

Table 2 Succinate dehydrogenase activity in the tissues of *Anabas scandens* under different nutritional status (values are mean \pm S.E. of ten determinations).

Dietary status	Liver	Muscle	Kidney	Brain	Gills
Control	0.93 \pm 0.04	2.18 \pm 0.03	0.36 \pm 0.01	0.90 0.02	0.39 0.01
High protein diet	1.11** \pm 0.02	2.64* \pm 0.01	0.41** \pm 0.01	1.24* \pm 0.01	0.43 \pm 0.03
%Change	19.37	21.04	12.77	38.21	8.90
High Carbohydrate diet	1.45* \pm 0.10	2.70* \pm 0.04	0.43*** \pm 0.01	1.24* \pm 0.04	0.46** 0.02
%Change	31.21	23.70	18.88	38.22	16.28
Starvation	0.88 \pm 0.02	1.21* \pm 0.05	0.29* \pm 0.02	0.80* \pm 0.01	0.31* \pm 0.05
% Change	- 5.38	-44.52	-20.27	-10.88	-21.8

Values expressed as units. 1 Unit = moles of formazan formed/mg. protein/hour. * $P < 0.001$
** $P < 0.01$, *** $P < 0.05$

ated levels of activity. Further, this increase is more than the values observed under high protein diet as a result of excessive intake of carbohydrates.

Under starvational stress the enzyme level falls in all the tissues except liver. The low level of activity coincides with the low metabolic rate due to the dearth of nutrients. The insignificant change in the activity levels of SDH in the liver tissue shows that this organ carries out its synthetic and catabolic function more or less at a steady state to regulate the adaptive mechanisms. The liver should continuously produce glucose to maintain a constant circulating level making use of all available sources and by gluconeogenesis. There is evidence of operation of gluconeogenesis during starvation in fishes⁴. Therefore it is probable that a similar mechanism is operating in the liver of *A. scandens* and consequently SDH level is not affected in the liver.

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ERYTHROCYTIC ANISOCYTOSIS DUE TO HELMINTHIASIS IN POULTRY

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ERYTHROCYTIC anisocytosis has been reported in several protozoan, bacterial, viral and nutritional deficiency diseases that affect the poultry. Microcytosis was observed by Gray *et al*¹ in haemorrhagic syndrome, Chandrasekharan and Krishnan² in ranikhet disease and Rajendran *et al*³ in fowl pox. Macrocytosis has been reported by Hogan and Parrott⁴ in Vitamin B₆ deficiency, Goff *et al*⁵ in riboflavin deficiency, Chandrasekharan *et al*⁶ in pullet disease and Rajendran *et al*³ in ranikhet disease, Caecal coccidiosis and erythroleucosis. Rajendran *et al*³ stated that the increase of the mean corpuscular volume in the diseases studied by them is due to the presence of a large number of immature cells in the blood.

In the present study the effect of helminthiasis on the mean corpuscular volume of erythrocytes of the domestic fowl was assessed. The total erythrocyte count (TEC) and the haematocrit (PCV) were estimated in 400 birds⁷ and from these values the mean corpuscular volume of erythrocytes was calculated. Visceral examinations were also carried out in these birds to record the number, sex, size and state of maturity of the various types of gastrointestinal helminths, if any, that were infecting the fowl.

The results (table 1) obtained with healthy fowls indicate that the corpuscular size of erythrocytes is

Table 1 The values of mean corpuscular volume (MCV) of erythrocytes in the healthy (uninfected) and helminthic infected (natural infection) domestic fowl, *Gallus domesticus* of 3-4 months age

	*MCV (Cubic microns)	
	In cockerels	In pullets
None	115.3 ± 28.4	146.4 ± 44.8
Single Infection ¹		
<i>Raillierina tetragona</i>	118.0 ± 30.4	128.2 ± 51.9
<i>Raillietina echinobothrida</i>	175.2 ± 79.0	151.2 ± 90.5
<i>Raillietina cestocillus</i>	95.6 ± 15.4	130.9 ± 6.7
<i>Choanotaenia infundibulum</i>	112.2 ± 1.4	—
<i>Hymenolepis carioca</i>	125.7 ± 7.2	—
<i>Ascaridia galli</i>	149.8 ± 41.8	156.6 ± 137.1
Double Infection ²		
Group-I	147.7 ± 10.3	169.7 ± 102.2
Group-II	133.6 ± 30.9	122.2 ± 8.5
Triple Infection ³		
Group-I	167.2 ± 64.7	122.1 ± 16.2
Group-II	120.7 ± 4.8	117.4 ± 14.0
Quadruple Infection ⁴		
Group-I	115.1 ± 11.6	126.8 ± 25.4
Group-II	205.2 ± 128.7	—

* The data includes an average of 15-20 samples

N.B.: Infection with 1. one 2. two 3. three 4. four different types of worms (among six types mentioned above) in combination at a time affecting the same fowl Group-I = Infections resulting in leucopenia Group-II = Infections resulting in leucocytosis.

much bigger in females than in males. The average of the values of the mean corpuscular volume in both the sexes is $130.9 \mu^3$ and this is in close agreement with that of Rajendran *et al*³ who observed $134.9 \mu^3$ as the mean corpuscular volume in chicks of mixed sex which were below 16 weeks of age. The cockerels and pullets used in the present investigation were 3 to 4 months old. Chandrasekharan *et al*⁶ reported much lower value of mean corpuscular volume in pullets; Goff *et al*⁵ observed a slightly higher value of mean corpuscular volume in cockerels.

In *Hymenolepis carioca*, *Ascaridia galli* and *Raillietina echinobothrida* infections, the mean corpuscular

volume in cockerels increased considerably, the maximum increase being in *R. echinobothrida* infection. Thus the infection with these three worms resulted in macrocytosis. In *R. cestocillus* infection the mean corpuscular volume was lowered quite significantly and this shows the macrocytic condition of the erythrocytes. The erythrocytes were normocytic in *R. tetragona* and *choanotaenia infundibulum* infections. In groups I and II of double, as well as triple infection and group II of quadruple infection, the mean corpuscular volume of erythrocytes registered a significant increase suggesting macrocytosis. In group I of quadruple infection, the mean corpuscular volume of erythrocytes registered a significant increase suggesting macrocytosis. In group I of quadruple infection, the mean corpuscular volume was almost the same as the normal thereby suggesting the normocytic nature of the erythrocytes in these infections.

In *R. tetragona*, *R. cestocillus*, group II of double infection, groups I and II of triple infection and group I of quadruple infection, the mean corpuscular volume in pullets was significantly lowered, whereas in the remaining infections, it registered a slight increase. But in the infections where there was an increase in the corpuscular volume, the standard deviation is exceptionally high thus suggesting that the individual values show high variation among themselves.

Thus, helminthiasis, in general, results in macrocytosis in cockerels and microcytosis in pullets.

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