PROSPECTS OF ALGAL BIODIVERSITY AND BIOTECHNOLOGICAL STUDY IN NORTH-EASTERN STATES OF INDIA

S.L.GUPTA
Arunachal Pradesh Field Station, Botanical Survey of India, Itanagar-791 111.

Biodiversity, i.e., biological diversity is defined as the variety and variability of plants, animals and microorganisms. Plants are the only natural productive resource of the nature and its loss is an irreversible process hence it is imperative to conserve this unique resource. India possess about 11% of total world's plant diversity and has been identified as one of the 12 'Mega Diversity' centres of the world. The north-eastern India including eastern Himalaya is the richest region due to which it is proposed to set up a national institute of biodiversity in Arunachal Pradesh. A central team, which recently visited different sites in Arunachal Pradesh, has also emphasized researches on microbial diversity in addition to the higher plant diversity study during discussions.

Algae is a major part of microbial diversity which is recognised as a major component of the food chain and on which no major exploration has been conducted in the past as far as Arunachal Pradesh is concerned. Represented by over 6500 species under about 666 genera, they grow in a variety of habitat and are source of several natural products, eco-friendly biofertilizers (Gupta, 1997a) and fine chemicals. Biotechnology has the potential to develop modified plants, animals and microorganisms. *In situ* protection of ecosystem and *ex situ* conservation of biological and genetic resources can help in using biological resources sustainably (Tewari, 1993). Likewise algal biotechology is one such area which despite many problems, also has many prospects in solving some environmental problems.

Prospects of advance researches on algal biotechnology are as follows :

i) *Algal biomass as food* : The chief component of algal biomass is crude protein. Many unicellular forms of algae like *Chlorella* is being exploited as a source of single protein (SCP) mainly in western countries. Large scale production of algal food is being carried out in pacific countries like Japan, Philippines etc. from marine algal species.

ii) *Algae as a biofertilizer* : Algae, particularly cyanobacteria, is a rich source of pollution free eco-friendly biofertilizers being utilized commercially for enhancing paddy production. At least 15 genera including *Tolypothrix, Nostoc, Anabaena* and *Cylindrospermum* are used for better crop production. 'Jhum' cultivation in Arunachal Pradesh is quite common which resulted loss of nutrient soil. Application of nitrogen fixing cyanobacteria may maintain nutrient status of the soil.

iii) *Hydrogen production* : Hydrogen is considered as a cheap and pollution free energy source. Many algal species of *Chlorella, Microcystis, Oscillatoria, Scenedesmus*, and *Synechococcus* may be exploited for hydrogen production which may become energy of the future.

In addition, photoproduction of ammonia from some cyanobacteria like *Anacystis nidulans* is a remarkable process for conversion of solar energy into chemical form. It is to be mentioned here that ammonia is also valuable as a fuel as well as a fertilizer.

iv) *Pollution indicator* : Many algal species act as an efficient pollution indicator. Microalgae may accumulate many thousand folds of heavy metal from polluted aquatic environment and thus may be applied in solving metal problems of the environment.

v) *Medicinal application* : Algae is a potent source of many kinds of medicines including vitamins. Chlorellin from *Chlorella*, acrylic acid from *Phaeocystis*, kainic acid from *Digenea*, tarpene from *Lyngbya* spp. and polysaccharides from *Asterionella* are some common examples. Recently a rich vitamin source is being marketed under the brand name 'Sunova Spirulina' extracted from cyanobacterium *Spirulina*.

Thus it is clear that study on algal biodiversity and advance researches on algal biotechnology may lead to proper environmental conservation programmes for achieving sustainable development in the benefit of local population of north-eastern states, in general and Arunachal Pradesh, in particular. Ecologically, both may act as supplement to each other. On one hand, biotechnology can alter the fundamental processes, viz, energy-flow and biogeochemical cycles and on the other hand, it depends on the availability of a sustainable gene pool (Gupta, 1996, 1997b) by keeping priorities of biodiversity in mind (Gupta, 1998).

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SOME OBSERVATIONS ON THE HAEMATOLOGICAL EFFECTS OF INHALATION EXPOSURE TO MOSQUITO REPELLENT IN RABBITS

G. KRITHIGA, REBECCA ISAAC and D.J. PRAKASH

Postgraduate and Research Department of Zoology, Voorhees College, Vellore (Tamil Nadu) - 632 001.

In recent years, a significant increase is seen in the use of electrically operated mosquito repellent mats in our country. Such mats are composed of paper mat, insecticide stabilizer, slow releasing agents and colour with fragrance. They have d-(trans) allethrin 4% W/W as the ingredient compounded with PBO form. Several experimental studies were conducted recently (Mc Govern & Schreck, 1988; Tunon, Thorsell & Bohlin, 1991) to show the effects of mosquito repellents on mice and in a separate study on the children (Azizi & Henry, 1994). However, the precise information on the toxic effects of them in mammals is obscure. The present study was undertaken to investigate the chronic effects of mosquito repellent on various blood parameters in rabbits.

Three adult male albino rabbits were exposed to commercially available mosquito repellent mat in an exposure chamber for 35 days, for 24 hours each day. Three control animals were sham - exposed simultaneously with air circulation only. Blood samples were collected at similar time intervals from the marginal ear veins. Red blood cell size measurement, enumeration of eyrthrocytes and leucocytes, haemoglobin, ESR, PCV and calculation of absolute values such as MCV, MCH, MCHC, MCD, MCAT, were done using standard methods.

Table 1 summarises the blood parameters and absolute values obtained during the present study. The red blood cell size remained unchanged (7 μm). The erythrocyte count gradually declined from 6,130,000/cu.mm to 2,050,000/cu.mm. Such a decrease reflected in the reduction of the haemoglobin concentration (9.6gm% to 4.6gm%). Corresponding differences were also observed in MCV, MCH, MCHC and MCAT. Similar decrease was also noticed in ESR (0.5 mm to 0.2 mm/hr) and PCV (44% to 32%). The total number of leucocytes was also lowered significantly (11,650/cu.mm to 5,600/cu.mm).

Table 1. Blood parameters and values during the experiment.

Parameter	Control	Experimental Days				
		7	14	21	28	35
RBC size (μm)	7.0	7.0	7.0	7.0	7.0	7.0
RBC count/cu.mm	6000000	6130000	4980000	4160000	3720000	2050000
Hb gms/100ml	9.6	8.6	7.4	6.1	5.2	4.6
ESR mm/hr	40	30	26	25	23	20
PCV%	46.8	44.0	42.0	40.0	38.0	38.0
WRC count/cu.mm	11650	10350	7900	7500	6400	5600
Mean Blood pressure mm/Hg	95	94	96	95	94	95
MCV	68.0	71.7	86.3	96.1	102.1	156.0
MCH	22.5	14.0	14.8	14.6	13.9	22.4
MCHC	33.0	19.5	17.2	15.2	13.6	14.3
MCD	7.0	7.0	7.0	7.0	7.0	7.0
MCAT	1.7	1.8	2.2	2.4	2.6	4.0