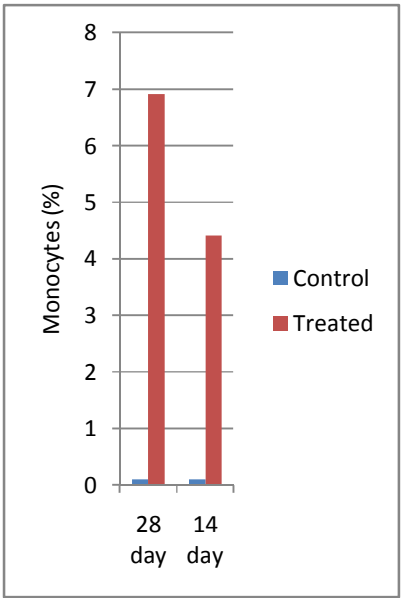

PLATE 7 PROFILES OF MONOCYTESIN NORMAL AND DAP TREATED OF Anabas testudineus

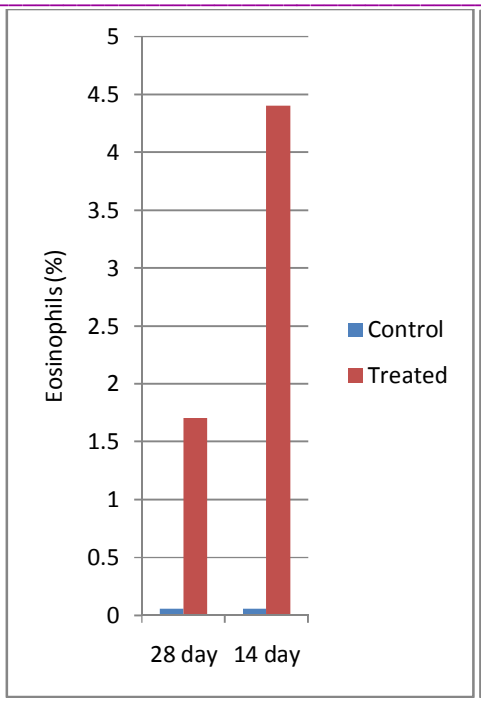

PLATE 8 PROFILES OF EOSINOPHILS IN NORMAL AND DAP TREATED OF Anabas testudineus

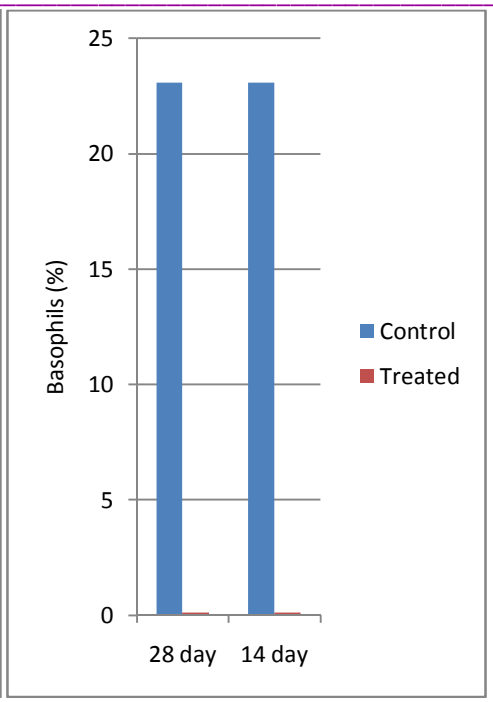

PLATE 9 PROFILES OF BASOPHILS IN NORMAL AND DAP TREATED OF Anabas testudineus

CONCLUSION

The effect of DAP on the haematological parameters assessed in the fish *Anabas testudineus* exhibited reduction in the haemoglobin, RBCs and Hot might be attributed to impairment of hematopoietic system. The increase in WBCs count might be attributed to the immune system of the fish to adapt to the change in their aqatic environments caused by the toxicity of DAP fertilizers. The result reveals that the physiology of fish gets affected under fertilizer stress harming the general health condition of Anabas testudineus, hence the use o DAP must be monitored for its judicious application by the concerned persons to keep its use environment friendly to the maximum possible extant, so that it may exert minimum possible stress on the fishes in their natural habitat.

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