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Research Article

IMPACT OF MORINGA LEAVES ON ERYTHROCYTES MATURATION IN A MAMMAL *CAVIA PORCELLUS*

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ABSTRACT
The experimental animal *Cavia porcellus* was fed experimental diet Moringa leaves at the rate of 40 gms/kg body weight of experimental animal per day for the different time duration i.e. 7, 15, 30, 45 and 60 days. A linear enhancement in erythrocytes in comparison to the control value (3.21 x 10^6 mm^3) was observed. The increased values were 3.48 x 10^6/ mm^3, 3.74 x 10^6/ mm^3, 4.28 x 10^6/ mm^3, 4.40 x 10^6/ mm^3 and 4.56 x 10^6/ mm^3 respectively. Which was proportional to the duration of feeding schedules and ranging from 8.41% to 42.05%. The increase in erythrocytes was probably due to the presence of some active ingredients of Moringa such as, β – carotene, cynocobalamine, and folic acids. They play a vital role in the maturation and formation of erythrocytes during haemopoisis and suggesting a very nutritionous food for human beings.

Key Words*: β – carotene, Cavia Porcellus, Cynocobalamine, Erythrocytes, Moringa*

INTRODUCTION
In general, eating a wide variety of fresh whole food has proven favorable for one's health compared to monotonous diets based on processed foods (Alexander, 1999). In particular, the consumption of entire plant foods slows digestion and allows better absorption and a more favorable balance of essential nutrients per calorie resulting in better management of cell growth, maintenance and cell division, as well as better regulations of appetite and blood sugar. Regular scheduled meals have also established more wholesome than infrequent haphazard ones.
As such, importance of a diet consisting of plant products, vegetables and fruits was known to people since ancient time. Even in modern days lot of investigation are being carried out in India and aboard to unearth the beneficial properties of plants and their products as diet keeping the human population healthy as well as to help in cure of various aliment.
Moringa oleifera is the most widely cultivated plant of family moringaceae. Over the past two decades, many reports have appeared describing its nutritional and medicinal properties. It is a rich source of vit.-A, B- complex, C, Fe, Ca, Na and other many ingredients, which improve Haemoglobin, Erythrocyte, Protein and some active constituents which show antidiabetic and anticholesterolemic property (Ross, 2009).
The study of haematology is undertaken for one of two general purpose, the first is the pursuit of knowledge about blood itself as a part of a physiological appreciation of life and the second depends on the fact that small samples of blood are easily obtainable during the life of the subject and can be examined to help in assessment of health status of the subject.
Estella *et al.,* (2002) were of the view that *Moringa* was considered good for woman suffering with anemia (Siddhuraju and Becker , 2003) and Anwar and Bhanger, (2003) have also found similar results. Anti-anemic role of *Moringa oleifera* in general has been observed by Olugbemi *et al.,* (2010). A review of literature shows that lot of scientific investigation is still required for understanding the Mystic relation of plants, their parts and ingredients with human welfare. As such, the present project has been undertaken to evaluate the effects of Moringa leaves on the erythrocytesin *Cavia porcellus*.
Main objective of this project is to find some scintillating results which will help in promoting the use of plants product and their parts as diet to the population for keeping one self healthy and energetic.

MATERIALS AND METHODS

Cavia porcellus were reared in the animal house of the Department of Zoology, V.K.S.U., Ara. Animal selected for the present experiment (4-5 month old male and weigh 400-500 gms) were kept in separate cages and maintained under natural photoperiod. Regular cleaning of the cages was done to maintain proper hygienic condition.

For the experiment the animals were divided into two group, control and experimental. The animal of both group were fed thrice in a day viz. 9.00 A.M., 3.00 P.M and 9.00 P.M. the animals of control group were fed with normal grass@ 40gm/kg body weight in each session. While the animals of experimental group were fed Moringa leaves only in the morning session and exclusively grass on the rest of session. The quantities of Moringa leaves and grass for the experimental animal at the time of each feeding were @ 40 gm/kg body wt.. Both groups of animals were fed regularly with their respective diets for 7 days, 15 days, 30 days, 45 days and 60 days respectively. The blood samples from the control and experimental animals were collected after completion of feeding scheduled between 10 A.M to 11 A.M to avoid the circadian rhythms if any.

The blood samples were collected though a syringe by puncturing the heart and kept in a dry clean vial containing the heart and kept in a dry clean vial containing a pinch of EDTA. The Total Erythrocyte Count (TEC) was done as per the method of Dacie and Lewies, (2008).

The data represents the mean value of six animals with ± standard error and statistical analysis for test of significance between treated and control animal was analyzed by using student't' test at 5% P-level.

RESULTS AND DISCUSSION

A linear enhancement was found when, the TEC was enumerated in the animals fed with Moringa leaves after feeding for 7 days, 15 days, 30 days, 45 days and 60 days, a value of $3.48 \times 10^6/ mm^3$, $3.74 \times 10^6/ mm^3$, $4.28 \times 10^6/ mm^3$, $4.40 \times 10^6/ mm^3$ and $4.56 \times 10^6/ mm^3$ respectively were obtained. These values and maturation of RBC. The final maturation of RBC depends on the presence of vitamin B_{12} and Folic acid because each in a different way was required for the formation of thymidine triphosphate (TTP) which is essential building block of DNA (Guyton, 2000).

show an increase of 8.41%, 16.51%, 33.33%, 37.07% and 42.05% respectively on comparison with the control TEC value ($3.21 \times 10^6 mm^3$). In this case also the increased values of TEC were found statistically significant at 5% P - level from the very start of the experiment and continue as such till the end of the experiments as evident from the calculated 't' values (Table – 1, Fig-1).

In the present study the scholar has tried to evaluate the nutritional as well as medicinal properties of *Moringa oleifera*. The maturation of R.B.C requires mainly two vitamins i.e. Cynocobalamine (B_{12}) and folic acid and β – carotene. Either vitamins B_{12} or folic acid deficiency causes failure of R.B.C. maturation known as erythropoiesis (Guyton, 2000; Johnson, 2006) has also observed that B_{12} is required for RBC maturation and its deficiency caused pernicious anemia. The Moringa leaves contains: 2000 µg β – carotene, 0.05 mg of B_{12} besides other vitamins.

Process of maturation of erythrocytes is divided mainly into three steps (a) Formation of early erythroblast (b) Normoblast and (c) Erythroblast. All these processes require iron for haemoglobin formation especially for synthesis of haem, whereas Cu and Mn help in to conversion of iron into haemoglobin by catalytic action, vitamins like C, B_{12}, B_2, B_6, folic acid and nicotinic acid, play important roles in maturation of erythrocytes (Chatterjee, 1994). These all nutrients and vitamins are present in Moringa in adequate amount. Siddhuraju and Becker, (2003) also observed that Moringa leaves were very useful in anaemic patients. Ghebereselassie *et al.*, (2011) reported that *Moringa* leaves extract increased erythrocytes approx. 30 % when treated with 600 mg per day to mice till 30 days and were of the view

Table 1: Erythrocytes (10^6/mm^3 blood) in experimental animals fed with *Moringa* leaves for different durations

S.N.	Day	Control value ± S.E	*Moringa* leaves fed experimental animals		
			Value ± S.E*	% Increase**	t- value***
1.	7	$3.21 \times 10^6 \pm 0.048$	3.48 ± 0.113	8.41	7.51
2.	15		3.74 ± 0.339	16.51	13.67
3.	30		4.28 ± 0.412	33.33	29.33
4.	45		4.40 ± 0.096	37.07	33.65
5.	60		4.56 ± 0.191	42.05	35.78

**S.E= Standard Error*
*** % decrease = percentage increase from control*
****'t' = 2.13 (5% P-Level)*
n = 6

that the glucosinolate presence in the Moringa leaves responsible for this. Chumark, (2005) also reported approximately 29% increase in R.B.C. content in the blood of rabbit when fed with water extract of Moringa leaves. *Moringa* leaves contain β-carotene, Fe and cynocobalamin are responsible for formation

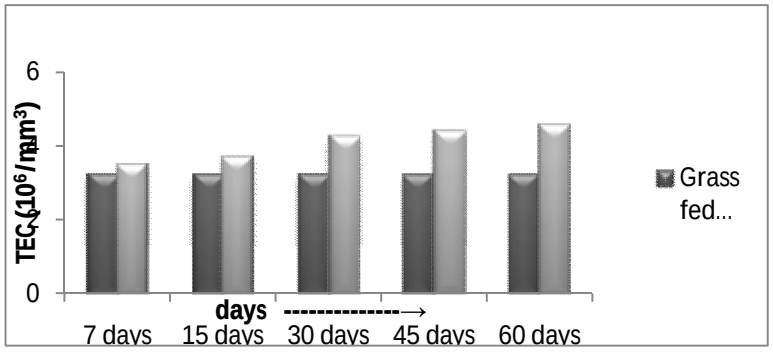

Figure 1: Total Erythrocyte Count (Tec) In Experimental Animals Fed With Moringa Leaves For

Thus, the finding of the present project is in conformity of the works of the earlier investigators and the scholars believe that the contents of the Moringa leaves contain sufficient amount of minerals and vitamins considered to be essential for RBC formation and maturation.

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